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Institutional Ownership Volatility and Investment Behavior of REITs

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We find that the volatility of institutional ownership affects the investment behavior of real estate investment trust (REIT) managers. REITs exhibit stronger growth in real estate assets when they experience more volatility in institutional ownership. Debt is the likely source of financing these investments, whereas institutional ownership volatility does not explain for the equity issuance decisions of REITs. The effect of ownership dynamics on the investment decisions of REITs is mostly driven by institutions that hold highly diversified portfolios, which are classified as quasi-indexers and transient investors. The contribution of ownership volatility emerging from individual trading decisions of institutional stakeholders matters more than the ownership volatility of the institutional sector as a whole. Our findings suggest that REITs may cater their portfolios to the preferences of certain institutional investors.

Keywords

REITs, Institutional ownership volatility, Investment decisions

1. Introduction

Institutional ownership in publicly-traded real estate investment trusts (REITs) has increased dramatically over time (e.g., Ling and Ryngaert, 1997; Chan et al., 1998; Chung et al., 2012; Devos et al., 2013). On average, institutions owned 47% of the outstanding REIT shares in 1998, and this rose to 69% in 2018. Significant changes in institutional ownership have likely affected REIT performance, governance mechanisms, and corporate decisions, among other characteristics.[1]

Research has shown that it is not just the level of institutional ownership that is important. For example, Elyasiani et al. (2010) find an inverse relation between the cost of debt and institutional ownership stability. Sakaki et al. (2017) show that the presence of stable institutional owners is associated with a lower degree of earnings management. The stability of institutional ownership is an important factor that affects managerial behavior and its outcomes because stable investors are more likely to be incentivized monitors, whereas unstable institutional investors tend to exhibit short-termism and trade for immediate profit, without any intention to influence management. Gaspar et al. (2005) find that ownership by institutions with higher portfolio turnover leads to undisciplined management decisions and affects merger and acquisition outcomes. Bushee (1998; 2001) shows that firms held by institutions with high portfolio turnover are more likely to reduce research and development (R&D) expenses to meet short-term earnings goals.

This paper examines the extent to which the volatility of REIT institutional ownership affects its investment in real estate. Being relatively small firms (the market capitalization of an average REIT in our sample is US$2.5 billion), REITs are likely to be more sensitive to dynamic changes in ownership by institutions compared to larger publicly-traded firms. To the best of our knowledge, this paper is the first to examine the effect of institutional ownership stability on the corporate decisions of REITs.

REITs operate in a regulated environment, where provisions are designed not only to protect investor interests, but also to attract institutional and retail capital to the generally illiquid real estate sector by offering more generous dividend policies and diversification benefits (e.g., Ghosh and Sirmans, 2006; Hartzell et al., 2006). The effects of regulation may either mitigate or elevate the conflicts of a REIT agency. For example, REITs are required to pay out ninety percent of their earnings as dividends to be exempt from corporate taxes. This payout requirement results in REITs frequently raising external capital, and thus provides increased opportunities for outsiders to monitor and

[1]See, for example, Akbulut et al. (2015), An et al. (2016), Chan et al. (1998, 2003), Cheung et al. (2015), Chung et al. (2012), Downs (1998), Feng et al. (2010), Graff and Young (1997), Hartzell et al. (2006, 2014), and Ling and Ryngaert (1997).

discipline management. In contrast, both the requirement of having at least 75% of REIT assets invested in real estate, which implies restricted investment opportunities, and the absence of an active takeover market may lead to managerial entrenchment (Campbell et al., 2011). Given these potentially countervailing forces of the regulated environment in which REITs operate, the effect of institutional ownership volatility on the investment decisions of REITs is an empirical question.

Hartzell et al. (2006) document that the investment expenditures of REITs are more sensitive to the Tobin's Q of their property type when institutions own a greater percentage of REIT shares, and this is consistent with the institutional monitoring of investment policies and stronger governance at the firm. Given recent evidence on institutional ownership stability, the volatility in institutional ownership may be a more important determinant of real estate investment than the ownership level itself, because unstable (short-term-focused) institutions are less likely to engage in monitoring and influence management (e.g., Elyasiani et al., 2010). We develop two hypotheses in this regard. One alternative is that since stable institutional investors have greater incentives to monitor, a stronger governance mechanism at a firm may induce greater growth in real estate assets. Under this scenario, we expect institutional ownership volatility to be inversely associated with the growth rate of real estate assets. In contrast, the literature provides evidence that REIT managers engage in catering behavior. For example, Case et al. (2012) find that REITs consider investor demand when making decisions regarding their dividend policies. Along these lines, we postulate that if REIT managers observe a high churn rate among their institutional shareholders, the company may choose to reconstitute their real estate portfolio by investing in new properties to make their assets look more appealing to these investors. In this situation, we expect the institutional ownership instability to be positively associated with growth in real estate assets.

We follow Elyasiani et al. (2010) and construct the institutional ownership volatility (instability) measure as the average standard deviation of institutional shareholding proportions across all investors who report equity positions in REITs over a five-year period. The real estate asset growth measure is constructed following Hartzell et al. (2006). We find that the volatility in institutional ownership is associated with stronger growth in real estate assets. This supports the hypothesis that REIT managers choose to acquire new properties to attract institutional investment, particularly when institutional ownership is unstable. Our findings are also economically meaningful. A one-unit increase in institutional ownership volatility is estimated to result in approximately a 12% higher rate of growth in real estate assets.

Consistent with Hartzell et al. (2006), we find that REITs with higher institutional ownership invest in real estate assets more when there are better investment opportunities, which can be explained by incentivized institutional

monitoring. However, they find the opposite effect for *director and officer* ownership, which is consistent with managerial entrenchment. This evidence suggests that REIT investment decisions may be affected by both incentive and entrenchment forces. Our main findings, however, show that monitoring by stable institutions is not a dominating factor in explaining for the investment behavior of REITs. The instability in ownership by institutions may trigger managerial decisions to revamp the firm's portfolio of real estate assets and look more appealing to investors. With less stable ownership, managers are likely to be under more pressure to take action and cater to their stakeholders.[2]

Regarding incentivized monitoring, Fich et al. (2015) stress that institutions are likely to allocate their monitoring efforts based on the importance of the firm's stock in their portfolios, and devote the most attention to their largest holdings. Institutional portfolios are generally very large, and unless an institution specializes in investing real estate products (as is the case with real estate mutual funds), REITs are often used for diversification purposes. Our investigation of institutional portfolio weights allocated to REITs and non-REIT stocks shows that the average portfolio weight of a REIT is 0.39%, whereas it is 0.53% for non-REIT holdings during the period of 2000-2018. While these statistics support the notion that REITs are less likely the highest priorities of motivated monitors, Hardin et al. (2017) show that REITs with shares held by motivated monitors perform better.

As our hypotheses reflect, the examination of institutional ownership volatility is broadly rooted in the dichotomy of managerial entrenchment and incentivized monitoring. Our main result regarding the positive link between institutional ownership volatility and real estate asset growth provides evidence in support of managerial entrenchment. However, in line with Hartzell et al. (2006), we also find that REITs with higher institutional ownership invest in real estate assets more when there are better investment opportunities, which is in support of incentivized monitoring. Collectively, our findings provide evidence in support of both entrenchment and monitoring that result from institutional investment in REITs. Similarly, Dolde and Knopf (2010) study the managerial entrenchment and incentive alignment forces through REIT risk-taking, and conclude the behavior of REIT managers is more complex than that of non-REIT managers. Examining the relation between insider ownership and REIT risk-taking, the authors find that with up to 36% of insider ownership, entrenched insiders mitigate their own risk aversion, and above 36%, as managers become more substantial owners, incentive alignment emerges. This is line with our findings that the managerial behavior of REITs can be a result of both mechanisms and is a function of the ownership constitution in the shareholder base of the firm.

[2]Other studies also note the limited extent of the role of institutional monitoring in REITs. See, for example, Friday et al. (1999) and Ghosh and Sirmans (2003).

Our results further indicate that decisions to invest in new real estate assets are likely to be financed with additional debt rather than equity. This is consistent with the evidence on REIT capital structure that REITs raise funds through debt issuance when faced with high growth opportunities (e.g., Feng et al., 2007; Hardin and Wu, 2010). We also find that the *type* of institution matters for the response of the REIT to institutional ownership volatility, as the results are more pronounced for institutions that hold highly diversified portfolios. This evidence is consistent with the notion that firms may cater to the tastes of specific investors in their shareholder base (e.g., Derrien et al., 2013). We find no relation between the volatility in aggregate institutional ownership and investment decisions of REITs. This is likely due to the fact that the trading behavior of one group of investors (e.g., buyers) can be offset by the selling activity of another group of institutions, and as a result, the volatility in aggregate institutional ownership does not capture well the trading dynamics at the individual investor level. In summary, it is the trading behavior of specific types of institutions, and not the ownership dynamics of the institutional sector as a whole, that explains the investment in new real estate assets by REITs.

