Motivated Institutional Investors and Firm Investment Efficiency*

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Abstract

This paper investigates whether firms with higher institutional investors' attention make more efficient investment decisions. Institutions have the most motivation to monitor firms whose holding value are in the top 10% of institutional portfolios. Using the Russell index reconstitution as exogenous shocks to institutional ownership during the 1995-2015 period, we find that U.S firms with high motivated monitoring institutional ownership deviate less from predicted investment levels. The higher motivated institutional ownership is associated with both lower over- and under-investment. Our results are consistent across the different classifications of institution types. Furthermore, we show that the motivated monitoring institutions mitigate over-investment of free cash flow and under-investment due to managers' career concerns. Firms benefit from institution monitoring because our inefficient investment proxies are negatively related to subsequent stock returns. Overall, our results provide new insights into the importance of institution's attention in corporate activities.

Keywords: Institutional investors; Investment efficiency; Monitoring attention; Index switch
JEL classification: G23; G30; G31; M4

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1 Introduction

Institutional investors are important in the capital market because they hold the majority of the market value of U.S stocks (Allen, 2001; Blume and Keim, 2012). The rise of institutional investors over the past four decades (Gompers and Metrick, 2001) positions them as the largest shareholders of most public firms. Compared with retail investors, institutional investors play a more active role in corporate activities. Recent literature uses Russell 1000/2000 index assignments to identify exogenous changes in institutional ownership and documents a positive effect of institutional ownership on corporate activities (e.g. Boone and White, 2015; Appel et al., 2016b; Bird and Karolyi, 2016; Crane et al., 2016; Schmidt and Fahlenbrach, 2016). In practice, it is expensive and time-consuming for investors to collect firm-specific information, analyze the information with professional expertise, monitor firm activities, and intervene through shareholder activism. Given the trade-off between the costs and benefits of active monitoring, institutional investors may not have the same incentive to improve firm governance for the following two reasons. First, institutional investors are heterogeneous at the portfolio level. They differ in terms of types, the length of trading horizons, and activeness (Bushee, 1998; Chen et al., 2007; Schmidt and Fahlenbrach, 2016). Second, the attention of institutional investors is limited. Institutional investors can not evenly monitor all firms held in their portfolios (Kempf et al., 2016) so the motivation of institutional monitoring would depend on the importance of an individual stock in their portfolios (Fich et al., 2015). The previous literature has largely focused on the heterogeneity of institutions and how investors with similar characteristics affect firm performance. Relatively little is known about the divergence of investor monitoring motivation or intensity among all stocks in their portfolios and how this divergence affects managerial decision making.

In this paper, we focus on the limited attention of institutional investors and examine the role of motivated monitoring institutional investors in mitigating corporate inefficient investment. We investigate the monitoring role of institutional investors in investment

because investing in projects with positive net present value (NPV) is one of the important determinants of firm future growth. Firms may not invest efficiently due to the conflict of interests between managers and shareholders. Several managerial agency problems leading to over-investment (e.g. Jensen and Meckling, 1976; Shleifer and Vishny, 1997; Richardson, 2006) and under-investment (e.g. Porter, 1991; Bertrand and Mullainathan, 2003; Aghion et al., 2013) are documented. Because higher inefficient investment is associated with lower firm performance (Titman et al., 2004; Cai and Zhang, 2011), understanding whether and how institutional investors improve firm investment decisions by monitoring activities is of particular importance.

When economic agents have limited information-processing capacity, less attention may be rational (Sims, 2003). Based on the assumption of limited attention, Kacperczyk et al. (2016) develop an attention allocation model to predict mutual funds' optimal information choices. Kempf et al. (2016) provide the empirical evidence that an institutional investor's monitoring attention on a certain firm gets distracted if there is an exogenous shock on unrelated firm stocks in its portfolio. Motivated by these studies, we measure an institutional investor' attention to a firm or willingness to monitor the firm by the fraction of the institution's portfolio represented by the firm. We predict that a higher proportion of an institution's portfolio represented by a firm will be associated with higher benefits of monitoring that firm. A firm should get more attention if it is more important to the institution's portfolio. So one can posit that there will be an optimal level of attention determined by this trade-off between monitoring benefits and costs. It is worth noting that the opportunity cost of attention should not be ignored in the trade-off when the attention is in limited supply. An institution's attention on an important firm may get distracted if the institution also monitors unimportant firms in its portfolio. Fich et al. (2015) use this measure as the proxy for the motivation of institutional monitoring and find that targets with more motivated monitoring institutional ownership have higher deal premiums and deal completion probabilities. We extend Fich et al.'s (2015) study to firm investment decisions and also compare the motivated monitoring institutional investors to those with

the least motivation to monitor.

Using a large U.S sample for the period of 1995-2015, we measure inefficient investment by the abnormal investment estimated by the investment model developed by Richardson (2006), where over-investment (under-investment) is reflected in a positive (negative) residual. In addition to using Richardson's (2006) single panel regression, we also estimate the inefficient investment in a year by a historical panel regression from 1981 to that year. The historical panel regression method avoids using the unknown firm information in the future to predict the optimal current level of investment. All three measures of inefficient investment are negatively associated with cumulative excess stock returns over the following year, suggesting that institutional investors should pay attention to firm investment decisions. Our measure of institutional investors' motivation to monitor follows Fich et al. (2015). We sort all stocks into ten decile groups by their holding value weights in institutional portfolios. Institutional investors have the highest (least) motivation to monitor firms in the decile 1 (10) groups including the top (bottom) 10% holding rankings. This motivation measure can also be taken as the incentive or intensity of institution monitoring, given that the monitoring attention of institutional investors is limited.

To test the relation between institutional ownership and firm inefficient investment, we must address the endogeneity of institutional ownership. Firms with higher or lower institutional ownership may differ in unobservable characteristics. Therefore, comparing investment efficiency between firms with higher or lower institutional ownership may simply capture the effect of the unobservable differences instead of the effect of institutional investor monitoring. Furthermore, institutional investors may have better information and choose to invest in firms with better investment efficiency and corporate governance. We attempt to mitigate the endogeneity due to the omitted variables and the reverse causality by using the instrumental variables (IV) based on the Russell index annual reconstitution. When firms switch between the Russell 1000 and 2000 indexes, get included in the Russell 2000 index for the first time, or leave the Russell 2000 index, there are exogenous changes in institutional holdings (e.g., Chang et al., 2015; Fich et al., 2015; Crane et al., 2016;

Schmidt and Fahlenbrach, 2016). We estimate the relation between institutional ownership and firm inefficient investment in a standard 2-stage least squares (2SLS) estimation framework, similar to Fich et al. (2015) and Schmidt and Fahlenbrach (2016).

Three key findings are yielded in our analyses. First, we show that higher motivated monitoring institutional ownership is associated with the less deviation of investment from its predicted level. Both under- and over-investment are negatively related to motivated monitoring institutional ownership, suggesting that firms which are more closely monitored tend to invest more efficiently. The monitoring role of motivated institutions is economically important. A one standard deviation increase in motivated monitoring institutional ownership results in a $22.8 million reduction in annual under-investment and a $60.1 million reduction in annual over-investment for the average sample-size firm with $2,648.1 million total assets.[1] Second, the effect of the least motivated institutional ownership on firm under-investment is positive and statistically significant, whilst the effect on firm over-investment is insignificant. This result supports our view that the effectiveness of institutional monitoring is influenced by the relative importance of the monitored firms within the institutional portfolios. Third, motivated monitoring investors mitigate the over-investment problem in firms with more cash reserves or free cash flows and mitigate the under-investment problem by reducing the career concerns of firm managers.

Our paper contributes to the literature in four ways. First, we contribute to a growing body of literature that studies the relation between the attention of institutional investors and corporate decision making. Our paper extends Fich et al.'s (2015) study of motivated monitoring institutional investors in M&As to firms' general investment decisions. Kempf et al. (2016) and Liu et al. (2016) find that the monitoring attention of institutional investors on one firm can be distracted by negative shocks to the others in the institutional investors' portfolios. In line with these studies, our results support the limited attention hypothesis that institutional investors can not evenly distribute their monitoring atten-

[1]The marginal effect numbers reported here are based on the inefficient investment estimated by the historical panel regressions.

tion among all firms in their portfolios. We show that the effectiveness of institutional monitoring on inefficient investment is reduced as the motivation of monitoring decreases.

Second, our study adds to the studies examining the factors that affect corporate investment, such as free cash flow (Jensen, 1986; Richardson, 2006), earnings management (McNichols and Stubben, 2008), financial reporting quality (Biddle et al., 2009; Cheng et al., 2013; Balakrishnan et al., 2014), management forecast ability (Goodman et al., 2013), product market competition (Gu, 2016; Stoughton et al., 2016), policy uncertainty (Gulen and Ion, 2016), accounting conservatism (Lara et al., 2016), mutual fund flow (Lou and Wang, 2016), and changes in GAAP (Shroff, 2016). Our paper identifies the motivated monitoring institutional ownership as a new factor that reduces firm inefficient investment in both directions.

Third, we shed light on the debate regarding which institutions are more likely to monitor corporate activities. Previous studies find that institutional investors are heterogeneous and only a subset plays an active role in corporate governance (e.g., Brickley et al., 1988; Bushee, 1998; Chen et al., 2007; Cronqvist and Fahlenbrach, 2009; Fich et al., 2015). Recently, Schmidt and Fahlenbrach (2016) find that exogenous increases in passive institutional ownership weaken firm corporate governance and reduce the subsequent firm performance, while Appel et al. (2016b) document that passive mutual funds actually influence firms' governance choices through their large voting blocs and improve firms' long-term performance. We find that all types of motivated monitoring institutional investors reduce inefficient investment, supporting the view that passive institutional investors do monitor important firms in their portfolios.

Finally, our paper complements a working paper on institutional investors and corporate investment. Wong and Yi (2015) find that firm total institutional ownership is positively related to firm investment and this relation is more pronounced for passive investors than the types of institutional investors. We examine both over- and under-investment in our analyses and use different definitions of inefficient investment. Contrary to Wong and Yi (2015), we document a negative relation between motivated monitoring institu-

tional ownership and firm inefficient investment. More importantly, this negative relation is robust to different types of institutional investors.

The rest of the paper is organized as follows. Section 2 develops our hypotheses. Section 3 describes the details regarding the data sources and variable definitions. Section 4 presents main test results and addresses endogeneity. Section 5 discusses how motivated monitoring institutional investors reduce inefficient investment and provides robustness test results. Finally, Section 6 concludes.

2 Hypotheses and empirical predictions

In a perfect capital market without any frictions (Modigliani and Miller, 1958), firm financing and investment decisions are independent. The neoclassical theory of investment predicts that the only determinant of a firm's investment policy is its growth opportunities which are commonly measured by Tobin's Q (Hayashi, 1982; Abel, 1983). Given this ideal framework, the optimal level of investment is achieved when the new investment's marginal benefit is equal to the sum of its marginal cost and the adjustment cost of capital. However, real firm investment usually deviates from the optimal level due to frictions in the capital market such as external financing costs, conflict of interests between managers and shareholders, information asymmetry, managerial optimism or pessimism.

Previous studies suggest that higher inefficient investment is associated with lower subsequent firm performance (e.g. Titman et al., 2004; Cai and Zhang, 2011). Therefore, firm shareholders have a strong incentive to monitor the managers' investment decisions. Institutional investors are usually more active and effective than individual investors in these monitoring activities, because shareholder activism is costly and it is difficult for individual investors to intervene collectively. Nevertheless, the attention of institutional investors is limited and they can not equally monitor all stocks in their portfolio (Kempf et al., 2016). The motivation of institutions to monitor must be positively related to the benefit of monitoring and negatively related to the cost of monitoring. Fich et al. (2015)

find that the institutional investors of M&A targets have a greater incentive to monitor when the target stocks are more important relative to their portfolios. Following Fich et al. (2015), we define for each firm, the most motivated (least motivated) monitoring investors as those whose holding value in the firm is in the top (bottom) 10% of their portfolio. Intuitively, the rank of a stock's weight in an institutional investor's portfolio is positively related to the benefit of monitoring. Given limited attention, even if the actual costs of monitoring are equal for all firms in the portfolio, the opportunity cost of monitoring is the highest for the firms in the bottom 10% of the portfolio. When institutional investors monitor the firms in the bottom 10% of their portfolios, attention on the other positions with higher holding value may get distracted. This leads to our first hypothesis:

- ***H1:*** *Motivated monitoring institutional ownership is positively associated with investment efficiency.*

Our next two hypotheses examine the inefficient investment direction. Previous studies document two agency problems leading to firm under-investment. First, it takes managers' time and effort to look for positive NPV projects. Managers may instead enjoy "the quiet life" if there is a lack of corporate governance (Hart, 1983; Bertrand and Mullainathan, 2003). Institutional investor monitoring may reduce this kind of managerial slack. Second, the outcomes of new projects remain uncertain, even if managers spend a great amount of effort on supervising the projects. When information is asymmetric, the *ex-ante* quality of new projects and managerial effort are not observable. Many managers' employment and compensation contracts are based on the noisy profitability of projects, instead of the *ex-ante* mean of the projects' returns and actual managerial effort. Managers may not invest on positive NPV projects because the possibility of loss can damage their reputation and job security. Institutional investors may adopt a more professional awareness of the volatility of profitability than other investors. Aghion et al. (2013) find that institutional investors may reduce managers' career concerns and increase firm innovation activities. Besides these two agency-problem-based explanations, firms may not capture positive NPV investment opportunities due to the debt overhang problem (Hen-

nessy, 2004). Institutional investors may mitigate the debt overhang problem by reducing a firm's debt borrowing cost. The above discussion leads to our second hypothesis:

- ***H2:*** *Motivated monitoring institutional investors reduce the under-investment problem.*

Jensen (1986) predicts that the empire building tendency of managers leads to firm over-investment. The prediction is supported by the empirical findings in Blanchard et al. (1994) that firms over-invest the money from cash windfalls. Harford (1999) finds that firms with higher cash holdings tend to make acquisitions with worse subsequent operation performance, while Richardson (2006) finds that firms with positive free cash flow tend to over-invest. Titman et al. (2004) document a negative relation between over-investment and stock returns, indicating that over-ivestment by managers is not in the interest of shareholders. We expect that a firm with higher motivated monitoring institutional ownership will exhibit less over-investment. Formally stated, our third hypothesis is as follows:

- ***H3:*** *Motivated monitoring institutional ownership is negatively associated with over-investment.*

3 Data and variable description

3.1 Data source

We include U.S firms with available stock returns in the Centre for Research in Security Prices (CRSP) and accounting information in the Compustat Fundamentals Annual files over the 1995–2015 period. Firms in financial (SIC 6000–6999) and regulated utility (SIC 4900–4999) industries are excluded from our sample. Institutional holdings data are obtained from the Thomson Financial CDA/Spectrum Institutional (13F) database. To avoid the potential problems of the reuse of institutional investor identifiers and institution type misclassification in the 13F database, we applied Bushee's data correction to our institutional holdings data. Our sample period is from 1995 to 2015 during which the Russell

index constituents data are available on Bloomberg. After these screens, our baseline sample contain 11,903 firms with 92,546 firm–year observations. In addition, we collect the corporate governance measure, $GIndex$ scores, from the Institutional Shareholder Services (ISS).

