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The Causal Effect of Institutional Ownership on Firm Level Risk Characteristics

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Abstract

We establish the causal effect of institutional ownership on a firm's total risk and its systematic and idiosyncratic components using Russell 2000 index membership as an instrument for institutional ownership following (Crane, Michenaud, and Weston, 2016). We find that for a median Russell 1000 firm, a one standard deviation increase in institutional ownership in a given quarter causes a decrease in idiosyncratic volatility of 13.3% in annualized terms, which results in a decrease in total volatility of 12.8%. Institutional investors achieve this effect on a firm's risk characteristics partially through their effect on its financial performance, as measured by unexpected earnings. More precisely, an increase in institutional ownership increases a firm's financial performance, which turns to a decrease in its total and idiosyncratic volatility.

JEL Codes: G11, G20

Keywords: Institutional investors, Risk characteristics, Russell Index

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1 Introduction

In today's financial markets, institutional investors play a central role. Their investment can reveal a lot about their preferences and/or private information. Thus, it is not surprising to find vast literature analyzing institutional investors' preferences for firm and stock-level characteristics. Of course, investment by institutional investors might also affect these characteristics. Documenting this effect is more challenging exactly for the reason that institutional investors have preferences for these characteristics. In other words, it is not easy to establish a causal link since it is challenging to distinguish between the institutional investors' effect on and preferences for these characteristics.

In this paper, we establish the causal effect of institutional ownership on a firm's total risk and its systematic and idiosyncratic components. This is an important topic since there is little consensus on the time-series evolution and the cross-sectional determinants of the total, and especially idiosyncratic risk in the literature. We contribute to this literature by showing that an increase in institutional ownership causes a decrease in a firm's total risk, which is mostly due to a decrease in its idiosyncratic volatility.

We establish this causal effect of institutional ownership on risk characteristics following (Crane, Michenaud, and Weston, 2016), which show that the discontinuity in index weights of firms around the Russell 1000/2000 threshold provides a good instrument for institutional ownership. To be more specific, firms whose market values are just above the Russell 1000/2000 threshold become the smallest firms in the Russell 1000 and receive very small weights due to the value-weighted nature of these indices. On the other hand, firms whose market values are just below this threshold become the largest firms in the Russell 2000 and receive significant index weights. Hence, there is a big difference in index weights of these firms around the Russell 1000/2000 threshold. More importantly, whether a firm around this threshold finds itself in the Russell 1000 or 2000 is practically a random event since these firms cannot control small variations in their market value rankings. (Crane, Michenaud, and Weston, 2016) show that this random assignment also leads to a big difference in the ownership of these firms by institutional investors. They would prefer to hold the largest stocks in Russell 2000 with high index weights than the smallest stocks in the Russell 1000 with trivial index weights for different reasons such as benchmarking or reducing tracking error. Thus, the inclusion in the Russell 2000 index is a potential instrument which needs to provide a significant variation in the institutional ownership that is exogenous to firm-level risk characteristics.

Hence, we first show that the inclusion in the Russell 2000 index is indeed a good instrument. To do this, we consider the 400 firms around the Russell 1000 and 2000 index threshold in each year between 1980 and 2014. The Russell indices are reconstituted annually following a mechanical rule based on market values as of the last day of May. The index constituents are determined using firms' market value ranks each year at the end of May and index membership locks for an entire year. We obtain data on historical constituents of these indices from Russell and match them with Thomson Reuters 13F filings, CRSP and COMPUSTAT using CUSIPs and company names. We compute quarterly institutional ownership of a stock as the ratio of its shares held by institutional investors to its total number of shares outstanding. To proxy for a firm's total risk, we use its quarterly realized volatility computed as the standard deviation of its daily excess returns in a given quarter. We then decompose its total risk into systematic and idiosyncratic risks based on the Fama-French four-factor model. More precisely, we regress the daily excess returns of stock ($r_{i,t}$) in a given quarter on the excess return of the market portfolio as well the size, book-to-market, and momentum factors. The idiosyncratic risk is then defined as the standard deviation of the residuals

from this regression, and the systematic risk is defined as the square root of the difference between squared total risk (realized standard deviation) and squared idiosyncratic risk (residual standard deviation).

In line with (Crane, Michenaud, and Weston, 2016) findings, institutional ownership also exhibits a significant variation around the Russell 1000/2000 in our sample. The mean (median) institutional ownership in the largest 200 firms in the Russell 2000 is about 61% (63%) while it is about 54% (53%) for the smallest 200 firms in the Russell 1000. More importantly, this significant variation in institutional ownership due to the Russell 2000 inclusion is exogenous to the risk characteristics of these firms. More precisely, we find that firms around the threshold are comparable in terms of their volatility as well as its systematic and idiosyncratic components. Having established the validity of our instrument based on the Russell 2000 index inclusion, we then use it to identify the exogenous variation in institutional ownership in a two-stage least squares framework. Specifically, we estimate the first stage regression of institutional ownership on a set of control variables as well as our instrument, a dummy variable that takes value one if a given firm is in the Russell 2000 and zero otherwise. In the second stage, we regress a given risk measure on the fitted values from the first stage, i.e., the exogenous variation in institutional ownership, as well as the same control variables from the first stage. The coefficient estimate on the instrumented institutional ownership can then be interpreted as the causal effect of institutional ownership on a given risk measure.

In this two-stage least squares framework, we first analyze the total effect of institutional ownership on total risk and its systematic and idiosyncratic components. We find that an increase in the institutional ownership significantly decreases a firm's total volatility. A one standard deviation increase in institutional ownership in a given quarter decreases total volatility by 46% in the following quarter. Given that the median annualized volatility of Russell 1000 firms is about 28% then this effect would be approximately 12.8% reduction in annualized volatility for a median Russell 1000 firm. Therefore, the effect of institutional ownership on total volatility is economically important. When we turn our attention to the components of total volatility, we observe a similar effect of institutional ownership on a firm's idiosyncratic volatility but not on its systematic volatility. More precisely, the coefficient estimate of instrumented institutional ownership is also negative and statistically significant for idiosyncratic volatility. This effect is also economically important since an increase in a firm's institutional ownership decreases its idiosyncratic volatility by 13.3% (in annualized terms) one quarter later, compared to the median annualized idiosyncratic volatility for Russell 1000 firms. The R^2s of the second stage regressions for total and idiosyncratic volatility are also quite high at 54% and 37%, respectively, suggesting that the second stage model can explain a significant part of the variation in risk measures. On the other hand, we do not find any significant effect of institutional ownership on a firm's systematic risk since institutional ownership does not significantly affect the firms' betas on the four factors. These results are robust to using the 800, instead of 400, firms around the threshold.

In our main empirical results, we compute institutional ownership as well as risk measures at the end of the third quarter and, thus, analyze the contemporaneous effect of institutional ownership in risk measures. It is possible that the effect of institutional ownership on risk measures takes more than one quarter to be fully realized. In other words, institutional ownership might have a delayed effect on risk measures, in addition to its contemporaneous effect documented above. To analyze this potential delayed effect, we consider risk measures at the end of the fourth quarter each year while measuring institutional ownership still at the end of the third quarter, as in our main empirical analysis. We find that total institutional ownership continues to have a negative and significant effect on idiosyncratic volatility even after one quarter. However, it

no longer has a significant effect on total volatility when we consider its delayed effect one quarter after. These findings suggest that the effect of total institutional ownership on total volatility takes one quarter to be fully realized while its effect on idiosyncratic volatility takes two quarters.

We then analyze how the effect of total institutional ownership on firm-level risk measures change with other firm-level characteristics. We do this by adding an interaction term of total institutional ownership with given firm-level characteristics in our second stage regressions from above. We consider eight firm-level characteristics that capture different dimensions of institutional investors' preferences. These characteristics are the market value, book-to-market ratio, illiquidity ratio, dividend yield, existing institutional ownership, earnings per share, total volatility and whether a firm pays dividend or not. We find that the effect of institutional ownership on total and idiosyncratic volatility is stronger for dividend-paying firms and firms with higher initial market values, earnings per share and liquidity but with lower initial volatility.

We also distinguish between different types of institutional investors based on their investment horizons using the classification suggested by (Bushee, 2001, 1998), which groups institutions into Dedicated, Quasi-Indexer, and Transient groups using factor and cluster analysis. We find that the Russell 2000 index inclusion is a good instrument for Quasi-Indexer and Transient institutions but not for Dedicated institutions. Our results for Quasi-Indexer and Transient institutions suggest that an increase in ownership by Quasi-Indexer or Transient institutions significantly decreases both total and idiosyncratic volatility but not systematic volatility. More importantly, Transient institutions seem to have a stronger effect on both total and idiosyncratic volatility than Quasi-Indexer institutions. This stronger effect might be due to the fact that Transient institutions are more likely to take an active role in a firm's decisions, than Quasi-Indexer institutions, which are mostly passive investors tracking the index.

Having established the causal effect of institutional ownership on a firm's total and idiosyncratic volatility, we now turn our attention to the mechanism through which institutional investors achieve this effect. We consider two potential channels: First, institutional ownership affects a firm's volatility by its effect on the firm's actual financial or operational performance and/or its variation over time. Second, institutional ownership affects a firm's volatility through its effect on the market's perceptions. We analyze the causal effect of institutional ownership on a firm's risk characteristics through these channels based on mediation analysis. We consider several mediator variables to capture these two channels. Specifically, we focus on the earnings per share as our main proxy for a firm's financial performance, while distinguishing between its expected and unexpected components based on an autoregressive model. We use the volatility of the residuals from this regression, i.e. the unexpected EPS, as our proxy for the volatility of the firm's financial performance. We also consider the market-to-book ratio and dividend yield as other potential proxies for financial performance. To capture the market's expectations about the firm's financial performance, we use data from the Institutional Brokers Estimate System (IBES). We use the quarterly average of the monthly mean EPS estimates as our proxy for the market's expectations about a firm's financial performance. We also use the difference between the actual EPS and the mean estimate as another proxy for unexpected earnings, or earnings surprise. To capture the market's uncertainty about the firm's financial performance, we use the standard deviation of analysts' EPS forecasts.

We first regress each mediator variable on instrumented institutional ownership separately. We find that an increase in the institutional ownership significantly increases the market-to-book ratio, unexpected earnings and analysts mean estimate

but decreases the dividend yield. Given these results, we focus only on these four mediator variables and estimate their effects on the total and idiosyncratic volatilities in the next step of our mediation analysis. Of these four variables, the unexpected earnings are the only variable with a statistically significant effect on the total volatility, where an increase in the unexpected earnings decreases the total volatility. We then decompose the total effect of instrumented institutional ownership on a firm's total volatility into its direct effect and its indirect effect through its effect on the firm's unexpected earnings. The total effect of institutional ownership is -2.6307 which can be decomposed into its indirect or mediated effect of -0.2859 and direct effect of -2.3448. Although the indirect effect is statistically significant, it only explains 11% of the total effect of institutional ownership on a firm's total volatility and the remaining 89% is due to its direct effect or its indirect effect via other channels. We find that a firm's financial performance as measured by its unexpected earnings continues to have a statistically significant mediation effect, even when we control for all other potential mediator variables in a multivariate mediation analysis. Overall, these results suggest that institutional ownership increases a firm's financial performance, as measured by unexpected earnings, which in turn leads to a decrease in its total and idiosyncratic volatility.

The rest of the paper is organized as follows. Section 2 discusses the related literature and Section 3 presents our data. Section 4 discusses our empirical methodology and Section 5 presents our main empirical results. Section 6 presents the mediation analysis. 7 reports robustness of our findings. Finally, Section 8 concludes.