While our baseline results suggest a positive link between institutional ownership volatility and real estate asset growth, this may not warrant a causal inference that REIT managers revamp their portfolios given a greater churn rate in institutional ownership. We utilize a two-stage least squares (2SLS) approach to address this potential endogeneity issue. Our instrument for institutional ownership volatility is the price informativeness measure. Developed by Roll (1988), price informativeness captures the portion of stock return variation that is unexplained by risk factors. Similarly, we measure price informativeness as one minus R^2 from regressions of REIT returns on property sector-specific benchmark returns (e.g., Chung et al., 2011). Higher levels of $(1 - R^2)$ indicate that more private information is moving the stock price. Given the evidence that at least some institutions are informed traders (e.g., Ali et al., 2008; Chung et al., 2011), we find a direct relation between institutional ownership volatility and the extent to which stock prices are driven by private information (also known as price informativeness). Utilizing price informativeness as the instrument, we find supporting evidence for a positive link between ownership volatility and investment in real estate assets by REITs.

Our paper contributes to the literature on institutional investment in REITs. It complements the work of Hartzell et al. (2006) in examining the effect of institutional ownership on the investment decisions of REIT managers. We provide evidence that although institutional investors play a monitoring role, REIT managers may also pursue growth to cater to institutional preferences. Although a number of studies have examined the level of institutional ownership in REITs, the stability in this ownership has received less attention. Devos et al. (2013) find that aggregate institutional ownership in REITs increased prior to, declined during, and rebounded after the global financial crisis. Our study shows that the dynamics in individual trading of institutional

stakeholders matters for the corporate decision making of REITs. Institutional ownership stability is particularly important for REITs, because they are typically smaller firms, and are likely to be more sensitive to institutional trades. To the best of our knowledge, the evidence we present in this study is new and advances our understanding about a complex interaction between the institutional ownership constitution and corporate decisions of REITs.

This paper proceeds as follows. The next section describes our data, sample construction, and variable characteristics. We then explain the empirical design, discuss the results on the relation between institutional ownership stability and investment decisions of REITs, and present the robustness tests. The final section concludes.

2. Data, Sample Construction, and Variable Definitions

We draw our sample from the following three sources: the information on prices, shares, and returns come from the Center for Research in Securities Prices (CRSP); accounting data are from the quarterly Compustat database; and institutional ownership data are from Thomson Reuters. Our sample begins in the first quarter of 2000 and runs through the last calendar quarter of 2018.[3] To identify REITs, we screen all securities in CRSP and retain those with the second share class digit of eight.[4]

There are 341 unique REITs during the period of 2000-2018 in CRSP. We eliminate mortgage and hybrid REITs to focus on equity REITs (RTYPE=2 in CRSP), and this procedure yields a sample of 266 firms. Appendix A shows the distribution of REITs in our sample by property type. We then obtain accounting information for these firms from Compustat and quarterly institutional holdings from Thomson Reuters.

We follow Hartzell et al. (2006) and construct the investment decisions variables as follows. *Real Estate Asset Growth* is the percent change in real estate property, where accumulated depreciation is added back to capture the change in real estate assets driven by active buying or selling properties rather than change due to a depreciated value. *Equity Growth* is the change in gross equity (total assets, plus accumulated depreciation, minus total liabilities), scaled by the beginning-of-quarter total assets. *Debt Growth* is the change in total liabilities, scaled by the beginning-of-quarter total assets. We study equity growth and debt growth separately to understand the possible sources of financing investment in REIT real estate. *Real Estate Asset Growth, Equity Growth* and *Debt Growth* are the measures of investment decisions of REIT

[3]The real estate property variable is not available in Compustat prior to 2000.
[4]Hartzell et al. (2010) use this approach to construct their sample of REITs.

managers, and the dependent variables in our analyses. Appendix B describes these variables in greater detail.

To explore the role of institutional ownership stability on the investment decisions of REIT managers, we define institutional ownership volatility following Elyasiani et al. (2010) as:

$$\mathrm{StdI}_i = \frac{\sum_{j=1}^{J_i} \mathrm{Std}(\mathrm{p}_{\mathrm{i,t}}^{\mathrm{j}})}{\mathrm{J_i}} \tag{1}$$

where $p_{i,t}^{j}$ is the proportion of firm i held by investor j over a 20-quarter horizon, and J_i is the number of institutional investors in firm i. $P_{i,t}^{j}$ is calculated by dividing shares held by institution j into the total shares outstanding of firm i. If institutional investor j does not report holdings in firm i between the first and the last quarters of ownership in this firm, the $p_{i,t}^{j}$ of investor j is set to zero for these quarters.[5] Institutional ownership volatility ($StdI_i$) for a firm represents the average standard deviation of shareholding proportions across all institutional investors holding the firm's stock over a five-year period. Lower levels of $StdI_i$ indicate higher stability in institutional ownership.

To control for the effect of institutional ownership level during the period of measuring ownership volatility, we construct the aggregate institutional ownership proportion averaged over the 20-quarter period as:

$$\mathrm{Prop}_i = \frac{\sum_{\mathrm{t=1}}^{20} \sum_{\mathrm{j=1}}^{\mathrm{J_i}} \mathrm{p}_{\mathrm{i,t}}^{\mathrm{j}}}{20} \tag{2}$$

We construct several control variables related to institutional ownership. We include the level of and change in institutional ownership as of the most recent quarter, IO_{t-1} and $\Delta IO_{t-2 \to t-1}$, respectively, as well as the change in institutional ownership level over the 20-quarter period, $\Delta IO_{t-20 \to t-1}$, in our analyses. In addition, we control for the institutional ownership concentration, measured by the Herfindahl-Hirschman Index (HHI).[6]

Our set of control variables for firm characteristics includes the Tobin's Q of property type, earnings before interest, tax, depreciation, and amortization (EBITDA) scaled by total assets, interest coverage, and market capitalization. In the spirit of Hartzell et al. (2006), we calculate *Property Type Q* as the average Tobin's Q across all REITs in a given property type. Tobin's Q is calculated as the market value of common equity plus total assets minus the book value of common equity, divided by the total assets of the firm, as of the

[5]For example, if institutional investor j reports holdings in firm i each quarter of 2003, followed by holdings records in the third and the fourth quarters of 2004, its ownership in the first two quarters of 2004 is imputed to be zero.

[6]The source of this variable is the Thomson Reuters stock ownership file.

end of the quarter.[7] Hartzell et al. (2006) show that investment decisions of REITs with greater institutional ownership are more sensitive to investment opportunities, as measured by *Property Type Q*, and therefore, we incorporate the interaction between institutional ownership and *Property Type Q* in our regressions.

The literature also documents the importance of cash flow on the investment decisions of a firm.[8] We measure cash flow with EBITDA, scaled by total assets as of the previous quarter-end. Investment in real estate assets is typically costly, and can be financed by using debt or equity. To capture the level of accessibility to the debt markets, we include *Interest Coverage*, the ratio of the EBITDA of a firm to interest expense. Lower interest coverage is associated with more difficult access to debt markets, which may affect managerial decisions regarding new investments in real estate. Market capitalization serves as a proxy for the size of a REIT, and larger REITs may have more resources allocated to investment in real estate assets. From another perspective, REITs with larger market capitalization may exhibit slower growth in real estate assets, since these firms already constitute a greater proportion of the market share in the sector. Appendix B provides a more detailed description of the above variables.

Table 1 reports the summary statistics for our measures. All continuous variables are winsorized at the 1% level. The mean of institutional shareholdings volatility, $StdI_i$, is 0.26%, and its median is 0.23%. The quarterly institutional ownership fraction averages about 62%. The one-quarter change in institutional ownership has a mean of 1.6%, while the five-year change in this variable is 27.5%, on average. Over our sample period, REITs have exhibited a positive growth rate in real estate assets of about 3.5%, on average, per quarter. The quarterly mean growth rates of equity and debt are 1.8% and 2.4%, respectively. The *Firm Q* and *Property Type Q* average values are very close, and both are above one. The ratio of EBITDA to total assets is about 1.5%, and the REITs have a mean (median) market capitalization of approximately US$2.5 billion (US$874 million). The average EBITDA interest coverage is about three times. These summary statistics are comparable to those in related studies.[9]

[7]Numerous studies use the Tobin's q ratio to identify companies with investment opportunities. See, for example, Blose and Shieh (1997), Chung et al. (1998), Denis (1994), Jung et al. (1996), and Lang et al. (1989).

[8]See, for example, Agca and Mozumdar (2017), Attig et al. (2012), Ascioglu et al. (2008), Brown and Petersen (2009), Fee et al. (2009), Gentry and Mayer (2003), Hovakimian (2009), and Lyandres (2007).

[9]See, for example, Table 1 of Hartzell et al. (2006). Note that their dependent variables reflect annual changes, and our variables are based on quarterly changes.

Table 1 Summary Statistics

This table reports the descriptive statistics for the sample of 266 equity REITs over the period of 2000-2018 at the firm×quarter level. *StdI* is institutional ownership volatility, measured as the average standard deviation of shareholding proportions across all institutional investors, defined in Equation (1). *IO* is the level of institutional ownership, calculated as a sum of all shares held by institutional investors as a fraction of total shares outstanding. $\Delta IO_{t-2\rightarrow t-1}$ and $\Delta IO_{t-20\rightarrow t-1}$ is the change in institutional ownership over one quarter and five years, respectively. *Blockholder ownership* is the fraction of shares outstanding held by blockholders. *IO HHI* is the institutional ownership concentration, measured by the HHI, as provided in the Thomson Reuters Stock Ownership file. *Real Estate Asset Growth* is the growth rate of the real estate assets including accumulated depreciation. *Equity Growth* is the change in the common equity of a firm, scaled by the beginning-of-quarter total assets. *Debt Growth* is the change in the total liabilities of a firm, scaled by the beginning-of-quarter total assets. *EBITDA* is the ratio of earnings before interest, tax, depreciation, and amortization to the total assets of the prior quarter. *Firm Q* is the Tobin's Q of a firm, and *Property Type Q* is the average *Firm Q* across all REIT companies in the same property type. *Interest coverage* is the ratio of EBITDA to interest expense, and *Market Capitalization* is a product of the share price and total shares outstanding. *Debt-to-Assets* is the ratio of total liabilities to total assets. Appendix B provides more details on variable definitions.