3.2 The definition of motivated monitoring institutions

Previous institutional investor literature documents the growth of general institutional investors in the U.S stock market over the past four decades. The two panels of Figure 1 display the time-series plots of institutional investors' market shares and institutional investor numbers at the end of each quarter from 1995 to 2015. Figure 1.1 shows that the percentages of market value held by all institutions, the 100 largest institutions, the 50 largest institutions, and the 10 largest institutions were stable over our sample period. Figure 1.2 presents the sharp increase in the number of institutional investors. The total number of institutions exceeded 3,000 for the first time in the first quarter of 2013. Panel A of Table 1 shows that both the U.S stock market value and the total market value of institutional holdings grew approximately four times over our sample period. Institutional holdings accounted for about 50% of total stock market value in September 1995, the highest level 65.5% in September 2009, and 59.6% in September 2015. The time-series trend of institutional ownership is not a major concern in our study. The annual average number of stocks in an institutional investor's portfolio is over 200, suggesting that a typical institutional investor is unlikely to monitor every firm in its portfolio.

Following Fich et al. (2015), we use stock holding value ranks in an investor's portfolio to differentiate its monitoring motivation among all the stocks in the portfolio. We sort all stocks in an investor's portfolio into ten decile groups by each stock's holding value. As shown in Panel B of Table 1, institutional investors distribute their holding value unevenly across these ten decile groups. On average, more than 40% of their portfolio value is concentrated in the decile 1 group, consisting of the largest 10% of the stocks in their portfolios. Also, the average holding value per stock position ($105.4 million) in the decile

1 group is almost five times more than it ($23.7 million) in the decile 2 group. On the other side, only 0.7% of institutional investor portfolio value is in the decile 10 group, consisting of the smallest 10% of the stocks in their portfolios. It is obvious that the performance of the firms in the decile 1 group is much more important than the performance of the rest of firms in institutional investor portfolios. Therefore, the benefit and motivation of monitoring the firms in the decile 1 group is the highest to institutional investors.

Following Fich et al. (2015), we define motivated monitoring institutional investors in a firm as institutional investors whose decile 1 groups include the firm. We aggregate the ownership of all motivated monitoring investors at the firm level and denote the sum as the total motivated monitoring institutional ownership $Tmi1_{i,t}$. Similarly, the firms in the decile 10 group are those which institutional investors have the least incentive to monitor. For comparison purposes, we also aggregate the ownership of these institutional investors at the firm level and construct the variable $Tmil10_{i,t}$, the ownership of investors who have the least motivation to monitor firms. Panel C of Table 1 shows that on average, the motivated monitoring investors hold about 9% of firm shares while the least motivated monitoring investors only hold 1% of firm shares. We also calculate two alternative measures of motivated monitoring institutional ownership: $Nmi1_{i,t}$ the number of motivated monitoring institutional investors and $Pmi1_{i,t}$ the ratio of $Nmi1_{i,t}$ to the number of firm institutional investors.

3.3 Measure of investment inefficiency

We identify inefficient investment as those deviating from the level that would be predicated by a firm-specific model of investment. Motivated by Richardson (2006) and Stoughton et al. (2016), we estimate the following regression and use the residuals as a proxy for the firm-specific inefficient investment:

$$\begin{aligned} INew_{i,t} =& \alpha + \beta_1 \frac{V}{P}_{i,t-1} + \beta_2 Leverage_{i,t-1} + \beta_3 Cash_{i,t-1} + \beta_4 Age_{i,t-1} + \beta_5 Size_{i,t-1} \\ &+ \beta_6 Return_{i,t-1} + \beta_2 INew_{i,t-1} + \delta_i + \mu_t + \epsilon_{i,t} \end{aligned} \tag{1}$$

where $INew_{i,t}$ is the new investment level for firm i in year t and $INew_{i,t} = ITotal_{i,t} - IMaintenance_{i,t}$. $ITotal_{i,t}$ is the overall investment, $IMaintenance_{i,t}$ is the investment expenditure to maintain assets in place. Previous finance and economics literature have shown that firm investment is jointly determined by growth opportunities, financial constraints, and other firm characteristics.[2] Firm growth opportunities are measured by V/P, where V is the assets in place and P is the market value of the firm (Ohlson, 1995; Feltham and Ohlson, 1996).[3] The higher the ratio, the lower the growth opportunities. Therefore we expect a negative relation between V/P and $INew$. The financial constraints are measured by $Leverage$ and $Cash$. Because a lower leverage ratio and higher cash holdings indicate less financial constraints. $INew$ is expected to be negatively related to $Leverage$ and positively related to $Cash$. Firm characteristics included in equation 1 are firm age (Age), the natural log of firm total assets ($Size$), cumulative stock returns over the previous year ($Return$), and the lag of new investment. We also include the firm fixed effects (δ_i) to control for the unobserved firm characteristics and the year fixed effects (μ_t) to control for the factors such as market movement and political cycles. $\epsilon_{i,t}$ are clustered by firm.[4] Following Richardson (2006), all variables are winsorized at the top and bottom 1%. Please refer to Appendix A for the detailed definitions and construction of these variables.

We define the inefficient investment in our empirical analyses as $Inef_{i,t} = |INew_{i,t} - \widehat{INew}_{i,t}|$. As discussed in the previous sections, both under-investment and over-investment are detrimental to the interests of shareholders. But the underlying mechanism of these two problems could be different. We further define the under-investment proxy variable as $Und_{i,t} = |INew_{i,t} - \widehat{INew}_{i,t}|$ if $INew_{i,t} < \widehat{INew}_{i,t}$ and the over-investment variable as $Ovr_{i,t} = |INew_{i,t} - \widehat{INew}_{i,t}|$ if $INew_{i,t} > \widehat{INew}_{i,t}$. These two variables help us to distinguish the roles of motivated monitoring institutional investors in mitigating two sources of investment inefficiency.

[2] See Hubbard (1998) for a detailed literature review.

[3] Richardson (2006) provides the detailed definition of V/P.

[4] Petersen (2009) suggests that when the number of firms is much larger than the the number of years, clustering standard errors by firm is similar to double clustering standard errors by firm and year.

To avoid the "look ahead bias" concern due to the use of unknown information at the time of our model prediction, we estimate equation 1 by each year t using the historical data before t, from 1995 to 2015. We trace the sample back to 1981 in order to increase the power of our investment prediction. For example, we run a panel regression from 1981 to 1995 to estimate $\widehat{INew}_{i,1995}$, a panel regression from 1981 to 1996 to estimate $\widehat{INew}_{i,1996}$, and so on. The predicted investment $\widehat{INew}_{i,t}$ is the results of 21 historical panel regressions from 1981 to year t, for each t between 1995 and 2015. We denote the inefficient investment proxy variables estimated by this procedure as $Inef1_{i,t}$, $Und1_{i,t}$, and $Ovr1_{i,t}$.[5] Alternatively, we follow Richardson (2006) and Stoughton et al. (2016) to estimate equation 1 by a single panel regression between 1995 and 2015. The inefficient investment proxy variables are defined as $Inef2_{i,t}$, $Und2_{i,t}$, and $Ovr2_{i,t}$.

Table 2 reports the corresponding results for the two specifications of equation 1. The left panel displays the average coefficients estimated by the 21 historical panel regressions. The number of negative $(-)$ and positive $(+)$ significant coefficient at the 1% significance level are reported in the parenthesis. The right panel presents the coefficients estimated by the signal panel regression between 1995 and 2015. The negative coefficients of V/P suggest that firms with high growth opportunities increase their investment. The negative (positive) coefficients of $Leverage$ ($Cash$) indicate that firms with less financial constraints increase their investment. The negative coefficients of $Size$ and Age are consistent with the findings in Stoughton et al. (2016) and the firm life cycle hypothesis. The positive coefficients of $Return$ and lag $INew$ are consistent with Richardson (2006) and Stoughton et al. (2016). The average R^2 of the historical panel and panel regressions are 0.208 and 0.259, suggesting that both of our investment model specifications can explain a significant portion of the variations in firm-specific investment.

[5]We also estimate equation 1 with five-year historical rolling windows between year $t-4$ and year t. The untabulated results are qualitatively similar.

3.4 Descriptive statistics

Panel C of Table 1 presents the descriptive statistics of all variables in our empirical analyses. The mean and standard deviation of $INew$ are 0.10 and 0.15, which are similar to those (0.08 and 0.13) reported in Richardson (2006). The mean and standard deviation of the difference between $INew$ and $\widehat{INew}$ estimated by the single panel regression are 0.00 and 0.13, similar to those (0.00 and 0.11) reported in Richardson (2006). The summary statistics of all our investment related variables are also comparable to Stoughton et al. (2016). The mean of our motivated monitoring institutional investor proxies are 0.09 ($Tmi1$), 9.3 ($Nmi1$), and 0.03 ($Pmi1$), which are comparable to those (0.07, 9, and 0.02, correspondingly) reported in Fich et al. (2015). Our proxies are slightly larger because they focus only on institutional investors of M&A targets and their sample spans from 1984 to 2011.

4 Main results

In this section, we present the empirical results for the effectiveness of motivated monitoring institutional investors. We first show a negative relation between our inefficient investment proxies and firm financial performance. Then we investigate the role of motivated monitoring institutional investors in firm investment decisions with both ordinary least squares (OLS) and 2SLS regressions. Finally, we study if the monitoring motivation varies across different types of institutional investors.

4.1 Inefficient investment and stock returns

Previous empirical studies suggest that inefficient investment has a negative impact on firm performance (Titman et al., 2004). In an efficient market, all information including firm investment decisions will ultimately be transferred into firm stock prices. It is important to show the negative relation between our inefficient investment proxies and subsequent stock returns in order to link institutional monitoring with firm value. To test

this relation, we study whether subsequent stock returns of firms with high inefficient investment are significantly lower than those with more efficient investment. If inefficient investment reduces firm value, subsequent stock returns will be lower no matter whether firms have over- or under-invested.

Similar to Daniel and Titman (1997), Faulkender and Wang (2006), and Fich et al. (2016), we measure the subsequent stock returns as the differences between the buy-and-hold returns of our sample firms and the buy-and-hold returns of a benchmark portfolio:

$$\text{Excess Return}_{i,t} = [\prod_{j=1}^{12}(1 + Ret_{i,j}) - 1] - [\prod_{j=1}^{12}(1 + \text{Benchmark Ret}_{i,j}) - 1] \tag{2}$$

where $Ret_{i,j}$ is the stock return of firm i during month j and Benchmark $\text{Ret}_{i,j}$ is the return of the benchmark portfolio for firm i during the same month. Following Fama and French (1993), we sort all the sample firms into quintile portfolios based on their market capitalization on June 30th every year and the book to market ratios at end of December in the previous year. We assign each firm to one of the five-by-five portfolios in every June, and then use the corresponding portfolio as the benchmark portfolio. The mean and median of the excess returns in our sample are -1.6% and -9.1%, which are comparable to those (-0.5% and -8.5%) in Faulkender and Wang (2006).

Next, we regress the excess returns on our inefficient investment proxies:

$$\begin{aligned}\text{Excess Return}_{i,t+1} =& \alpha + \beta_1 \text{Inefficient investment}_{i,t} + B * \text{Control variables}_{i,t} \\ &+ \theta_j + \epsilon_{i,t}\end{aligned} \tag{3}$$

where Inefficient investment is one of the following six variables: $Inef1$, $Und1$, $Ovr1$, $Inef2$, $Und2$, and $Ovr2$. The control variables include MTB, $Leverage$, $Cash$, and $Size$. θ_j are the industry fixed effects based on Fama–French 48 industry classification. We estimate equation 3 using a standard panel regression with year fixed effects. $\epsilon_{i,t}$ are clustered by firm. As an alternative measure, we also use the Fama and Macbeth (1973)

regression to estimate equation 3.[6]

The results of these regressions are reported in Table 3. The coefficients of all the inefficient investment proxies are negative and statistically significant. Column (1) of Table 3 suggests that one standard deviation increase in $Inef1$ is associated with 2.96% decrease in firm annual excess returns. It is worth noting that the negative effect of inefficient investment on subsequent stock returns is relatively symmetric between under-investment and over-investment. For example, column (3) of Table 3 shows that one standard deviation increase in $Und1$ is associated with 2.62% decrease in firm annual excess returns, and column (5) of Table 3 shows that one standard deviation increase in $Ovr1$ is associated with 3.19% decrease in firm annual excess returns.

4.2 Institutional ownership and investment inefficiency: Baseline regressions

Given the negative relation between inefficient investment and subsequent stock returns, we expect that strongly motivated monitoring institutional investors will improve firm investment efficiency. To test our three hypotheses, we adapt the following baseline model to capture the effects of institutional investors on investment:

$$\begin{aligned}\text{Inefficient investment}_{i,t+1} =& \alpha + \beta_1 Tmi1_{i,t} + \beta_2 * Tmi10_{i,t} + B * \text{Control variables}_{i,t} \\ &+ \theta_j + \mu_t + \epsilon_{i,t}\end{aligned} \tag{4}$$

where $\text{Inefficient investment}_{i,t+1}$ is one of the six proxies: $Inef1$, $Und1$, $Ovr1$, $Inef2$, $Und2$, and $Ovr2$. $Tmi1$ is the total ownership of motivated monitoring institutions. To compare monitoring roles between the most motivated monitoring investors and the least motivated monitoring investors, we add $Tmi10$ in equation 4. We test these two variables both individually and jointly. Our control variables are based on Stoughton et al. (2016)

[6]The panel regression coefficients may be affected more by the years that have more observations. This concern is mitigated by the Fama and Macbeth (1973) regression, in which all years are treated as equally important.

and include MTB, $Leverage$, $Cash$, $Size$, $Tangibility$, and Age.[7] We also control for the Fama-French 48 industry (θ_j) and year (μ_t) fixed effects. The standard errors are clustered by firm.