2 Related Literature

Our paper is related to a large literature analyzing institutional investors' preferences for firm-level characteristics. (Falkenstein, 1996) shows that institutional investors have a significant preference for large firms with high visibility and low transaction costs, and are averse to firms with low idiosyncratic volatility. (Del Guercio, 1996) finds that banks tend to tilt their portfolios toward "prudent" stocks. (Gompers and Metrick, 2001) find that institutional investors in the US invest mostly in firms that are larger, more liquid, and have had relatively low returns during the previous year. (Dahlquist and Robertsson, 2001) analyzes the preferences of foreign institutional investors and finds that they prefer firms with high market capitalizations, large cash positions, and low dividends but without any large dominant owners. However, most of this literature does not consider any time variation in institutional investors' preferences. The only exception to this is (Bennett, Sias, and Starks, 2003), which finds that institutional investors shifted their preferences towards smaller and riskier stocks over time. In an earlier study ((Cenesizoglu, Papageorgiou, and Radmehr, 2017)), we also consider the time variation in institutional investors' preferences for firm-level characteristics and precisely study how they change their preferences with the underlying interest rate environment. We find that institutional investors hold riskier stocks when the level of interest rates are low and less risky stocks when they are high, in line with predictions of (Rajan, 2006).

The other strand of the literature related to our research project analyzes the risk characteristics of stocks and their evolution over time. For example, (Campbell, Lettau, Malkiel, and Xu, 2001) documents a persistent increase in firm-level idiosyncratic volatility while the aggregate market and industry volatilities remain almost constant over the time. (Xu and Malkiel, 2003) studies the determinants of idiosyncratic volatilities of individual stocks and finds that idiosyncratic volatility of a stock is associated with the degree to which their shares are owned by institutional investors. However, (Brandt, Brav,

Graham, and Kumar, 2009) show that the aggregate idiosyncratic volatility level in the early 2000s after an increase during 1990 is similar to its pre-1990 levels; and argue that this increase and reversal of idiosyncratic volatility is more pronounced for firms with lower price and high level of retail investors. (Rubin and Smith, 2009) show that the correlation between institutional ownership and idiosyncratic volatility depends on the firm's dividend policy. In particular, institutional ownership is negatively related to idiosyncratic volatility for non-dividend paying stocks while this relation is positive for dividend-paying stocks. (Chichernea, Petkevich, and Zykaj, 2015) examines how the aforementioned relation between institutional investor's ownership and idiosyncratic volatility changes based on the investment horizon of institutional investors and find that ownership by short-term (long-term) institutional investors is positively (negatively) related to idiosyncratic volatility. (Kang, Kondor, and Sadka, 2014) studies the effect of hedge funds on idiosyncratic volatility and demonstrate that hedge funds and other institutional investors decrease idiosyncratic volatility, with the exception of firms with extremely high initial idiosyncratic volatility where this relation is reversed.

However, most of the studies in the latter strand cannot establish a causal effect of institutional ownership on risk characteristics mostly due to the findings of the former. To be more precise, it is not straightforward to obtain a causal effect since the former strand of the literature shows that institutional investors also have preferences for these risk characteristics. In other words, it is not easy to distinguish between the institutional investors' effect on and preferences for risk characteristics. This complication is also why there is no consensus in the literature on the sign of this effect. In this paper, we fill this gap by establishing causality and determining the sign of this relationship in a conclusive manner. Furthermore, we also contribute to the literature by analyzing the sources of this causal effect, which the previous literature mostly ignores.

3 Data

Our data consists of the 400 (or 800) firms around the Russell 1000 and 2000 index threshold in each year between 1980 and 2014. The Russell indices are reconstituted annually following a mechanical rule based on market values as of the last day of May. The index constituents are determined using firms' market value ranks each year at the end of May and index membership locks for an entire year. We obtain data on historical constituents of these indices from Russell and match them with Thomson Reuters 13F filings, CRSP and COMPUSTAT using CUSIPs and company names. One of our main variables of interest is the percentage of a given stock held by institutional investors. We obtain this variable using 13F filings, where all institutional investors with more than $100 million in equity ownership report their holdings to the SEC each quarter. We aggregate each institutional investor m's holdings in stock i in quarter t (own_{imt}) and divide it by the total number of shares outstanding of stock i at the end of quarter t ($share_{it}$) to obtain the percentage of stock i held by institutional investors:

$$Own_{it} = \sum_{m=1}^{M} \frac{own_{imt}}{shares_{it}} \tag{1}$$

Other main variables of interest are the total risk of a stock and its components, i.e., systematic and idiosyncratic risks. We use daily stock return data from CRSP and compute realized volatility, defined as the standard deviation of daily excess returns on a stock in a given quarter, as our measure of total risk. We then decompose total risk into systematic and idiosyncratic

risks based on the Fama-French four-factor model. More precisely, we regress the daily excess returns of a stock ($r_{i,t}$) in a given quarter on the excess return on the market portfolio ($MKTRF_t$) and the size (SMB_t), book-to-market (HML_t) and momentum (UMD) factors.

$$r_{i,t} = \alpha + \beta_{MKT} MKTRF_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{MOM} MOM_t + \varepsilon_{i,t} \tag{2}$$

The idiosyncratic risk is then defined as the standard deviation of the residuals from this regression, and the systematic risk is defined as the square root of the difference between squared total risk (realized standard deviation) and squared idiosyncratic risk (residual standard deviation). We also consider a suite of variables computed using data from CRSP and COMPUSTAT based on standard definitions[1] as either control variables in our main analysis or mediator variables in our mediation analysis.

Finally, we are also interested in different types of institutional investors, such as pension and mutual funds. Although Thompson Reuters provides a classification of institutional investors, it is not reliable after 1998 as noted by several authors as well as on WRDS. Instead, we categorize institutional investors based on their investment horizons using the classification suggested by (Bushee, 2001, 1998). To be more precise, (Bushee, 2001, 1998) classify institutions into Dedicated, Quasi-Indexer, and Transient groups using factor and cluster analysis.

Transient institutions have high portfolio turnover and diversified portfolios. These investors with their small ownership in numerous firms and frequent trading activities are interested in short-term earnings or stock return. (Porter, 1992) argues that myopic investment behavior is mainly created by Transient investors. (Bushee, 1998) provides empirical evidence that managers in firms which are dominated by Transient investors are more likely to reduce R& D investment in order to meet investors' short-term earning targets. On the other hand, Dedicated institutions have low turnover and less diversified portfolio holdings. (Porter, 1992) argues that these type of investors are in exact contrast with Transient investors and tend to have large and long-term ownership concentrated in only a few firms. They do not exhibit myopic investment behavior and are interested more towards long-term dividend or capital appreciation. Finally, Quasi-indexers have low turnover and diversified portfolio holdings. (Porter, 1992) argue that these type of investors are mainly considered as passive investors following an indexing or buy-and-hold strategy. They tend to have small long-term ownership in a wide variety of stocks which reduces their incentive to monitor managers. On the other hand, (Carleton, Nelson, and Weisbach, 1998; Monks and Minow, 2015) discuss that indexing strategy restricts these type of institutions from selling and urges them to monitor and influence firms' governance.

For comparison purposes, we first present some summary statistics on all constituents of Russell 1000 and 2000 indices before focusing more on the firms around the thresholds in the next section. Table 1 presents these summary statistics for Russell 1000 firms in panel (a) and Russell 2000 firms in panel (b). Given that institutional investors have preferences towards larger stocks, it is not surprising to find that institutional ownership in Russell 1000 firms is higher than Russell 2000 firms. This difference is mainly driven by Quasi-Indexers which have about 10% more ownership in Russell 1000 stocks compared to Russell 2000 stocks. Turning our attention to risk measures reveals that Russell 2000 stocks have, on average, higher total risk than Russell 1000. This difference is mostly driven by the fact that Russell 2000 stocks have higher idiosyncratic volatilities compared to Russell 1000 stocks, although they also have slightly higher systematic risk than Russell 1000. These

[1] More specifically, we compute the variables based on the WRDS definitions.

results are expected since it is well known that small stocks tend to have higher total and idiosyncratic risks.

4 Methodology

In this section, we discuss our empirical approach to establish a causal effect of institutional ownership on different risk measures. Our approach closely follows the method of (Crane, Michenaud, and Weston, 2016) based on the discontinuity in index weights of firms around the Russell 1000/2000 threshold. To this end, we first provide a brief background on the Russell indices and our identification assumption. We then discuss our two-stage least squares (TSLS) approach and present results based on the first stage estimation of institutional ownership on our instrument.

4.1 Identification Assumption

The Russell 1000 and 2000 are value-weighted indices of the largest 1000 and the subsequent largest 2000 U.S.-listed firms, respectively. The market value threshold between Russell 1000 and 2000 firms is determined based on the closing prices and the number of shares outstanding at the end of May each year. The exact index weights are determined only at the end of June. Hence, in our main empirical analysis, we consider data on institutional ownership as well as different risk measures from the third quarter of each year, which is the quarter immediately following the index construction at the end of June. Figure 5 depicts this timeline and the measurement of our variables.

At the time of the index construction, firms just above the threshold become the smallest firms in the Russell 1000 and receive very small weights due to the value-weighted nature of these indices. On the other hand, firms just below this threshold are the largest firms in the Russell 2000 and receive significant index weights. The assignment to the Russell 1000 or 2000 indices for firms around the threshold is practically a random event since these firms cannot control small variations in their market value rankings. However, this random assignment leads to big differences in index weights for these firms, as shown in panel (a) of Figure 2 for 400 firms around the threshold.

More importantly, institutional investors would prefer to hold the largest stocks in Russell 2000 with high index weights than the smallest stocks in the Russell 1000 with trivial index weights for different reasons such as benchmarking or reducing tracking error. In other words, the institutional ownership of the largest firms in the Russell 2000 would be higher than that of the smallest firms in the Russell 1000. This is specifically what we observe in panel (b) of Figure 2 and Table 2. More precisely, the mean institutional ownership in the largest 200 firms in the Russell 2000 is about 61% while it is about 54% for the smallest 200 firms in the Russell 1000. The difference is even bigger at 10% when we consider the median ownership. Figure 2 also presents the ownership in these firms by Quasi-Indexer, Dedicated and Transient investors. As discussed above, it is not surprising to find that the difference in institutional ownership in these firms around the threshold is mostly driven by Quasi-Indexer institutions, which are generally passive investors following these indices. Transient institutions also own a slightly higher percentage of the largest 200 firms in the Russell 2000 index compared to the smallest 200 firms in the Russell 1000 while there is no difference in ownership of these firms by Dedicated institutions.

For our instrument based on the Russell index inclusion to be valid, firms around the threshold should be comparable, especially concerning their volatility and its components, which are our main variables of interest. Figure 3 presents the total

volatility as well as its components, systematic and idiosyncratic volatility around the threshold. Unlike total institutional ownership, total volatility, as well as its components, do not exhibit a drastic discontinuity around the threshold. This is also confirmed based on summary statistics on these volatility measures for the 400 firms around the threshold. These findings show that total volatility and its components are very similar for firms around the threshold, suggesting the validity of our instrument based on the Russell index inclusion.

There are also other factors that might affect the validity of our instrument. (Crane, Michenaud, and Weston, 2016) discuss these factors and how to adjust for them in detail. Given that we follow their approach very closely, we refer the reader to their paper for further details.