Variable	Mean	Median	Std. Dev.	5th percentile	95th percentile
StdI (%)	0.261	0.228	0.174	0.064	0.594
IO (%)	61.72	66.94	13.04	3.24	86.13
$\Delta IO_{t-2\rightarrow t-1}$ (%)	1.593	0.241	11.259	-9.124	13.292
$\Delta IO_{t-20\rightarrow t-1}$ (%)	27.53	18.29	34.26	-15.23	93.05
Blockholder ownership	0.214	0.206	0.159	0.000	0.489
IO HHI	0.117	0.063	0.167	0.034	0.454
Real Estate Asset Growth	0.035	0.009	0.115	-0.042	0.188
Equity Growth	0.018	0.004	0.060	-0.023	0.106
Debt Growth	0.024	0.005	0.096	-0.061	0.162
EBITDA	0.015	0.014	0.012	-0.001	0.034
Firm Q	1.297	1.210	0.394	0.820	2.060
Property Type Q	1.287	1.245	0.226	0.989	1.760
Interest coverage	2.916	1.803	6.184	-0.125	7.500
Market capitalization ($bil)	2.523	0.874	5.307	0.024	10.069
Total Debt ($bil)	1.721	0.784	2.688	0.019	6.460
Debt-to-Assets	0.556	0.555	0.197	0.166	0.876

Figure 1 shows the trends in institutional ownership volatility and proportion for an average REIT over time. The institutional ownership proportion increases, but the volatility of ownership declines over time.[10] We later explore the effect of this decline on our main results.

Figure 1 Institutional Ownership Volatility and Proportion Over Time

This figure shows the evolution of institutional ownership volatility, $StdI_i$, as defined by Equation (1), and proportion, $Prop_i$ (Equation (2)), for an average REIT over time.

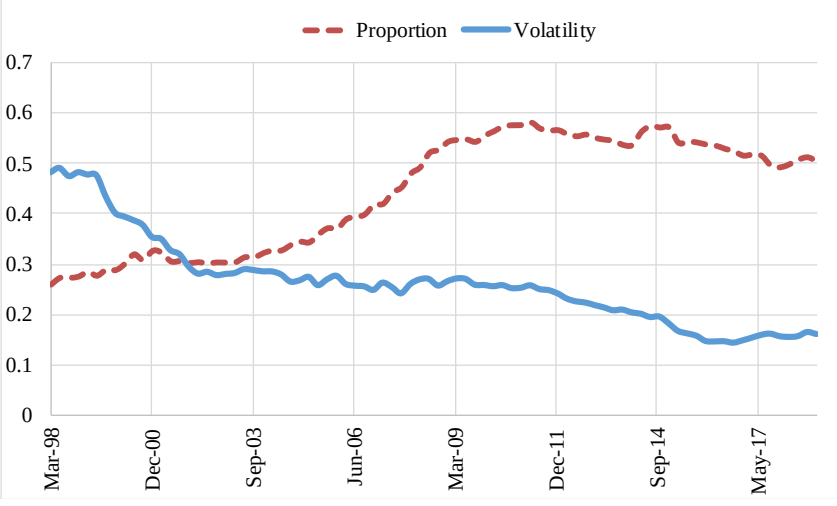

Table 2 shows the Spearman correlation coefficients for the variables used in our tests. *P*-values are reported in parentheses. Multicollinearity is not a concern for our regression analyses, as our set of explanatory variables does not show strong pairwise correlations. The highest correlation is between a ratio of EBITDA-to-assets and interest coverage, 0.571.

[10]Note that this institutional ownership proportion measure is based on the 20-quarter rolling average, as defined by Equation (2), to match the ownership volatility measurement horizon.

Table 2 Spearman Correlation Matrix

This table reports the Spearman correlation coefficients for the sample of 266 equity REITs from 2000 to 2018 based on firm×quarter observations. All variables are defined in Table 1 and described in more detail in Appendix B. P-values are in parentheses.

	StdI	IO	1q ΔIO	5yr ΔIO	Block holder owner ship	IO HHI	Real Estate Asset Growth	Equity Growth	Debt Growth	EBITDA	Firm q	Property Type q	Interest coverage	Market cap
StdI	1													
IO	0.061*** (0.000)	1												
1q ΔIO	0.017 (0.166)	-0.029** (0.019)	1											
5yr ΔIO	0.232*** (0.000)	0.033*** (0.007)	0.171*** (0.000)	1										
Block holder owner ship	-0.051*** (0.000)	0.449*** (0.000)	0.064*** (0.000)	0.263*** (0.000)	1									
OI HHI	0.014 (0.240)	-0.452*** (0.000)	-0.021** (0.039)	-0.133*** (0.000)	-0.218*** (0.000)	1								
Real Estate Asset Growth	0.049*** (0.000)	-0.044*** (0.002)	0.058*** (0.000)	0.152*** (0.000)	0.013 (0.315)	-0.05*** (0.000)	1							
Equity Growth	-0.018 (0.206)	0.003 (0.806)	0.011 (0.374)	0.009 (0.458)	0.020 (0.111)	-0.08*** (0.000)	0.366*** (0.000)	1						

(Continued…)

(Table 2 Continued)

Debt	0.112***	-0.029**	0.036***	0.139***	-0.034***	-0.008	0.594***	-0.065***	1					
Growth	(0.000)	(0.019)	(0.000)	(0.000)	(0.001)	(0.414)	(0.000)	(0.000)						
EBITDA	0.057***	0.018	-0.007	0.032***	-0.235***	0.016	0.058***	0.157***	0.091***	1				
	(0.000)	(0.143)	(0.493)	(0.002)	(0.000)	(0.107)	(0.000)	(0.000)	(0.000)					
Firm q	-0.374***	0.260***	-0.020*	-0.070***	0.262***	-0.28***	0.121***	0.167***	0.072***	0.276***	1			
	(0.000)	(0.000)	(-0.045)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
Property	-0.378***	0.087***	-0.000	0.017	0.226***	-0.18***	0.109***	0.046***	0.045***	0.040***	0.551***	1		
Type q	(0.000)	(0.000)	(0.925)	(0.101)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
Interest	-0.141***	0.013	-0.024**	0.004	-0.128***	-0.07***	0.077***	0.157***	0.092***	0.571***	0.297***	0.138***	1	
coverage	(0.000)	(0.291)	(0.021)	(0.721)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Market	-0.512***	0.407***	-0.003***	-0.042***	0.451***	-0.59***	-0.012	0.071***	-0.037***	-0.007	0.567***	0.447***	0.165***	1
cap	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.309)	(0.000)	(0.000)	(0.438)	(0.000)	(0.000)	(0.000)	
Debt-to-	-0.029**	0.169***	-0.058***	-0.084***	0.072***	-0.05**	-0.08***	0.013	-0.095***	0.015*	0.186***	0.061***	-0.382***	0.068***
Assets	(0.016)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.266)	(0.000)	(0.098)	(0.000)	(0.000)	(0.000)	(0.000)

3. Empirical Design

To examine the effect of institutional ownership dynamics on investment decisions of REITs, we study the investment rate of REIT, proxied by real estate asset growth, as a function of volatility in institutional shareholding. We begin by estimating the following panel regression:

$$\begin{aligned} Real\ Estate\ Asset\ Growth_{i,t} = \alpha_1 + \beta_1 StdI_{i,t-1} + \beta Controls_{i,t-1} \\ + Quarter\ dummies_{t-1} \\ + Firm\ dummies_i + \varepsilon_{i,t-1} \end{aligned} \quad (3)$$

All variables are discussed in the previous section. We include firm fixed effects to account for REIT-specific variation that could be correlated with our output variables. Since all variables are measured quarterly, we also include calendar quarter fixed effects. We also include the one-quarter - and two quarter-lagged dependent variables to control for the past change in real estate assets. All variables in this and subsequent regression models are standardized to have a mean of zero and a standard deviation of one, and all models cluster standard errors at the firm level.

We then explore two possible sources of financing the investment in real estate assets by examining the growth rates of equity and debt. We want to understand whether the stability in institutional ownership channels investment in real estate through debt or equity issuance, or both. We estimate the following panel regression of *Equity Growth:*

$$\begin{aligned} Equity\ Growth_{i,t} = \alpha_2 + \psi_1 StdI_{i,t-1} + \psi Controls_{i,t-1} \\ + Quarter\ dummies_{t-1} \\ + Firm\ dummies_i + \eta_{i,t-1} \end{aligned} \quad (4)$$

We use a similar approach to explore the effect of institutional ownership volatility on the change in debt:

$$\begin{aligned} Debt\ Growth_{i,t} = \alpha_3 + \psi_1 StdI_{i,t-1} + \psi Controls_{i,t-1} \\ + Quarter\ dummies_{t-1} \\ + Firm\ dummies_i + \xi_{i,t-1} \end{aligned} \quad (5)$$

4. Results

Baseline specifications

We examine the effect of institutional ownership volatility on *Real Estate Asset Growth,* as outlined by Equation (3), where the dependent variable is the one-quarter forward growth rate in real estate assets. Table 3 reports our main results. The results in Table 3 show various combinations of institutional ownership volatility and control variables. Intercept coefficients are not reported.