Table 4 presents the results from estimating equation 4. Panel A is based on the inefficient variables estimated by historical panel regressions and Panel B is based on the inefficient variables estimated by the single panel regression. All the coefficients of $Tmi1$ are negative and statistically significant, suggesting that motivated monitoring institutional investors can enhance investment efficiency. Motivated monitoring institutions also reduce the tendency of firms to under- and over-invest consistently. On the other hand, we find that $Tmi10$ is positively associated with $Inef$ in both Panel A and Panel B. This positive relation is only statistically significant for the over-investment sample. It is unlikely that the least motivated monitoring investors actually lead to the increase of investment inefficiency. A more rational explanation is that firm managers tend to under-invest when the external monitoring by institutional investors is scarce. Both the quiet life hypothesis and managers' career concern may explain the under-investment tendency of firm managers. We will directly test these two explanations in Section 5.

4.3 Institutional ownership and investment inefficiency: Instrumental variable analyses

The results in our baseline regressions may be driven by the endogeneity between motivated monitoring institutional ownership and inefficient investment. The first concern is the potential omitted variable bias. Although we have controlled for several firm characteristics in equation 4, there might be certain unobservable firm characteristics that are correlated with both the motivated monitoring institutional ownership and investment inefficiency. The second concern is the reverse causality that motivated monitoring institutional investors may have inside information on firms' investment efficiency and choose to invest more in those firms with more efficient investment (Giannetti and Simonov, 2006).

[7] Appendix A provides the detailed definitions and construction of these variables.

Motivated by the recent studies on firm switching between the Russell 1000 and 2000 indexes, we adopt an IV approach similar to Fich et al. (2015), Schmidt and Fahlenbrach (2016), and Crane et al. (2016).

The Russell 1000 and 2000 indexes are reconstituted in June every year. Based on the market capitalization of firm common stocks as of May 31, the largest 1,000 firms are included in the Russell 1000 index and the subsequent 2,000 firms are included in the Russell 2000 index.[8] In 2005, about $90 billion institutional assets tracked the Russell 1000 index and above $200 billion institutional assets tracked the Russell 2000 index (Chang et al., 2015). Both indexes are value-weighted and no other criteria besides the market capitalization is used in the index reconstitution. Therefore, when a stock drops from the Russell 1000 index to the Russell 2000 index or gets newly added in the Russell 2000 index, the institutional ownership of the stock will increase exogenously. On the other hand, there is a negative and exogenous shock on a firm's institutional ownership, when a stock moves up from the Russell 2000 index to the Russell 1000 index or gets excluded from the Russell 2000 index. For the firms which are not affected by the Russell index reconstitution, there is still an exogenous shock on the weights of their holding value in the institutional portfolios when institutional investors adjust their portfolio weights over the annual Russell index reconstitution periods.

The switch of firms between the two Russell indexes and the inclusion/exclusion of firms in the Russell 2000 index are used as the IV in our first stage regression:

$$\begin{aligned} Tmi1_{i,t} =& \alpha + \beta_1 R1TR2_{i,t} + \beta_2 R2TR1_{i,t} + \beta_3 R2TN + \beta_4 NTR2 \\ &+ B * \text{Control variables}_{i,t} + \theta_j + \mu_t + \epsilon_{i,t} \end{aligned} \tag{5}$$

where $R1TR2_{i,t}$ ($R2TR1_{i,t}$) is an indicator variable equal to 1 if firm i switches from the Russell 1000 (2000) index to the Russell 2000 (1000) index in year t. $R2TN_{i,t}$ ($NTR2_{i,t}$) is an indicator variable equal to one if firm i enters (leaves) the Russell 2000 index. The rele-

[8]The London Stock Exchange bought Russell Investments in 2014. The merged firm is called FTSE Russell. For the detailed explanations of the Russell Index reconstitution, please refer to http://www.ftserussell.com/research-insights/russell-reconstitution.

vancy condition of our IV is satisfied because the index reconstitution affects the motivated institutional ownership in all firms. The exclusion restriction is also satisfied because the only index assignment rule (the rank of market capitalization) is mechanical and firm stock prices are stochastic. We control for MTB, $Leverage$, $Cash$, $Size$, $Tangibility$, and Age in equation 5. θ_j are Fama–French 48 industry fixed effects and μ_t are year fixed effects. In the second step regression, we estimate equation 4 by replacing $Tmi1$ with $\widehat{Tmi1}$, the predicted value of motivated monitoring institutional ownership from equation 5.

Panel A of Table 5 reports the 2SLS regression results. $R1TR2$, $R2TN$, and $NTR2$ are negatively associated with $Tmi1$ in the first stage regression, while $R1TR2$ is positively correlated with $Tmi1$. These results are generally in line with Fich et al. (2015). The results of the second stage regressions are presented in columns (1)–(6). In columns (1) and (4), the dependent variables are firm inefficient investment proxies: $Inef1$ and $Inef2$. The coefficients of $\widehat{Tmi1}$ are negative and statistically significant at the 1% level. Our first hypothesis H1 is confirmed. In columns (2) and (5), the dependent variables are under-investment proxies: $Und1$ and $Und2$. The coefficients of $\widehat{Tmi1}$ remain negative and statistically significant at the 1% level. The marginal effect of $\widehat{Tmi1}$ on the under-investment proxies is economically significant. For example, a one standard deviation increase in $\widehat{Tmi1}$ is associated with a 0.86% decrease in $Und1$ for the average sample-size firm with \$2,648.1 million total assets. This result confirms hypothesis H2. In columns (3) and (6), the dependent variables are over-investment proxies: $Ovr1$ and $Ovr2$. The negative and statistically significant coefficients of $\widehat{Tmi1}$ confirm that motivated monitoring institutional ownership reduces firm over-investment. The economic significance is such that a one standard deviation increase in $\widehat{Tmi1}$ results in a 2.27% decrease in $Ovr1$, which translates into a \$60.1 million reduction in annual over-investment for the average sample-size firm. This result provides direct support for our hypothesis H3.

As an alternative test, we adopt the first difference specification used in Schmidt and Fahlenbrach (2016) and remove any firm-specific time-invariant unobservable firm characteristics. In the 2SLS model estimated in Panel A of Table 5, we replace all the

dependent variables and control variables of firm characteristics by their annual change terms. Panel B of Table 5 presents the results of the 2SLS regressions with the first difference specification. All our results remain robust.

4.4 Monitoring motivation and institution types

Institutional investors are different in terms of investment strategies, fiduciary duties, and trading horizons. Previous institutional investor studies document that long-term investors and independent investors are more active in firm monitoring than grey investors and short-term investors (Chen et al., 2007). However, Appel et al. (2016b) find that passive mutual funds can actually improve firm governance and long-term performance. Our motivated monitoring investors include all types of investors in the 13F universe. Therefore, a natural question is whether the monitoring motivation of institutional investors varies across different institution types.

First, we divide all motivated monitoring institutional investors into independent (Tmi_Ind) and grey investors (Tmi_Grey) based on the potential business relationship between institutional investors and their holding firms (e.g., Brickley et al., 1988; Almazan et al., 2005; Chen et al., 2007). Independent investment advisors, investment companies, and public pension funds are classified as independent investors. Private pension funds, banks, and insurance companies are classified as grey investors, because their monitoring ability might be compromised due to business interests.[9] Second, we separate institutional investors into transient (Tmi_Tran) and non-transient investors ($Tmi1\_NonTran$) based on their investment horizons. Bushee (1998) classifies institutional investors into dedicated, quasi-index, and transient investors based on their investment patterns such as portfolio turnover, diversification, and momentum, etc. Follow Chen et al. (2007), we take transient investors as short-term investors, while dedicated and quasi-index investors as non-transient or long-term investors.

Panel A of Table 6 reports the 2SLS regression results of inefficient investment on

[9]We follow Bushee's institution type classification for institutional investors after 1998.

Tmi_Ind and Tmi_Grey and Panel B of Table 6 reports similar regression results for those variables in the first difference terms. Similarly, Panel C of Table 6 reports the 2SLS regression results of inefficient investment on Tmi_Tran and $Tmi\_NonTran$ and Panel D of Table 6 reports the regression results for those variables in the first difference terms. Among all specifications, the motivated monitoring institutional ownership proxies are negatively related to investment inefficiency. These results suggest that the monitoring incentive derived from the relative importance of firms in the institutional investors' portfolios is independent of investor type characteristics. Even for the institutions which are usually taken as inefficient monitors or passive investors, the benefit of monitoring still increases with the holding firms' relative value in their portfolios. In turn, all motivated monitoring institutional investors improve firm investment efficiency.

5 Robustness tests and further discussions

Our results thus far establish a significantly negative relation between motivated monitoring institutional ownership and firm inefficient investment. It is useful to attempt to investigate the channels through which motivated monitoring institutional investors reduce firm over-investment and under-investment. This section concludes with two robustness checks of our main findings.

5.1 Motivated monitoring investors, cash, and over-investment

From an agency perspective, managers have an incentive to over-invest and grow their firms beyond the optimal firm size. This empire building activity increases the resources under the control of firm managers (Jensen, 1986). Previous studies document that the empire building problem is more severe when firms have a substantial amount of free cash flow (e.g., Stulz, 1990; Lang et al., 1991; Brush et al., 2000; Richardson, 2006). Motivated monitoring institutions should have therefore a larger impact on curbing the managers' over-investment tendencies, when firms have more cash reserves or free cash flows. We use

following the specification to test this hypothesis:

$$\begin{aligned} Ovr_{i,t} =& \alpha + \beta_1 \widehat{Tmi1}_{i,t} + \beta_2 \widehat{Tmi1}_{i,t} * \text{Cash measures}_{i,t} + \beta_3 \text{Cash measures}_{i,t} \\ &+ B * \text{Control variables}_{i,t} + \theta_j + \mu_t + \epsilon_{i,t} \end{aligned} \tag{6}$$

where $\widehat{Tmi1}_{i,t}$ is the predicated value of $Tmi1_{i,t}$ in equation 5, Cash measures are either the cash reserve ratio ($Cash$) or the free cash flow (FCF), and the other control variables are the same as those in equation 4. We adopt the FCF definition in Richardson (2006)[10]:

$$FCF_{i,t} = \text{Operating cash flow}_{i,t} - IMaintaince_{i,t} + R\&D_{i,t} - \widehat{INew}_{i,t} \tag{7}$$

Because empire building is usually observed in firms with positive free cash flows (Richardson, 2006), we exclude the negative FCF firm-year observations when we estimate equation 6. The regression results of equation 6, presented in Table 7, show that firms with more cash holdings and free cash flows are more likely to over-invest. This finding is consistent with the prediction that managers may engage in empire building and over-invest when the firms have abundant cash. More importantly, the coefficients (β_2) of the interaction terms are all negative and statistically significant, indicating that the monitoring role of motivated institutional investors in firm over-investment is more important for firms with the higher empire building tendency.

5.2 Quiet life or career concern

The agency problem associated with firm under-investment is that managers do not exert enough effort to seek investment opportunities. There are two possible explanations that predict firm under-investment given the lack of investor monitoring. On the one hand, firm managers overall prefer a quiet life (e.g., Hart, 1983; Bertrand and Mullainathan,

[10]Because two different specifications are used to estimate the predicted new investment $\widehat{INew}$, we have two measures of free cash flows accordingly. $\widehat{INew}$ is estimated by the historical panel regressions in $FCF1$ and the single panel regression in $FCF2$.

2003), because it is costly for firm mangers to seek positive NPV projects and make difficult investment decisions. We call this the "quiet life" or "lazy manager" hypothesis. On the other hand, firm managers are risk averse and do not like to take the risk of new investments. Instead of being lazy, firm managers have job security concerns if the new investment has unfavorable outcomes due to some random factors (Aghion et al., 2013). This possibility is designated as the "career concern" hypothesis.

Although both hypotheses predict that the motivated monitoring investors could reduce firm under-investment, the interaction effect of shareholder monitoring and other external monitoring on under-investment is different. If the "quiet life" hypothesis is correct, monitoring investors have a less important role when market competition is higher. This is because the market competition is positively related to the probability of firm bankruptcy (Hart, 1983). Firm managers are less likely to enjoy "quiet lives" in a competitive market. However, the "career concern" hypothesis predicts the opposite. In a highly competitive market, the probability of new investment failures is larger, which increases the career concerns of firm managers and leads to the under-investment. Monitoring institutional investors may alleviate the managers' career concerns because these investors are informed and can more effectively distinguish the random negative outcomes from the lack of managerial ability. Therefore, monitoring investors have an important role in mitigating under-investment when market competition is greater.

These two hypotheses also have opposite predictions when managerial entrenchment is high. If the "quiet life" hypothesis is correct, managers with the lower risk of being fired have less incentive to seek investment opportunities. Therefore, monitoring investors have a stronger effect on mitigating firm under-investment when managers are more entrenched. If the "career concern" hypothesis is correct, managers have a lower probability of being fired when managerial entrenchment is higher. Therefore, the monitoring investors have a weaker effect on mitigating firm under-investment in this case. We use the following model

specification to test these two possible hypotheses:

$$\begin{aligned} Und_{i,t} =& \alpha + \beta_1 \widehat{Tmi1}_{i,t} + \beta_2 \widehat{Tmi1}_{i,t} * \text{Competition or Entrenchment}_{i,t} + \beta_3 \\ & \text{Competition or Entrenchment}_{i,t} + B * \text{Control variables}_{i,t} + \theta_j + \mu_t + \epsilon_{i,t} \end{aligned} \tag{8}$$

where *Competition* is 1 − Lerner ratio (Aghion et al., 2013) and *Entrenchment* is the governance index *GIndex* (Gompers et al., 2003). The Lerner ratio is the median growth margin of the industry in which firms are assigned.[11] Because the *GIndex* is only available for the S&P 1500 companies between 1995–2007, our sample size in the entrenchment analysis is smaller than it in the main tests.