4.2 Two Stage Least Squares

In this section, we discuss our estimation approach to establish a causal effect of institutional ownership on total volatility and its components. Following (Crane, Michenaud, and Weston, 2016), we employ a two-stage least squares (TSLS), which can be summarized as follows: In the first stage of our TSLS approach, we regress the institutional ownership of 400 stocks around the threshold on a dummy variable of Russell 2000 index membership and market capitalization rankings as well as their interaction term:

$$\begin{aligned} Own_{i,t} &= \alpha_t + \lambda_i + \kappa Russell2000_{i,t} + \delta_1(MCAPRank_{i,t} - 1000) \\ &\quad + \delta_2 Russell2000_{i,t}(MCAPRank_{i,t} - 1000) + \delta_3 FloatAdj_{i,t} + \epsilon_{i,t} \end{aligned} \tag{3}$$

where $Russell2000_{i,t}$ is dummy variable which indicates Russell 2000 inclusion for firm i at year t measured May 31st of each year. We control for for firm's distance to the threshold by including $MCAPRank_{i,t} - 1000$, which is firm i's distance to the threshold based on its market value at the end of May of year t, and its interaction with the Russell 2000 inclusion dummy variable, i.e., $Russell2000_{i,t}(MCAPRank_{i,t} - 1000)$. We also include $FloatAdj_{i,t}$ which is the $MCAPRank_{i,t}$ minus the actual Russell rank which is available in June. This variable controls for any characteristic other than market value, which might have been used to determine Russell index weight. We also include firm fixed effects captured by λ_i, in addition to the year fixed effects captured by α_t as considered by (Crane, Michenaud, and Weston, 2016). Finally, $Own_{i,t}$ is the institutional ownership of firm i in year t which is measured at the third quarter of each year, i.e., the quarter immediately following Russell index disclosure.

In the second stage, we regress different measures of risk, $Risk_{i,t}$, on the instrumented institutional ownership and the same control variables from the first stage as well as the year and firm fixed effects. Hence, our second stage regression is given by:

$$\begin{aligned} Risk_{i,t} &= \theta_t + \mu_i + \beta \widehat{Own_{i,t}} + \gamma_1(MCAPRank_{i,t} - 1000) \\ &\quad + \gamma_2 Russell2000_{i,t}(MCAPRank_{i,t} - 1000) + \gamma_3 FloatAdj_{i,t} + \eta_{i,t} \end{aligned} \tag{4}$$

where $Risk_{i,t}$ is one of the three risk measures – total, systematic or idiosyncratic – for firm i in the third quarter of year t. $\widehat{Own_{i,t}}$ is the fitted value of institutional ownership from the first stage, i.e., the instrumented institutional ownership.

Overall, the first stage allows us to identify the exogenous variation in institutional ownership based on the discontinuity of Russell index weights around the threshold. We then use this exogenous variation in our second stage to establish the causal effect of institutional ownership on different risk measures. We estimate both first and second stage regression via ordinary least squares with standard errors clustered at firm level.

5 Results

In this section, we first present the effect of Russell 2000 inclusion on institutional ownership based on the first stage estimation. We then direct our attention to our main empirical results on the causal effect of institutional ownership on different risk measures based on our second stage estimation. Finally, we analyze how different types of institutional investors and firm characteristics impact the effect of institutional ownership on different risk measures.

5.1 The Effect of Russell 2000 Inclusion on Institutional Ownership

As we have discussed in Section 4, inclusion in the Russell 2000 index for firms around the threshold affects the institutional ownership of these firms. However, we have not analyzed whether this effect is statistically significant. We do this based on the first stage estimation while controlling for other factors as discussed above. Table 3 presents these results.

We start our discussion with the effect of Russell 2000 inclusion on the total ownership. The dummy variable for inclusion in the Russell 2000 has a significant and positive effect on total institutional ownership in the 400 firms around the threshold. This is in line with our findings in Section 4 and shows that inclusion in the Russell 2000 index increases the total institutional ownership in the largest 200 firms in the Russell 2000 by about 1.9% compared to the smallest 200 firms in the Russell 1000. This effect is economically important when we consider that the mean and median institutional ownership in the Russell 2000 index are about 47% and 44%, respectively, as presented in Table 3. Furthermore, the market value rank has a negative effect, suggesting that the total institutional ownership decreases as the market value rank increases, or equivalently, market value decreases. This is in line with institutional investors' preferences for larger firms. $FloatAdj$ as mentioned previously controls for the difference between May end market cap ranking and Russell ranking and is calculated by firm's market cap rank minus Russell index rank. The positive and significant coefficient shows that smaller the firm's rank in Russell comparing to market cap rank, higher the ownership. This is in line with institutional investors' preference for firms with larger index weights in Russell. The adjusted R^2 of the first stage is also quite high at 88%, suggesting that our first stage regression can explain most of the variation in total institutional ownership. More importantly, the F-statistics of 16.48, which is significant at 1% level, suggests that the Russell inclusion dummy can be considered a good instrument for institutional ownership.

Table 3 also presents the results from the first stage regressions for different types of institutional investors. The Russell 2000 inclusion dummy has significantly positive coefficient estimates for Quasi-Indexer and Transient institutions while it has a coefficient estimate that is practically zero for Dedicated institutions. These results suggest that the Russell 2000 inclusion dummy is a good instrument for Quasi-Indexer and Transient institutions but not for Dedicated institutions, a conclusion also supported by the F-statistics. These results are not entirely unexpected. As discussed above, Quasi-Indexers and Transient investors are likely to track indices while Dedicated investors are long-term investors and their portfolio allocation do not

depend on index inclusions or exclusions. Given these results, we only present results from the second stage regressions for ownership by all institutions, Quasi-Indexers, and Transient investors.

5.2 The Effect of Institutional Ownership on Firm Level Risk Measures

5.2.1 The Effect of Total Institutional Ownership

Table 4 presents the results from the estimation of the second stage regressions. As discussed above, the coefficient estimate on the instrumented institutional ownership in the second stage regressions can be interpreted as the causal effect of institutional ownership on firm-level risk characteristics, the main interest of our paper.

We start our discussion with the effect of institutional ownership on the firm's total volatility. The instrumented institutional ownership has a significantly negative effect on total volatility, suggesting that an increase in the institutional ownership significantly decreases a firm's total volatility. To be more precise, a one standard deviation increase in institutional ownership in a given quarter decreases total volatility by 46% in the following quarter. Given that the median annualized volatility of Russell 1000 firms is about 28%, this effect of institutional ownership on a median firm in Russell 1000 would be approximately 12.8% reduction in annualized total volatility which is economically important.

When we turn our attention to the components of total volatility, we observe a similar effect of institutional ownership on a firm's idiosyncratic volatility but not on its systematic volatility. More precisely, the coefficient estimate of instrumented institutional ownership is also negative and statistically significant for idiosyncratic volatility. This effect is also economically important since an increase in a firm's institutional ownership increases its idiosyncratic volatility by 13.3% (in annualized terms) one quarter later, compared to the median annualized idiosyncratic volatility for Russell 1000 firms.

On the other hand, we do not find any significant effect of institutional ownership on a firm's systematic risk. To be more specific, although the coefficient of institutional ownership is negative, it is not significantly different from zero. There might be two potential explanations for this insignificant effect of institutional ownership on systematic risk: (1) Institutional investors cannot affect any component of a firm's systematic risk; (2) Institutional investors can affect the components of a firm's systematic risk, but these effects cancel each other. In an unreported analysis, we considered the effect of instrumented institutional ownership on the four components of systematic risk, i.e. the loadings on the four factors: $\beta_{mkt}, \beta_{hml}, \beta_{smb}$ and β_{mom}. The coefficient estimates on the instrumented ownership in all these second stage regressions are all statistically insignificant. This, in turn, suggests that institutional investors do not affect systematic risk because they do not affect any of its components and not because their effects on different components cancel each other out.

Furthermore, for all three risk measures, the market value rank has a positive coefficient, which means in general smaller firms (higher rank) are more volatile. However, in Russell 2000 we notice a decrease in total volatility. R^2 of the second stage is also quite high at 54%, 37%, and 65% for total volatility, idiosyncratic and systematic volatility respectively, suggesting that our second stage regression can explain a significant part of the variation in risk measures.

5.2.2 How does the Effect of Total Institutional Ownership Change with other Firm Level Characteristics?

Here, we analyze how the effect of total institutional ownership on firm-level risk measures change with other firm-level characteristics. We do this by adding an interaction term of total institutional ownership with given firm-level characteristics in our second stage regressions from above. We consider eight firm-level characteristics that capture different dimensions of institutional investors' preferences. These characteristics are the market value, book-to-market ratio, illiquidity ratio, dividend yield, existing institutional ownership, earnings per share, total volatility and whether a firm pays dividend or not. We measure these characteristics at the end of the first quarter of each year, i.e., one quarter before the Russell index construction at the end of May, to avoid any effect of institutional ownership on these characteristics. Table 5 presents the results from the estimation of second stage regressions that include the interaction term in addition to all the variables in our main empirical specification described in Section 4.

Panel (a) reports results for total volatility as the dependent variable. The overall effect is negative as expected for different columns. However, the negative and significant interaction term for market cap reveals that for firms with the higher initial market cap the effect is stronger. Also, the negative and significant coefficient of interaction term with EPS explains that firms with higher Earnings per share before Russell1000 inclusion, tend to experience the stronger effect of Institutional ownership on their volatility. Further, the positive and significant coefficient for the interaction terms of illiquidity (ILR) and volatility $VOLAT$ reveals that the effect of ownership on volatility is more pronounced for firms with higher initial liquidity and lower volatility. Finally, the negative and significant coefficient of dividend dummy (dummy variable equal to 1 if the firm pays dividends) attests that the mentioned effect is stronger in dividend-paying firms.

Panel (b) shows results when idiosyncratic is the dependent variable. Similar to the panel (a), these results explain that the effect of institutional investors on firms' idiosyncratic volatility is negative and significant in general. However, this effect is stronger for firms with higher liquidity, higher earnings per share, lower volatility, and paying dividends.

Panel (c) also presents results where systematic risk is the dependent variable. As it is expected, the effect of institutional ownership on systematic risk is insignificant in most of the cases. However we can observe some significant effects in a few subcategories of firms. By introducing the interaction term of market size, the overall effect becomes positive and significant along with the negative coefficient of the interaction term. That means institutional investors affect positively firm systematic risk for small market cap stocks. Also, based on other interaction term coefficient estimates, we can say that it is possible to observe a negative effect on systematic risk in firms with high earnings per share and firms already held more by institutional investors. On the other hand, we can also observe positive effect for firms with extremely high initial volatility. These findings are not in the main scope of our paper, but we provide them for completeness.

5.2.3 The Effect of Ownership by Different Types of Institutions on Firm Level Risk Measures

We now analyze the effect of ownership by different types of institutions on firm-level risk measures. As discussed above, the dummy variable for Russell 2000 inclusion is a good instrument for Quasi-Indexer and Transient institutions but not for Dedicated institutions. Hence, Table 6 presents the estimation results from the second stage regression for Quasi-Indexer institutions in panel (a) and Transient institutions in panel (b).

An increase in ownership by Quasi-Indexer or Transient institutions significantly decreases both total and idiosyncratic

volatility but not systematic volatility. To be more precise, a one standard deviation increase in ownership by Quasi-Indexer institutions would decrease total and idiosyncratic volatilities by 14% and 14.3% (in annualized terms for a median Russell 1000 firm), respectively. Similarly, a one standard deviation increase in ownership by Transient institutions would decrease total and idiosyncratic volatility by 10.7% and 11.4% (in annualized terms for a median Russell 1000 firm), respectively. These values are economically important given that the median firm in the Russell 1000 index has total and idiosyncratic volatilities of 27.69% and 22.8%, respectively. Furthermore, by comparing the coefficient estimates, Transient institutions seem to have a stronger effect per one unite of change on both total and idiosyncratic volatility than Quasi-Indexer institutions. This might be due to the fact that Transient institutions are more likely to take an active role in a firm's decisions, which in turn affect its risk, than Quasi-Indexer institutions, which are passive investors tracking the index.

5.2.4 The Delayed Effect of Total Institutional Ownership on Risk Measures

In our main empirical results, we compute institutional ownership as well as risk measures at the end of the third quarter and, thus, analyze the contemporaneous effect of institutional ownership in risk measures. It is possible that the effect of institutional ownership on risk measures takes more than one quarter to be fully realized. In other words, institutional ownership might have a delayed effect on risk measures, in addition to its contemporaneous effect documented above. To analyze this potential delayed effect, we consider risk measures at the end of the fourth quarter each year while measuring institutional ownership still at the end of the third quarter, as in our main empirical analysis. Figure 6 depicts this timeline of measurement for different variables. We then run the second stage regressions by replacing the contemporaneous risk measures (measured at the end of third quarter of each year) by their one-quarter ahead values (measured at the end of fourth quarter) as the left-hand side variable, while keeping all the right-hand side variables including the time and firm fixed effects the same.