In our specifications, we control either for the average institutional ownership over a five-year period, $Prop_{t-20 \rightarrow t-1}$, or the level of institutional ownership at the end of quarter t-1, IO_{t-1}. Across all specifications, we find a strong positive relation between institutional ownership volatility and future investment in real estate assets. This implies that larger ownership changes by institutional investors, on average, are associated with stronger growth in the real estate assets of REITs. The coefficient estimates indicate that a one-unit increase in institutional ownership volatility is associated with approximately a 12% higher growth in real estate assets. Positive and significant coefficients on *EBITDA* support the notion that REITs invest more when there are better opportunities. The results in Models (4) and (5) of Table 3 are consistent with those of Hartzell et al. (2006). A positive and significant coefficient on the interaction term between *Property Type Q* and IO_{t-1} indicates that REITs with higher institutional ownership invest in real estate assets more when there are better investment opportunities. Our results in Models (4) and (5) also show that the growth rate in real estate assets is higher in the face of good investment opportunities when blockholder ownership is smaller. This may be driven in part by insider ownership, which would be consistent with managerial entrenchment and inaction when good investment opportunities arise. Institutional ownership concentration does not appear to affect the investment behavior of REIT managers. It is worthwhile to note that the coefficient on institutional ownership volatility has the largest magnitude, relative to those associated with other variables.[11]

We explore the link between institutional ownership volatility and growth in the real estate assets of REITs by studying possible financing sources. We want to understand whether REIT managers issue additional debt or equity (or both) to invest in real estate assets, when institutional ownership is dynamic. We first explore the effect of institutional ownership volatility on the growth rate in equity by running the regression specification outlined in Equation (4). Table 4 reports the results of this estimation.

Our findings reveal a weak relation between institutional ownership volatility and growth in equity, as the coefficients on our main explanatory variable, $StdI_i$, across all specifications of Table 4 are positive, but statistically insignificant. This implies that equity issuance is likely not a primary financing source for investment in real estate assets by REITs. Note the positive significant coefficients on the change in institutional ownership, whether it is more recent (over one quarter) or long-term (over five years), in Models (3)

[11]We explore if our results are driven by REITs of extremely small or large market capitalizations. We do so by excluding the bottom and top 5% REITs by their size. We also investigate the size effects by using interaction terms between the institutional ownership volatility and a dummy indicating the bottom/top 5% REITs by market capitalization. We find that it is unlikely that our results are driven by the smallest and/or largest REITs in our sample.

Table 3 Investment in Real Estate Assets

This table reports the results of panel regressions of one-quarter-forward growth rate in real estate assets on institutional ownership volatility and control variables. The regression equation is outlined in Equation (3). The dependent variable is *Real Estate Asset Growth*$_t$. Standard errors are clustered at the firm level, and the corresponding t-statistics are reported in parentheses. All variables are standardized to have a mean of zero and a standard deviation of one. Appendix B provides a detailed description of all variables. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Real Estate Asset Growth$_t$				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
StdI$_{t-20\rightarrow t-1}$	0.061**	0.127***	0.126***	0.125***	0.118**
	(2.38)	(3.01)	(2.77)	(2.71)	(2.57)
Prop$_{t-20\rightarrow t-1}$	-0.033*	-0.028			
	(-1.83)	(-0.65)			
IO$_{t-1}$			-0.031	-0.027	-0.020
			(-0.89)	(-0.79)	(-0.57)
ΔIO$_{t-2\rightarrow t-1}$			0.022	0.025	0.027
			(1.06)	(1.23)	(1.28)
ΔIO$_{t-20\rightarrow t-1}$			0.026	0.034	0.039
			(0.98)	(1.28)	(1.39)
EBITDA$_{t-1}$			0.057**	0.052**	0.053**
			(2.30)	(2.12)	(2.12)
Interest coverage$_{t-1}$			0.004	0.004	0.002
			(0.20)	(0.21)	(0.13)
Log(Market cap)$_{t-1}$			0.064	0.070	0.066
			(1.13)	(1.26)	(1.16)
Property Type Q$_{t-1}$			0.027	0.033	0.041
			(0.62)	(0.86)	(1.11)
IO$_{t-1}$×Property			0.018	0.045**	0.067***
Type Q$_{t-1}$			(0.63)	(2.06)	(2.67)
BlockholderOwn$_{t-1}$				-0.023	-0.018
				(-1.02)	(-0.75)
BlockholderOwn$_{t-1}$				-0.057***	-0.047**
×Property Type Q$_{t-1}$				(-3.07)	(-2.30)
IO HHI$_{t-1}$					0.002
					(0.03)
IO HHI$_{t-1}$					0.085
×Property Type Q$_{t-1}$					(1.04)
Real Estate Asset			-0.086***	-0.087***	-0.087***
Growth$_{t-1}$			(-4.24)	(-4.31)	(-4.27)
Real Estate Asset			-0.040***	-0.041**	-0.041**
Growth$_{t-2}$			(-2.08)	(-2.14)	(-2.11)
Quarter fixed effects	No	Yes	Yes	Yes	Yes
Firm fixed effects	No	Yes	Yes	Yes	Yes
N	4,866	4,866	4,644	4,644	4,644
R^2 (%)	0.61	9.38	10.17	10.38	10.47

through (5), thus suggesting that REITs tend to issue more equity when ownership by institutional investors increases to a higher extent.

Other results in Table 4 are generally similar to those in Table 3. The interaction term between institutional ownership and *Property Type Q* is positive and significant in Models (4) and (5), which suggests that the effect of institutional monitoring on the investment behavior of REIT managers, when there are investment opportunities in their respective property type, is at least partially driven by choices to issue equity. In addition, we find that REITs with a higher degree of institutional ownership concentration exhibit greater growth in equity.

Next, we explore the link between institutional ownership volatility and growth in debt by following the regression specification outlined in Equation (5). We summarize the results of this estimation in Table 5. Unlike the results on $StdI_i$ for equity growth, there is a positive significant association between institutional ownership volatility and debt growth. This implies that REITs that experience more dynamic changes in institutional ownership tend to issue more debt, which could be used as a financial source for investment in new properties. These findings are in line with evidence in other studies. For example, Hardin and Wu (2010) report a substantial increase in the use of bank debt by REITs over 1992-2003, and suggest it is likely driven by new property acquisitions, development, and mergers. Ott et al. (2005) state that REITs primarily finance their investment by long-term debt and equity rather than retained earnings. Feng et al. (2007) note that REITs with better growth opportunities are more likely to fund investment via external debt rather than equity. The summary statistics for an average REIT in our sample also show a higher level of debt growth, 2.4% per quarter, than equity growth of 1.8% per quarter over our sample period (Table 1). Positive and significant coefficients on *Property Type Q* indicate that REITs are likely to issue more debt when they have profitable opportunities to invest. The results in Columns (3) through (5) also suggest that REITs with higher market values tend to issue more debt. It is possible that larger REITs have easier access to the debt markets.

We include a debt-to-assets ratio in the *Equity Growth* (Table 4) and *Debt Growth* (Table 5) regressions to control for the effect of leverage in new financing decisions of REITs. A negative significant coefficient on the debt-to-assets ratio in Table 5 indicates that REITs with a higher level of leverage are less likely to issue new debt. A positive and significant coefficient on debt-to-assets ratio in the *Equity Growth* regressions suggests that debt and equity issuance decisions in REITs act as close substitutes.[12]

[12]Ott et al. (2005) examine the REIT sector during the 1891-1999 time period and report that 84% of aggregate investment of REITs was financed by equity and long-term debt, 7% by retained earnings, and the rest by short-term debt and preferred stock.