Table 8 presents the results. Consistent with the "career concern" hypothesis, when market competition is higher and managers are less entrenched, the under-investment problem is more severe. Furthermore, when career concerns are higher, the effect of motivated monitoring investors on the under-investment is more prominent. These results support the "career concern" hypothesis but oppose the "quiet life" hypothesis.

5.3 Alternative measures of motivated monitoring investors

In our main analyses, we use the ownership of motivated monitoring institutional investors as our proxy for the strength of monitoring. In this section, we examine two alternative measures of motivated monitoring institutional ownership that have been used in Fich et al. (2015): (1)the proportion of motivated monitoring investors in all the firm institutional investors ($Pmi1$), and (2) the natural log of one plus the number of motivated monitoring investors ($Ln(1 + Nmi1)$). We rerun our 2SLS regression analyses, i.e., equations 5 and 4, where we substitute $Pmi1$ and $Ln(1 + Nmi1)$ as the dependent variables in the first stage regressions and use the predicted value of them in the second stage regressions. The results are tabulated in Panel A and B of Table 9. We find that the negative relation between motivated monitoring institutional ownership and inefficient investment

[11] Following Aghion et al. (2013), the Lerner ratio is based on 3-digit SIC codes and the industry fixed effects are based on 4-digit SIC codes in the regressions related to market competition.

is robust to both alternative measures.

5.4 Discussions of the identification using the Russell index reconstitution

The identification of our IV is slightly different from those in Fich et al. (2015) and Schmidt and Fahlenbrach (2016). We do not include Russell's float-adjusted market cap-based rankings as IV in our 2SLS regressions. As indicated in Appel et al. (2016a), the float-adjusted market cap-based rankings are affected by insider ownership and liquid outstanding shares. It may overstate the impact of the Russell index reconstitution on the changes in institutional ownership if we include the rankings as IV.[12] The other issue is that Russell adopted a "banding" rule to index assignment in 2007.[13] Although we use the IV method instead of the regression discontinuity method (e.g. Chang et al., 2015) in our paper, we rerun the regressions reported in Table 5 in a restricted sample period 1995-2006. The untabulated test results are similar to those in Table 5.

6 Conclusions

Managers may either under-invest or over-invest due to the potential agency problems, which can negatively impact firm subsequent returns. Institutional investors may mitigate firm inefficient investment through monitoring and activism and thereby benefit from the increase in firm value. However, the attention of institutional investors is limited Kempf et al. (2016) and the opportunity cost of monitoring a firm may exceed the benefit if the firm stock's weight is very small in the institutional investor portfolios. Follow Fich et al. (2015), we proxy for the motivation of an institutional investor to monitor a firm by the importance the firm stock in the institutional investor's portfolio. We examine whether motivated monitoring institutional investors can improve firm investment efficiency. By ex-

[12]Please refer to Appel et al. (2016a) for detailed discussions.
[13]Please refer to Crane et al. (2016) for detailed discussions.

tending the measure of abnormal investment developed in Richardson (2006), we show that higher motivated monitoring institutional ownership is associated with both lower under-investment and over-investment. A similar relation is not found between investors with the least motivation to monitor and inefficient investment. These results are consistent with the limited attention hypothesis.

Our paper contributes to the ongoing debate on whether all types of institutional investors, including the grey and passive ones, contribute to corporate governance. Our evidence strongly suggests that as long as the holdings of a firm stock are important to institutional investors, even grey and passive ones may influence the firm's investment decisions. We also document the channels through which motivated institutional investors mitigate inefficient investment. The role of monitoring investors in reducing over-investment is stronger if firms have higher cash reserves and more free cash flows. Also the role of monitoring investors in reducing under-investment is stronger if firm managers are more likely to have career concern. Overall, our results establish a robust link between institutional investors' motivation and attention and corporate investment decisions.

Appendix A

Table A1: Variable Definitions

This table provides variable definitions and corresponding data sources. CRSP refers to the Centre for Research in Security Prices, ISS refers to the Institutional Shareholder Services (formerly RiskMetrics), 13F refers to Thomson Reuters 13F Database, and Bushee's website refers to http://acct.wharton.upenn.edu/faculty/bushee/IIclass.html.

Variable	Definition	Source
Investment regression variables		
AT	Total assets.	Compustat
$ITotal$	Annual total investment expenditure normalized by AT: [Capital expenditure(CAPX)+ acquisition expenditure(AQC)+ R&D expenditure(XRD)- Receipts from sale of property, plant and equipment(SPPE)]/AT (Richardson, 2006).	Compustat
$IMaintenance$	Annual required investment expenditure to maintain assets in place normalized by AT: Depreciation and amortization(DPC)/AT (Richardson, 2006).	Compustat
$INew$	Annual investment expenditure on new projects normalized by AT: $ITotal$- $IMaintenance$ (Richardson, 2006).	Compustat
MV	Market value of equity: price(PRCC_F) * common shares outstanding (CSHO).	Compustat
V/P	Growth opportunity: Assets in place/MV, where the assets in place is estimated as $(1-\alpha r)BV+\alpha(1+r)X-\alpha rd$, α=$\omega/1+r-\omega$, $r=12\%$, $\omega=0.62$, BV is the book value of equity(CEQ), d is annual dividend (DVC), and X is operating income after depreciation (OIADP) (Ohlson, 1995; Richardson, 2006).	Compustat
$Leverage$	Leverage ratio: the book value of total debt (long term debt(DLTT) + short term debt(DLC)) divided by the sum of the book value of total debt and BV (Richardson, 2006).	Compustat
$Cash$	Cash holding ratio: cash and short term investment(CHE) divided by AT at the start of year (Richardson, 2006).	Compustat
Age	Firm age: the natural log of (1 + the number of years the firm has been listed on CRSP as of the start of the year) (Richardson, 2006).	CRSP
$Size$	The natural log of AT at the start of the year (Richardson, 2006).	Compustat
$Return$	The percent change of firm market value over that prior year: $MV_t/MV_{t-1}-1$ (Richardson, 2006).	CRSP
MTB	Market to book ratio: market value of asset (MV+$Totaldebt$) dividend by AT (Stoughton et al., 2016).	Compustat

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Table A1 – continued from previous page

Variable	Definition	Source
$Tangibility$	Firm asset tangibility: Property Plant and Equipment(PPENT)/AT (Stoughton et al., 2016).	Compustat
$Inef1$	Inefficient investment proxy variable: $\|INew - \widehat{INew}\|$, where $\widehat{INew}_t$ is estimated by the historical panel regressions between 1982 and year t.	Compustat & CRSP
$Und1$	Under-investment proxy variable: $Inef1$ if $INew < \widehat{INew}$, and zero otherwise.	Compustat & CRSP
$Ovr1$	Over-investment proxy variable: $Inef1$ if $INew > \widehat{INew}$, and zero otherwise.	Compustat & CRSP
$Inef2$	Inefficient investment proxy variable: $\|INew - \widehat{INew}\|$, where $\widehat{INew}$ is estimated by the panel regressions between 1995 and 2015 (Richardson, 2006).	Compustat & CRSP
$Und2$	Under-investment proxy variable: $Inef2$ if $INew < \widehat{INew}$, and zero otherwise.	Compustat & CRSP
$Ovr2$	Over-investment proxy variable: $Inef2$ if $INew > \widehat{INew}$, and zero otherwise.	Compustat & CRSP
Variables related to institutional investors		
$Nmi1$	Number of motivated monitoring investors: the number of investors whose holding value in the firm is in the top 10% of their portfolio (Fich et al., 2015).	13F
$Nmi10$	Number of investors who have the least motivation to monitor firms: the number of investors whose holding value in the firm is in the bottom 10% of their portfolio.	13F
$Tmi1$	Total firm ownership of the motivated monitoring investors (Fich et al., 2015).	13F
$Tmi10$	Total firm ownership of the investors who have the least motivation to monitor firms.	13F
$Tmi1\_Ind$	Total firm ownership of the motivated monitoring investors who are classified as independent institutional investors.	13F & Bushee's website
$Tmi1\_Grey$	Total firm ownership of the motivated monitoring investors who are classified as grey institutional investors.	13F & Bushee's website
$Tmi1\_Tran$	Total firm ownership of the motivated monitoring investors who are classified as transient institutional investors.	13F & Bushee's website
$Tmi1\_NonTran$	Total firm ownership of the motivated monitoring investors who are classified as non-transient institutional investors.	13F & Bushee's website
$Pmi1$	The proportion of motivated institutional investors: the ratio of $Nmi1$ to the number of firm institutional investors	13F
IV is used as a prefix for all predicted institutional investor variables in 2SLS regressions.		
IV in 2SLS regressions		
$R1TR2$	Indicator variable: one if a firm switches from the Russell 1000 to the Russell 2000 index, and zero otherwise (Fich et al., 2015).	Bloomberg

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Table A1 – continued from previous page

Variable	Definition	Source
$R2TN$	Indicator variable: one if a firm drops out of the Russell 2000 index due to the decrease of market value, and zero otherwise (Fich et al., 2015).	Bloomberg
$R2TR1$	Indicator variable: one if a firm switches from the Russell 2000 to the Russell 1000 index, and zero otherwise (Fich et al., 2015).	Bloomberg
$NTR2$	Indicator variable: one if a firm gets included in the Russell 2000 index due to the increase of market value, and zero otherwise (Fich et al., 2015).	Bloomberg
Others		
$Competition$	The industry competition level is defined as 1-Lerner index, where the Lerner ratio is the industry median gross margin Revenue-Cost of goods sale/$Revenue$. Firms are assigned by 3-digit SIC codes (Aghion et al., 2013).	Compustat
$GIndex$	The numbers of anti-takeover provisions (Gompers et al., 2003).	ISS
$FCF1$	Free cash flow: $Operatingcashflow(OANCF) - IMaintenance + R\&D(XRD) - \widehat{INew}$, where $\widehat{INew}_t$ is estimated by the histroical panel regressions between 1982 and year t.	Compustat & CRSP
$FCF2$	Free cash flow: $Operatingcashflow(OANCF) - IMaintenance + R\&D(XRD) - \widehat{INew}$, where $\widehat{INew}$ is estimated by the panel regressions between 1995 and 2015 (Richardson, 2006).	Compustat & CRSP

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Figure 1: Institutional ownership over the sample period 1995–2015

Figure 1.1. Market shares of institutional investors. This figure presents the cumulative institutional holdings as a percent of total U.S. stock market value for all, top 10, top 50, and top 100 institutional investors, respectively. The sample period is from March 1995 to December 2015.

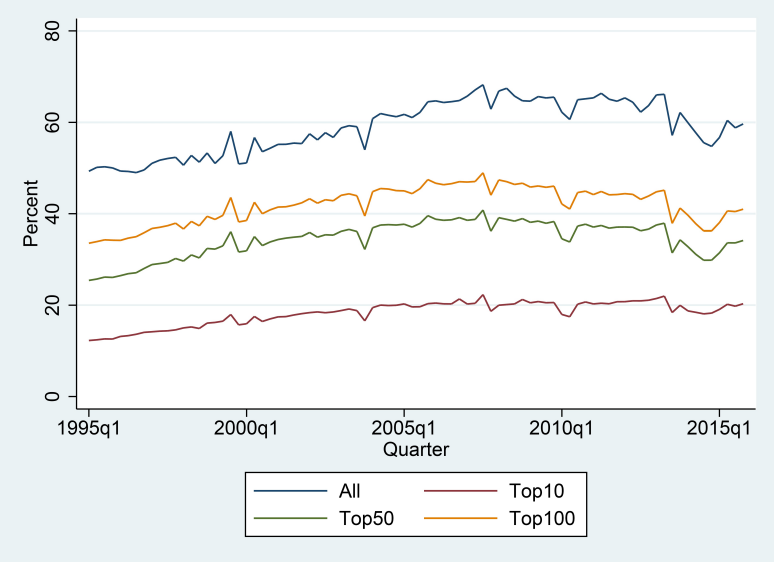

Figure 1.2. Number of institutional investors. This figure plots the number of institutional investors in the U.S. stock market. The sample period is from March 1995 to December 2015.

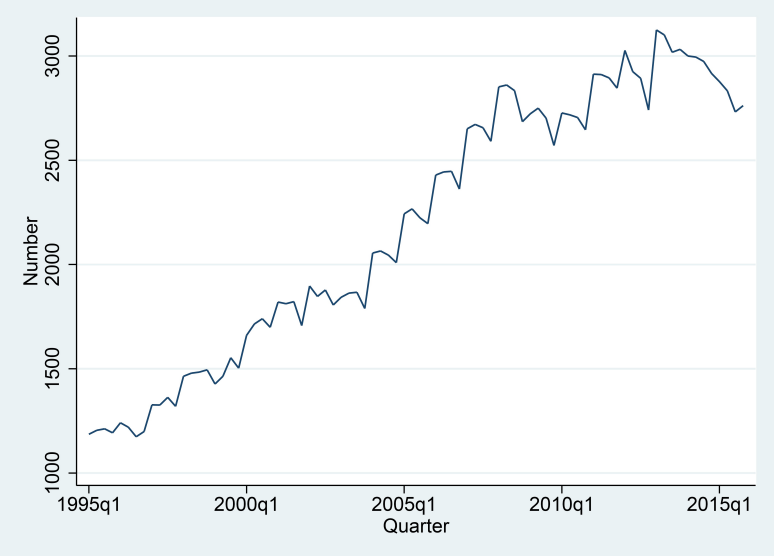

Table 1: Summary statistics

Panel A. Time series of institutional holdings. This panel presents the number of reported institutional positions, the number of stocks on the market, the number of institutional investors, the total market value of institutional holdings (billion dollars), the stock market value (billion dollars), the percentage of stock market share held by institutions, and the average number of stocks in institutional investor portfolios. We report these summary statistics in every September from 1995 to 2015.