Table 7 presents the results from these second stage regressions. Total institutional ownership continues to have a negative and significant effect on idiosyncratic volatility even after one quarter. It also continues to have an insignificant effect on systematic risk. However, it no longer has a significant effect on total volatility when we consider its delayed effect one quarter after. In an unreported analysis, we also considered risk measures three quarter after Russell index construction, i.e., the first quarter of the following calendar year, and found that the total institutional ownership does not have any statistically significant effect on total volatility or its components. These findings suggest that the effect of total institutional ownership on total volatility takes one quarter to be fully realized while its effect on idiosyncratic volatility takes two quarters. In other words, institutional investors continue to decrease a firm's idiosyncratic volatility even after their initial investments.

6 How do Institutional Investors Affect Firm Level Risk Measures?

In the previous section, we document that an increase in institutional ownership in a firm causes a decrease in the firm's total volatility. We also show that this is due to the fact that institutional ownership decreases the firm's idiosyncratic volatility but does not significantly affect its systematic risk. In this section, we analyze the mechanism through which institutional investors achieve this effect on a firm's total and idiosyncratic volatilities. To this end, we first present our approach based on

the mediation analysis. We then discuss potential mediator variables and present our empirical results.

6.1 Mediation Analysis

In mediation analysis, an independent variable hypothesized to affect a dependent variable through one or more intervening variables which are called mediators. Figure 7 depicts different steps in simple mediation analysis. Panel (a) presents the total effect of institutional ownership on a given risk measure, denoted by c. This total effect can then be decomposed into the direct effect of the independent variable on the dependent variable and its indirect effect through the mediator(s). One can achieve this decomposition by considering either a single mediator as depicted in panel (b) or multiple mediators as depicted in panel (c). The indirect effect of ownership on a given risk measure is given by $a \times b$ in the single mediator case and $\sum_{i=1}^{j} a_i \times b_i$ in the multiple mediator case where a (or a_i) denote the effect institutional ownership on the mediator variable and b (or b_i) denote the effect of the mediator variable on a given risk measure. The direct effect c' is then simply the difference between the total and indirect effects as $c' = c - a \times b$ in the single mediator case and $c' = c - \sum_{i=1}^{j} a_i \times b_i$ in the multiple mediator case. (Baron and Kenny, 1986) argue that the following conditions should hold to establish mediation in our framework: (1) The independent variable should have a significant effect on the dependent variable; (2) The independent variable should have a significant effect on the mediator; (3) The mediator should have a significant effect on the dependent variable.

In our main empirical analysis, we show that the first condition holds, i.e., the instrumented institutional ownership has a significant effect on a firm's total and idiosyncratic volatilities. To decompose this total effect via mediation analysis, we follow (Baron and Kenny, 1986) and first estimate the following regression for each mediator variable $Mediator_{i,t}$ separately.

$$\begin{aligned} Mediator_{i,t} =& \theta_{2,t} + \lambda_{2,i} + a\widehat{Own_{i,t}} + \phi_{2,1}(MCAPRank_{i,t} - 1000) + \\ & \phi_{2,2} Russell2000_{i,t}(MCAPRank_{i,t} - 1000) + \phi_{2,3} FloatAdj_{i,t} + \eta_{i,t} \end{aligned} \tag{5}$$

This regression allows us to establish the second condition. If the instrumented institutional ownership does not have a significant effect on a given mediator variable, i.e., the estimate of a is statistically insignificant, it then does not make sense to analyze whether the mediator variable has a significant effect on a given risk measure. On the other hand, if the instrumented institutional ownership does have a significant effect on a given mediator variable, we then proceed to the estimation of the following regression to establish whether the mediator variable has a significant effect on a given risk measure:

$$\begin{aligned} Risk_{i,t} =& \theta_{3,t} + \lambda_{3,i} + bMediator_{i,t} + c'\widehat{Own_{i,t}} + \phi_{3,1}(MCAPRank_{i,t} - 1000) + \\ & \phi_{3,2} Russell2000_{i,t}(MCAPRank_{i,t} - 1000) + \phi_{3,3} FloatAdj_{i,t} + \zeta i, t \end{aligned} \tag{6}$$

This regression allows us to establish the third condition and, thus, the mediation effect of a given variable of interest. We run this regression for each mediator variable separately in order to understand their mediation role in the causal effect of institutional ownership on different risk measures. However, this regression does not allow us to understand the mediation role of a given variable when we control for other potential mediator variables. To this end, we also consider a multivariate

mediation analysis by examining each potential mediator variable jointly in the following regression.

$$\begin{aligned} Risk_{i,t} =& \theta_{3,t} + \lambda_{3,i} + \sum_j b_j Mediator_{j,i,t} + c'\widehat{Own_{i,t}} + \phi_{3,1}(MCAPRank_{i,t} - 1000) + \\ & \phi_{3,2} Russell2000_{i,t}(MCAPRank_{i,t} - 1000) + \phi_{3,3} FloatAdj_{i,t} + \zeta i, t \end{aligned} \tag{7}$$

We estimate all the coefficients via OLS with firm-level clustered standard errors. Finally, In order to test the significance of Mediated effect, we use bootstrapped standard errors as suggested by (Preacher and Hayes, 2008). The bootstrapped standard errors are widely used in the literature using mediation analysis since it does not impose any assumption regarding the distribution of $a \times b$. We also consider the Sobel test statistic based on clustered standard error given by $\sqrt{a^2 s_b^2 + b^2 s_a^2 + s_a^2 s_b^2}$ which is assumed to have standard normal distribution ((Baron and Kenny, 1986)).

6.2 Mediator Variables

There are many potential channels through which institutional investors might be affecting the risk of a firm in which they invest. We consider two such channels. First, institutional ownership affects a firm's volatility by its effect on the firm's actual financial or operational performance and/or its variation over time. Second, institutional ownership affects a firm's volatility through its effect on the market's perceptions. To be more precise, investment by institutions might alter the market's expectations about the firm's performance and/or the market's uncertainty surrounding this performance.

These two channels have also been discussed in the literature, (McConnell and Servaes, 1990; Himmelberg, Hubbard, and Palia, 1999) studied the effect of institutional investors on firms' performance. They find a significant positive relation between firm's Tobins' Q measure and the fraction of shares owned by institutional ownership. (Ackert and Athanassakos, 2003) examined the relationship between analysts' forecast and institutional investors' ownership for a firm's stock and documented that analysts increase their optimism about firm's earnings following institutional investors holding increase. (O'Brien and Bhushan, 1990) Also studied the relation between the number of institutional investors and analysts following the firms during 1981-1987 and they documented no significant relation in a simultaneous equations setup.

Consequently, we consider two sets of mediator variables to analyze the effect of institutional ownership on a firm's risk measures through these two channels. We focus on the earnings per share ($EPS_{i,t}$) as our main proxy for a firm's financial performance. We also distinguish between its expected and unexpected components based on the following AR(1) model:

$$EPS_{i,t} = c + QuarterDummies_t + \alpha EPS_{i,t-1} + \epsilon_{i,t}$$

We estimate this model via OLS separately for each firm that has at least 30 quarterly EPS available through time. We consider both the actual ($EPS_{i,t}$) and unexpected ($\epsilon_{i,t}$) EPS as proxies for financial performance. We use the square of the residuals from this regression, i.e. the unexpected EPS, as our proxy for the volatility of the firm's financial performance ($EPSSR$). Finally, we also consider market-to-book ratio ($MtoB$) and dividend yield ($DivY$) as other potential proxies for financial performance.

To capture the market's expectations about the firm's financial performance, we use data from the Institutional Brokers

Estimate System (IBES), which provides monthly data on analysts' EPS estimates and other related statistics. We match the IBES database to our firms imposing three conditions: (1) The firm's fiscal year ends in December; (2) The firm has at least three estimates for a given quarter; (3) The firm has at least one month of data in a given quarter. We use the quarterly average of the monthly mean EPS estimates ($IBESMEANEST_{i,t}$) as our proxy for the market's expectations about a firm's financial performance. We also use the difference between the actual EPS, $EPS_{i,t}$, and the mean estimate ($IBESESTERR_{i,t}$) as another proxy for unexpected earnings, or earnings surprise. To capture the market's uncertainty about the firm's financial performance, we use the standard deviation of analysts' EPS forecasts ($IBESSTDEV_{i,t}$).

6.3 Empirical Results

6.3.1 Single Variable Mediation Analysis

Table 8 presents the effect of instrumented institutional ownership on the potential mediator variables. These results suggest that an increase in the institutional ownership significantly increases the market-to-book ratio, unexpected earnings, and Analysts mean estimate but decreases the dividend yield. On the other hand, institutional ownership does not have a statistically significant effect at the 10% level on any of the other mediator variables. As mentioned above, the independent variable of interest (instrumented institutional ownership) needs to have a statistically significant effect on a given variable to establish its mediation effect. Hence, we focus only on these four mediator variables – the market-to-book ratio, unexpected earnings, analysts' mean EPS estimate, and dividend yield – in the next step and estimate their effects on the total and idiosyncratic volatilities.

Panel (a) of Table 9 presents the effect of these variables on total volatility when considered separately. Of these four variables, the unexpected earning is the only variable with a statistically significant effect on total volatility. To be more precise, an increase in the unexpected earnings decreases the total volatility, while controlling for all the other variables considered in the second stage estimation of our TSLS approach. These results, in turn, suggest that of all the potential mediator variables considered only the unexpected earnings satisfies all the conditions required of a mediator variable. We then decompose the total effect of instrumented institutional ownership on a firm's total volatility into its direct effect and its indirect effect through its effect on the firm's unexpected earnings. Panel (b) of Table 9 presents this decomposition. The total effect of institutional ownership is -2.6307 which can be decomposed into its indirect or mediated effect of -0.2859 and direct effect of -2.3448. Although the indirect effect is statistically significant, we can explain only 11% of the total effect of institutional ownership on a firm's total volatility by its effect via the firm's unexpected earnings. The remaining 89% is due to its direct effect or its indirect effect via other channels.

Table 10 presents similar results for the decomposition of the total effect of institutional ownership on a firm's idiosyncratic volatility. To be more precise, in Panel (a) the unexpected earnings is the only variable with a statistically significant effect on idiosyncratic volatility, in other words, an increase in the unexpected earnings decreases the idiosyncratic volatility. In panel (b) the total effect of ownership on the firm's idiosyncratic volatility is decomposed to direct and indirect effects. The indirect effect is statistically significant and shows that almost 8% of the total effect of institutional investors on firms' idiosyncratic volatility is mediated through unexpected earnings.

Overall, these results suggest that institutional ownership increases a firm's financial performance, as measured by unex-

pected earnings, which in turn leads to a decrease in both its total and idiosyncratic volatilities.

6.3.2 Multivariate Mediation Analysis

As discussed above, single variable mediation analysis allows us to analyze the mediation effect of potential variables when considered separately. However, it does not let us understand whether this mediation effect remains significant when we control for other potential channels. We turn to the multivariate mediation analysis to analyze the mediation effect of all potential variables jointly. Panel (a) of Table 11 presents the regression of total and idiosyncratic volatilities on all the mediator variables and instrumented institutional ownership as well as other control variables. These results show that four variables – unexpected earnings and its volatility, Market to book ratio, and dividend yield have statistically significant effect on a firm's total and idiosyncratic volatilities, making them potential channels through which institutional ownership might be affecting a firm's risk measures. In line with our previous results based on single mediator variables, an increase in unexpected earnings decreases a firm's total and idiosyncratic volatilities. On the other hand, an increase in the dividend yield, volatility of unexpected earnings, and market to book ratio increases a firm's total and idiosyncratic volatilities.