Table 4 Growth in Equity of REITs

This table reports the results of the panel regressions of one-quarter-forward growth rate in equity on institutional ownership volatility and control variables. The regression equation is outlined in Equation (4). The dependent variable is *Equity Growth*$_t$. Standard errors are clustered at the firm level, and the corresponding t-statistics are reported in parentheses. All variables are standardized to have a mean of zero and a standard deviation of one. Appendix B provides a detailed description of all variables. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Equity Growth$_t$				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
StdI$_{t-20\rightarrow t-1}$	0.027	0.067	0.056	0.054	0.052
	(1.12)	(1.42)	(1.12)	(1.08)	(1.08)
Prop$_{t-20\rightarrow t-1}$	-0.006	-0.045			
	(-0.32)	(-0.95)			
IO$_{t-1}$			0.039	0.043	0.067
			(0.87)	(0.97)	(1.52)
ΔIO$_{t-2\rightarrow t-1}$			0.047*	0.050*	0.060**
			(1.70)	(1.79)	(2.08)
ΔIO$_{t-20\rightarrow t-1}$			0.058**	0.066**	0.081***
			(2.17)	(2.55)	(2.90)
EBITDA$_{t-1}$			0.038	0.034	0.034
			(0.99)	(0.87)	(0.87)
Interest coverage$_{t-1}$			0.009	0.009	0.006
			(0.57)	(0.58)	(0.41)
Log(Market cap)$_{t-1}$			0.171**	0.178***	0.195***
			(2.56)	(2.67)	(2.84)
Property Type Q$_{t-1}$			0.012	0.016	0.018
			(0.24)	(0.36)	(0.47)
IO$_{t-1}$×Property Type Q$_{t-1}$			0.018	0.043	0.076**
			(0.45)	(1.38)	(2.40)
BlockholderOwn$_{t-1}$				-0.023	-0.025
				(-0.77)	(-0.84)
BlockholderOwn$_{t-1}$				-0.054*	-0.036
×Property Type Q$_{t-1}$				(-1.88)	(-1.39)
IO HHI$_{t-1}$					0.103**
					(2.07)
IO HHI$_{t-1}$×Property					0.119**
Type Q$_{t-1}$					(2.18)
Equity Growth$_{t-1}$			-0.014	-0.015	-0.020
			(-0.57)	(-0.64)	(-0.79)
Equity Growth$_{t-2}$			0.006	0.005	0.004
			(0.18)	(0.15)	(0.14)
Debt-to-Assets$_{t-1}$			0.182***	0.183***	0.177***
			(4.60)	(4.44)	(4.37)
Quarter fixed effects	No	Yes	Yes	Yes	Yes
Firm fixed effects	No	Yes	Yes	Yes	Yes
N	4,870	4,870	4,644	4,644	4,644
R^2 (%)	0.08	9.15	9.98	10.18	10.47

Table 5 Growth in Debt of REITs

This table reports the results of panel regressions of one-quarter-forward growth rate in debt on institutional ownership volatility and control variables. The regression equation is outlined in Equation (5). The dependent variable is *Debt Growth*$_t$. Standard errors are clustered at the firm level, and the corresponding t-statistics are reported in parentheses. All variables are standardized to have a mean of zero and a standard deviation of one. Appendix B provides a detailed description of all variables. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Debt Growth$_t$				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
StdI$_{t-20\rightarrow t-1}$	0.052***	0.076**	0.101***	0.100***	0.106***
	(2.79)	(2.36)	(2.71)	(2.68)	(2.77)
Prop$_{t-20\rightarrow t-1}$	-0.000	0.033			
	(-0.01)	(1.00)			
IO$_{t-1}$			0.019	0.019	0.038
			(0.73)	(0.74)	(1.42)
ΔIO$_{t-2\rightarrow t-1}$			-0.015	-0.015	-0.007
			(-0.71)	(-0.69)	(-0.33)
ΔIO$_{t-20\rightarrow t-1}$			0.006	0.007	0.022
			(0.33)	(0.37)	(1.03)
EBITDA$_{t-1}$			0.034	0.033	0.031
			(1.55)	(1.50)	(1.44)
Interest coverage$_{t-1}$			-0.028	-0.028	-0.029
			(-1.35)	(-1.34)	(-1.41)
Log(Market cap)$_{t-1}$			0.104*	0.105*	0.141**
			(1.66)	(1.68)	(2.15)
Property Type Q$_{t-1}$			0.057**	0.058**	0.053**
			(2.16)	(2.14)	(2.03)
IO$_{t-1}$×Property Type			0.012	0.016	0.027
Q$_{t-1}$			(0.65)	(0.87)	(1.29)
BlockholderOwn$_{t-1}$				-0.003	-0.012
				(-0.15)	(-0.67)
BlockholderOwn$_{t-1}$				-0.008	-0.001
×Property Type Q$_{t-1}$				(-0.76)	(-0.11)
IO HHI$_{t-1}$					0.121***
					(3.01)
IO HHI$_{t-1}$×Property					0.019
Type Q$_{t-1}$					(0.83)
Debt Growth$_{t-1}$			-0.056***	-0.056***	-0.056***
			(-3.73)	(-3.74)	(-3.76)
Debt Growth$_{t-2}$			-0.022	-0.022	-0.023
			(-1.32)	(-1.33)	(-1.38)
Debt-to-Assets$_{t-1}$			-0.191***	-0.190***	-0.194***
			(-6.53)	(-6.56)	(-6.52)
Quarter fixed effects	No	Yes	Yes	Yes	Yes
Firm fixed effects	No	Yes	Yes	Yes	Yes
N	5,693	5,693	5,569	5,569	5,569
R^2 (%)	0.40	8.61	10.86	10.87	11.17

We draw our main conclusion from Tables 3, 4, and 5: REITs tend to increase their investments in new properties when they experience larger volatility in institutional ownership, and the source of financing these investments is more likely to be through additional debt rather than equity issuance.

Institutional ownership volatility and REIT performance

Our results thus far indicate a positive link between institutional ownership volatility and investment in real estate assets. We next explore the relation between ownership volatility and future REIT stock performance to understand whether dynamic ownership appears to create or destroy firm value. In each quarter, we group REITs in equally-sized quartiles based on institutional ownership volatility and calculate the equally-weighted stock returns in excess of the NAREIT index return for all equity REITs for each quartile in the following 3, 6, 9, and 12 months by compounding monthly stock returns.

The results in Table 6 reveal that REITs with a higher degree of institutional ownership volatility (highest quartile) experience stronger stock performance in the following year, but the difference between the highest and lowest quartile groups is not statistically significant. This evidence suggests that institutional ownership volatility does not appear to be detrimental to future REIT stock performance.

Table 6 Institutional Ownership Volatility and REIT Performance

This table reports the REIT stock performance results. In each quarter, we group REITs in equally-sized quartiles based on institutional ownership volatility, $StdI_{t-20 \rightarrow t-1}$, and calculate the equally-weighted stock performance in excess of the NAREIT index return for each group in the following 3, 6, 9, and 12 months by compounding monthly return observations. The NAREIT index return is based on all equity REITs. T-statistics (in parentheses) are Newey-West-adjusted.

	3-month return in excess of the NAREIT index return (%)	6-month return in excess of the NAREIT index return (%)	9-month return in excess of the NAREIT index return (%)	12-month return in excess of the NAREIT index return (%)
Lowest quartile	0.56	1.72	3.20	4.88
Quartile 2	0.41	1.86	3.42	4.79
Quartile 3	0.57	1.49	2.77	4.42
Highest quartile	0.99	2.58	4.52	6.58
Highest-Lowest	0.43	0.85	1.32	1.68
t-stats	(0.87)	(1.06)	(1.13)	(1.14)

Types of institutions

Numerous studies highlight the differences in characteristics of various types of institutional investors.[13] Some institutions, such as banks and insurance companies, may have established business relations with firms, and to maintain business ties, these institutions may not want to challenge the managerial decisions of companies. For other institutions, such as investment companies and independent investment advisors, the cost of monitoring is lower (e. g., Almazan et al., 2005). In addition, Elyasiani et al. (2010) show that stability of ownership by active institutions has a greater impact on the cost of debt in comparison to other institutions. We next examine whether the effect of institutional ownership dynamics on the investment activity of REITs depends on the institutional investor type.

Bushee and Noe (2000) classify all institutions in Thomson Reuters based on portfolio turnover and position size into three categories: "dedicated" (institutions with low portfolio turnover and large investment positions); "transient" (those with frequent portfolio turnover and high levels of diversification); and "quasi-indexers" (institutions that exhibit low levels of turnover in their highly diversified holdings).[14] We use this classification and analyze the effects of ownership volatility by the institutions in these three groups. We follow Equation (1) and calculate the ownership volatility separately for each group of institutions. As before, the three measures of investment decisions include the growth rates in real estate assets, equity, and debt. Table 7 presents the results.

The results in Model (1) reveal that the relation between ownership instability and real estate investment is driven by quasi-indexers and transient institutions, and the economic and statistical effects are stronger for quasi-indexers. Although this may be due to a substantially smaller number of dedicated investors in our sample, the ownership volatility of these institutions does not appear to affect investment in real estate assets or debt decisions. The Model (2) results show that volatility in ownership by quasi-indexers and transient institutions does not affect the equity decisions of REITs, but more stability in ownership by dedicated institutions is associated with higher equity issuance. The ownership volatility is positively and significantly associated with the growth rate in debt for quasi-indexers and transient with comparable economic effects (Model (3)).[15] To summarize these results, the effect of ownership dynamics on the investment decisions of REITs is mostly pronounced among institutions that hold highly diversified portfolios, which are quasi-indexers and

[13]See, for example, Almazan et al. (2005), Brickley et al. (1988), Chen et al. (2007), Cornett et al. (2007).
[14]We are grateful to Brain Bushee for providing this information on his website: https://accounting-faculty.wharton.upenn.edu/bushee/
[15]We also run regressions separately for each group of institutions, and the results are qualitatively similar to those in Table 7.

transient investors. Since dedicated investors hold larger stakes and exhibit less frequent portfolio turnover, there is less incentive for REIT managers to cater their projects to these types of institutions.