Time	Reported positions	Number of stocks	Number of institutions	Market value of institutional holdings	Stock market value	Percentage	Average number of stocks per institution
Sep-95	343,187	8,256	1,212	3,303	6,570	50.0%	283
Sep-96	340,827	8,760	1,174	3,896	7,951	49.6%	290
Sep-97	400,135	9,062	1,363	5,677	10,898	52.3%	294
Sep-98	428,053	9,170	1,484	5,761	11,232	53.3%	288
Sep-99	459,388	8,871	1,553	8,260	14,232	50.9%	296
Sep-00	514,160	9,071	1,740	9,699	18,102	54.3%	295
Sep-01	491,891	8,604	1,822	6,997	12,615	55.4%	270
Sep-02	504,951	8,175	1,878	6,061	10,495	56.7%	269
Sep-03	524,618	7,432	1,867	7,843	13,283	54.0%	281
Sep-04	574,246	7,733	2,045	9,443	15,343	61.2%	281
Sep-05	605,990	7,718	2,224	11,002	17,694	64.5%	272
Sep-06	654,812	7,607	2,447	12,333	19,113	64.8%	268
Sep-07	690,667	7,618	2,656	15,036	22,036	62.9%	260
Sep-08	683,039	7,503	2,834	10,966	16,680	64.7%	241
Sep-09	660,354	7,114	2,702	10,154	15,538	65.5%	244
Sep-10	664,732	7,009	2,705	11,101	17,092	65.2%	246
Sep-11	673,870	6,549	2,895	10,779	16,568	64.6%	233
Sep-12	673,732	6,139	2,893	12,769	20,517	63.7%	233
Sep-13	687,379	5,893	3,018	13,524	23,669	62.2%	228
Sep-14	714,804	5,849	2,974	14,910	26,842	54.7%	240
Sep-15	649,619	5,231	2,732	13,686	23,274	59.6%	238

Panel B. Institutional stock holdings by decile portfolios. This panel reports the summary statistics of stock holdings in institutional investor portfolios. We sort all stocks of each institutional investor into decile groups by the market value of holdings. Group 1 is the top decile that includes the stocks of the largest holding value. For each decile group, we report the average holding value (thousand dollars) of individual stocks, the average ratio of the decile group holding value to the total institutional portfolio value, the median ratio of the decile group holding value to the total institutional portfolio value, the 25th percentile of the ratios of the decile group holding value to the total institutional portfolio value, and the 75th percentile of the ratios of the decile group holding value to the total institutional portfolio value. The sample period is from March 1995 to December 2015.

	Individual stock	**Decile portfolio value to total portfolio value**			
Group	**Average holding value**	**Mean**	**Median**	**25th percentile**	**75th percentile**
Decile 1	105,443.7	41.5%	38.1%	27.2%	53.0%
Decile 2	23,676.6	18.8%	18.9%	15.9%	21.7%
Decile 3	11,977.7	12.5%	13.1%	9.9%	15.3%
Decile 4	6,999.6	8.6%	9.0%	5.9%	11.3%
Decile 5	4,339.2	6.1%	6.1%	3.5%	8.6%
Decile 6	2,790.4	4.7%	4.3%	2.2%	6.8%
Decile 7	1,745.8	3.3%	2.8%	1.3%	4.7%
Decile 8	1,057.9	2.3%	1.8%	0.8%	3.2%
Decile 9	594.2	1.5%	1.1%	0.5%	2.1%
Decile 10	235.7	0.7%	0.5%	0.2%	1.0%

Panel C. Main variables. This panel presents the descriptive statistics of firm and institutional investor variables in our sample. The sample period is between 1995 and 2015. All firms have complete information in the CRSP and Compustat databases. We also require that our sample firms have institutional ownership information from the Thomson Financial CDA/Spectrum Institutional (13F) database. The number of observations, mean, standard deviation, minimum, 25th percentile, median, 75th percentile, and maximum are reported from left to right in sequence for each variables. Detailed definitions of all variables can be found in Appendix A.

Variable	Obs.	Mean	S.D.	Min	p25	Median	p75	Max
Investment regression variables								
AT	92,546	2,648.1	7,563.3	2.3	62.2	265.5	1,302.2	47,604.0
$ITotal$	92,546	0.15	0.15	-0.03	0.05	0.10	0.20	0.74
$IMaintenance$	92,546	0.05	0.04	0.00	0.03	0.04	0.06	0.24
$INew$	92,546	0.10	0.15	-0.18	0.00	0.05	0.14	0.71
MV	92,546	3,864.9	17,935.9	0.0	60.7	281.6	1,327.0	630,000.0
V/P	92,546	0.49	0.71	-2.74	0.20	0.44	0.74	3.07
$Leverage$	92,546	0.31	0.33	0.00	0.01	0.24	0.48	1.71
$Cash$	92,546	0.22	0.30	0.00	0.02	0.10	0.30	1.59
Age	92,546	2.24	1.01	0.00	1.61	2.30	3.00	4.19
$Size$	92,546	5.35	2.46	0.00	3.79	5.36	7.01	10.69
$Return$	92,546	0.21	0.85	-0.87	-0.25	0.00	0.39	4.48
MTB	92,546	1.86	1.81	0.27	0.83	1.25	2.10	11.10
$Tangibility$	92,546	0.26	0.24	0.00	0.08	0.18	0.39	0.91
Excess Return_$FF25$	78,602	-0.02	0.57	-2.03	-0.33	-0.09	0.18	14.63
$INew - \widehat{INew}_1$	84,731	0.01	0.13	-0.43	-0.06	-0.01	0.05	0.77
$INew - \widehat{INew}_2$	84,731	0.00	0.13	-0.44	-0.07	-0.02	0.04	0.76
$Inef1$	84,731	0.09	0.10	0.00	0.03	0.06	0.11	0.77
$Und1$	47,613	0.07	0.05	0.00	0.03	0.06	0.09	0.43
$Ovr1$	37,118	0.11	0.13	0.00	0.03	0.06	0.15	0.77
$Inef2$	84,731	0.09	0.09	0.00	0.03	0.06	0.11	0.76
$Und2$	47,613	0.08	0.05	0.00	0.04	0.07	0.10	0.44
$Ovr2$	37,118	0.10	0.13	0.00	0.02	0.05	0.13	0.76
Variables related to institutional investors								
$Tmi1$	92,546	0.09	0.15	0.00	0.00	0.00	0.13	1.00
$Tmi10$	92,546	0.01	0.02	0.00	0.00	0.00	0.01	1.00
$Nmi1$	92,546	9.3	41	0	0	0	3	1,058
$Nmi10$	92,546	9.2	10	0	3	6	12	295
$Tmi1\_Ind$	92,546	0.07	0.11	0.00	0.00	0.00	0.10	1.00
$Tmi1\_Grey$	92,546	0.02	0.06	0.00	0.00	0.00	0.00	1.00
$Tmi1\_Tran$	92,546	0.02	0.05	0.00	0.00	0.00	0.03	1.00
$Tmi1\_NonTran$	92,546	0.06	0.12	0.00	0.00	0.00	0.08	1.00
$Pmi1$	92,546	0.03	0.06	0.00	0.00	0.00	0.04	1.00
Instrumental variables in 2SLS regressions								
$R1TR2$	94,648	0.01	0.10	0.00	0.00	0.00	0.00	1.00
$R2TN$	94,648	0.03	0.17	0.00	0.00	0.00	0.00	1.00
$R2TR1$	94,648	0.01	0.11	0.00	0.00	0.00	0.00	1.00
$NTR2$	94,648	0.04	0.19	0.00	0.00	0.00	0.00	1.00
Others								
$Competition$	92,545	0.63	0.15	0.15	0.53	0.64	0.74	3.04
$GIndex$	7,317	8.94	2.66	1.00	7.00	9.00	11.00	17.00
$FCF1$	84,731	-0.04	0.18	-0.92	-0.10	-0.01	0.06	0.60
$FCF2$	84,731	-0.05	0.18	-0.94	-0.11	-0.02	0.05	0.50

Table 2: Optimal investment expenditure regressions

This table reports the regression coefficients of the optimal investment expenditure model developed by Richardson (2006). The dependent variable is $INew$ measured in year t. The independent variables are V/P, $Leverage$, $Cash$, $Size$, $Return$, Age, and $INew$ measured in year $t-1$. Detailed definitions of these variables are described in Appendix A. In the historical panel regressions, we run a panel regression with firm year observations between 1982 and year t, for each year t of our sample period 1995-2015. We only report the time series average of the coefficients estimated by twenty-one historical panel regressions. The numbers of positive and negative coefficients, with 1% significance level, are reported in parenthesis. In the panel regressions, we run one panel regression over our sample period 1995-2015. The standard errors are clustered by firm in both regressions. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively. Firm and year fixed effects are controlled in all regressions.

Historical panel regressions		**Panel regressions**	
$\frac{V}{P}_{t-1}$	-0.016	$\frac{V}{P}_{t-1}$	-0.021***
	(- 21, + 0)		[-19.26]
$Leverage_{t-1}$	-0.091	$Leverage_{t-1}$	-0.082***
	(- 21, + 0)		[-24.76]
$Cash_{t-1}$	0.033	$Cash_{t-1}$	0.030***
	(- 0, + 21)		[10.10]
$Size_{t-1}$	-0.008	$Size_{t-1}$	-0.009***
	(- 21, + 0)		[-18.42]
$Return_{t-1}$	0.009	$Return_{t-1}$	0.007***
	(- 0, + 21)		[11.35]
Age_{t-1}	-0.011	Age_{t-1}	-0.002
	(- 21, + 0)		[-1.01]
$INew_{t-1}$	0.115	$INew_{t-1}$	0.124***
	(- 0, + 21)		[19.24]
$Constant$	0.166	$Constant$	0.166***
	(- 0, + 21)		[50.69]
Average Observation	89,129	Observations	84,731
Average Adj. R-Squared	0.208	Adj. R-squared	0.259
Year fixed effects	Yes	Year fixed effects	Yes
Firm fixed effects	Yes	Firm fixed effects	Yes
Number of historical panels	21		

Table 3: Investment inefficiency and stock returns

This table presents the regression results of the firm cumulative stock returns in year $t+1$ on the investment inefficiency proxy variables in year t. The coefficients of both the panel regressions and the Fama and Macbeth (1973) (F&M) regressions are reported. Our sample consists of 68,840 firm years for the period 1995–2015. The dependent variable is the firm cumulative annual stock return and the independent variables of interest are the inefficient investment estimated by the investment regressions reported in Table 2. $Inef1$, $Und1$, and $Ovr1$ are estimated by the historical panel regressions. $Inef2$, $Und2$, and $Ovr2$ are estimated by the panel regressions. Detailed definitions of the independent variables are described in Appendix A. Fama–French 48 industry fixed effects are controlled for in all regressions. Year fixed effects are controlled and the standard errors are clustered by firm in the panel regressions. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	**(1) Panel**	**(2) F&M**	**(3) Panel**	**(4) F&M**	**(5) Panel**	**(6) F&M**	**(7) Panel**	**(8) F&M**	**(9) Panel**	**(10) F&M**	**(11) Panel**	**(12) F&M**
$Inef1$	-0.296***	-0.264***										
	[-10.67]	[-8.77]										
$Und1$			-0.524***	-0.310***								
			[-7.62]	[-3.29]								
$Ovr1$					-0.245***	-0.237***						
					[-7.59]	[-7.71]						
$Inef2$							-0.297***	-0.264***				
							[-10.22]	[-8.42]				
$Und2$									-0.552***	-0.346***		
									[-7.73]	[-3.73]		
$Ovr2$											-0.249***	-0.235***
											[-7.55]	[-7.67]
MTB	-0.003	-0.006*	-0.010***	-0.012***	0.007**	0.003	-0.003	-0.006**	-0.010***	-0.012***	0.007**	0.003
	[-1.16]	[-2.09]	[-3.36]	[-4.22]	[2.04]	[0.78]	[-1.27]	[-2.13]	[-3.34]	[-4.22]	[2.02]	[0.73]
$Leverage$	0.035***	0.026	-0.022	-0.023	0.119***	0.105***	0.033***	0.025	-0.020	-0.021	0.117***	0.103***
	[3.20]	[0.98]	[-1.55]	[-0.85]	[6.86]	[3.39]	[3.04]	[0.93]	[-1.36]	[-0.77]	[6.77]	[3.35]
$Cash$	-0.069***	-0.036	-0.053***	-0.018	-0.078***	-0.047	-0.070***	-0.036	-0.057***	-0.020	-0.077***	-0.047
	[-5.78]	[-1.10]	[-3.33]	[-0.53]	[-4.25]	[-1.44]	[-5.88]	[-1.12]	[-3.53]	[-0.59]	[-4.22]	[-1.42]
$Size$	-0.027***	-0.024***	-0.030***	-0.026***	-0.022***	-0.020***	-0.027***	-0.024***	-0.030***	-0.027***	-0.022***	-0.020***
	[-21.49]	[-7.99]	[-16.98]	[-8.02]	[-11.81]	[-5.22]	[-21.59]	[-8.06]	[-17.12]	[-7.99]	[-11.83]	[-5.27]
$Constant$	0.109***	0.291***	0.169***	0.337***	0.021	0.069	0.113***	0.294***	0.182***	0.341***	0.019	0.068
	[4.88]	[4.40]	[5.87]	[3.52]	[0.61]	[1.27]	[5.04]	[4.49]	[6.21]	[3.63]	[0.54]	[1.27]
Observations	68,840	68,840	38,829	38,829	30,011	30,011	68,840	68,840	38,829	38,829	30,011	30,011
Adj. R-squared	0.016	0.092	0.016	0.092	0.018	0.120	0.016	0.091	0.016	0.092	0.018	0.120
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Number of groups		21		21		21		21		21		21

Table 4: Motivated institutional ownership and inefficient investment: Baseline regressions