We now analyze the mediated effect of these variables while still controlling for all potential mediator variables. These results are presented in Panel (b) of Table 11. In line with our conclusions based on single mediator variables, we find that institutional ownership increases a firm's financial performance as measured by its unexpected earnings. This increase in unexpected earnings, in turn, decreases the firm's total and idiosyncratic volatilities. The multivariate mediation analysis reveals that in addition to unexpected earnings, institutional ownership affects a firm's risk measures through its effect on the firm's dividend yield and earnings volatility. More precisely, an increase in institutional ownership decreases a firm's dividend yield and earnings volatility, which themselves have positive effects on the firm's risk measures, for a negative mediated effect. Finally, when considered jointly, all the considered mediator variables have a significant mediated effect, which accounts for 18% to 13% of the total effect of institutional ownership on firm's total and idiosyncratic volatilities. The remaining 82% and 87% is either due to the direct effect of institutional ownership on the firm's total and idiosyncratic volatilities or its indirect effect through other unaccounted channels.

7 Robustness check

In this section to do robustness check, we expand the bandwidth from 400 to 800 firms around the Russell 1000/2000 threshold. In Table 12 we report second stage regression results for this setup. The coefficients of $\widehat{Own}_t$ demonstrates that the effect of institutional ownership on firm-level volatility and idiosyncratic risk is negative and statistically significant. Comparing these results with ones in Table 4 confirms that our findings in two different setups are qualitatively identical and the model is reasonably robust when tested in a different sample.

8 Conclusion

In this paper, we established the causal effect of institutional investors on the firm-level risk measures including firms' total, idiosyncratic and systematic risk. To this goal, we utilized a two-stage regression model which used Russell2000 index inclusion as an instrumental variable for institutional investors following (Crane, Michenaud, and Weston, 2016). We first show that the drastic change of Russell index weight at 1000/2000 threshold affects Institutional ownership but is exogenous to the firm-level risk measures. Utilizing this IV, we documented that an increase in institutional ownership significantly reduces the firm's total and idiosyncratic volatilities. However, there is no effect on the firm's systematic risk. We extend our analysis by studying the lagged effect of ownership and showed that institutional ownership measured at the end of the third quarter decreases firm's idiosyncratic volatility at the end of the fourth quarter each year. However, effects on total volatility do not persist till the end of the fourth quarter.

In another section, by adding the interaction term to our second stage regression models, we found that the effect of institutional ownership on firms' total and idiosyncratic volatility is stronger in firms with specific characteristics such as paying dividend, higher earnings per share and liquidity, but lower initial volatility. Moreover, we studied different categories of institutional investors and pointed out that Quasi-Indexers and Transient institutional investors reduce firms' risk. In comparison, this effect is more stronger for the Transient investors per one unit of increase in ownership.

In the second part of the paper, we studied the mechanism through which institutional investors affect firms' risk measures. We consider two mechanisms for this effect. First, Institutional investors decrease firm risk by increasing its performance. Second, Institutional investors decrease firm risk by affecting market perceptions around the firm. We used mediation analysis and employed several variables (mediators) as proxies for each channel. Then, we reported that institutional investors reduce firms' volatility by increasing its financial performance measured by unexpected earnings per share. This indirect effect contributes to almost 11% of the total effect of institutional ownership on firms' volatility and is reasonably robust with including all of the mediators.

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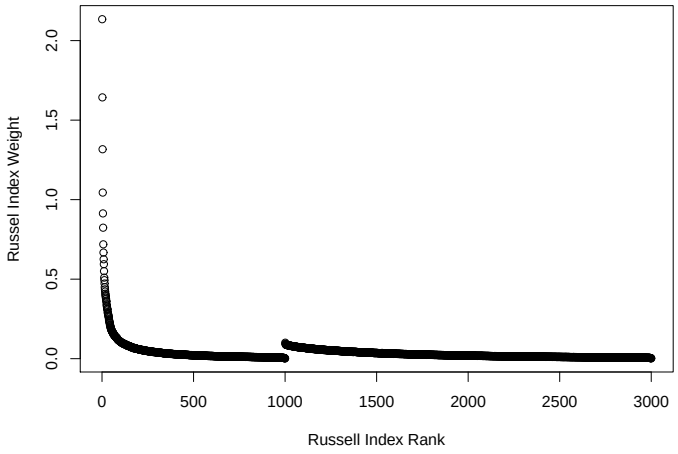
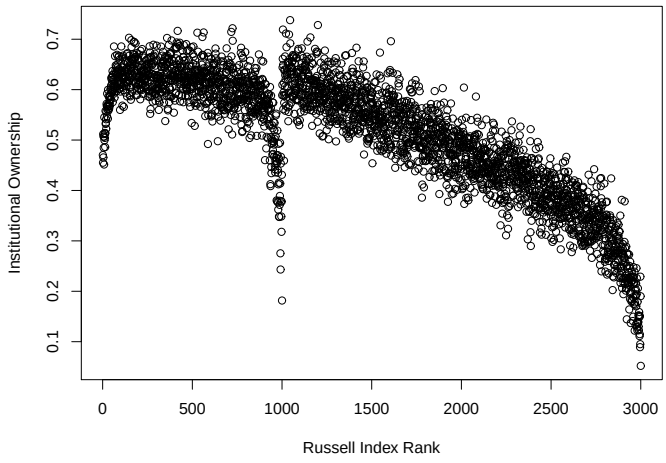
Figure 1: Russell Index and Total Institutional Ownership

(a) Russell Index weight



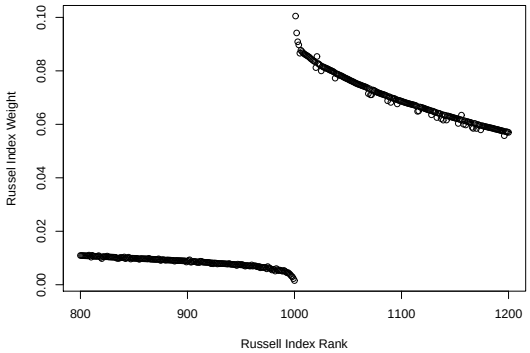
(b) Institutional investors



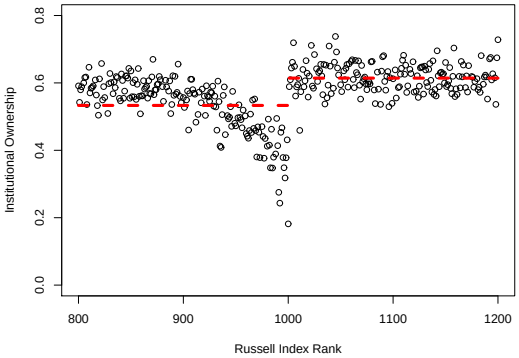
These figures present average index weight and institutional ownership for firms based on Russell index weight, panel (a) represents average Russell index weight for 3000 firms listed in Russell index, first 1000 firms are assigned to the Russell 1000 index and following 2000 firms assigned to Russell 2000 at May of each year and index weights released Jun of each year. Panel (b) depicts average Institutional ownership for firms in Russell index based on their Index weight.

Figure 2: Russell Index and Categories of Institutional Investors Around the Cutoff

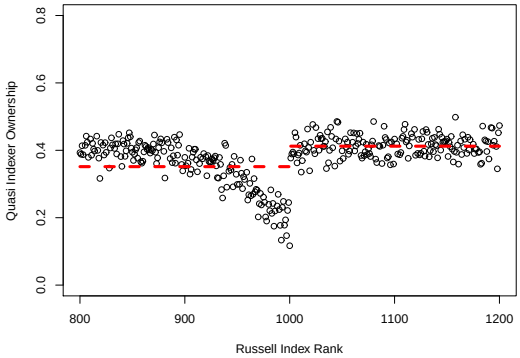
(a) Russell index weight close to 1000 cutoff



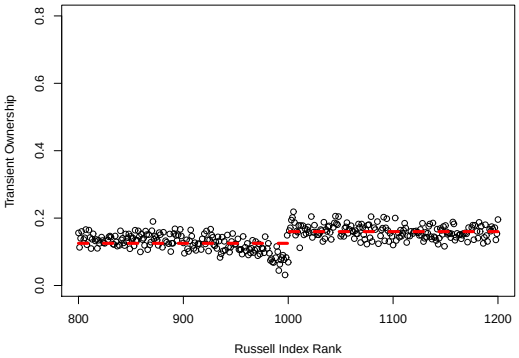
(b) Total Institutional ownership close to cutoff



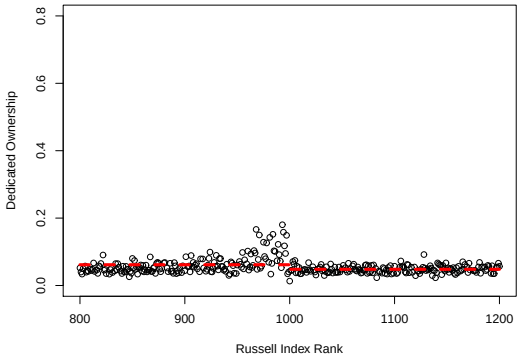
(c) Quasi-Indexers ownership close to cutoff



(d) Transient investor ownership close to cutoff



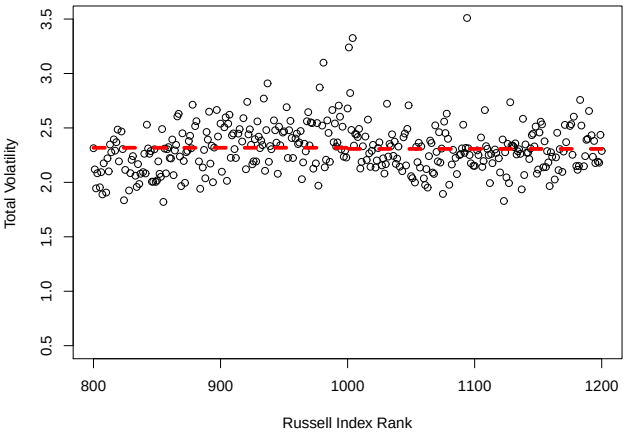
(e) Dedicated investor ownership close to cutoff



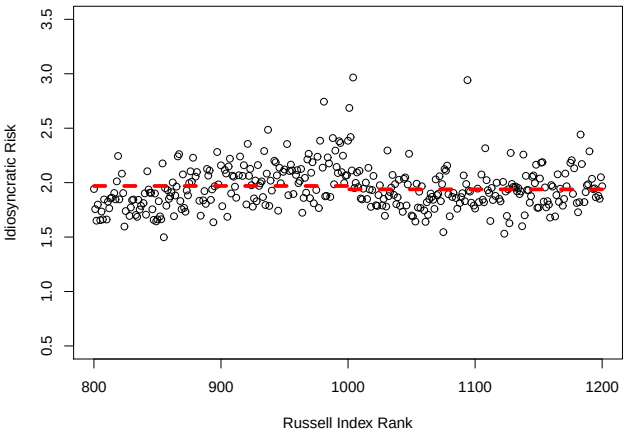
These figures present average index weight and Institutional ownership for firms around the Russell 1000/2000 threshold ($\pm$ 200 firms) based on their Russell index rank through 1980-2014. Panel (a) shows Russell index weight. Panel (b) shows average total institutional ownership for firms. Panel (c) depicts average Quasi-Indexer ownership for firms. Panel(d) shows average Transient ownership for firms. Panel (e) shows average Dedicated ownership for firms.