Table 7 Ownership Volatility by Institution Type

In this table, we examine the relation between the investment behavior of REITs and institutional ownership volatility for different types of institutions: quasi-indexers, transient and dedicated investors, as classified by Bushee and Noe (2000). We classify institutions as quasi-indexers (N=3,292), transient (N=2,710), and dedicated (N=257), and calculate ownership volatility separately for each group in each firm as in Equation (1). Standard errors are clustered at the firm level, and the corresponding t-statistics are reported in parentheses. All variables are standardized to have a mean of zero and a standard deviation of one. Appendix B provides a detailed description of all variables. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variable		
	(1)	**(2)**	**(3)**
	Real Estate Asset Growth$_t$	Equity Growth$_t$	Debt Growth$_t$
StdI Quasi-indexers$_{t-20\rightarrow t-1}$	0.499***	0.204	0.365***
	(2.91)	(1.07)	(3.14)
StdI Transient$_{t-20\rightarrow t-1}$	0.292*	0.117	0.310**
	(1.77)	(0.76)	(2.35)
StdI Dedicated $_{t-20\rightarrow t-1}$	-0.021	-0.038**	0.006
	(-1.08)	(-2.06)	(0.37)
IO$_{t-1}$	-0.019	0.074**	-0.012
	(-0.55)	(2.01)	(-0.48)
ΔIO$_{t-2\rightarrow t-1}$	0.026	0.063**	-0.010
	(1.22)	(2.14)	(-0.48)
ΔIO$_{t-20\rightarrow t-1}$	0.041	0.070***	0.036*
	(1.47)	(2.69)	(1.87)
EBITDA$_{t-1}$	0.056**	0.048	0.024
	(2.24)	(1.21)	(1.14)
Interest coverage$_{t-1}$	0.005	-0.027	0.010
	(0.26)	(-1.51)	(0.62)
Log(Market cap)$_{t-1}$	0.074	0.123*	0.208***
	(1.35)	(1.82)	(3.77)
Property Type Q$_{t-1}$	0.043	0.037	0.049*
	(1.18)	(0.92)	(1.96)
IO$_{t-1}$×Property Type Q$_{t-1}$	0.071***	0.087***	0.034*
	(2.78)	(2.89)	(1.76)
BlockholderOwn$_{t-1}$	-0.015	-0.019	-0.013
	(-0.61)	(-0.65)	(-0.76)
BlockholderOwn$_{t-1}$×Property Type Q$_{t-1}$	-0.048**	-0.038	-0.008
	(-2.36)	(-1.62)	(-0.72)
IO HHI$_{t-1}$	-0.012	0.102**	0.096**
	(-0.21)	(2.07)	(2.27)

(Continued…)

(Table 7 Continued)

IO HHI_{t-1}×Property Type Q_{t-1}	0.096**	0.126**	0.025
	(2.30)	(2.30)	(1.29)
Real Estate Asset $Growth_{t-1}$	-0.088***		
	(-4.36)		
Real Estate Asset $Growth_{t-2}$	-0.040**		
	(-2.10)		
Equity $Growth_{t-1}$		-0.032	
		(-1.28)	
Equity $Growth_{t-2}$		-0.004	
		(-0.13)	
Debt $Growth_{t-1}$			-0.076***
			(-4.84)
Debt $Growth_{t-2}$			-0.036**
			(-2.28)
Quarter and firm fixed effects	Yes	Yes	Yes
N	4,644	4,644	5,569
R^2 (%)	10.59	9.97	10.17

5. Robustness

Fama-MacBeth regressions

Our main explanatory variable, $StdI_i$, is calculated as the average standard deviation of ownership by institutions over a 20-quarter period. Given that we design our main tests in a panel framework with a firm×quarter unit observation, institutional ownership volatility is assessed based on rolling quarterly observations. The nature of such estimation creates interdependence between data points over time, and we employ a regression technique by Fama and MacBeth (1973) to address the issue with overlapping observations.

In each quarter, we run regressions of the one-quarter-forward growth rate in real estate assets, growth rate in equity, and growth rate in debt, as outlined by Equations (3) through (5), respectively. We control for the institutional ownership level, change in institutional ownership over one quarter and five years, EBITDA, *Property Type Q*, interest coverage, and the natural logarithm of market capitalization. We then average the estimation coefficients across quarters and report the results in Table 8. The t-statistics are based on average estimates across 72 calendar quarters.

Model (1) of Table 8 reports the results for investment in real estate assets, Model (2) shows the results for equity decisions, and Model (3) presents the coefficients for determinants of debt issuance decisions. The main results are consistent with those in Table 3: REITs tend to increase their investment in real estate assets when institutional ownership is more volatile. The results of the Fama-MacBeth estimation also show that institutional ownership volatility

affects both the equity and debt decisions of REITs. The coefficients for all independent variables are generally consistent with and in some cases stronger than those reported in previous tables. This highlights the importance of including time and firm fixed effects in our analyses to control for unobservable firm- and time-specific variation that could be driving our results. Whereas the Fama-MacBeth estimation helps us to address the issue with overlapping observations, we believe that a panel regression framework, including time- and firm fixed effects, is more appropriate to study the role of institutional ownership instability on the investment decisions of REITs.

Table 8 Investment in Real Estate Assets, Equity and Debt Growth – Fama-MacBeth regressions

This table reports the results of the Fama and MacBeth (1973) regressions of one-quarter-forward growth rate in real estate assets (Model 1), growth rate in equity (Model 2), and growth rate in debt (Model 3) on institutional ownership volatility and control variables. The reported coefficients are the average estimates across 72 calendar quarters. T-statistics are reported in parentheses. All variables are standardized to have a mean of zero and a standard deviation of one. Appendix B provides a detailed description of all variables. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variable		
	(1)	**(2)**	**(3)**
	Real Estate Asset Growth$_t$	Equity Growth$_t$	Debt Growth$_t$
$StdI_{t-20\rightarrow t-1}$	0.119***	0.075***	0.104***
	(3.94)	(3.37)	(4.82)
IO_{t-1}	-0.045***	-0.027**	-0.030***
	(-3.35)	(-2.47)	(-2.79)
$\Delta IO_{t-2\rightarrow t-1}$	0.020	0.104***	-0.006
	(0.61)	(3.18)	(-0.16)
$\Delta IO_{t-20\rightarrow t-1}$	0.032*	0.036**	0.027*
	(1.70)	(1.99)	(1.79)
$EBITDA_{t-1}$	0.080***	0.089***	0.018
	(2.89)	(2.65)	(1.18)
Property Type Q_{t-1}	0.043	0.042*	0.035*
	(1.40)	(1.70)	(1.74)
Interest coverage$_{t-1}$	-0.017	-0.012	-0.008
	(-1.32)	(-0.95)	(-0.73)
Log(Market cap)$_{t-1}$	0.020	0.035*	0.033**
	(0.74)	(1.67)	(2.16)
N	72	72	72

Potential endogeneity issues

Our baseline model suggests a positive relation between institutional ownership volatility and real estate asset growth. It may be the case that institutions

increase (decrease) their holdings in REITs that are more (less) likely to acquire new assets. In other words, institutional ownership may become more volatile in anticipation of real estate growth or reduction. Under this possibility, causality runs in the opposite direction, and we adopt an instrumental variable approach to address the potential endogeneity problem. We use a measure of price informativeness as an instrument in the 2SLS procedure. The price informativeness measure captures the extent to which prices are driven by private information.

Similar to Chung et al. (2011), we estimate price informativeness (aka non-synchronicity), by using regressions of REIT returns on property sector-specific benchmark returns for each company in each quarter.[16] Since we use a 20-quarter time period to calculate $StdI_i$, we utilize regressions of 60 monthly REIT returns in excess of the risk-free rate on their corresponding risk-free-rate-adjusted property type returns, and generate the R^2 value from each regression. Price informativeness is measured as (1 - R^2). Higher values of (1 - R^2) indicate more firm-specific variation relative to variation in the property sector benchmark returns, thus suggesting that more private information is driving the stock price.

Our expectation is that institutional ownership volatility and price informativeness are positively correlated, as evidence exists that at least some institutions are informed traders. For example, Ali et al. (2008) find that institutions with medium ownership stakes are likely to possess more precise private pre-disclosure information, and have incentive to trade on this information around earnings announcements. Lantushenko and Nelling (2021) find that more active mutual funds embed a higher degree of private information into prices of traded stocks than their less active peers. Chung et al. (2011) find that prices of REITs with greater hedge fund ownership exhibit a higher level of price informativeness. When rebalancing their holdings, informed traders incorporate private information in stock prices, and this is likely to contribute to an increase in the price informativeness measure.

In the first-stage test, we regress institutional ownership volatility on the price informativeness measure, institutional ownership proportion ($\mathrm{Prop_i}$), monthly stock price volatility, average monthly trading volume, and average bid-ask spread. These variables are calculated over the same 60-month period. The results are reported in Model (1) of Table 9. Consistent with our expectations, we find a positive significant relation between institutional ownership volatility and price informativeness. The *F*-statistic of a joint test is 7.53 (p-value<0.0001), thus suggesting that our instrument satisfies the relevancy condition.

[16]We download monthly property sector returns from reit.com.

In the second-stage tests, the fitted value from the first-stage regression becomes the key explanatory variable in other specifications. In Model (2), the coefficient on the instrumented institutional ownership volatility variable is positive and significant, consistent with our baseline outcomes. This result mitigates the concern that causality goes in the opposite direction. The results in the last two models are also consistent with our earlier findings.