Panel A. Inefficient investment estimated by the historical panel regressions. This panel presents the panel regression results of the firm inefficient investment on the institutional ownership. Our sample consists of 80,031 firm years for the period 1995–2015. The dependent variables are the firm inefficient investment proxy variables: $Inef1$, $Und1$, and $Ovr1$ estimated by the historical panel regressions. The independent variables of interest are the most motivated institutional investor ownership ($Tmi1$) and the least motivated institutional investor ownership ($Tmi10$). Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	$Inef1$			$Und1$			$Ovr1$		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
$Tmi1$	-0.007**		-0.006*	-0.009***		-0.007***	-0.019***		-0.018***
	[-2.26]		[-1.94]	[-3.40]		[-2.90]	[-3.62]		[-3.52]
$Tmi10$		0.079***	0.075***		0.081***	0.076***		0.064	0.049
		[3.57]	[3.37]		[4.84]	[4.57]		[1.24]	[0.95]
MTB	0.006***	0.006***	0.006***	-0.001**	-0.001**	-0.000	0.009***	0.008***	0.009***
	[13.84]	[14.17]	[13.98]	[-2.00]	[-2.08]	[-1.59]	[13.14]	[13.08]	[13.13]
$Leverage$	0.008***	0.008***	0.008***	-0.028***	-0.028***	-0.028***	0.019***	0.019***	0.018***
	[3.67]	[3.65]	[3.60]	[-21.31]	[-21.36]	[-21.44]	[5.83]	[6.02]	[5.80]
$Cash$	0.024***	0.024***	0.024***	0.014***	0.014***	0.014***	0.023***	0.023***	0.023***
	[11.86]	[12.00]	[11.85]	[9.96]	[10.05]	[9.91]	[6.55]	[6.83]	[6.55]
$Size$	-0.008***	-0.008***	-0.008***	-0.008***	-0.009***	-0.008***	-0.010***	-0.011***	-0.010***
	[-33.04]	[-34.90]	[-32.77]	[-46.53]	[-50.77]	[-46.20]	[-21.29]	[-25.26]	[-21.17]
$Tangibility$	0.017***	0.017***	0.017***	0.011***	0.011***	0.011***	0.020***	0.021***	0.020***
	[5.93]	[6.03]	[5.95]	[4.55]	[4.64]	[4.53]	[3.80]	[3.99]	[3.83]
Age	-0.003***	-0.003***	-0.003***	-0.005***	-0.005***	-0.005***	-0.002*	-0.002*	-0.002*
	[-6.13]	[-6.21]	[-6.18]	[-13.44]	[-13.38]	[-13.53]	[-1.72]	[-1.89]	[-1.74]
$Constant$	0.119***	0.119***	0.118***	0.130***	0.129***	0.129***	0.146***	0.148***	0.145***
	[25.41]	[25.44]	[25.15]	[36.75]	[36.68]	[36.40]	[14.31]	[14.64]	[14.23]
Observations	80,031	80,031	80,031	45,018	45,018	45,018	35,013	35,013	35,013
Adj. R-squared	0.160	0.160	0.160	0.246	0.246	0.246	0.184	0.184	0.184
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Inefficient investment estimated by the panel regressions. This panel presents the panel regression results of the firm inefficient investment on the institutional ownership. Our sample consists of 80,031 firm years for the period 1995–2015. The dependent variables are the firm inefficient investment proxy variables: $Inef2$, $Und2$, and $Ovr2$ estimated by the panel regressions. The independent variables of interest are the most motivated institutional investor ownership ($Tmi1$) and the least motivated institutional investor ownership ($Tmi10$). Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	*Inef*2			*Und*2			*Ovr*2		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
*Tmi*1	-0.017***		-0.016***	-0.007***		-0.006**	-0.022***		-0.021***
	[-5.97]		[-5.59]	[-2.85]		[-2.33]	[-4.39]		[-4.30]
*Tmi*10		0.095***	0.082***		0.083***	0.079***		0.060	0.042
		[4.21]	[3.71]		[4.70]	[4.48]		[1.18]	[0.83]
MTB	0.005***	0.005***	0.005***	-0.000	-0.000	-0.000	0.008***	0.008***	0.008***
	[12.97]	[12.83]	[13.14]	[-0.44]	[-0.40]	[-0.01]	[12.67]	[12.46]	[12.65]
Leverage	0.004*	0.004*	0.003*	-0.017***	-0.017***	-0.017***	0.010***	0.011***	0.010***
	[1.85]	[1.95]	[1.77]	[-12.22]	[-12.30]	[-12.36]	[3.18]	[3.43]	[3.16]
Cash	0.021***	0.021***	0.021***	0.011***	0.011***	0.011***	0.023***	0.024***	0.023***
	[10.77]	[11.10]	[10.76]	[7.70]	[7.76]	[7.64]	[6.88]	[7.21]	[6.88]
Size	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***	-0.010***	-0.011***	-0.010***
	[-37.91]	[-42.10]	[-37.56]	[-50.77]	[-55.04]	[-50.47]	[-20.22]	[-24.52]	[-20.10]
Tangibility	0.013***	0.013***	0.013***	0.011***	0.011***	0.011***	0.016***	0.018***	0.017***
	[4.66]	[4.92]	[4.67]	[4.46]	[4.52]	[4.43]	[3.17]	[3.39]	[3.19]
Age	-0.001**	-0.001***	-0.001***	0.004***	0.004***	0.004***	-0.008***	-0.009***	-0.008***
	[-2.54]	[-2.65]	[-2.59]	[10.70]	[10.67]	[10.63]	[-8.27]	[-8.52]	[-8.28]
Constant	0.127***	0.128***	0.126***	0.135***	0.134***	0.133***	0.141***	0.144***	0.141***
	[28.94]	[29.32]	[28.63]	[38.14]	[38.01]	[37.78]	[14.56]	[14.99]	[14.48]
Observations	80,031	80,031	80,031	45,018	45,018	45,018	35,013	35,013	35,013
Adj. R-squared	0.165	0.164	0.165	0.238	0.238	0.238	0.192	0.192	0.192
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Motivated institutional ownership and inefficient investment: Instrumental variable method

Panel A. The institutional ownership level and the inefficient investment level. This panel presents the two stage least squares (2SLS) regression results of the firm inefficient investment on the institutional ownership. The dependent variable in the first stage regression is the most motivated institutional investor ownership ($Tmi1$). The instrumental variables used in the first stage regressions are the dummy variables: $R1TR2$ indicating whether the firm switches from the Russell 1000 index into the Russell 2000 index, $R2TR1$ indicating whether the firm switches from the Russell 2000 index into the Russell 1000 index, $R2TN$ indicating whether the firm drops out of the Russell 2000 index due to the market value decrease, and $NTR2$ indicating whether the firm gets included in the Russell 2000 index due to the market value increase. Our sample in the first step regressions consists of 92, 546 firm years with data from the Centre for Research in Security Prices, Compustat, and Thomson Financial CDA/Spectrum Institutional (13F) database during the period 1995–2015. In columns 1–3 of the second stage regressions, the dependent variables are the firm inefficient investment proxy variables: $Inef1$, $Und1$, and $Ovr1$ estimated by the historical panel regressions. In columns 4–6 of the second stage regressions, the dependent variables are the firm inefficient investment proxy variables: $Inef2$, $Und2$, and $Ovr2$ estimated by the panel regressions. The independent variable of interest in the second stage regressions is $IVTmi1$, the predicted $Tmi1$ by the first stage regressions. Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	First stage	**Second stage**					
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	$Tmi1$	$Inef1$	$Und1$	$Ovr1$	$Inef2$	$Und2$	$Ovr2$
$IVTmi1$		-0.104***	-0.057***	-0.151***	-0.112***	-0.063***	-0.148***
		[-3.85]	[-3.12]	[-2.95]	[-4.28]	[-3.45]	[-2.95]
$R1TR2$	-0.059***						
	[-14.93]						
$R2TR1$	0.041***						
	[8.67]						
$R2TN$	-0.053***						
	[-33.55]						
$NTR2$	-0.033***						

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	First stage	Second stage					
		(1)	(2)	(3)	(4)	(5)	(6)
Variables	$Tmi1$	$Inef1$	$Und1$	$Ovr1$	$Inef2$	$Und2$	$Ovr2$
	[-17.30]						
MTB	0.018***	0.008***	0.000	0.011***	0.007***	0.001**	0.010***
	[33.16]	[11.24]	[0.91]	[9.28]	[10.67]	[2.19]	[8.96]
$Leverage$	-0.025***	0.005**	-0.029***	0.015***	0.001	-0.018***	0.007**
	[-9.21]	[2.41]	[-20.95]	[4.54]	[0.60]	[-12.54]	[2.08]
$Cash$	-0.035***	0.020***	0.012***	0.018***	0.017***	0.008***	0.019***
	[-12.82]	[8.88]	[7.72]	[4.45]	[7.90]	[5.45]	[4.79]
$Size$	0.039***	-0.004***	-0.007***	-0.005***	-0.005***	-0.007***	-0.005**
	[56.85]	[-3.92]	[-9.04]	[-2.63]	[-4.99]	[-9.66]	[-2.44]
$Tangibility$	-0.040***	0.013***	0.009***	0.015***	0.009***	0.009***	0.012**
	[-6.88]	[4.16]	[3.58]	[2.61]	[3.00]	[3.37]	[2.05]
Age	0.001	-0.003***	-0.005***	-0.002*	-0.001**	0.004***	-0.008***
	[1.22]	[-5.80]	[-12.99]	[-1.65]	[-2.23]	[11.05]	[-8.23]
$Constant$	-0.115***	0.108***	0.124***	0.131***	0.116***	0.128***	0.128***
	[-13.15]	[18.63]	[29.56]	[11.00]	[21.24]	[30.43]	[11.17]
Observations	92,546	80,031	45,018	35,013	80,031	45,018	35,013
Adj. R-squared	0.379	0.160	0.246	0.184	0.164	0.238	0.192
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. The change in institutional ownership and the change in inefficient investment. This panel presents the two stage least squares (2SLS) regression results of the change in firm inefficient investment on the change in institutional ownership. The dependent variable in the first stage regression is the change in the most motivated institutional investor ownership ($Tmi1$) from year $t-1$ to year t. The instrumental variables used in the first stage regressions are the dummy variables: $R1TR2$ indicating whether the firm switches from the Russell 1000 index into the Russell 2000 index, $R2TR1$ indicating whether the firm switches from the Russell 2000 index into the Russell 1000 index, $R2TN$ indicating whether the firm drops out of the Russell 2000 index due to the market value decrease, and $NTR2$ indicating whether the firm gets included in the Russell 2000 index due to the market value increase. Our sample in the first step regressions consists of 83,778 firm years with data from the Centre for Research in Security Prices, Compustat, and Thomson Financial CDA/Spectrum Institutional (13F) database during the period 1995–2015. In columns 1–3 of the second stage regressions, the dependent variables are the changes in the firm inefficient investment proxy variables from year t to year $t+1$: $\Delta Inef1$, $\Delta Und1$, and $\Delta Ovr1$. The level of these variables are estimated by the historical panel regressions. In columns 4–6 of the second stage regressions, the dependent variables are the changes in the firm inefficient investment proxy variables from year t to year $t+1$: $\Delta Inef2$, $\Delta Und2$, and $\Delta Ovr2$. The level of these variables are estimated by the panel regressions. The independent variable of interest in the second stage regressions is the predicted $\Delta Tmi1$ by the first stage regressions. All the other control variables are the changes of themselves from from year $t-1$ to year t. Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	First stage	**Second stage**					
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	$\Delta Tmi1$	$\Delta Inef1$	$\Delta Und1$	$\Delta Ovr1$	$\Delta Inef2$	$\Delta Und2$	$\Delta Ovr2$
$IV\Delta Tmi1$		-0.878***	-0.346**	-1.587***	-0.810***	-0.260	-1.609***
		[-3.38]	[-2.17]	[-3.57]	[-3.25]	[-1.62]	[-3.71]
$R1TR2$	-0.007**						
	[-2.43]						
$R2TR1$	0.013***						
	[3.64]						
$R2TN$	0.002**						

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	First stage	Second stage					
		(1)	(2)	(3)	(4)	(5)	(6)
Variables	$\Delta Tmi1$	$\Delta Inef1$	$\Delta Und1$	$\Delta Ovr1$	$\Delta Inef2$	$\Delta Und2$	$\Delta Ovr2$
	[2.42]						
$NTR2$	0.002*						
	[1.77]						
ΔMTB	0.005***	0.009***	0.002**	0.016***	0.008***	0.001	0.016***
	[21.19]	[5.95]	[2.36]	[6.50]	[5.77]	[1.40]	[6.81]
$\Delta Leverage$	-0.007***	-0.063***	-0.042***	-0.088***	-0.060***	-0.033***	-0.094***
	[-4.96]	[-12.56]	[-15.61]	[-10.18]	[-12.91]	[-11.83]	[-11.23]
$\Delta Cash$	0.010***	0.014***	0.034***	0.001	0.013***	0.027***	0.007
	[9.31]	[3.57]	[14.95]	[0.23]	[3.52]	[11.84]	[1.14]
$\Delta Size$	-0.000	-0.003***	-0.007***	0.003**	-0.003***	-0.008***	0.004***
	[-0.67]	[-6.36]	[-24.77]	[2.56]	[-7.55]	[-28.41]	[3.14]
$\Delta Tangibility$	-0.020***	-0.023*	0.120***	-0.086***	-0.010	0.129***	-0.088***
	[-4.76]	[-1.92]	[13.55]	[-4.21]	[-0.84]	[14.07]	[-4.39]
ΔAge	0.007***	0.003	-0.009***	-0.034***	0.006*	0.015***	-0.052***
	[3.38]	[0.99]	[-3.62]	[-4.22]	[1.70]	[5.83]	[-6.75]
$Constant$	0.001	0.006**	-0.008***	-0.019***	0.008***	-0.012***	-0.016**
	[0.44]	[2.50]	[-3.81]	[-2.74]	[3.46]	[-5.44]	[-2.37]
Observations	83,778	73,466	40,880	32,586	73,466	40,880	32,586
Adj. R-squared	0.018	0.018	0.086	0.035	0.020	0.089	0.037
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: Motivated institutional ownership by institutional investor types