Figure 3: Russell Index and Risk Measures Around the Cutoff

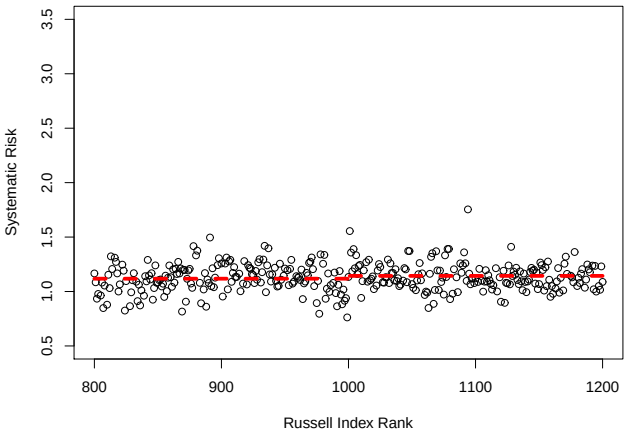
(a) Total Volatility around the cutoff



(b) Idiosyncratic Volatility around the cutoff



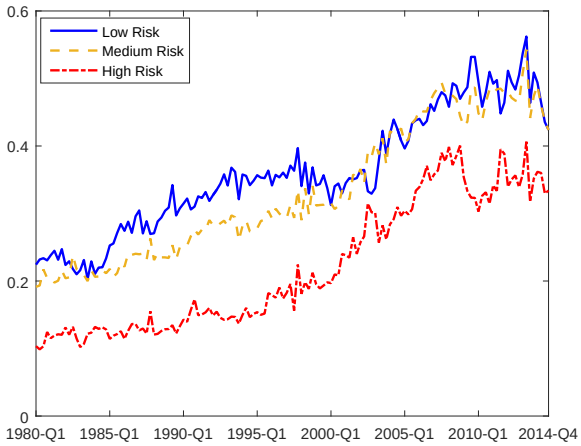
(c) Systematic Volatility around the cutoff



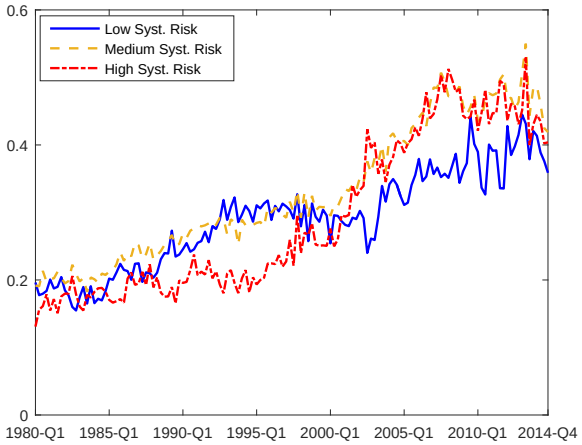
These figures present average risk measures for firms around the Russell index threshold based on their Russell index rank through 1980-2014. Panel (a) shows average total volatility of firms. Panel (b) shows average Idiosyncratic volatility of firms. Panel (c) depicts average systematic risk of firms.

Figure 4: Institutional Investors Preferences for Total Risk and Its Components

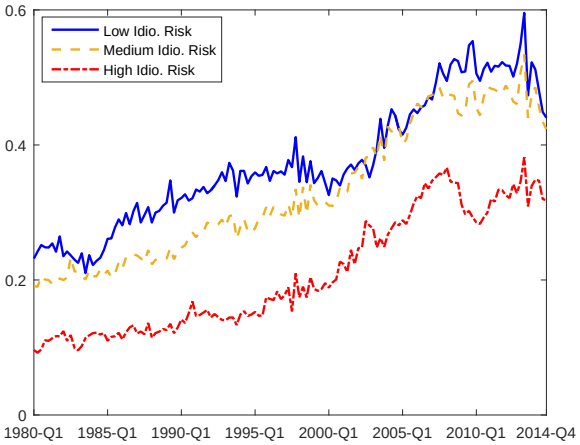
(a) Total Risk



(b) Systematic Risk

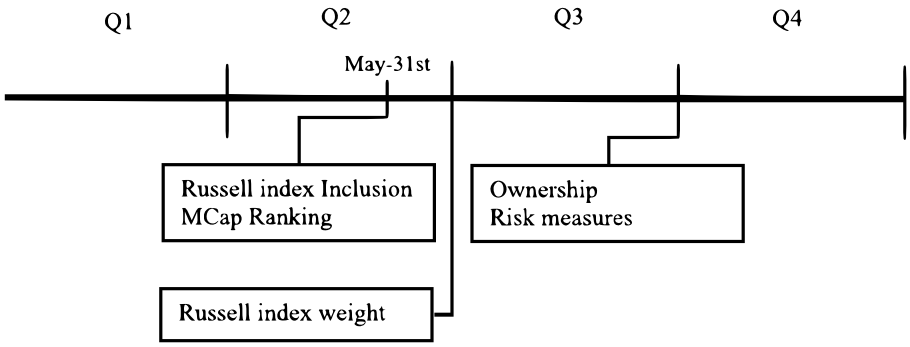


(c) Idiosyncratic Risk



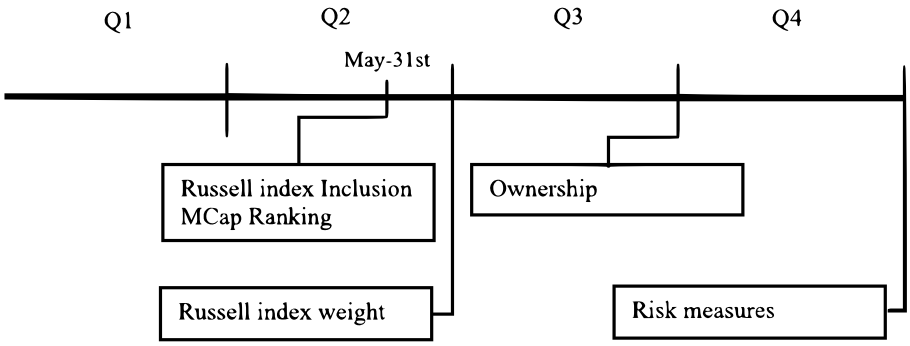
This figure presents average percentage institutional ownership in each tercile of stocks sorted based on their total risk in panel (a), systematic risk in panel (b) and idiosyncratic risk in panel (c). The solid, dashed and dotted lines present average percentage institutional ownership for low, medium and high risk stocks, respectively.

Figure 5: Variable Measurement Timeline



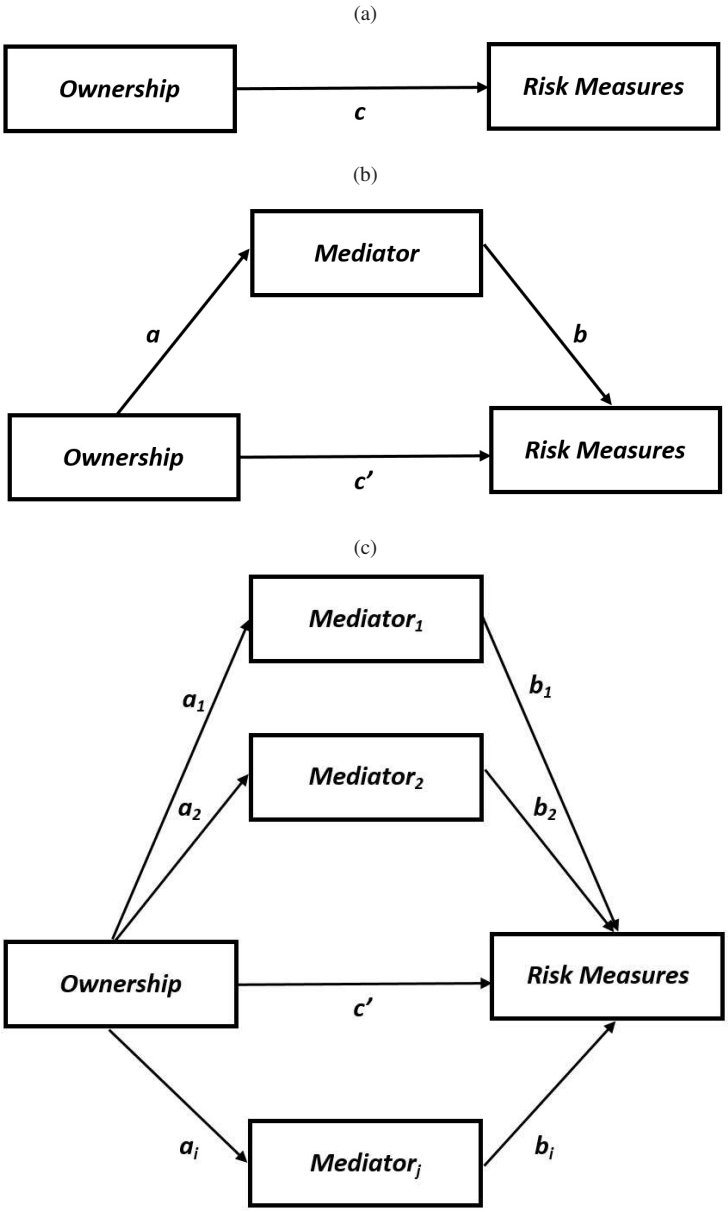
The Figure shows the variable measurement timeline in TSLS models. Each year, Russell inclusion index measured May-31st. CRSP unadjusted market cap end of May used as a proxy to identify firms around Russell index 1000/2000 threshold. Russell index weights disclose at the end of the second quarter each year. Institutional ownership and Risk characteristics are measured at the end of the third quarter.

Figure 6: Variable Measurement Timeline for Delayed Effect



The Figure shows the variable measurement timeline in TSLS models. Each year, Russell inclusion index measured May-31st. CRSP unadjusted market cap end of May used as a proxy to identify firms around Russell index 1000/2000 threshold. Russell index weights disclose at the end of the second quarter each year. Institutional ownership are measured at the end of the third quarter, and Risk characteristics are measured at the end of the fourth quarter.

Figure 7: Mediation Analysis



Panel (a) shows total effect of Ownership on Risk Measures. panel (b) simple mediation model, *Ownership* is hypothesized to conduct indirect effect on *Risk measures* through *Mediator*. panel(c) depicts multiple mediator model, *Ownership* is hypothesized to conduct indirect effect on *Risk measures* through $Mediator_1$, $Mediator_2$, ..., $Mediator_j$.

Table 1: Summary Statistics

(a) Russell1000

	p25	Median	Mean	p75	SD
Total Institutional Ownership	0.4280	0.6190	0.6020	0.7850	0.2420
Dedicated Ownership	0.0110	0.0340	0.0540	0.0730	0.0691
Quasi indexer Ownership	0.2960	0.4270	0.4200	0.5460	0.1760
Transient Ownership	0.0570	0.1070	0.1300	0.1800	0.0976
Volatility	1.3300	1.7440	2.0150	2.3430	1.1260
Idiosyncratic Risk	1.0720	1.4360	1.6460	1.9550	0.8981
Systematic Risk	0.6120	0.8860	1.0770	1.2800	0.8063
Market Cap (in million $)	1034.9	2450.4	7952.8	5891.7	23070.0

(b) Russell2000

	p25	Median	Mean	p75	SD
Total Institutional Ownership	0.2200	0.4400	0.4720	0.7020	0.2971
Dedicated Ownership	0.0050	0.0260	0.0520	0.0710	0.0738
Quasi indexer Ownership	0.1440	0.2820	0.3140	0.4600	0.2069
Transient Ownership	0.0330	0.0910	0.1230	0.1830	0.1140
Volatility	1.8390	2.5210	2.8570	3.4580	1.5995
Idiosyncratic Risk	1.5690	2.2070	2.5100	3.0860	1.4556
Systematic Risk	0.6570	1.0290	1.2280	1.5250	0.8917
Market Cap (in million $)	110.90	257.01	427.90	555.80	497.39

Panel (a) presents the summary statistics for firms that listed in Russell 1000 index and panel(b) presents same information for firms assigned to Russell 2000 index. Note: p25 and p75 represent 25 and 75 percentiles of data respectively.