Table 9 Potential Endogeneity Issues – The Instrumental Variable (IV) Approach

This table presents the 2SLS results. In the first stage (Model (1)), we regress institutional ownership volatility on the price informativeness measure, institutional ownership proportion ($Prop_i$), monthly stock price volatility, average monthly trading volume, and average bid-ask spread. These variables are calculated over the same 60-month period. In the second-stage tests, the fitted value from the first-stage regression is the key explanatory variable in Models (2) through (4). Standard errors are clustered at the firm level, and the corresponding t-statistics are reported in parentheses. All variables are standardized to have a mean of zero and a standard deviation of one. Appendix B provides a detailed description of all variables. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	First Stage	**Second Stage**		
	(1)	**(2)**	**(3)**	**(4)**
Dependent variable:	$StdI_{t-20\rightarrow t-1}$	Real Estate Asset $Growth_t$	Equity $Growth_t$	Debt $Growth_t$
$StdI_{t-20\rightarrow t-1}$		0.277**	0.174	0.421***
		(2.00)	(1.18)	(2.61)
$Prop_{t-20\rightarrow t-1}$	-0.010			
	(-0.60)			
Stock $volatility_{t-20\rightarrow t-1}$	0.018			
	(1.17)			
Trading $volume_{t-20\rightarrow t-1}$	-0.027**			
	(-2.29)			
Bid-ask $spread_{t-20\rightarrow t-1}$	0.023*			
	(1.79)			
Price $Informativeness_{t-20\rightarrow t-1}$	0.055***			
	(3.09)			
IO_{t-1}		-0.017	0.068*	-0.000
		(-0.49)	(1.81)	(-0.00)
$\Delta IO_{t-2\rightarrow t-1}$		0.022	0.063**	-0.011
		(1.05)	(2.16)	(-0.53)
$\Delta IO_{t-20\rightarrow t-1}$		0.071***	0.078***	0.044**
		(2.97)	(3.07)	(2.06)
$EBITDA_{t-1}$		0.054**	0.049	0.019
		(2.21)	(1.21)	(0.80)
Interest $coverage_{t-1}$		0.005	-0.027	0.006
		(0.30)	(-1.47)	(0.37)

(Continued…)

(Table 9 Continued)

Log(Market cap)$_{t-1}$		0.048	0.117*	0.209***
		(0.74)	(1.70)	(3.59)
Property Type Q$_{t-1}$		0.044	0.033	0.071**
		(1.16)	(0.86)	(2.47)
IO$_{t-1}$×Property		0.066**	0.086***	0.051**
Type Q$_{t-1}$		(2.51)	(2.83)	(2.35)
BlockholderOwn$_{t-1}$		-0.017	-0.021	-0.009
		(-0.72)	(-0.74)	(-0.50)
BlockholderOwn$_{t-1}$		-0.041**	-0.033	-0.016
×Property Type		(-2.01)	(-1.36)	(-1.14)
Q$_{t-1}$				
IO HHI$_{t-1}$		-0.004	0.110**	0.118**
		(-0.007)	(2.14)	(2.25)
IO HHI$_{t-1}$		0.103**	0.129**	0.038*
×Property Type		(2.40)	(2.31)	(1.82)
Q$_{t-1}$				
Real Estate Asset		-0.083***		
Growth$_{t-1}$		(-4.05)		
Real Estate Asset		-0.034*		
Growth$_{t-2}$		(1.76)		
Equity Growth$_{t-1}$			-0.031	
			(-1.22)	
Equity Growth$_{t-2}$			-0.005	
			(-0.15)	
Debt Growth$_{t-1}$				-0.077***
				(-5.22)
Debt Growth$_{t-2}$				-0.034**
				(-2.10)
Quarter and firm fixed effects	Yes	Yes	Yes	Yes
N	6,195	4,605	4,605	5,247
R^2 (%)	35.05	12.08	9.94	10.22

Effects of size, institutional ownership level, and time

We next explore if our baseline results are driven mainly by smaller firms. For each quarter, we classify all REITs in our sample in two groups, above and below the median size based on market capitalization. *Above Median Size* is a dummy variable that equals 1 if a REIT has a larger market capitalization than the median-size REIT in a given quarter and 0 otherwise. We test whether the relation between ownership volatility and investment decisions of REITs is different for smaller companies with the interaction term between $StdI_i$, and *Above Median Size.* Models (1), (3), and (5) of Panel A in Table 10 show the results. The effect of ownership volatility on the investment decisions of REITs is not significantly different across companies with various market capitalizations.

We perform a similar procedure with respect to the institutional ownership level and classify all REITs into two groups, above and below the median institutional ownership, in each quarter. *Above Median IO* is a dummy variable that equals 1 if a REIT has a greater institutional ownership level than that in the median REIT in a given quarter and 0 otherwise. Models (2), (4), and (6) of Panel A in Table 10 show the results for the interaction term between the institutional ownership volatility and the *Above Median IO* dummy. These outcomes suggest no difference in the effect of $StdI_i$ on the investment decisions of REITs with various institutional ownership levels.

As mentioned above, Figure 1 illustrates a declining trend in institutional ownership volatility for the average REIT firm over time. We observe similar patterns for the three types of institutions: quasi-indexers, transient, and dedicated. We next explore whether the effect of ownership volatility on investment decisions changes over time. First, we examine if our results are driven by the market turbulence during the 2008 financial crisis by excluding all observations in 2007 and 2008. The results in the first three models of Panel B in Table 10 show that this is not the case. The last three models of this panel test for the difference in the effect of $StdI_i$ on real estate, equity, and debt growth between two sub-periods with the interaction term between the ownership volatility and the post 2008 dummy. *Post 2008* equals 1 for all quarters in the 2009-2018 period and 0 otherwise. Although the volatility of institutional ownership for an average REIT declines over time, its effect on the investment decisions of REITs does not change significantly in the later part of the sample period.

Volatility in total institutional ownership

In earlier analyses, we measure institutional ownership instability by calculating the average standard deviation of institutional holding proportions over a five-year period. In this section, we construct the institutional ownership volatility variable differently. Instead of calculating the standard deviation in ownership for each institutional investor and then averaging out across all institutions that hold the stock, we calculate the standard deviation based on the aggregate institutional holdings over 20 quarters. Conceptually, this measure of instability, *StdIO*, is substantially different, ignores the volatility of the REIT ownership of individual institutions and focuses on the total institutional ownership movements over time. As a hypothetical example, suppose there are only two institutional investors who hold shares of a REIT. In the spirit of our measurement horizon, assume that in each quarter over a 5-year period, one investor purchases 2000 shares and the second investor sells 2000 shares. For each quarter, the ownership stake held by each institution changes and purchasing or selling shares of stock contributes to the volatility in ownership by each investor over time. The *total* institutional ownership, however, remains the same from quarter to quarter, thus resulting in a zero-level volatility in the aggregated institutional ownership during this time period.

Table 10 Effects of Size, Institutional Ownership Level, and Time

This table reports the robustness test results with respect to the market capitalization, institutional ownership level, and time effects of a company. The set of control variables in all of the models of this table is the same as those in Model (5) of Tables 3-5. Panel A examines the effects of the size and institutional ownership level of a REIT. Each quarter, we calculate the median market capitalization of all REITs in our sample. *Above Median Size* is a dummy variable that equals 1, if a REIT has a larger market capitalization than the median across all REITs in a given quarter; and 0, otherwise. Each quarter, we calculate the median institutional ownership in all REITs in our sample. *Above Median IO* is a dummy variable that equals 1, if a REIT has a greater institutional ownership level than the median across all REITs in a given quarter; and 0, otherwise. These dummy variables are not entered separately in specifications because we control for firm fixed effects. Models (1) through (3) of Panel B exclude all observations in 2007 and 2008. *Post 2008* is a dummy variable that equals 1 for all quarters in the 2009-2018 period; and 0, otherwise. This dummy variable is not entered separately in specifications because we control for quarter fixed effects. Standard errors are clustered at the firm level, and the corresponding t-statistics are reported in parentheses. All variables are standardized to have a mean of zero and a standard deviation of one. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Effects of Size and Institutional Ownership Level

	Dependent variable					
	Real Estate Asset Growth$_t$		Equity Growth$_t$		Debt Growth$_t$	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
StdI$_{t-20\rightarrow t-1}$	0.123**	0.122**	0.044	0.024	0.121***	0.131***
	(2.41)	(2.28)	(0.90)	(0.47)	(2.87)	(2.86)
StdI$_{t-20\rightarrow t-1}$ ×Above Median Size	-0.019		-0.018		-0.022	
	(-0.29)		(-0.33)		(-0.45)	
StdI$_{t-20\rightarrow t-1}$ ×Above Median IO		-0.009		0.043		-0.050
		(-0.16)		(0.76)		(-1.09)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	4,644	4,644	4,644	4,644	5,569	5,569
R^2 (%)	10.47	10.47	9.88	9.90	10.01	10.05

Panel B. Excluding the financial crisis years and examining the effect in the later part of the sample period

	Excluding years 2007-2008			Effect in the later part of the sample period		
Dependent variable:	Real Estate Asset Growth$_t$ **(1)**	Equity Growth$_t$ **(2)**	Debt Growth$_t$ **(3)**	Real Estate Asset Growth$_t$ **(4)**	Equity Growth$_t$ **(5)**	Debt Growth$_t$ **(6)**
$StdI_{t-20\rightarrow t-1}$	0.127**	0.014	0.139***	0.109**	0.025	0.111***
	(2.56)	(0.29)	(3.45)	(2.29)	(0.50)	(2.61)
$StdI_{t-20\rightarrow t-1}$ ×Post 2008				0.042	0.064	0.019
				(0.55)	(1.12)	(0.33)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	4,182	4,182	5,049	4,644	4,644	5,569
R^2 (%)	11.10	10.06	10.62	10.48	9.92	10.01

We repeat the estimation as in Tables 3 through 5, except the main explanatory variable is the standard deviation in total institutional ownership, *StdIO*, and report the results in Table 11. The coefficient estimate on institutional instability, as measured by volatility in aggregate institutional holdings, does not load significantly. This result is not surprising, as due to its construction, *StdIO* has a weaker statistical significance. This suggests that the contribution of ownership volatility, emerging from the individual trading decisions of institutional stakeholders rather than from the institutional sector as a whole, is important for the investment behavior of REIT managers. Our earlier findings also contrast the effects of institutional ownership volatility by different institutional investor types.

6. Conclusion

In this paper, we explore the factors that affect the investment decisions of REITs. Specifically, we study the effect of institutional ownership stability on growth rate in real estate assets, as well as the sources of financing such growth. Our work builds on Hartzell et al. (2006), who document that REITs with stronger corporate governance invest more when their investment opportunities are better. We corroborate this result, but find that the volatility in institutional ownership is an important determinant of REIT investment behavior. Our results show that REITs exhibit stronger growth in real estate assets when institutional ownership volatility is greater. This evidence suggests that REIT

Table 11 Total institutional ownership volatility

In this table, we examine the effect of total institutional ownership volatility on the investment decisions of REITs. The total institutional ownership volatility, $StdIO_{t-20 \rightarrow t-1}$, is calculated as the standard deviation of aggregate institutional holdings over a five-year period (20 quarters). The dependent variable is one-quarter-forward growth rate in real estate assets (Model 1), one-quarter-forward growth rate in equity (Model 2), and one-quarter-forward growth rate in debt (Model 3). Standard errors are clustered at the firm level, and the corresponding t-statistics are reported in parentheses. All variables are standardized to have a mean of zero and a standard deviation of one. Appendix B provides a detailed description of all variables. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variable		
	(1)	**(2)**	**(3)**
	Real Estate Asset Growth$_t$	Equity Growth$_t$	Debt Growth$_t$
$StdIO_{t-20 \rightarrow t-1}$	0.002	-0.016	0.006
	(0.18)	(-1.19)	(0.48)
IO_{t-1}	-0.029	0.035	-0.019
	(-0.81)	(0.87)	(-0.69)
$\Delta IO_{t-2 \rightarrow t-1}$	0.018	0.052*	-0.021
	(0.84)	(1.87)	(-0.98)
$\Delta IO_{t-20 \rightarrow t-1}$	0.054**	0.054**	0.041**
	(2.12)	(2.21)	(2.39)
$EBITDA_{t-1}$	0.062**	0.054	0.028
	(2.41)	(1.36)	(1.25)
Property Type Q_{t-1}	0.025	0.022	0.051**
	(0.57)	(0.50)	(2.01)
Interest coverage$_{t-1}$	0.007	-0.026	0.010
	(0.40)	(-1.42)	(0.56)
Log(Market cap)$_{t-1}$	0.018	0.071	0.134**
	(0.27)	(1.07)	(2.15)
Real Estate Asset Growth$_{t-1}$	-0.082***		
	(-4.03)		
Real Estate Asset Growth$_{t-2}$	-0.035*		
	(-1.76)		
Equity Growth$_{t-1}$		-0.024	
		(-1.00)	
Equity Growth$_{t-2}$		-0.000	
		(-0.01)	
Debt Growth$_{t-1}$			-0.067***
			(-4.65)
Debt Growth$_{t-2}$			-0.029*
			(-1.84)
Quarter fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
N	4,644	4,644	5,569
R^2 (%)	9.83	9.33	9.27

managers may be motivated to invest in new assets to appeal to specific institutional investor clienteles.

We examine ownership changes of different types of institutions and find that volatility in ownership by institutions that hold highly diversified portfolios exhibits the strongest relationship with REIT asset growth, and firms tend to finance such decisions through debt issuance. In summary, our study presents unique evidence regarding investment decision-making by REIT managers, showing that it is driven by both stronger governance and the desire to appeal to their dynamic institutional shareholder base.

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Appendices

Appendix A

This table reports the distribution of REIT companies by property type. Our sample includes equity REITs over the period of 2000 to 2018. To classify REITs in property types, we search online sources, such as MarketWatch and Bloomberg, by company name.

Property type	Number of REITs
Diversified	26
Health care	18
Industrial/Office	65
Lodging/Resorts	26
Residential	40
Retail	60
Self storage	7
Specialty	24
Total	266

Appendix B

This table provides the definition of the variables.

Variable	Definition
Real Estate Asset Growth	The percent change in *Real Estate Property,* where accumulated depreciation is added back. *Real Estate Property* is a Compustat quarterly item #270, RETQ. It represents investment in real estate less accumulated depreciation and amortization. *Real Estate Property including depreciation:* RETD = RETQ + Accumulated depreciation of Real Estate property *(*Compustat Item #269) $$Real\ Estate\ Asset\ Growth_t = \frac{(\mathrm{RETD_t} - \mathrm{RETD_{t-1}})}{\mathrm{RETD_{t-1}}}$$
Equity Growth	The change in gross equity, scaled by the beginning-of-quarter gross assets: $$Equity\ Growth_t = \frac{[(\mathrm{ATQ_t} + \mathrm{AccumDepr_t} - \mathrm{LTQ_t}) - (\mathrm{ATQ_{t-1}} + \mathrm{AccumDepr_{t-1}} - \mathrm{LTQ_{t-1}})]}{\mathrm{ATQ_{t-1}}}$$ where ATQ is Compustat item #44, LTQ is Compustat item #54, and AccumDepr is Compustat item #269.
Debt Growth	The change in total liabilities, scaled by the beginning-of-quarter gross assets: $$Debt\ Growth_t = \frac{(\mathrm{LTQ_t} - \mathrm{LTQ_{t-1}})}{\mathrm{ATQ_{t-1}}}$$ where LTQ is Compustat item #54 and ATQ is Compustat item #44.
Institutional ownership volatility ($\mathrm{StdI_i}$)	The average standard deviation of shareholding proportions across all institutional investors holding the stock of a firm over a five-year period (20 quarters): $$\mathrm{StdI_i} = \frac{\sum_{j=1}^{J_i} \mathrm{Std}(p_{i,t}^{j})}{\mathrm{J_i}}$$ where $p_{i,t}^{j}$ is the proportion of firm i held by investor j over a 20-quarter horizon, and $\mathrm{J_i}$ is the number of institutional investors in firm i. $p_{i,t}^{j}$ is calculated by dividing shares held by institution j into the total shares outstanding of firm i.
Institutional ownership proportion ($\mathrm{Prop_i}$)	The aggregate institutional ownership proportion averaged over a five-year period: $$\mathrm{Prop_i} = \frac{\sum_{t=1}^{20} \sum_{j=1}^{J_i} p_{i,t}^{j}}{20}$$ where $p_{i,t}^{j}$ is the proportion of firm i held by investor j as of quarter t. $P_{i,t}^{j}$ is calculated by dividing shares held by institution j into the total shares outstanding of firm i.

(Continued…)

(Appendix B Continued)

IO_{t-1}	The level of institutional ownership as of the end of quarter t-1, calculated by summing up all shares held by institutions and dividing by the total shares outstanding of a firm.
$\Delta IO_{t-2 \rightarrow t-1}$	The change in institutional ownership from the end of quarter (t-2) to the end of quarter (t-1).
$\Delta IO_{t-20 \rightarrow t-1}$	The change in institutional ownership over a five-year period: from the end of quarter (t-20) to the end of quarter (t-1).
IO HHI	Institutional ownership concentration, measured by the Herfindahl-Hirschman index (HHI). The source of this variable is the Thomson Reuters stock ownership file.
Blockholder ownership	The level of ownership by blockholders, measured by summing up all shares held by blockholders, as reported in the Thomson Reuters stock ownership file, and dividing by total shares outstanding.
Log(Market cap)	Logarithm of the market capitalization of a firm calculated as a product of price and shares outstanding.
Firm Q	Tobin's Q of a firm calculated as follows: $$Firm\ Q = \frac{(\text{Market cap} + \text{ATQ} - \text{Common equity})}{\text{ATQ}}$$ where market capitalization is the product of price and shares outstanding; Common equity is Compustat item #59, and ATQ is Compustat item #44.
Property Type Q	The average Firm Q across all REITs in a given property type.
$EBITDA_t$	Earnings before interest, tax, depreciation, and amortization, scaled by the previous quarter assets: $$EBITDA_t = \frac{(\text{Sales}_t - \text{COGS}_t - \text{SG\&}A\ Exp_t)}{\text{ATQ}_{t-1}}$$ where Sales is Compustat item #2, Cost of Goods Sold (COGS) is Compustat item #30, and Selling, General, and Administrative Expense is Compustat item #1.
Interest coverage	The ratio of EBITDA to Interest Expense (Compustat item #22).