Panel A. The institutional ownership level and the inefficient investment level: Independent vs. grey investors. This panel presents the two stage least squares (2SLS) regression results of the firm inefficient investment on the institutional ownership by types. We divide total motivated institutional ownership $Tmi1$ into motivated independent institutional ownership $Tmi1\_Ind$ and motivated grey institutional ownership $Tmi1\_Grey$. In columns (1) and (4), the dependent variables in the first stage regressions are $Tmi1\_Ind$ and $Tmi1\_Grey$. The instrumental variables used in the first stage regressions are the dummy variables: $R1TR2$ indicating whether the firm switches from the Russell 1000 index into the Russell 2000 index, $R2TR1$ indicating whether the firm switches from the Russell 2000 index into the Russell 1000 index, $R2TN$ indicating whether the firm drops out of the Russell 2000 index due to the market value decrease, and $NTR2$ indicating whether the firm gets included in the Russell 2000 index due to the market value increase. Our sample in the first step regressions consists of 92,546 firm years with data from the Centre for Research in Security Prices, Compustat, and Thomson Financial CDA/Spectrum Institutional (13F) database during the period 1995–2015. In columns (2) and (4), the dependent variables in the second stage regressions are the firm inefficient investment proxy variables: $Inef1$ estimated by the historical panel regressions and $Inef2$ estimated by the panel regressions. The independent variables of interest in the second stage regressions are $IVTmi1\_Ind$ and $IVTmi1\_Grey$, the predicted ownership by the first stage regressions. Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	First stage	**Second stage**		**First stage**	**Second stage**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	$Tmi1\_Ind$	$Inef1$	$Inef2$	$Tmi1\_Grey$	$Inef1$	$Inef2$
$IVTmi1\_Ind$		-0.140***	-0.112***			
		[-3.95]	[-4.28]			
$IVTmi1\_Grey$					-0.281***	-0.309***
					[-3.12]	[-3.58]
$R1TR2$	-0.038***			-0.021***		
	[-12.40]			[-10.41]		
$R2TR1$	-0.038***			-0.016***		
	[-28.83]			[-23.13]		

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	First stage	Second stage		First stage	Second stage	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	$Tmi1\_Ind$	$Inef1$	$Inef2$	$Tmi1\_Grey$	$Inef1$	$Inef2$
$R2TN$	0.046***			-0.005***		
	[11.64]			[-2.88]		
$NTR2$	-0.021***			-0.012***		
	[-13.09]			[-14.99]		
MTB	0.013***	0.008***	0.007***	0.005***	0.007***	0.007***
	[32.03]	[11.50]	[10.67]	[23.64]	[11.13]	[10.53]
$Leverage$	-0.017***	0.005**	0.001	-0.007***	0.006***	0.002
	[-8.16]	[2.51]	[0.60]	[-6.78]	[2.62]	[0.82]
$Cash$	-0.019***	0.021***	0.017***	-0.016***	0.019***	0.016***
	[-8.78]	[9.93]	[7.90]	[-14.88]	[7.44]	[6.47]
$Size$	0.027***	-0.004***	-0.005***	0.012***	-0.005***	-0.006***
	[57.01]	[-4.58]	[-4.99]	[39.27]	[-4.60]	[-5.63]
$Tangibility$	-0.028***	0.013***	0.009***	-0.012***	0.013***	0.009***
	[-6.50]	[4.31]	[3.00]	[-5.09]	[4.42]	[3.24]
Age	-0.002**	-0.004***	-0.001**	0.003***	-0.003***	-0.000
	[-2.54]	[-6.58]	[-2.23]	[6.71]	[-3.90]	[-0.60]
$Constant$	-0.071***	0.110***	0.116***	-0.045***	0.108***	0.115***
	[-9.31]	[20.21]	[21.24]	[-13.61]	[17.00]	[19.26]
Observations	92,546	80,031	80,031	92,546	80,031	80,031
Adj. R-squared	0.328	0.160	0.164	0.241	0.160	0.164
Industry fixed effects	Yes	Yes	Yes	Yes		Yes
Year fixed effects	Yes	Yes	Yes	Yes		Yes

Panel B. The change in institutional ownership and the change in inefficient investment: Independent vs. grey investors. This panel presents the two stage least squares (2SLS) regression results of the change in firm inefficient investment on the change in institutional ownership by types. We divide total motivated institutional ownership $Tmi1$ into motivated independent institutional ownership $Tmi1\_Ind$ and motivated grey institutional ownership $Tmi1\_Grey$. In columns (1) and (4), the dependent variables in the first stage regressions are the changes in $Tmi1\_Ind$ and $Tmi1\_Grey$, from year $t-1$ to year t. The instrumental variables used in the first stage regressions are the dummy variables: $R1TR2$ indicating whether the firm switches from the Russell 1000 index into the Russell 2000 index, $R2TR1$ indicating whether the firm switches from the Russell 2000 index into the Russell 1000 index, $R2TN$ indicating whether the firm drops out of the Russell 2000 index due to the market value decrease, and $NTR2$ indicating whether the firm gets included in the Russell 2000 index due to the market value increase. Our sample in the first step regressions consists of 84,731 firm years with data from the Centre for Research in Security Prices, Compustat, and Thomson Financial CDA/Spectrum Institutional (13F) database during the period 1995–2015. In columns (2) and (4), the dependent variables in the second stage regressions are the changes in the firm inefficient investment proxy variables from year t to year $t+1$:: $\Delta Inef1$ estimated by the historical panel regressions and $\Delta Inef2$ estimated by the panel regressions. The independent variables of interest in the second stage regressions are $\Delta IVTmi1\_Ind$ and $\Delta IVTmi1\_Grey$, the predicted ownership changes by the first stage regressions. All the other control variables are the changes of themselves from from year $t-1$ to year t. Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	First stage	**Second stage**		**First stage**	**Second stage**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	$\Delta Tmi1\_Ind$	$\Delta Inef1$	$\Delta Inef2$	$\Delta Tmi1\_Grey$	$\Delta Inef1$	$\Delta Inef2$
$IV\Delta Tmi1\_Ind$		-1.068***	-0.972***			
		[-3.48]	[-3.31]			
$IV\Delta Tmi1\_Grey$					-1.647**	-1.592**
					[-2.18]	[-2.25]
$R1TR2$	-0.003			-0.004***		
	[-1.54]			[-2.96]		
$R2TR1$	0.001			0.001		

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	First stage	Second stage		First stage	Second stage	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	$\Delta Tmi1\_Ind$	$\Delta Inef1$	$\Delta Inef2$	$\Delta Tmi1\_Grey$	$\Delta Inef1$	$\Delta Inef2$
	[0.97]			[1.35]		
$R2TN$	0.012***			0.000		
	[4.03]			[0.05]		
$NTR2$	0.001			0.000		
	[1.34]			[0.52]		
ΔMTB	0.004***	0.009***	0.008***	0.001***	0.006***	0.005***
	[19.51]	[6.16]	[5.92]	[9.38]	[6.56]	[6.56]
$\Delta Leverage$	-0.006***	-0.064***	-0.061***	-0.001	-0.059***	-0.057***
	[-5.33]	[-12.57]	[-12.88]	[-1.47]	[-12.38]	[-12.83]
$\Delta Cash$	0.009***	0.015***	0.014***	0.001	0.006**	0.006**
	[9.71]	[3.68]	[3.59]	[1.45]	[2.11]	[2.17]
$\Delta Size$	0.000	-0.003***	-0.003***	-0.000*	-0.003***	-0.004***
	[0.55]	[-5.54]	[-6.76]	[-1.92]	[-6.27]	[-7.37]
$\Delta Tangibility$	-0.017***	-0.024**	-0.011	-0.002	-0.010	0.003
	[-5.15]	[-2.01]	[-0.92]	[-1.24]	[-0.86]	[0.25]
ΔAge	0.003*	0.000	0.003	0.004***	0.004	0.006
	[1.92]	[0.16]	[1.00]	[3.58]	[0.88]	[1.55]
$Constant$	0.003**	0.009***	0.010***	-0.003***	0.000	0.002
	[2.13]	[3.42]	[4.22]	[-3.45]	[0.10]	[0.80]
Observations	84,731	73,466	73,466	84,731	73,466	73,466
Adj. R-squared	0.016	0.018	0.020	0.011	0.018	0.020
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Panel C. The institutional ownership level and the inefficient investment level: Transient vs. non-transient investors. This panel presents the two stage least squares (2SLS) regression results of the firm inefficient investment on the institutional ownership by types. We divide total motivated institutional ownership $Tmi1$ into motivated transient institutional ownership $Tmi1\_Tran$ and motivated non-transient institutional ownership $Tmi1\_NonTran$. In columns (1) and (4), the dependent variables in the first stage regressions are $Tmi1\_Tran$ and $Tmi1\_NonTran$. The instrumental variables used in the first stage regressions are the dummy variables: $R1TR2$ indicating whether the firm switches from the Russell 1000 index into the Russell 2000 index, $R2TR1$ indicating whether the firm switches from the Russell 2000 index into the Russell 1000 index, $R2TN$ indicating whether the firm drops out of the Russell 2000 index due to the market value decrease, and $NTR2$ indicating whether the firm gets included in the Russell 2000 index due to the market value increase. Our sample in the first step regressions consists of 92,546 firm years with data from the Centre for Research in Security Prices, Compustat, and Thomson Financial CDA/Spectrum Institutional (13F) database during the period 1995–2015. In columns (2) and (4), the dependent variables in the second stage regressions are the firm inefficient investment proxy variables: $Inef1$ estimated by the historical panel regressions and $Inef2$ estimated by the panel regressions. The independent variables of interest in the second stage regressions are $IVTmi1\_Tran$ and $IVTmi1\_NonTran$, the predicted ownership by the first stage regressions. Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	First stage	**Second stage**		**First stage**	**Second stage**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	$Tmi1\_Tran$	$Inef1$	$Inef2$	$Tmi1\_NonTran$	$Inef1$	$Inef2$
$IVTmi1\_Tran$		-0.237***	-0.245***			
		[-3.62]	[-3.90]			
$IVTmi1\_NonTran$					-0.132***	-0.143***
					[-3.50]	[-3.95]
$R1TR2$	-0.012***			-0.046***		
	[-8.23]			[-13.30]		
$R2TR1$	-0.013***			-0.039***		
	[-16.74]			[-32.21]		
$R2TN$	0.037***			0.005		

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	First stage	Second stage		First stage	Second stage	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	$Tmi1\_Tran$	$Inef1$	$Inef2$	$Tmi1\_NonTran$	$Inef1$	$Inef2$
	[15.93]			[1.27]		
$NTR2$	-0.004***			-0.029***		
	[-3.87]			[-21.05]		
MTB	0.005***	0.007***	0.006***	0.013***	0.008***	0.007***
	[27.78]	[12.16]	[11.29]	[30.39]	[11.22]	[10.63]
$Leverage$	-0.002**	0.007***	0.003*	-0.022***	0.005**	0.001
	[-2.34]	[3.47]	[1.76]	[-10.55]	[2.16]	[0.35]
$Cash$	0.002**	0.025***	0.022***	-0.037***	0.019***	0.016***
	[2.47]	[12.28]	[11.41]	[-17.07]	[7.42]	[6.45]
$Size$	0.009***	-0.006***	-0.007***	0.030***	-0.004***	-0.005***
	[56.28]	[-9.97]	[-12.36]	[51.10]	[-3.90]	[-4.86]
$Tangibility$	-0.009***	0.015***	0.011***	-0.030***	0.013***	0.009***
	[-5.61]	[5.09]	[3.96]	[-6.28]	[4.21]	[3.03]
Age	-0.003***	-0.004***	-0.002***	0.004***	-0.003***	-0.001
	[-8.51]	[-7.09]	[-3.67]	[5.17]	[-4.73]	[-1.25]
$Constant$	-0.023***	0.115***	0.123***	-0.092***	0.108***	0.116***
	[-9.72]	[23.02]	[26.49]	[-11.98]	[17.96]	[20.42]
Observations	92,546	80,031	80,031	92,546	80,031	80,031
Adj. R-squared	0.172	0.160	0.164	0.350	0.160	0.164
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Panel D. The change in institutional ownership and the change in inefficient investment: Transient vs. non-transient investors. This panel presents the two stage least squares (2SLS) regression results of the change in firm inefficient investment on the change in institutional ownership by types. We divide total motivated institutional ownership $Tmi1$ into motivated transient institutional ownership $Tmi1\_Tran$ and motivated non-transient institutional ownership $Tmi1\_NonTran$. In columns (1) and (4), the dependent variables in the first stage regressions are the changes in $Tmi1\_Tran$ and $Tmi1\_NonTran$, from year $t-1$ to year t. The instrumental variables used in the first stage regressions are the dummy variables: $R1TR2$ indicating whether the firm switches from the Russell 1000 index into the Russell 2000 index, $R2TR1$ indicating whether the firm switches from the Russell 2000 index into the Russell 1000 index, $R2TN$ indicating whether the firm drops out of the Russell 2000 index due to the market value decrease, and $NTR2$ indicating whether the firm gets included in the Russell 2000 index due to the market value increase. Our sample in the first step regressions consists of 84,731 firm years with data from the Centre for Research in Security Prices, Compustat, and Thomson Financial CDA/Spectrum Institutional (13F) database during the period 1995–2015. In columns (2) and (4), the dependent variables in the second stage regressions are the changes in the firm inefficient investment proxy variables from year t to year $t+1$:: $\Delta Inef1$ estimated by the historical panel regressions and $\Delta Inef2$ estimated by the panel regressions. The independent variables of interest in the second stage regressions are $\Delta IVTmi1\_Tran$ and $\Delta IVTmi1\_NonTran$, the predicted ownership changes by the first stage regressions. All the other control variables are the changes of themselves from from year $t-1$ to year t. Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	First stage	**Second stage**		**First stage**	**Second stage**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	$\Delta Tmi1\_Tran$	$\Delta Inef1$	$\Delta Inef2$	$\Delta Tmi1\_NonTran$	$\Delta Inef1$	$\Delta Inef2$
$IV\Delta Tmi1\_Tran$		-2.140***	-1.910***			
		[-3.92]	[-3.65]			
$IV\Delta Tmi1\_NonTran$					-1.421***	-1.298***
					[-3.57]	[-3.42]
$R1TR2$	-0.002*			-0.005**		
	[-1.72]			[-2.45]		
$R2TR1$	0.000			-0.000		

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	First stage	Second stage		First stage	Second stage	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	$\Delta Tmi1\_Tran$	$\Delta Inef1$	$\Delta Inef2$	$\Delta Tmi1\_NonTran$	$\Delta Inef1$	$\Delta Inef2$
	[0.36]			[-0.66]		
$R2TN$	0.006***			0.009***		
	[3.45]			[3.33]		
$NTR2$	0.002**			-0.000		
	[2.03]			[-0.26]		
ΔMTB	0.003***	0.010***	0.009***	0.003***	0.008***	0.007***
	[18.15]	[6.37]	[6.04]	[16.64]	[6.86]	[6.64]
$\Delta Leverage$	-0.003***	-0.063***	-0.060***	-0.005***	-0.065***	-0.062***
	[-3.56]	[-12.81]	[-13.13]	[-5.51]	[-12.54]	[-12.84]
$\Delta Cash$	0.006***	0.018***	0.017***	0.004***	0.010***	0.010***
	[9.08]	[4.09]	[3.91]	[5.83]	[3.26]	[3.22]
$\Delta Size$	-0.000	-0.003***	-0.003***	0.000*	-0.002***	-0.003***
	[-0.70]	[-6.44]	[-7.61]	[1.67]	[-4.35]	[-5.55]
$\Delta Tangibility$	-0.009***	-0.024**	-0.010	-0.011***	-0.021*	-0.008
	[-3.44]	[-2.03]	[-0.89]	[-3.91]	[-1.82]	[-0.71]
ΔAge	0.000	-0.002	0.000	-0.001	-0.004	-0.001
	[0.18]	[-0.87]	[0.08]	[-0.33]	[-1.44]	[-0.45]
$Constant$	0.001	0.007***	0.009***	0.001	0.007***	0.009***
	[0.78]	[2.96]	[3.85]	[1.22]	[2.98]	[3.89]
Observations	84,731	73,466	73,466	84,731	73,466	73,466
Adj. R-squared	0.014	0.018	0.020	0.010	0.018	0.020
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: How do motivated monitoring institutional investors mitigate firm over-investment?