Table 2: Summary Statistics for Firms Around the Cutoff (± 200)

(a) Russell800-1000

	p25	Median	Mean	p75	SD
Total Institutional Ownership	0.3079	0.5319	0.5408	0.7716	0.2865
Dedicated Ownership	0.0049	0.0242	0.0594	0.0722	0.1046
Quasi indexer Ownership	0.1930	0.3381	0.3588	0.5026	0.2051
Transient Ownership	0.0397	0.0999	0.1274	0.1865	0.1100
Volatility	1.4630	1.9909	2.3179	2.7561	1.3639
Idiosyncratic Risk	1.2547	1.7076	1.9648	2.3573	1.0942
Systematic Risk	0.5689	0.8758	1.1266	1.3499	0.9517
Market Cap (in million $)	408.0	1066.9	1287.3	1851.4	1112.1

(b) Russell1001-1200

	p25	Median	Mean	p75	SD
Total Institutional Ownership	0.3688	0.6331	0.6143	0.8567	0.2990
Dedicated Ownership	0.0061	0.0260	0.0480	0.0675	0.0619
Quasi indexer Ownership	0.2471	0.4149	0.4130	0.5704	0.2066
Transient Ownership	0.0562	0.1330	0.1587	0.2333	0.1257
Volatility	1.5219	2.0398	2.3038	2.7727	1.2783
Idiosyncratic Risk	1.2400	1.7150	1.9360	2.3490	1.0919
Systematic Risk	0.6115	0.9615	1.1402	1.4166	0.8366
Market Cap (in million $)	294.85	971.34	1061.69	1558.43	870.32

Panel (a) presents the summary statistics for bottom 200 firms listed in Russell 1000 based on Russell Rank, panel (b) presents same information for top 200 firms assigned to Russell 2000 index. Note: p25 and p75 represent 25 and 75 percentiles of data respectively.

Table 3: First Stage Regressions

	Total Own	Dedicated	Quasi Indexers	Transient
$MCAPRank_t - 1000$	-0.5912**	0.0161	-0.2810	-0.4691**
$FloatAdj_t$	0.9518***	-0.0474	0.6722***	0.5527***
$(MCAPRank_t - 1000)(Russell2000_t)$	0.0829	0.1228	-0.0695	0.1296
$RUIndex2000_t$	0.0186***	0.0002	0.0132***	0.0107***
Adjusted R^2	88%	58%	84%	68%
F-statistic(excl instr.)	16.4800***	0.0037	11.2200***	9.5770***

This table represents first stage regression in Equation 3 for $\pm$ 200 firms bandwidth around Russell 1000/2000 threshold. $Russell2000_{i,t}$ is a dummy variable which indicates Russell 2000 inclusion for firm i at the second quarter of year t, and its coefficient represents the discontinuity parameter in Ownership at the threshold ($Rank = 1000$). $MCAPRank_{i,t} - 1000$ is the distance to threshold for firms ranked based on their May 31th Market-cap. $FloatAdj_{i,t}$ is the difference between the $MCAPRank_{i,t}$ and the actual Russell rank which is available in June. Coefficients estimates are based on OLS with firm and time fixed effects and clustered standard errors at firm level. ***, **, * denote statistically significant coefficient estimates at the 1%, 5%, and 10% levels.

Table 4: Second Stage Regressions

	Volatility	Idiosyncratic	Systematic
$MCAPRank_t - 1000$	3.3186***	3.3750***	2.4415**
$FloatAdj_t$	1.4672	2.3260*	0.1551
$(MCAPRank_t - 1000)(Russell2000_t)$	-4.0785**	-4.7400**	-1.5998
$\widehat{Own}_t$	-2.8557**	-4.0440***	-0.4056
Adjusted R^2	54%	37%	65%

This table represents result for the second stage regression in Equation 4 for $\pm$ 200 firms bandwidth around the Russell 1000/2000 threshold. Dependent variables are firm-level risk measures: volatility, idiosyncratic and systematic risks respectively in three columns. Dependent variables are measured at the end of the third quarter each year. $\widehat{Own}_t$ is instrumented total institutional ownership. $MCAPRank_{i,t} - 1000$ is the distance to threshold for firms ranked based on their May 31th Market-cap. $FloatAdj_{i,t}$ is the difference between the $MCAPRank_{i,t}$ and the actual Russell rank which is available at each June. Coefficients estimates are based on OLS with firm and time fixed effects and standard errors are clustered at firm level. ***, **, * denote statistically significant coefficient estimates at the 1%, 5%, and 10% levels.

Table 5: Impact of Firm Characteristics on The Causal Effect

(a) Total Volatility

	Mcap	MToB	ILR	DIVY
$\widehat{Own}_t$	-0.5837	-2.7002***	-2.6616***	-2.6773***
$MCAPRank_t - 1000$	1.9168**	3.0908***	3.0267***	3.0979***
$FloatAdj_t$	0.2670	1.2139	1.2509	1.2032
$Char_t \times \widehat{Own}_t$	-0.1529***	0.0017	0.3099***	-0.0038
$(MCAPRank_t - 1000)(Russell2000_t)$	-3.7020***	-3.9194***	-3.9186***	-3.9448***
Adjusted R^2	66%	66%	66%	66%

	OWN	EPS	DIVdummy	VOLAT
$\widehat{Own}_t$	-2.4619**	-2.4276**	-2.6424***	-1.8529**
$MCAPRank_t - 1000$	3.0866***	2.9016***	3.1067***	2.1138***
$FloatAdj_t$	1.1756	0.9750	1.2076	0.1923
$Char_t \times \widehat{Own}_t$	-0.2475	-0.0512***	-0.0813*	0.7563***
$(MCAPRank_t - 1000)(Russell2000_t)$	-3.9744***	-3.7073***	-4.0040***	-2.6337**
Adjusted R^2	66%	66%	66%	70%

(b) Idiosyncratic Volatility

	Mcap	MToB	ILR	DIVY
$\widehat{Own}_t$	-2.9782***	-3.8632***	-3.8264***	-3.8441***
$MCAPRank_t - 1000$	2.7172***	3.1996***	3.1213***	3.2054***
$FloatAdj_t$	1.7047*	2.1011**	2.1492**	2.0921**
$Char_t \times \widehat{Own}_t$	-0.0632	0.0014	0.3664***	-0.0026
$(MCAPRank_t - 1000)(Russell2000_t)$	-4.5704***	-4.6501***	-4.6403***	-4.6710***
Adjusted R^2	62%	62%	62%	62%

	OWN	EPS	DIVdummy	VOLAT
$\widehat{Own}_t$	-3.7270***	-3.6211***	-3.8008***	-3.0845***
$MCAPRank_t - 1000$	3.1993***	3.0299***	3.2167***	2.2982***
$FloatAdj_t$	2.0769**	1.8883**	2.0985**	1.1606
$Char_t \times \widehat{Own}_t$	-0.1342	-0.0458***	-0.1031**	0.6972***
$(MCAPRank_t - 1000)(Russell2000_t)$	-4.6869***	-4.4586***	-4.7464***	-3.4625**
Adjusted R^2	62%	62%	62%	66%

Table 5: Continued

(c) Systematic Volatility

	Mcap	MToB	ILR	DIVY
$\widehat{Own}_t$	5.2019***	-0.6134	-0.5729	-0.5771
$MCAPRank_t - 1000$	-1.2132	2.0375*	2.0356*	2.0485*
$FloatAdj_t$	-2.4772*	0.1233	0.1136	0.1060
$Char_t \times \widehat{Own}_t$	-0.4224***	0.0026*	0.0562	-0.0038
$(MCAPRank_t - 1000)(Russell2000_t)$	-0.5589	-1.1894	-1.2229	-1.2282
Adjusted R^2	66%	65%	65%	65%

	OWN	EPS	DIVdummy	VOLAT
$\widehat{Own}_t$	-0.0670	-0.3029	-0.5702	0.3362
$MCAPRank_t - 1000$	2.0216*	1.8328	2.0499*	0.9580
$FloatAdj_t$	0.0422	-0.1446	0.1056	-1.0140
$Char_t \times \widehat{Own}_t$	-0.5886***	-0.0563***	-0.0128	0.8380***
$(MCAPRank_t - 1000)(Russell2000_t)$	-1.2996	-0.9673	-1.2369	0.2245
Adjusted R^2	65%	65%	65%	68%

The table represents result for second stage regression with an added interaction term of firm characteristics and instrumented ownership. Panel (a) represents results where the dependent variable is total volatility. Panel (b) and (c) demonstrate results for idiosyncratic and systematic volatility respectively. Dependent variables are measured at the end of the third quarter each year t. $\widehat{Own}_t$ is instrumented total institutional ownership from the first stage regressions. Each column represents result for regression including the interaction term of instrumented ownership and characteristic mentioned at the top of the column $Char_t \times \widehat{Own}_t$; the firm characteristics $Char_t$ is measured at the end of the first quarter year t. $MCAPRank_{i,t} - 1000$ is the distance to threshold for firms ranked based on their May 31th Market-cap. $FloatAdj_{i,t}$ is the difference between the $MCAPRank_{i,t}$ and the actual Russell rank which is available in June. Coefficients estimates are based on OLS with firm and time fixed effects and clustered standard errors at firm level for $\pm$ 200 firms around Russell 1000/2000 threshold. ***, **, * denote statistically significant coefficient estimates at the 1%, 5%, and 10% levels.

Table 6: Second Stage Regressions – Categories of Institutional Ownership

(a) Quasi-Indexers

	Volatility	Idiosyncratic	systematic
$MCAPRank_t - 1000$	4.1470***	4.4330***	2.8871**
$FloatAdj_t$	1.6540	2.5250*	0.3982
$(MCAPRank_t - 1000)(Russell2000_t)$	-5.0750***	-6.0040***	-2.1566
$\widehat{Own}_{QIX,t}$	-4.3530**	-6.0570***	-1.0316
Adjusted R^2	43%	16%	65%

(b) Transient

	Volatility	Idiosyncratic	systematic
$MCAPRank_t - 1000$	2.8210**	2.6030*	2.4882**
$FloatAdj_t$	1.5200	2.4340	0.0820
$(MCAPRank_t - 1000)(Russell2000_t)$	-4.0710**	-4.6580*	-1.6024
$\widehat{Own}_{TRA,t}$	-5.2580**	-7.4130**	-0.8665
Adjusted R^2	33%	-3%	65%

The table presents result for the second stage regression in Equation 4 for $\pm$ 200 firms bandwidth around the Russell 1000/2000 threshold. Dependent variables are firm-level risk measures: volatility, idiosyncratic and systematic risks respectively in three columns. Dependent variables are measured at the end of the third quarter each year. Panel (a) represents results where the independent variable is Quasi-investors ownership, and panel (b) represents results for Transient institutional investors. $MCAPRank_{i,t} - 1000$ is the distance to threshold for firms ranked based on their May 31th Market-cap. $FloatAdj_{i,t}$ is the difference between the $MCAPRank_{i,t}$ and the actual Russell rank which is available at each June. Coefficients estimates are based on OLS with firm and time fixed effects and clustered standard errors at firm level. ***, **, * denote statistically significant coefficient estimates at the 1%, 5%, and 10% levels.

Table 7: Delayed Effect

	Volatility	Idiosyncratic	Systematic
$MCAPRank_t - 1000$	2.7549***	2.6470**	2.9880**
$FloatAdj_t$	0.7594	2.2560*	-1.8840
$(MCAPRank_t - 1000)(Russell2000_t)$	-3.0554**	-3.6770**	-2.0070
$\widehat{Own}_t$	-1.2988	-3.0680**	2.1650
Adjusted R^2	70%	55%	66%

The table presents result for the second stage regression in Equation 4 including $\pm$ 200 firms bandwidth around the Russell 1000/2000 threshold. Dependent variables are firm-level risk measures: volatility, idiosyncratic and systematic risks in three columns. Dependent variables are measured at the end fourth quarter year t. Coefficients estimates are based on OLS with firm and time fixed effects and clustered standard errors at firm level. ***, **, * denote statistically significant coefficient estimates at the 1%, 5%, and 10% levels.

Table 8: Mediation Analysis – Effect of Institutional Ownership on Mediators

	MToB	EPS	EPSSR	EPSRES
$\widehat{Own}_t$	29.2610**	2.9420	-11.7926	10.7860***
$MCAPRank_t - 1000$	-10.7310	-13.9910***	0.4358	-4.6470*
$FloatAdj_t$	-27.7030**	-0.1780	8.2200	-6.2170**
$(MCAPRank_t - 1000)(Russell2000_{t_1})$	-9.5190	20.1830***	-11.1683	5.3040
	36%	94%	22%	5%

	DIVY	IBESMEANEST	IBESESTERR	IBESSDTEV
$\widehat{Own}_t$	-0.5741*	24.6140***	-10.2880	-1.3786
$MCAPRank_t - 1000$	0.4863	-31.1810***	4.0110	0.4857
$FloatAdj_t$	0.3038	-21.7470***	3.5230	0.5798
$(MCAPRank_t - 1000)(Russell2000_{t_1})$	-0.7884	18.8080	-13.7490	-3.9189
	37%	100%	5%	100%

The table represents results for the regression in Equation 5 which measures the effect of total institutional ownership on Mediator candidates for $\pm$ 200 firms around the Russell 1000/2000 threshold. Institutional ownership is instrumented by Russell index, and Mediators selected as a proxy for firm's financial performance (MToB, EPS, EPSSR, EPSRES, and DIVY) and information asymmetry (IBESMEANEST, IBESESTERR, IBESSDTEV). Coefficients estimates are based on OLS with firm and time fixed effects and clustered standard errors at firm level. ***, **, * denote statistically significant coefficient estimates at the 1%, 5%, and 10% levels.

Table 9: Mediation Analysis – Mediators effect on Total Volatility

(a) Mediators effect on Total Volatility

	Volatility	Volatility	Volatility	Volatility
$MToB_t$	0.0011			
$EPSRES_t$		-0.0265***		
$DIVY_t$			0.0496	
$IBESMEANEST$				-0.0039
$\widehat{Own}_t$	-2.8869***	-2.3448**	-2.8272***	-4.2504***
$MCAPRank_t - 1000$	3.3300***	3.1403***	3.2945***	3.6642***
$FloatAdj_t$	1.4967*	0.8480	1.4521*	1.9740*
$(MCAPRank_t - 1000)(Russell2000_t)$	-4.0684***	-4.1238***	-4.0395***	-3.9617**
Adjusted R^2	66%	66%	66%	68%

(b) Mediated effect of Ownership on Total Volatility

Mediator	EPSRES
Mediated Effect	-0.2859***
Direct Effect	-2.3448**
Total Effect	-2.6307***
Prop. Mediated	11%

This table reports the indirect effect of ownership on total volatility through mediator candidates for $\pm$ 200 firms around the Russell 1000/2000 threshold. Panel (a) shows results for the indirect effect of ownership on total volatility while controlling for mediators happened to be significant in Table 8. Coefficients estimates are based on OLS with firm and time fixed effects and clustered standard errors at firm level. Mediators with significant coefficients in panel (a) are chosen for the panel(b). Panel (b) reports Bootstrapped (1000 Rep) point estimates and significance levels for the total and specific mediated effects of ownership on total volatility through Mediator. ***, **, * denote statistically significant coefficient estimates at the 1%, 5%, and 10% levels.

Table 10: Mediation Analysis – Mediators effect on Idiosyncratic Volatility

(a) Mediators effect on idiosyncratic volatility

	Idiosyncratic	Idiosyncratic	Idiosyncratic	Idiosyncratic
$MToB_t$	0.0007			
$EPSRES_t$		-0.0288***		
$DIVY_t$			0.0704	
$IBESMEANEST$				-0.0028
$\widehat{Own}_t$	-4.0658***	-3.6391***	-4.0041***	-5.9445***
$MCAPRank_t - 1000$	3.3832***	2.9997***	3.3412***	4.0175***
$FloatAdj_t$	2.3462***	1.8229*	2.3047**	3.2766***
$(MCAPRank_t - 1000)(Russell2000_t)$	-4.7335***	-4.6433***	-4.6849***	-4.9666***
Adjusted R^2	62%	63%	63%	65%

(b) Mediated effect of ownership on idiosyncratic volatility

Mediator	EPSRES
Mediated Effect	-0.3110***
Direct Effect	-3.6391***
Total Effect	-3.9502***
Prop. Mediated	8%

This table reports the indirect effect of ownership on idiosyncratic volatility through mediator candidates for $\pm$ 200 firms around the Russell 1000/2000 threshold. Panel (a) shows results for the indirect effect of ownership on idiosyncratic volatility while controlling for mediators happened to be significant in Table 8. Coefficients estimates are based on OLS with firm and time fixed effects and clustered standard errors at firm level. Mediators with significant coefficients in panel (a) are chosen for the panel(b). Panel (b) reports Bootstrapped (1000 Rep) point estimates and significance levels for the total and specific mediated effects of ownership on idiosyncratic volatility through Mediator. ***, **, * denote statistically significant coefficient estimates at the 1%, 5%, and 10% levels.

Table 11: Multiple Mediation Analysis

(a) Mediators effect on risk measures

	Volatility	Idiosyncratic
EPS_t	-0.0036	-0.0043
$EPSRES_t$	-0.0228***	-0.0229***
$EPSSR_t$	0.0089***	0.0089***
$MToB_t$	0.0030*	0.0032**
$DIVY_t$	0.1694***	0.1721***
$IBEMEANEST_t$	-0.0085	-0.0086
$IBESSTDEV_t$	0.0092	0.0115
$IBESESTERR_t$	0.0010	0.0014
$\widehat{Own}_t$	-3.4449***	-5.2490***
$MCAPRank_t - 1000$	3.0535***	3.1128***
$FloatAdj_t$	0.8920	2.3597**
$(MCAPRank_t - 1000)(Russell2000_t)$	-2.9565*	-3.7413**
Adjusted R^2	68%	64%

(b) Mediated effect of ownership on risk measures

	Volatility	Idiosyncraitic
EPS_t	-0.0174	-0.0209
$EPSRES_t$	-0.3191**	-0.3207***
$EPSSR_t$	-0.1510**	-0.1519**
$MToB_t$	0.1181	0.1281
$DIVY_t$	-0.1677***	-0.1703***
$IBEMEANEST_t$	-0.1734	-0.1761
$IBESSTDEV_t$	-0.0351	-0.0438
$IBESESTERR_t$	-0.0123	-0.0166
Mediated Effect	-0.7579*	-0.7723*
Direct Effect	-3.4449***	-5.2490***
Total Effect	-4.2028***	-6.0213***
Prop. Mediated	18%	13%

This table reports indirect effect of ownership on total and idiosyncratic volatility through multiple mediator candidates for $\pm$ 200 firms around the Russell 1000/2000 threshold. Panel (a) shows results for indirect effect of ownership on risk measures while controlling for multiple mediators. Coefficients estimates are based on OLS with firm and time fixed effects and clustered standard errors at firm level. Panel(b) reports Bootstrapped (1000 Rep) Point Estimates and significance levels for the total and specific mediated effects of Ownership on total and idiosyncratic volatility through multiple mediators. ***, **, * denote statistically significant coefficient estimates at the 1%, 5% and 10% levels.

Table 12: Second Stage Regressions – 800 Firm Bandwidth

	Volatility	Idiosyncratic	Systematic
$MCAPRank_t - 1000$	1.5711***	1.5457***	0.7754
$FloatAdj_t$	0.5525	1.7621**	-1.5507*
$(MCAPRank_t - 1000)(Russell2000_t)$	-1.8780***	-2.3449***	-0.0557
$\widehat{Own}_t$	-1.8768***	-3.3246***	1.3982
Adjusted R^2	59%	44%	62%

This table represents result for the second stage regression in Equation 4 for $\pm$ 400 firms bandwidth around the Russell 1000/2000 threshold. Dependent variables are firm-level risk measures: volatility, idiosyncratic and systematic risks respectively in three columns. Dependent variables are measured at the end of the third quarter each year. $\widehat{Own}_t$ is instrumented total institutional ownership. $MCAPRank_{i,t} - 1000$ is the distance to threshold for firms ranked based on their May 31th Market-cap. $FloatAdj_{i,t}$ is the difference between the $MCAPRank_{i,t}$ and the actual Russell rank which is available at each June. Coefficients estimates are based on OLS with firm and time fixed effects and standard errors are clustered at firm level. ***, **, * denote statistically significant coefficient estimates at the 1%, 5%, and 10% levels.

9 Appendix

9.1 Forming The Databases

We base our main DATABASE by matching Ownership data from Thomson Reuters 13F data, which reports the equity ownership of all institutional investors with more than $100 million filed with the SEC each quarter, with CRSP and Compustat databases. To match 13F filings and CRSP, we mainly utilized Cusips under 13F filings and matched through time with historical CUSIPs in the CRSP database. As a second check, we also reviewed matching firms' tickers to confirm the correct match. We mainly used the CRSP database for the price, outstanding shares, dividend information and daily and monthly return as well as calculating firms different risk measures. To have other financial ratios, we merge Compustat with our database for this purpose we utilized CCM table which links gvkey from Compustat to permnos from CRSP. Since CRSP and 13F databases are based on calendar quarters, we merged Compustat fiscal quarter to the nearest calendar quarter to have all data in calendar quarters. After merging all databases, we apply some filters to reduce the effect of outliers.

- Winsorize top 1% of ownership data at each quarter.
- Filter shares with less than 1 dollar price.
- Windsorize firms at each Quarter at lowest 1% percentile of market-Cap.

Finally, we keep the data which we have all necessary clean information which formed our main DATABASE. For some specific analysis, To capture the market's expectations about the firm's financial performance, we use data from the Institutional Brokers Estimate System (IBES), which provides monthly data on analysts' EPS estimates and other related statistics. To this purpose we merge the IBES database into our main DATABASE. We used summary history database from 1980/01/01-2014/12/31 to match with the quarterly database. We combined monthly data to build quarterly mean and standard deviation for each firm. We also considered some conditions to meet while building the database.

- The company's fiscal year ends in December.
- At least three estimates at each quarter for a firm.
- At least one month of data in a quarter.

Finally, for some of our analysis, we also merged Russell annual constitutes for Russell 1000 and 2000 indexes from 1980 till 2014. The match between Russell index and our database happened through firms' CUSIPs. Table 13 summarizes the matching process, each row shows the number of unique identification codes (CUSIP, permno, ...) for each database and number of the unique identification code for matched databases. Panel (a) reports matching for the main DATABASE which is a merged database of 13F, Compustat and CRSP, covers more than 23000 unique firms through the time. Panel (b) reports the pairing of DATABASE and IBES database, which shows that out of 17338 unique CUSIPs 14920 CUSIPS are matched with the DATABASE and matching ratio is about 86%. Panel(c) reports the matching outcome of DATABASE and Russell indexes which indicates that the matching ratio is about 99% for Russell1000 and Russell2000 with DATABASE.

Table 13: Merging Database

(a) Principal DATABASE

	CRSP	13F	CRSP-13F	Compustat	DATABASE
CUSIP	37456	58770	33459	34101	32132
permno	27514		25018		23848
gvkey				34120	

(b) DATABASE - IBES match

	IBES	DATABASE-IBES
CUSIP	17338	14920
permno		11046
gvkey		

(c) DATABASE and Russell Match

	Russell1000	DATABASE - Rusell1000
CUSIP	4566	4517
permno		3757
gvkey		

	Russell2000	DATABASE - Rusell2000
CUSIP	13188	13016
permno		11261
gvkey		

Table shows the merging process to build necessary databases. CUSIP, gvkey and permnos are unique identification numbers used in each database. Panel (a) shows the main DATABASE which is matched database of CRSP, COMPUSTAT, and 13F. Panel (b) shows the match of DATABASE and IBES database. Panel (c) reports the pairing of DATABASE and Russell indexes.