This table presents the second-stage regressions of firm over-investment on the product of the predicated motivated institutional ownership and firm cash. The first step regression is the same as the one in Panel A of Table 5. In columns 1 and 3, the dependent variables are the firm over-investment proxy variable $Ovr1$, estimated by the historical panel regressions. In columns 2 and 4, the dependent variables are the firm over-investment proxy variable $Ovr2$, estimated by the panel regressions. The independent variables of interest in the second stage regressions are the product of the predicted $Tmi1$ by the first stage regressions and $Cash$ ($IVTmi1 * Cash$) and the product of the predicted $Tmi1$ by the first stage regressions and FCF ($IVTmi1 * FCF$). FCF1 (FCF2) are estimated by the historical panel regressions (the panel regressions). Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	**(1)** $Ovr1$	**(2)** $Ovr2$	**(3)** $Ovr1$	**(4)** $Ovr2$
$IVTmi1$	-0.106**	-0.106**	-0.128*	-0.132*
	[-2.02]	[-2.07]	[-1.86]	[-1.82]
$IVTmi1 * Cash$	-0.130***	-0.120***		
	[-3.80]	[-3.58]		
$IVTmi1 * FCF1$			-0.264**	
			[-2.06]	
$FCF1$			0.128***	
			[5.09]	
$IVTmi1 * FCF2$				-0.302**
				[-2.28]
$FCF2$				0.124***
				[4.66]
$Cash$	0.025***	0.025***	0.013**	0.011*
	[5.67]	[5.90]	[2.00]	[1.73]
MTB	0.011***	0.011***	0.008***	0.008***
	[9.40]	[9.07]	[4.85]	[4.57]
$Leverage$	0.016***	0.007**	0.013***	0.007
	[4.62]	[2.16]	[3.22]	[1.61]
$Size$	-0.006***	-0.006***	-0.005**	-0.005*
	[-3.05]	[-2.84]	[-1.98]	[-1.82]
$Tangibility$	0.015***	0.012**	0.022***	0.016**
	[2.66]	[2.09]	[3.16]	[2.23]
Age	-0.002**	-0.009***	-0.003**	-0.008***
	[-2.09]	[-8.69]	[-2.14]	[-6.32]
$Constant$	0.132***	0.128***	0.131***	0.131***
	[11.14]	[11.31]	[8.14]	[7.97]
Observations	35,013	35,013	19,333	17,529
Adj. R-squared	0.185	0.192	0.134	0.144
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Table 8: How do motivated monitoring institutional investors mitigate firm under-investment?

This table presents the second-stage regressions of firm under-investment on the product of the predicated motivated institutional ownership and the variables proxy for firm managers' career concern. The first step regression is the same as the one in Panel A of Table 5. In columns 1 and 3, the dependent variables are the firm under-investment proxy variable $Und1$, estimated by the historical panel regressions. In columns 2 and 4, the dependent variables are the firm under-investment proxy variable $Und2$, estimated by the panel regressions. In columns (1) and (2), the independent variable of interest is the product of the predicted $Tmi1$ by the first stage regressions and $Competition$ ($IVTmi1 * Competition$). In columns (3) and (4), the independent variable of interest is the product of the predicted $Tmi1$ by the first stage regressions and $GIndex$ ($IVTmi1 * GIndex$). Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	**(1)** $Und1$	**(2)** $Und2$	**(3)** $Und1$	**(4)** $Und2$
$IVTmi1$	-0.029	-0.033	-0.116**	-0.119**
	[-1.15]	[-1.28]	[-2.00]	[-1.99]
$IVTmi1 * Competition$	-0.059**	-0.062**		
	[-2.29]	[-2.34]		
$Competition$	0.035***	0.034***		
	[4.94]	[4.65]		
$IVTmi1 * GIndex$			0.008*	0.008*
			[1.65]	[1.80]
$GIndex$			-0.002**	-0.002**
			[-2.01]	[-2.13]
MTB	-0.001***	-0.001**	0.000	0.001
	[-2.83]	[-2.17]	[0.23]	[0.64]
$Leverage$	-0.032***	-0.027***	-0.029***	-0.015***
	[-23.57]	[-18.32]	[-7.51]	[-3.68]
$Cash$	0.016***	0.013***	0.007	0.006
	[10.03]	[7.70]	[1.40]	[1.20]
$Size$	-0.004***	-0.005***	-0.007***	-0.008***
	[-6.15]	[-6.57]	[-3.87]	[-4.21]
$Tangibility$	0.012***	0.011***	0.021***	0.023***
	[4.06]	[3.79]	[2.66]	[2.87]
Age	-0.001**	0.006***	-0.007***	0.003***
	[-2.52]	[13.55]	[-7.55]	[3.46]
$Constant$	0.047***	0.051***	0.136***	0.141***
	[6.39]	[6.90]	[10.97]	[11.53]
Observations	47,445	47,445	3,082	3,082
R-squared	0.198	0.181	0.251	0.265
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Table 9: Alternative measures of motivated monitoring institutional investor ownership

Panel A. The ratio of the most motivated monitoring institutional investor number to the total institutional investor number. This panel presents the two stage least squares (2SLS) regression results of the firm inefficient investment on the institutional ownership. The dependent variable in the first stage regression is the ratio of the most motivated institutional investor number to the total institutional investor number ($Pmi1$). The instrumental variables used in the first stage regressions are the dummy variables: $R1TR2$ indicating whether the firm switches from the Russell 1000 index into the Russell 2000 index, $R2TR1$ indicating whether the firm switches from the Russell 2000 index into the Russell 1000 index, $R2TN$ indicating whether the firm drops out of the Russell 2000 index due to the market value decrease, and $NTR2$ indicating whether the firm gets included in the Russell 2000 index due to the market value increase. Our sample in the first step regressions consists of 92,546 firm years with data from the Centre for Research in Security Prices, Compustat, and Thomson Financial CDA/Spectrum Institutional (13F) database during the period 1995–2015. In columns 1–3 of the second stage regressions, the dependent variables are the firm inefficient investment proxy variables: $Inef1$, $Und1$, and $Ovr1$ estimated by the historical panel regressions. In columns 4–6 of the second stage regressions, the dependent variables are the firm inefficient investment proxy variables: $Inef2$, $Und2$, and $Ovr2$ estimated by the panel regressions. The independent variable of interest in the second stage regressions is $IVPmi1$, the predicted $Pmi1$ by the first stage regressions. Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	First stage	**Second stage**					
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	$Pmi1$	$Inef1$	$Und1$	$Ovr1$	$Inef2$	$Und2$	$Ovr2$
$IVPmi1$		-0.265***	-0.145***	-0.392***	-0.288***	-0.172***	-0.382***
		[-3.41]	[-2.84]	[-2.63]	[-3.87]	[-3.33]	[-2.62]
$R1TR2$	-0.017***						
	[-14.61]						
$R2TR1$	-0.017***						
	[-29.90]						
$R2TN$	0.023***						
	[13.78]						

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	First stage	Second stage					
		(1)	(2)	(3)	(4)	(5)	(6)
Variables	$Pmi1$	$Inef1$	$Und1$	$Ovr1$	$Inef2$	$Und2$	$Ovr2$
$NTR2$	-0.011***						
	[-16.84]						
MTB	0.007***	0.008***	0.000	0.011***	0.007***	0.001**	0.010***
	[25.70]	[10.48]	[0.90]	[8.47]	[10.01]	[2.25]	[8.18]
$Leverage$	-0.012***	0.005**	-0.030***	0.015***	0.001	-0.018***	0.006*
	[-10.27]	[2.11]	[-20.41]	[4.04]	[0.30]	[-12.40]	[1.74]
$Cash$	-0.013***	0.020***	0.012***	0.018***	0.017***	0.008***	0.019***
	[-10.00]	[8.80]	[7.71]	[4.37]	[7.81]	[5.36]	[4.71]
$Size$	0.013***	-0.005***	-0.007***	-0.006***	-0.006***	-0.007***	-0.006***
	[34.88]	[-4.46]	[-9.62]	[-2.94]	[-5.53]	[-10.09]	[-2.76]
$Tangibility$	-0.013***	0.013***	0.010***	0.016***	0.009***	0.009***	0.013**
	[-5.88]	[4.45]	[3.76]	[2.80]	[3.28]	[3.51]	[2.24]
Age	0.001**	-0.003***	-0.005***	-0.002	-0.001**	0.004***	-0.008***
	[2.15]	[-5.53]	[-12.72]	[-1.46]	[-1.96]	[11.20]	[-7.98]
$Constant$	-0.024***	0.114***	0.127***	0.139***	0.122***	0.131***	0.136***
	[-3.51]	[22.14]	[33.46]	[12.84]	[25.39]	[34.49]	[13.11]
Observations	92,546	80,031	45,018	35,013	80,031	45,018	35,013
Adj. R-squared	0.328	0.160	0.246	0.184	0.164	0.238	0.192
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. The natural log of one plus the most motivated institutional investor number ($Nmi1$): $Ln(1+Nmi1)$. This panel presents the two stage least squares (2SLS) regression results of the firm inefficient investment on the institutional ownership. The dependent variable in the first stage regression is $Ln(1+Nmi1)$: the natural log of one plus the most motivated institutional investor number ($Nmi1$). The instrumental variables used in the first stage regressions are the dummy variables: $R1TR2$ indicating whether the firm switches from the Russell 1000 index into the Russell 2000 index, $R2TR1$ indicating whether the firm switches from the Russell 2000 index into the Russell 1000 index, $R2TN$ indicating whether the firm drops out of the Russell 2000 index due to the market value decrease, and $NTR2$ indicating whether the firm gets included in the Russell 2000 index due to the market value increase. Our sample in the first step regressions consists of 92,546 firm years with data from the Centre for Research in Security Prices, Compustat, and Thomson Financial CDA/Spectrum Institutional (13F) database during the period 1995–2015. In columns 1–3 of the second stage regressions, the dependent variables are the firm inefficient investment proxy variables: $Inef1$, $Und1$, and $Ovr1$ estimated by the historical panel regressions. In columns 4–6 of the second stage regressions, the dependent variables are the firm inefficient investment proxy variables: $Inef2$, $Und2$, and $Ovr2$ estimated by the panel regressions. The independent variable of interest in the second stage regressions is $IVLn(1+Nmi1)$, the predicted $Ln(1+Nmi1)$ by the first stage regressions. Detailed definitions of all variables are described in Appendix A. Fama–French 48 industry and year fixed effects are controlled for in all regressions. The standard errors are clustered by firm. t-values are reported in brackets. $***$, $**$, and $*$ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	First stage	**Second stage**					
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	$Ln(1+Nmi1)$	$Inef1$	$Und1$	$Ovr1$	$Inef2$	$Und2$	$Ovr2$
$IVLn(1+Nmi1)$		-0.011***	-0.006***	-0.016***	-0.012***	-0.007***	-0.015***
		[-4.11]	[-3.33]	[-3.04]	[-4.49]	[-3.54]	[-3.03]
$R1TR2$	-0.070**						
	[-2.36]						
$R2TR1$	-0.551***						
	[-49.14]						
$R2TN$	1.134***						
	[37.22]						
$NTR2$	-0.278***						

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	First stage	Second stage					
		(1)	(2)	(3)	(4)	(5)	(6)
Variables	$Ln(1+Nmi1)$	$Inef1$	$Und1$	$Ovr1$	$Inef2$	$Und2$	$Ovr2$
	[-20.76]						
MTB	0.180***	0.008***	0.001	0.011***	0.007***	0.001**	0.010***
	[38.09]	[11.27]	[1.16]	[9.33]	[10.68]	[2.31]	[9.01]
$Leverage$	-0.266***	0.005**	-0.030***	0.015***	0.001	-0.018***	0.007**
	[-12.89]	[2.19]	[-20.81]	[4.41]	[0.39]	[-12.52]	[1.97]
$Cash$	-0.338***	0.020***	0.012***	0.018***	0.017***	0.008***	0.019***
	[-15.29]	[8.89]	[7.62]	[4.57]	[7.94]	[5.42]	[4.92]
$Size$	0.366***	-0.004***	-0.006***	-0.006***	-0.005***	-0.007***	-0.005***
	[61.84]	[-3.97]	[-8.98]	[-2.91]	[-5.13]	[-9.73]	[-2.71]
$Tangibility$	-0.346***	0.013***	0.009***	0.016***	0.009***	0.009***	0.012**
	[-7.53]	[4.31]	[3.63]	[2.78]	[3.16]	[3.46]	[2.21]
Age	0.041***	-0.003***	-0.005***	-0.001	-0.001	0.004***	-0.008***
	[4.83]	[-5.06]	[-12.29]	[-1.20]	[-1.55]	[11.37]	[-7.60]
$Constant$	-1.125***	0.107***	0.123***	0.131***	0.115***	0.127***	0.127***
	[-14.48]	[18.45]	[29.24]	[11.05]	[21.08]	[30.16]	[11.23]
Observations	92,546	80,031	45,018	35,013	80,031	45,018	35,013
Adj. R-squared	0.513	0.160	0.246	0.184	0.164	0.238	0.192
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes