NAV Premiums & REIT Property Transactions

Abstract

REITs are uniquely positioned between dual asset markets. REIT managers face opportunities to exploit mispricings between the stock market and property market when the two disagree, transferring capital from the overvalued ownership claim to its counterpart. In this study, we provide evidence that investment in real estate is net increasing with NAV premiums. REIT managers increase acquisitions and reduce dispositions when share prices exceed the implied value of equity claims based on NAV. NAV premiums are caused by flow of funds to real estate stocks, and not the other way around. Using a large sample of transactions for three different property types, observed clientele effects for REIT managers are confirmed. REITs appear to pay significant premiums relative to other investors for retail, office, and multifamily assets. However, when matched sampling is introduced and the comparison is drawn to other institutional investors only, the estimated clientele effect disappears. Yet, consistent across all estimations and property types, the relative transaction prices paid for properties acquired by REIT managers are positively and significantly affected by NAV premiums. REIT clientele effects in the property market are not persistent without the existence of NAV premiums.

Keywords: Real estate investment trusts; investment policy; clientele effects; valuation; retail; office; multifamily

I. Introduction

Equity claims on real estate assets are exchanged in two parallel markets. In the local property market, ownership claims are purchased and sold in private transactions for individual properties. In the stock market, equity claims on the portfolio of underlying assets for a real estate investment trust (REIT) are traded among shareholders. Often times, valuations for these equity claims become disconnected as share prices deviate from per share values of the equity claims on the underlying assets. Net asset values (NAV) for the property portfolio are noisy to estimate, but readily available from several data sources for most REITs.[1] The ratio of share price-to-NAV is an indicator for the cohesion of the two markets. NAV discount refers to conditions when share prices are less than the estimated NAV per share. NAV premium describes conditions when the price-to-NAV ratio is greater than one – a proxy for overvaluation by the stock market.

The opportunity to exploit mispricings across the two asset markets is outlined in Geltner et al. (2014). NAV premiums create an opportunity for REIT managers to perform a seasoned equity offering (SEO) in the stock market, where the underlying assets are relatively overvalued. The proceeds can then be used to acquire new holdings in the property market. When there are NAV discounts, REIT managers can divest of assets in the property market and distribute the asset sale proceeds to shareholders as special dividends or share repurchases. Opportunities also exist at the entity level for unlisted real estate funds to conduct initial public offerings (IPOs) and become exchange-listed REITs whenever the sector is overvalued by the stock market, or for REITs to become acquisition targets when undervalued.

[1] Here and throughout the article, NAV refers to the value of the equity position. NAV is the estimated value for all properties in a portfolio minus the value of debt and other priority claims, divided by the number of shares outstanding.

The focus of our study is on the outcome from actions taken by REIT managers in the property market, responding NAV premiums and discounts. *Do REIT managers actually increase acquisitions activity in the property market when there are NAV premiums? What are the underlying causes of deviations in the price-to-NAV ratio? For an individual property, do NAV premiums impact the transaction price paid by REIT managers relative to other investors?* Non-REIT investors in the property market generally do not enjoy the same opportunities to exploit mispricings between the dual asset markets either because they are not publicly-traded companies, or because they are not structured as pass-through entities which means that commercial real estate holdings would represent only a fraction of total assets.[2]

The opportunities faced by REIT managers do not constitute pure arbitrage due to the uncertainty involved and the transaction costs required. First, NAV is simply an approximation of market value, not a guaranteed price for which properties can be purchased or sold. Second, most REITs invest in commercial properties, which are highly illiquid and require high search and transactions costs. The time commitment to purchase or sell a commercial property is often greater than one year. Nevertheless, extended periods of pronounced NAV premiums or discounts arise and should induce REIT managers to take action. Regarding equity issuance (not the focus of this article), previous studies provide evidence that REIT managers take actions that are directionally consistent with the opportunities presented by the dual market mispricing. For instance, REITs are more likely to issue equity when NAV premiums are high (Boudry, Kallberg and Liu, 2010). Yet, the outcome from actions taken by REIT managers in the property market remains to be explored – the central focus of our study.

[2] Pension funds and life insurance companies are examples of publicly-listed companies that invest directly in commercial properties, but also have many other types of asset holdings.

The relative transaction price that REIT managers pay when acquiring new property has been documented in the extant literature, although NAV premiums have not previously been considered as the possible culprit. Several studies provide evidence of a clientele effect for REITs, who appear to pay significantly higher prices for acquisitions in the property market (Hardin and Wolverton, 1999; Lambson, McQueen and Slade, 2004; Ling and Petrova, 2012; Akin et al., 2013). For an individual firm, such behavior is puzzling. Why overpay for an investment if the NAV premium is firm-specific? On the other hand, if NAV premiums apply to the entire REIT sector, there may be increased competition among REIT managers bidding against one another for certain segments of the property market. REITs uphold a preference for acquiring institutional-grade, newer, and larger commercial properties (Akin et al., 2013) – a cohort of the market that is especially thin. Yet, REIT buyers represent a nontrivial component of institutional-grade commercial property transactions, ranging from 12% to 26% for the property types considered in this study. We investigate whether REITs increase their acquisitions activity in response to NAV premiums. We introduce a matched-sampling procedure in an effort to limit the extent to which clientele effects for REITs result from their investment focus on high-quality assets. After carefully controlling sample selection issues, we evaluate whether NAV premiums are able to explain the difference in transactions prices paid by REIT managers.

The remainder of this article is organized as follows. The next section provides background on the NAV premium and REIT managerial behavior, including studies for the underlying causes of NAV premiums, outcomes for investment policy and the property transactions market, and outcomes in the market for equity issuance. The third section empirically explores whether REIT managers increase or decrease investment in response to NAV premiums by utilizing a combined sample from Green Street Advisors and SNL Financial. The fourth section considers underlying

causes of NAV premiums. The fifth section evaluates the impact of NAV premiums on REIT clientele effects, making use of property transactions data from CoStar and incorporating a matched sampling methodology. The final section offers concluding remarks.

II. Background

The opportunity for REIT managers to exploit mispricings between asset values in the stock market and property market is outlined in Geltner et al. (2014). In the property market, assets are transacted among the parties to a sale. The property market is thinly traded and inefficient, containing assets that are bulky and heterogeneous. An estimate for market values in the property market can be obtained from the distribution of transaction prices. For a publicly-listed REIT, equity shares are highly-liquid as they trade on an organized stock exchange. Share prices are immediately observable and adjust continuously over the course of each trading day. As a result, the market capitalization for the REIT can be readily obtained, and the value of the equity position for the property portfolio can be estimated using appraisal methods, after subtracting debt and other priority claims. The relation between the stock market and property market values for equity should affect the investment policy of REIT management.

When the stock market values the portfolio of a REIT's properties greater than the property market does, REIT managers face an opportunity for positive gains by issuing equity in the stock market (where the underlying properties are overvalued), and using the proceeds to acquire new assets in the property market. Conversely, if share prices are discounted relative to NAV, REIT managers can divest of assets in the property market and distribute the proceeds from asset sales to shareholders via share repurchases or special dividends. Whether share prices trade at a premium or discount to NAV have obvious implications for investment, which should influence the behavior

of REIT managers as investors in the property market – the central focus of this study. This section discusses the extant literature for the underlying causes of NAV premiums/discounts, as well as the consequences for outcomes in the property markets and the capital markets (i.e., equity issuances, share repurchases, dividend policy).

Causes of NAV Premiums & Discounts

One thread of the literature seeks to explain the underlying cause of pricing deviations between the stock market for REITs and the underlying equity value of their property portfolio. Capozza and Lee (1995) notice that retail REITs trade at significant premiums while warehouse/industrial REITs trade at discounts. They suggest that this mispricing may explain the prevalence of the number of REITs that are focused on the retail sector, rather than the industrial sector. The authors also observe that larger firms tend to enjoy NAV premiums while shares for smaller REITs are discounted relative to NAV, even though NAV premiums do not appear to impact cash flow yields. Small REITs tend to have higher expense ratios which represent deadweight losses to the shareholders.

Barkham and Ward (1999) focus on a sample of listed property companies in the U.K. and notice that the market cap is typically discounted relative to NAV for U.K. firms. They argue that a portion of the discount may be explained by the capital gains tax and other selling costs which would directly subtract from the cash available for distribution in the event of divestiture. Other firm-specific determinants may include firm size, insider ownership, and share price volatility. However, firm-specific factors explain only a small portion of the NAV discount; co-movement with the sector is the most meaningful factor that affects NAV discounts. In turn, aggregated NAV discounts for the sector are heavily influenced by investor sentiment.

Brounen, Ling and Prado (2013) study the ability of short-sale constraints to explain NAV premiums for REIT stocks. They provide evidence that short-sale activity explains roughly one-third of the volatility in NAV premiums. Overvaluation occurs when demand for short positions is strong, but supply is limited. Short-sale constraints impose a limit to arbitrage wherein dual market mispricings can only be corrected if REIT shares trade at a premium to NAV.

While deviations between share prices and NAV per share exist, it is possible that the ratio of share prices-to-NAV per share is mean reverting. Barkham and Ward (1999) investigate the long-term relationship between stock prices and NAVs for U.K. property companies and find a stable equilibrium relationship. In another U.K. study, Patel, Pereira and Zavodov (2009) show that the discount to NAV has a mean-reverting tendency to the long-term mean of 20%. For property companies in Singapore, Liow (2003) provides evidence that share prices tend to revert to underlying NAV per share.

Consequences: Property Transactions

The actions that REIT managers take in response to NAV premiums have not yet been investigated for transactions in the property market. This topic builds on several areas of the extant literature. One thread of the literature explores investment policy for REIT managers, primarily at the firm level – stopping short of utilizing property transactions data. A second body of work emphasizes the outcome for REIT shareholders following property transactions. A third strand of the real estate literature focuses on the relative transaction prices paid and received by various investor clienteles, with REITs appearing to pay higher prices. Related to the third are studies that incorporate the methodological advancement of matched sampling procedures, particularly when estimating investor clienteles for commercial real estate transactions data.

The investment decision of REIT managers is explored in Riddiough and Wu (2009). At the firm-level, investment policy and liquidity management are closely related. Since REITs may become cash-constrained due to the dividend payout requirements, investment is increasing with the cash stock and bank line of credit availability. Eichholtz and Yönder (2015) analyze the influence of CEO overconfidence on REIT investment activity. REITs buy more property and sell less frequently when the CEO is overconfident, but tend to have anemic net operating income and revenue growth. The investment opportunity set in both Riddiough and Wu (2009) and Eichholtz and Yönder (2015) is controlled using Tobin's *q* (Brainard and Tobin 1968; Tobin 1969). Tobin's *q* may be more accurately measured for REITs using NAV rather than book values for assets (Hartzell, Sun and Titman, 2006). REIT investment increases with the investment opportunity set.

On the divestiture side, REITs are constrained in their ability to sell property due to REIT regulation. Mühlhofer (2013) examines the impact of the dealer rule on REIT returns. The dealer rule imposes selling constraints on REITs: property should be held for at least four years and no more than 10% of the portfolio can be sold in a given year.[3] Mühlhofer (2013) shows that REIT returns do not reflect capital gains in the short-run due to the dealer rule constraint. However, umbrella partnership REITs (UPREITs) are less constrained by the dealer rule since the contributing partner's holding period is allowed to count toward the REIT holding period. NAV premiums or discounts have not been explored as an underlying motive for REIT investment or divestiture.

Property transactions can impact a firm's stock returns. Glascock, Davidson and Sirmans (1991) investigate firm restructurings that involve real estate holdings. Surrounding the property transaction announcement day, divesting firms experience positive abnormal returns; acquiring

[3] The minimum holding period requirement was reduced to two years on July 30, 2008.

firms do not. If a firm divests of a fully-amortized asset and replaces it with a similar asset, the firm enjoys greater depreciation benefits. Focusing exclusively on REITs, McIntosh, Ott and Liang (1995) find no abnormal returns surrounding transaction announcements, except when the asset sale is followed by an increase in dividends. On the other hand, Campbell, Petrova and Sirmans (2003) document positive and significant abnormal returns surrounding the announcement of portfolio acquisitions by REITs. The favorable gain is stronger for firms that bolster their existing geographical concentration (rather than expand into new markets) and when the project finance provides positive signaling. On the divestiture side, Campbell, Petrova and Sirmans (2006) analyze a sample of REIT property sell-offs and provide evidence of positive abnormal returns surrounding the announcement date. Consistent with the acquisition side, the gains appear to accrue from efficiencies in portfolio reallocations. Wiley (2013) finds that the outcome from REIT asset sales depends largely on the relative sale price. Properties sold above the hedonic estimate for market value are opportunistic and followed by positive abnormal returns. Properties sold below the estimated market value are classified in the study as liquidations and are not followed by abnormal returns. The magnitude of returns relies heavily on the use of sale proceeds.

Clientele effects in the property market exist when an identifiable investor type either pays or accepts a significantly different price from the rest of the market. Examples of investor clienteles include corporate investors (Wiley, 2012), and nonlocal investors (Liu, Gallimore and Wiley, 2015) overpaying for acquisitions in the office market. REITs have also been observed to pay significantly higher transaction prices for income-producing property. Hardin and Wolverton (1999) document that apartment REITs pay premiums of 27% above market value for properties in Atlanta and Phoenix. They argue that REIT managers may be pressured to expand or believe that they can attain operating efficiencies from scale. Lambson, McQueen and Slade (2004)

provide similar results to Hardin and Wolverton (1999) for REIT apartment acquisitions in Phoenix. Ling and Petrova (2012) estimate premiums paid by REITs in the range of 14-16% for office, industrial and retail transactions.

Akin et al. (2013) estimate the premium paid by REITs to be 30% for commercial real estate after controlling physical property characteristics. Yet, when a repeat-sales approach is applied, the estimated premium reduces to 6.4%. The authors conclude that REITs buy properties with unobserved higher-quality characteristics. The residual premium of 6.4% is explained by two factors. First, REITs are willing to overpay due to their cost of capital advantages. Publicly-traded and large REITs tend to pay higher premiums. Second, REITs are occasionally time-constrained in acquisitions due to REIT regulation.[4] A REIT has essentially one year to deploy new capital into real estate holdings, or jeopardize REIT status. REIT mangers have added incentives to deploy capital quickly resulting from contractual obligations, management fees, earnings calls, and performance evaluations. As a consequence, REITs that recently obtained new capital tend to pay larger premiums for acquisitions.

Whereas the repeat-sales methodology is shown to explain a portion of the estimated overpayment by REIT managers (Akin et al., 2013), another approach to mitigate sample selection issues is by incorporating a matched sampling procedure. In hedonic asset pricing, goods are valued primarily for their utility-producing attributes and hedonic pricing models have become widely used in real estate research (Rosen, 1974). The high degree of heterogeneity that exists in transactions samples can be addressed using propensity-score matching (Rosenbaum and Rubin, 1983, 1984). For commercial real estate, the propensity score matching procedure has been applied

[4] At least 75% of a REIT's assets are required to be invested in real estate, cash or government securities, and at least 75% of a REIT's gross income should be generated from real estate, including rents, mortgage interest and capital gains from asset sales.

by Eichholtz, Kok and Quigley (2010), Wiley (2014), Wiley et al. (2014), and Liu, Gallimore and Wiley (2015). For the housing sector, McMillen (2012) recommends the matching estimator price index as an alternative to hedonic or repeat sales based indices. The hedonic approach suffers from omitted variable bias. The repeat sales approach reduces omitted variable issues but sharply reduces sample size and assumes that property characteristics do not change over the sample period. McMillen (2012) argues that matching procedures allow for larger samples than repeat sales and reasonably curtails bias from omitted variables. McMillen (2012) demonstrates that the matching procedure generates an estimator that is equivalent to the repeat sales estimator.

An alternative to propensity-score matching involves characteristic-matched samples, applied by Eichholtz, Kok and Quigley (2010) and Wiley (2012). Following the characteristic-matching, control groups are constructed with transactions of comparable properties for each transaction of a subject property. The subject properties are green office buildings in Eichholtz, Kok and Quigley (2010) and acquisitions by corporate investors in Wiley (2012). In the present study, the subject property involves acquisitions by REIT managers. Each transaction is matched with properties of the same submarket, same property type, and same property class. Parameters are specified for acceptable ranges for property age, property size, and the transaction date relative to the subject transaction. The method employed in the present study compares estimated clientele effects for REIT managers using a full sample hedonic approach, as well as the characteristic-matched sample. For robustness, results are also estimated using a propensity-score matched sample.

Consequences: Capital Markets

Capital market consequences refer to the equity issuance, share repurchases, and dividend policies that are affected by NAV premiums. In corporate finance, the capital budgeting and capital structure decisions should be independent from one another. However, in commercial real estate, the assets are large, bulky, and typically require secured mortgage debt. These conditions make it more difficult to completely disentangle capital structure decisions from investment in commercial real estate.

For REITs, there are dividend payout requirements that limit a firm's ability to fund new investment through retained earnings. As a result, REITs frequently access the capital markets. Ott, Riddiough and Yi (2005) report that 84% of REITs investments were financed by equity and long-term debt while only 7% were financed by retained earnings. Brown and Riddiough (2003) find that REITs are mostly likely to use proceeds from new equity issues for investment, while proceeds from public debt offerings tend to be used for restructuring liabilities.

Traditional capital structure theory claims that there is an optimal capital structure which exists at the point where the marginal benefits are exactly offset by the marginal costs from added debt (Modigliani and Miller, 1958, 1963). Pecking-order theory implies that there may not be an optimal capital structure due to the inherent preference of managers to select among alternative sources of funding (Myers and Majluf, 1984). Management may have a strong preference for financing new projects with internally-generated cash flows, debt would be the second-order preference, and equity issuance is the most expensive and least desirable. Supporting the negative signal from equity issuance, the stock market tends to react negatively to firms announcing seasoned equity offerings (Asquith and Mullins, 1986; Masulis and Korwar, 1986) and firms with seasoned equity offerings tend to underperform over the long-horizon (Loughran and Ritter, 1995; Spiess and Affleck-Graves, 1995).

In the case of REITs, negative share price reactions following SEOs are somewhat mitigated compared to non-REIT firms. Howe and Shilling (1988) find -1.9% average two-day abnormal returns surrounding the announcement, compared to -3.1% for non-REIT firms. Francis, Lys and Vincent (2004) also find negative stock market reaction to the SEO announcements but with smaller magnitude relative to non-REIT firms. The reduced severity of negative reactions has been attributed to the fact that the high-dividend requirement for REITs causes firms in this sector to frequently tap the equity market to fund new investment, which is not necessarily a negative signal. The negative share price reaction surrounding the SEO announcement is further mitigated for REITs that simultaneously announce property acquisitions (Ong, Ooi and Kawaguichi, 2011).

Market timing explanations suggest that managers attempt to time the market based on their private beliefs about the true value of the firm (Graham and Harvey, 2001; Baker and Wurgler, 2002). Equity issues are more likely to occur when managers believe the share price is overvalued. Yet, for REITs, there is less information asymmetry and the degree of overvaluation is observable as NAV premiums. Boudry, Kallberg and Liu (2010) find strong support for market timing theory of equity issuance for REITs. REIT managers are more likely to issue equity when the premium to NAV is high. Thus, REIT managers rely on information about NAV premiums to identify opportunities to exploit mispricings between public and property markets.

For the firm as a whole, the stock market's overvaluation of real property can be exploited through the decision to become publicly-listed or go private. Extensive research has been conducted on the motivation for going public (Rock, 1986; Welch, 1989; Chemmanur and Fulghieri, 1999) and going private (Jensen, 1986; Wruck, 1990; North, 2001). For REITs, IPO activity increases acutely during periods when property market conditions are favorable and REIT share prices are elevated (Hartzell, Kallberg and Liu, 2005). REITs are more likely to go private

when share prices are low relative to dividends (Ling and Petrova, 2011) and when they have recently underperformed (Brau et al., 2013).

Overall, evidence from the capital markets supports the notion that REIT managers take actions which are consistent with mispricings from the property market. While NAV premiums create opportunities for REIT managers to take action in both the capital market (e.g., by issuing new equity, repurchasing shares, or increasing dividends) and the property market, the focus in this study is on the outcome in the property market.

III. NAV Premiums & REIT Investment Growth

This section focuses on identifying the extent to which NAV premiums induce REIT managers to increase their property market acquisitions or asset sales. When the stock market values the underlying assets more highly than the property market (i.e., premium to NAV), REIT managers are faced with relatively favorable conditions for purchasing new properties. The acquisitions can be funded in part by new equity issues. Thus, when shares trade at a premium to NAV, REIT managers are expected to become more active buyers in the property market.

On the other hand, when shares trade at a discount to NAV, REIT managers can exploit the mispricing by selling assets in the property market and distributing the proceeds to shareholders either through share repurchases or dividends. REIT managers are expected to become active sellers in the property market when shares trade at a discount to NAV. One potentially limiting factor on the divestiture side involves the dealer rule for REITs which constrains the sale of assets for capital gains and places minimum holding periods (Mühlhofer, 2013). However, the typical REIT portfolio includes many assets from a wide array of holding terms to select among for divestiture. Another potentially relevant aspect is the managerial compensation structure which

typically increases with total assets under management for REITs (Graff, 2001). Compensation linked to firm size creates incentives to retain assets under management, rather than liquidate.

Data is collected from the SNL database and Green Street Advisors to evaluate the impact for NAV premiums on REIT investment activity, where a total of 284 REITs are identified (175 active REITs and 109 historical). For historical firms, investment activity is excluded from the sample for transactions occurring within two years of a delisting event. Over the period 2001 to 2014, NAV premiums and firm characteristics are collected for each REIT. Data for NAV premiums are available for 161 REITs, representing 1,016 firm-years. SNL data for NAV premiums and investment activity is supplemented with Compustat data on REIT firm characteristics, including firm size, age, debt ratios, cash ratios, and EBIT ratios, along with share prices from CRSP.

Table 1 provides summary statistics for the sample of REIT firms. NAVπ is the annual average of every month-end market capitalization divided by the monthly NAV estimate. NAVπ averages 0.3% for the sample and nearly half of observations occur during positive NAV firm-years. The presentation in Table 1 displays the full sample, along with subsamples for 523 firm-years where NAV premiums are positive ($NAV_{\pi>0}$), and 493 firm-years where NAV premiums are negative ($NAV_{\pi<0}$). Whereas NAVπ is measured for the sector, an alternate measure is relative NAVπ, which measures the difference between NAVπ for an individual firm and NAVπ for the aggregated sector in a given quarter.

Real estate investment growth is reported directly in SNL, reflecting the percentage change in assets under management. Acquisitions and dispositions are reported in counts (number of deals) per quarter, measured relative to the average number of properties in the REIT portfolio

during the current and prior quarter.[5] This measurement is consistent with Eichholtz and Yönder (2015) who consider the impact of CEO overconfidence on investment. Net transactions equals acquisitions minus dispositions. REITs are net increasing their assets under management during the sample. Real estate investment growth is positive on average, and acquisitions exceed dispositions in the average firm-year. During periods when NAV premiums are positive, real estate investment growth, acquisitions, and net transactions are all significantly greater than when share prices fall below the fundamental property market values.

Firm characteristics relevant to investment include firm age, firm size, financial leverage (debt ratio), cash available for investment (cash ratio), profitability (EBIT ratio), and the proportion of assets invested in the six premier U.S. markets (major mkt share).[6] Sample means for each of the firm characteristics are similar between periods of NAV premiums versus discounts, with the exceptions of the debt ratio (lower during NAV premiums) and profitability (higher during NAV premiums).

Figure 1 depicts the relation between NAV premiums and real estate investment growth in the aggregate series. Overall, the REIT sector tends to have positive real estate investment growth, with the highest growth periods coinciding with NAV premiums at its highest values. Investment activity is positive, but at markedly lower levels during periods when NAV premiums are negative. Investment appears to lag NAV premiums since considerable time is required to search for desirable acquisitions, conduct due diligence, and close on transactions in commercial real estate.

Figure 2 presents total acquisitions (in Panel A) and dispositions (in Panel B), along with

[5] Value-based transactions data are also available from SNL, but tend to underestimate the actual value of REIT investment activity since SNL does not include land or development acquisitions. In untabulated analysis, our analysis of value-based transactions provides empirical results that are consistent with those presented for count-based transactions metrics.

[6] The six major markets are identified following Real Capital Analytics, including Boston, Chicago, Los Angeles, New York City, San Francisco, and Washington, D.C.).

NAV premiums. Acquisitions activity appears to follow periods when NAV premiums are positive, but with a lag. The relation to dispositions is less apparent, however, and managers have reduced incentives to divest existing assets. The amount of time required to complete a commercial property acquisition or disposition is typically at least one year including search, bargaining, financing, and closing. In light of this, the analysis evaluates the impact on investment from NAV premiums lagged by one year.

The empirical model for investment includes characteristics for firm age, firm size, debt ratios, cash ratios, and EBIT ratios, along with the NAV premium – each lagged one year.

$$Investment_{i,t} = \beta_0 + \beta_1 \cdot Firm\ age_{i,t-1} + \beta_2 \cdot Firm\ size_{i,t-1} + \beta_3 \cdot Debt\ ratio_{i,t-1} + \beta_4 \cdot Cash\ ratio_{i,t-1} + \beta_5 \cdot EBIT\ ratio_{i,t-1} + \beta_6 \cdot NAV\pi_{t-1} + \gamma \cdot P_i + \delta \cdot Y_t + \varepsilon. \quad (1)$$

Four versions of the dependent variable are estimated, including real estate investment growth, acquisitions, dispositions, and net transactions. Firm age and size are logged. The estimation includes fixed-effects for eight different property type foci (P_i) and 14 calendar years (Y_t). Eichholtz and Yönder (2015) provide evidence that firm age is negatively related to investment activity, while size and leverage do not appear to influence investment. Both Riddiough and Wu (2009) and Eichholtz and Yönder (2015) find that higher cash holdings have a positive and significant impact on REIT investment activity. The key variable of interest is NAVπ. REITs are expected to increase investment activity responding to rising NAV premiums, and decrease investment when NAV premiums decline.

Table 2 presents results from the estimation of equation (1). Panel A focuses on net investment, including real estate investment growth and net transactions as dependent variables. Two estimations are provided for each dependent variable: one with EBIT ratio suppressed since profitability is potentially endogenous with other firm characteristics; the other with EBIT ratio

included. Firms that are younger and smaller have higher investment growth and greater net transactions, measured as acquisitions minus dispositions. Higher cash ratios tend to support increased levels of investment, consistent with the findings of Riddiough and Wu (2009) and Eichholtz and Yönder (2015). In all estimations of Panel A, NAVπ has a positive and significant coefficient. The estimated magnitude of NAVπ is between 0.3 and 0.4. A one standard deviation increase in NAVπ (i.e., share prices rise 15.3% relative to fundamental values) leads to a 4.6% to 6.1% increase in real estate investment growth in the following year. With real estate investment growth averaging 12% during the sample, the result is economically consequential. A similar result obtains for net transactions where the estimated coefficient is between 0.2 and 0.3, and one standard deviation increase in NAVπ precedes a net increase of 3.1 to 4.6 more acquisitions than dispositions in the subsequent year (when the sample average net transactions is 2.7 per year).

Panel B of Table 2 presents the estimations with total acquisitions and total dispositions accounted separately as dependent variables, since real estate investment growth and net transactions (covered in Panel A of Table 2) provide a somewhat limited view. Acquisitions are calculated as the total acquisition count relative to the existing portfolio count. The existing portfolio count is the average of beginning-of-year and end-of-year existing property counts, following Eichholtz and Yönder (2015). Consistent with results for net investment, total acquisitions are higher for younger and smaller firms, while lagged cash ratios tend to support increased acquisition activity. Dispositions increase in incidence with firm maturity. The estimated impact of NAVπ is positive and significant for acquisitions; negative and significant for dispositions. The findings suggest that rising NAV premiums not only lead to increased acquisitions activity, they also have the effect of deterring future dispositions. The results for net investment are a product of these two effects.

Table 3 reports parameter estimates for alternate measures of the NAV premium in equation (1). Beyond NAVπ for the full sample (results shown in Table 2), the alternate measures include positive values only (NAV premium^{+}), the absolute value of negative values only (NAV premium^{-}), and an indicator for positive NAV premiums ($I\{NAV_{\pi>0}\}$). Since asset sales tend to be linked with financial distress, the sample is divided into pre-crisis (2001-2006), financial crisis (2007-2009) and post-crisis (2010-2014) sub-periods. Results in the first two columns are largely consistent with Table 2 including sub-periods. Investment, net transactions, and acquisitions are each increasing with NAV premiums; dispositions are reduced as NAV premiums rise. Muting negative values for NAV premiums (by using the NAV premium^{+} measure) in the second column causes the estimated effect during positive years to appear even more pronounced. In the third column, the results for negative NAV premiums are flipped from those for positive NAV premiums. When shares trade at a discount to NAV, future investment is stunted and dispositions increase. The greater the magnitude of negative values for NAV premiums, the greater the scale of divestitures. The final column of results considers the impact from being in a positive NAV premium regime alone – irrespective of magnitude. During periods when shares trade at a positive spread to NAV, real estate investment is higher by 6.2%, net transactions are increasing by 5.4%: 3.3% attributable to the increase in acquisitions and 2.1% to the decrease in dispositions.

Table 4 provides the estimation results for equation (1) with NAV premiums treated as a set of categorical variables. Due to high search and transactions costs in commercial real estate, it is possible that a minimum threshold for NAV premiums or discounts is required before REIT managers will change their behavior in the property transactions market. The evidence provided in Table 4 reveals that even relatively small positive spreads to the NAV premium (less than 5%) trigger REIT managers to increase investment and net transactions. The result appears to be a

product of stunted disposition activity, more so than increased acquisitions. The magnitude of the increase in real estate investment activity is considerably higher corresponding with periods of higher NAV premiums (10% or greater). Discussed previously, mispricings between the property and stock market are relatively cyclical and persistent over a time-series. Even relatively small premiums are indicative of a period with favorable conditions for property acquisitions. By maintaining assets under management, REIT managers enjoy management fees, which creates incentives to expand the property portfolio (Graff, 2001). With embedded incentives to preserve assets under management, even a relatively small NAV premium can serve as rationale for managers to delay asset sales.

One factor that could act to mitigate opportunities to exploit mispricings is the high transaction costs involved in commercial real estate transactions, including brokerage commission fees. However, many REITs are internally-advised with real estate transaction experts. Upon evaluating CoStar transactions data (more complete discussion in a later section), REITs tend to involve commercial brokers much less frequently than other investors. For instance, REIT acquisitions involving broker representation represent just 14% of retail properties, 17% of office, and 21% of multifamily – all other institutional investors have higher frequencies of brokerage intermediation for each property type.[7] The ability of REITs to economize on transaction costs suggests that even small share price premiums to NAV are indicative of conditions that are favorable for net increases in property investment activity.

The dual asset market is unique to publicly-traded real estate firms and NAV premiums can be evaluated by analysts. Consequently, REIT managers are often faced with opportunities to exploit inter-market mispricings. The extant literature has focused on explaining the underlying

[7] Other investor types includes equity funds, insurance, investment managers, and pension funds.

causes of NAV premiums, and the findings in this section complement that thread of the literature by providing evidence that REIT managers increase net investment in response to rising NAV premiums.

IV. Determinants of NAV Premiums

While the primary focus of this study is to examine the consequences of asset pricing differentials, it is useful to briefly explore the determinants of NAV spreads at the firm level and to consider whether NAV premiums are caused by real estate mutual fund flows. We investigate the concentration of property holdings in major commercial real estate markets and the role of REIT profitability as possible determinants of NAV premiums, in addition to a set of factors that have collectively been considered in previous studies (e.g., Capozza and Lee 1995; Barkham and Ward 1999; Gentry, Kemsley and Mayer 2003; Brounen, Ling and Prado 2013).

A REIT's portfolio concentration within the six major metro markets may increase the quality and reduce the overall risk of the portfolio.[8] For each REIT, the major share in a given year equals the number of properties own in major markets divided by the total number of properties – the sample average is 26% of a firm's portfolio is held in major markets. In addition, operating performance for the underlying assets may cause underlying property values to deviate from stock market valuations. The EBIT ratio is used as the property performance measure, calculated as earnings before interest and taxes divided by total assets. The determinants of firm-level NAV premiums is modeled as:

$$NAV\pi_{i,t} = \beta_0 + \beta_1 \cdot Firm\ age_{i,t} + \beta_2 \cdot Firm\ size_{i,t} + \beta_3 \cdot Debt\ ratio_{i,t} + \beta_4 \cdot Cash\ ratio_{i,t} + \beta_5 \cdot EBIT\ ratio_{i,t} + \beta_6 \cdot Major\ share_{i,t} + \gamma \cdot P_i + \delta \cdot Y_t + \varepsilon. \quad (2)$$

[8] The six major commercial real estate markets that comprise the Moody's/RCA Commercial Property Price Index includes Boston, Chicago, Los Angeles, San Francisco, New York and Washington DC.

Other firm characteristics include firm age, firm size, financial leverage (debt ratio), and liquidity (cash ratio). The estimation includes fixed effects for eight different property types (P_i) and 14 calendar years (Y_t). In addition to firm-level NAVπ, relative NAVπ is substitute as the dependent variable, which differences the firm-level NAVπ from the aggregated NAV premium for the sector. For relative NAVπ, the calendar-year fixed effects are suppressed as annual changes are controlled by sectoral shifts in the aggregate NAV premium.

Table 5 presents the estimation results for the determinants of NAV premiums. In both estimations, the coefficients for major market share are positive and significant. REITs with greater allocations to the major markets are more likely to experience share price premiums to NAV – enhancing their opportunities to exploit inter-market mispricings. Estimated coefficients for EBIT ratio are also positive and significant in both estimations. Firms that are highly profitable experience higher premiums to NAV. Larger REITs tend to trade at premium, consistent with Capozza and Lee (1995). Controls for firm age, leverage, and cash are not consistently significant. Greater allocations to the major commercial real estate markets and enhanced firm profitability are discovered to be important determinants for firm-level NAV premiums.

Investor sentiment in the stock market is another factor that may exacerbate deviations between share prices and underlying NAVs. Investor sentiment can affect the numerator of NAV premiums (share prices), independent from underlying property values. Share prices typically change daily, even when the underlying property market experiences little fluctuation. Real estate mutual fund flow is used to proxy investor sentiment to the real estate sector. Data for mutual fund flows is collected from CRSP during the period of 2001-2014 on a monthly basis. Real estate mutual funds are identified following Cici, Corgel and Gibson (2011) and Chou and Hardin (2014) by searching fund names contain key words “Real Estate”, “Realty”, or “REIT”. The set is

restricted to include only actively-managed domestic funds.[9] Real estate mutual fund flows for each fund in each month are calculated as:

$$RE\ mutual\ fund\ flow_{i,t} = (Fund\ value_{i,t} - Fund\ value_{i,t-1}*(1+r_{i,t}))/\ Fund\ value_{i,t-1}. \quad (3)$$

Fund value is the total net asset value, and $r_{i,t}$ is the fund's return for that month. The real estate mutual fund flow measure is aggregated for all funds after being Windsorized, eliminating funds with less than 5% or greater than 95% fund flow.

Figure 3 displays the time series for real estate mutual fund flows calculated from CRSP data, and aggregate NAV premiums for the REIT sector from Green Street Advisors data on a quarterly basis during 2001 thru 2014. While the two series appear correlated, it is important to consider causality since one possibility is that real estate mutual funds flows simply follow periods of rising or falling NAV premiums. Upon visual inspection, aggregate NAV premiums for the REIT sector appears to lag real estate mutual fund flows.

Figure 4 displays the correlations between real estate mutual fund flows and NAV premiums with choice of lags ranging from ±18 months. The horizontal axis represents lags in real estate mutual fund flow. The two series are characterized by significant positive correlations with 6 months or more lead in mutual fund flows. Stock market investor sentiment, proxied by real estate mutual fund flows, can lead to inflated stock market valuations for REITs, which then produces change in NAV premiums.

Table 6 presents results from a series of Granger-causality tests between NAV premiums and real estate mutual fund flows with choice of lags including 1, 2, 4, and 6 months. The first row considers whether NAV premiums Granger cause real estate mutual fund flows. The corresponding *F*-statistics are insignificant from zero for each lag choice. The second row

[9] Effectively, this eliminates funds with international key words including "Russell", "Global" or "Glbl", "International" or "Intl", "European", and "Index".

considers whether real estate mutual fund flows cause NAV premiums, and significant evidence for Granger causality is found under each lag choice. The results suggest that real estate mutual fund flows Granger causes NAV premiums but the reverse is not true. Thus, NAV premiums appear to be strongly influenced by stock market investor sentiment, as proxied by real estate mutual fund flows.

V. NAV Premiums & Acquisition Prices

This section explores whether REIT managers pay higher transaction prices as a consequence of asset market mispricings. REITs have been observed to pay relatively higher transaction prices in previous studies. Premiums for property acquisitions are documented in the range of 14% to 27%, when compared to other buyer types (Hardin and Wolverton, 1999; Lambson, McQueen and Slade, 2004; Ling and Petrova, 2012). Compared to other clientele effects, the premium paid by REITs is substantial.[10]

To what extent is the degree of overpayment attributable to NAV premiums? To answer this question, it is important to consider alternate explanations. One argument for the overpayment in the property market by REITs is attributed to firm size, with larger firms tending to pay more. Akin et al. (2013) argue that REITs are willing to pay a premium in the property market because they enjoy a lower cost of capital. They use large vs. small and public vs. private REITs as proxies for advantages in cost of capital. They find that large REITs and public REITs tend to pay more compared to small REITs and private REITs respectively. If REIT managers attempt to exploit the mispricing opportunities, they should experience the greatest cost of capital advantages during periods when share prices trade at a premium to NAV.

[10] For example, Wiley (2012) reports an estimated 12% premium paid by corporate investors and Liu, Gallimore and Wiley (2015) document an estimated 14% premium paid by nonlocal investors.

Another issue that arises in empirical work on asset pricing in commercial real estate involves controlling for all relevant characteristics. Much of the prior literature applied methods that did not control for selection bias, yet REITs tend to select assets that are significantly larger and higher quality than the general population of commercial real estate transactions. Perhaps the magnitude of premiums for REIT acquisitions is smaller if a matched sampling procedure were introduced. Akin et al. (2013) find that REITs typically purchase different types of properties compared to non-REIT buyers and argue that REITs do not necessarily pay a significant premium but instead purchase properties with unobserved higher-quality characteristics. To address sample selection issues, Akin et al. (2013) limits the data to properties with greater than 20,000 square feet and apply a repeat-sales methodology. However, they still find 6.4% premium paid by REITs. Some studies adopt matching procedures to overcome issues with sample selection (e.g., Eichholtz, Kok and Quigley, 2010; Wiley, 2012). In housing research, McMillen (2012) demonstrates that the matching estimator produces equivalent results to repeat-sales estimator. Thus, when each property acquired by a REIT is paired with a transaction of a similar asset purchased by non-REIT institutional investors, the estimated premium paid by REITs may be lower than estimated premiums when matching techniques are not applied.

Even if a REIT can afford to pay a higher price for a property, it may not be prudent to persistently do so. REIT management often includes sophisticated investors and the infinite-life organizational structure may provide the needed patience to time the property market. On the other hand, NAV premiums may not be firm-specific, but rather a market-wide phenomenon. NAV premiums that affect the entire sector may induce competition from other REIT managers who compete for similar assets, bidding up transaction prices on acquisitions. Once the capital market is tapped and new equity is issued, the clock starts ticking on capital deployment. Under these

conditions, REIT managers may bid aggressively with one another in competition for the acquisition.

On the divestiture side, REIT managers are less likely to act with the same time pressure – compelled by temporal NAV premiums. As a REIT continues to preserve assets under management, its managers enjoy management fees (Graff, 2001). The compensation structure creates incentives to preserve the portfolio size and a reluctance to liquidate. Further, as Mühlhofer (2013) points out, the dealer rule restricts REIT managers in their ability to sell for capital gains which effectively places minimum holding periods for REIT assets. As a result, asset sales by REITs are not expected to be impacted as directly by NAV premiums or discounts.

Data & Sample: Property Acquisitions

Two sources of data are used in the analysis of REIT property purchase prices. The series for market-wide NAV premiums is collected from the Green Street Advisors. Green Street offers the monthly average NAV premium since February 1990. As of 2013, Green Street covered 87 REITs, of which 21 were specialized in the retail sector, 18 in office, and 10 in multifamily. Taken together, these three property types represent 56% of the number of firms covered, or 59% of total assets. With the coverage heavily comprised of retail, office, and multifamily REITs, the purchase price analysis is focused on these three property types.

Data for property transactions are collected from CoStar. Within the CoStar data, buyer types can be identified as individual, corporate/user, equity fund, insurance, investment manager, pension fund, private REITs, and REITs. However, public REITs are not differentiated between listed versus unlisted REITs. Since NAV premiums should only be relevant for listed REITs, the company name is matched with the SNL database to identify exchange-listed REITs. Properties

transaction dates range from January 2001 through December 2014, and the sample is restricted to include only transactions with a sale price of at least $50,000 and building size of at least 10,000 square feet (SF). The sample is further refined to include only transactions that occur in submarkets which have at least 100 transactions during the period in order to avoid bias from thinly-traded submarkets.

Table 7 displays the distribution of property transactions in the CoStar data by investor type. Across each property type, individuals and corporate/users tend to purchase much smaller assets when compared to other institutional investor types. Akin et al. (2013) argue that REITs prefer institutional-grade assets with higher-quality characteristics. There are potential selection bias issues if REITs tend to buy properties with distinct physical and market characteristics.

To address the sample selection issues, a comparison group of transactions is constructed, which is restricted to only assets that were acquired by institutionals (includes equity funds, insurance companies, investment managers, pension funds, listed REITs, private REITs, and unlisted REITs). A property-characteristic matching procedure is applied as a preliminary step following Wiley (2012, 2013). If overly restrictive matching criteria are applied, then only a small number of matched pairs will be generated. If the criteria are too relaxed, the outcome from the matching may not effectively resolve sample selection issues. In this study, listed REIT acquisitions are matched with acquisitions by other investors based on being of the same submarket, same property class, property age within five years range, property size within 40% range, and transaction date within two years range. Propensity-score matching methods similar to those in Eichholtz, Kok and Quigley (2010) are also considered as a robustness check, and yield qualitatively similar results to those from the characteristics-matched sample.

Table 8 displays the summary statistics for the full sample of property purchases, the listed REIT subsample, and the characteristic-matched sample. Across all three property types, listed REITs tend to favor properties that are larger, newer, and more likely to be class A. REIT managers are less likely to select acquisitions involving distressed sales or 1031 exchanges. The matched sampling substantially reduces the differences in the control group relative to the subsample of listed REIT acquisitions. Following the property matching process, acquisition premiums paid by listed REITs are expected to be lower in magnitude when compared to estimates from previous research where matched sampling was not incorporated.

Empirical Estimation: Property Acquisitions

A hedonic model is used to estimate the purchase price for listed REIT acquisitions relative to other investors. The base model is written as:

$$Price_t = X\beta + M\kappa + \Sigma\, \delta_t T_t + B\theta + \theta_1 NAV\pi_{t-1} + \varepsilon. \quad (4)$$

The dependent variable is the transaction price paid for the property acquisition. X is a vector of physical and transactional characteristics that includes the property size (building and land), age, number of floors, floor size (for multifamily), number of units (for multifamily), property class (for office and multifamily), and 1031 exchange or distress sales. For retail, a set of indicator variables are used to control for property sub-type (e.g., grocery-anchored neighborhood, enclosed shopping mall). M is a vector of fixed-effects (FEs) for the geographic submarket for the property type, as classified in CoStar. T_t are calendar year fixed-effects. B is a vector of investor clienteles, including *Listed REIT*. The estimation also includes an interaction term, $NAV\pi_{t-1}$, to capture the effect of NAV premiums on prices paid by listed REITs. The market-wide NAV premium is used to capture the effect of multiple REIT managers competing in bids for new acquisitions. The

interaction term for NAVπ is lagged one year, considering the amount of time required to complete a new acquisition in commercial real estate, including property search, due diligence, and deal closing.

Table 9 presents results from the estimated impact of NAV premiums on property acquisitions by REIT managers. Results are displayed for the acquisition of retail properties (in Panel A), office (Panel B), and multifamily (Panel C). In the first column of each panel, results from the full sample are presented with the NAV premium interaction term suppressed. The estimated acquisition premium paid by REIT managers is 15% for retail, 25% for office, and 8% for multifamily.

In the second column of Table 9, the NAV premium interaction term is included in the estimations. The NAV premium has a positive and significant impact on the relative price paid for acquisitions by REIT managers. The estimated coefficients range from 1.25 to 2.35 multiples of the NAV premium. Moreover, the coefficient for listed REIT is no longer significant for any of the three property types – suggesting that the degree of overpayment by REIT managers is practically entirely determined by the magnitude of NAV premiums.

The third columns for each panel of Table 9 present similar estimations based on the matched samples. In the third column, the estimated coefficient for listed REITs is insignificant after the matching procedure is applied. This finding suggests that the estimated clientele effects for REIT managers documented in previous studies can be largely attributed to sample selection issues, with REITs selecting higher quality assets. Such potential issues are generally acknowledged in prior studies, yet not fully accounted. The matched sampling methodology advances the empirical ability to provide an accurate comparison amongst investor clienteles in commercial real estate.

In the fourth column of Table 9, the NAV premium interaction term is included in the matched sample estimations. Whereas listed REITs do not appear to pay significantly different prices on average when matched sampling is applied (third columns of Table 9), the relative prices paid by REIT managers appear to be significantly influenced by NAV premiums. Higher spreads in the value of the equity claim to Wall Street, leads to higher prices paid on Main Street.

Alternate Specifications

While the results in Table 9 are presented in a condensed form for brevity in exposition, a number of alternate specifications are considered and discussed here in untabulated analysis. As an alternate to the characteristics-matched samples, a propensity-score matching is applied – as in previous studies (Eichholtz, Kok and Quigley, 2010; Wiley, 2014; Wiley et al., 2014; Liu, Gallimore and Wiley, 2015). The results from the propensity-score matched samples are highly similar with those presented in Table 9. Matching eliminates the average overpayment by listed REITs, while the relative price is significantly impacted by NAV premiums.

The matched sample is restricted so that it excludes individuals and corporates. In alternate specification, individuals and corporates are allowed to enter the matched sample. This offers a comparison that is more consistent with previous studies (Hardin and Wolverton, 1999; Lambson, McQueen and Slade, 2004; Ling and Petrova, 2012; Akin et al., 2013). With individuals and corporates included, the matching procedure reduces the acquisition premium paid by REIT managers, but does not eliminate the premium entirely. Shown previously, individuals and corporate/users select substantially smaller size buildings compared to institutional investors such as listed REITs. Thus, the estimated acquisition premiums appear driven by sample selection issues rather than REIT clientele effects since the effect vanishes when measured relative to institutional

investors only. Independent from the inclusion of individuals and corporates, the acquisition prices paid by REIT managers are positively and significantly impacted by NAV premiums.

Another path focuses on the measurement of NAV premiums, measured for the REIT sector and lagged by one year in the base case (Table 9). When NAV premiums are contemporaneous, the effect is reduced and insignificant in some cases. This suggests that REIT managers are not anticipatory of NAV premiums, rather they are reactionary. It further supports the notion that the market mispricing is not pure arbitrage, since significant lead time is required to search, conduct due diligence, fund, and close new acquisitions.

Instead of market-wide measurement, NAV premiums are available directly for a subsample of the REITs in this study. There is cross-sectional heterogeneity and NAV premiums at the firm-level can be disconnected from market-wide shifts. For instance, some firms may experience NAV premiums, even when the aggregated sector is discounted. Substituted firm-level NAV premiums are not found to have a significant impact on acquisition premiums paid by REIT managers, in contrast to the impact from market-wide NAV premiums. If just one firm experiences NAV premiums, it is not rational to substantially overpay for an investment. At the margin, the firm with a cost of capital advantage needs only to outbid the next highest bidder. If instead, the sector as a whole experiences NAV premiums, then there are multiple bidders with cost of capital advantages. While the asset market for commercial real estate is broad, it is also thinly-traded and there may only be a few active listings at a given time in each market for the highest-quality, institutional-grade assets. Since REIT managers exhibit a strong preference for these assets, NAV premiums for the sector as a whole (rather than firm-specific only) lead to increased competition among REIT managers, bidding up property prices.

The estimation results can be biased when variables that should have a significant impact on value are omitted. The property occupancy rate is unquestionably an important determinant of value to the investor, yet data for the property occupancy is only available for a substantially reduced subsample. The number of available observations is reduced from 1,218 to 93 for retail, from 1,222 to 505 for office and from 748 to 416 for multifamily. Despite the reduced sample size, when property occupancy is accounted for, the estimated coefficient for NAV premiums is positive and significant for retail and multifamily, insignificant from zero for office, and never negative.

All analysis thus far has focused on the impact from NAV premiums on the acquisition side, with the evidence suggesting that the ratio of share prices to asset prices leads to both increased acquisition activity and higher transaction prices paid. Yet, the opportunity for REIT managers to exploit the mispricing between the stock market and property market can also run in the opposite direction. If share prices are significantly discounted relative the value of the equity claims on the real property, managers can divest from assets in the property market and return the gains to shareholders in the form of special dividends or share repurchases. While the equity issuance, dividend policy, and share repurchases are beyond the scope of this paper (which focuses on the property market outcomes), we are able to estimate the potential impact of NAV premiums on the divestiture side. In untabulated analysis, the results are insignificant from zero.

NAV premiums have no effect on the asset prices received by REIT managers in divestitures. There are several possible explanations for why NAV premiums would have little to no effect on the sell side. First, in order to successfully sell an asset, a REIT manager must market the property and find a buyer who is ready, willing, and able to purchase the asset. If it is a non-REIT buyer, then that party is unconcerned with NAV premiums. The bid price would be based on competitive market conditions. This is in contrast to the acquisition side, where the purchase

price is directly decided by the REIT manager. Second, the selling process is lengthy and it is not uncommon for large commercial properties to experience marketing durations of two years or beyond. The execution of an asset sale is subject to market conditions, whereas on the acquisition side the ability to successfully purchase a property is directly under the manager's control. Third, the dealer rule may place restrictions on which assets can be sold (Mühlhofer. 2013), since preserving REIT status imposes certain hold periods, limits the portion of the portfolio which can be sold, and constrains the amount of cash flow which can come from capital gains on asset sales. Fourth, even if all of the above are non-binding, REIT managers may have very little incentive to divest from the portfolio when compensation is increasing with the scale of assets under management.

Conclusion

REIT managers are uniquely positioned to exploit mispricings between the value of their shares in the stock market and the value of their equity claim on the underlying portfolio in the property market. Previous work finds that equity issuance actions taken by REIT managers are consistent with opportunities presented by the dual market mispricings. By contrast, the focus in the present study is for how outcomes in the property transactions market are affected by NAV premiums. Evidence for the outcome in the property market is provided in three segments.

First, the net investment in real estate is investigated. REIT share prices can become substantially disconnected from NAVs and for prolonged periods of time. Real estate investment growth appears to closely track the pattern of NAV premiums, with a lag (Figure 1). The lag is approximately one year, which is roughly the amount of time required to search, bid, and close a new acquisition in commercial real estate. Evidence is provided that property acquisitions are increasing with NAV premiums; dispositions are decreasing. Thus, net investment in the property

market by REITs is positively affected by the degree of overvaluation by the stock market. The strong connection between REIT investment and NAV premiums is documented across sub-periods, and by considering alternate measures for REIT investment and for NAV premiums.

The second segment evaluates the underlying determinants of NAV premiums cross-sectionally and explores causality for the aggregate time series. At the firm-level, we contribute two additional findings: NAV premiums are increasing with a firm's profitability and its portfolio concentration in major U.S. markets. For the sector as a whole, NAV premiums are caused by real estate mutual fund flows, and not the other way around. The exploration in this section helps rule out possible endogeneity issues which might suggest that NAV premiums exist as a consequence of actions taken by REIT managers in the property market. Instead, we find the intuitive result that NAV premiums are decided by investor flows.

Third, we examine a large sample of transactions for the three largest property types of REIT specialization: office, retail, and multifamily. When using the full samples, clientele effects are confirmed for each property type – supportive of existing literature. REIT managers appear to pay significantly higher prices for property acquisitions. However, there are sampling issues that arise when exploring clientele effects in commercial real estate transactions since REITs tend to acquire institutional-grade assets that are newer, larger, and more likely to be Class A or concentrated in premier submarkets. Estimation results when matched samples are introduced provide a different outcome: the estimated clientele effect for REIT managers is zero across all three property types. The matched samples restrict the comparison to acquisitions by other institutional investors and to properties that are of the same submarket, same property class, and within a specified range for property size and property age. Even though the acquisition price paid by REIT managers is no different, on average, it is positively and significantly impacted by the

degree of NAV premiums in all estimations. Thus, without NAV premiums, REIT clientele effects in the property market are not persistent.

References

Asquith, P., Mullins, D.W. 1986. Equity Issues and Offering Dilution. *Journal of Financial Economics* 15:61–89.

Akin, S.N., Lambson, V.E., McQueen, G.R., Platt, B.C., Slade, B.A., Wood, J.P. 2013. Rushing to Overpay: Modeling and Measuring the REIT Premium. *Journal of Real Estate Finance and Economics* 47:506–537.

Baker, M., Wurgler, J. 2002. Market Timing and Capital Structure. *Journal of Finance* 62:1–32.

Barkham, R.J., Ward, C.W. 1999. Investor Sentiment and Noise Traders: Discount to Net Asset Value in Listed Property Companies in the U.K. *Journal of Real Estate Research* 18:291–312.

Boudry, W.I., Kallberg, J.G., Liu, C.H. 2010. An Analysis of REIT Security Issuance Decisions. *Real Estate Economics* 38:91–120.

Brau, J.C., Carpenter, J.T., Rodriguez, M., Sirmans, C.F. 2013. REIT Going Private Decisions. *Journal of Real Estate Finance and Economics* 46:24–43.

Brainard, W.C., Tobin, J. 1968. Pitfalls in Financial Model Building. *American Economic Review* 58:99–122.

Brounen, D., Ling, D.C., Prado, M.P. 2013. Short Sales and Fundamental Value: Explaining the REIT Premium to NAV. *Real Estate Economics* 41:481–516.

Brown, D.T., Riddiough, T.J. 2003. Financing Choice and Liability Structure of Real Estate Investment Trusts. *Real Estate Economics* 31:313–346.

Campbell, R.D., Petrova, M., Sirmans, C.F. 2003. Wealth Effects of Diversification and Financial Deal Structuring: Evidence from REIT Property Portfolio Acquisitions. *Real Estate Economics* 31:347–366.

Campbell, R.D., Petrova, M., Sirmans, C.F. 2006. Value Creation in REIT Property Sell-Offs. *Real Estate Economics* 34:329–342.

Capozza, D.R., Lee, S. 1995. Property Type, Size and REIT value. *Journal of Real Estate Research* 10:363–378.

Chemmanur, T.J., Fulghieri, P. 1999. A Theory of the Going-Public Decision. *Review of Financial Studies* 12:249–279.

Chou, W., Hardin, W.G. 2014. Performance Chasing, Fund Flows and Fund Size in Real Estate Mutual Funds. *Journal of Real Estate Finance and Economics* 49:379–412.

Cici, G., Corgel, J., Gibson, S. 2011. Can Fund Managers Select Outperforming REITs? Examining Fund Holdings and Trades. *Real Estate Economics* 39:455–486.

Eichholtz, P., Kok, N., Quigley, J.M. 2010. Doing Well by Doing Good? Green Office Buildings. *American Economic Review* 100:2492–2509.

Eichholtz, P., Yönder, E. 2015. CEO Overconfidence, REIT Investment Activity and Performance. *Real Estate Economics* 43:139–162.

Francis, J., Lys, T., Vincent, L. 2004. Valuation Effects of Debt and Equity Offerings by Real Estate Investment Trusts (REITs). Unpublished working paper. Duke University and Northwestern University.

Geltner, D.M., Miller, N.G., Clayton J., Eichholtz, P. 2014. *Commercial Real Estate: Analysis and Investments*. 3rd edition. Boston, MA: Cengage.

Gentry, W.M., Kemsley, D., Mayer, C.J. 2003. Dividend Taxes and Share Prices: Evidence from Real Estate Investment Trusts. *Journal of Finance* 58:261–282.

Glascock, J.L., Davidson, W.N., Sirmans, C.F. 1991. The Gains from Corporate Selloffs: The Case of Real Estate Assets. *AREUEA Journal* 19:567–582.

Graff, R.A. 2001. Economics Analysis Suggests that REIT Investment Characteristics Are Not as Advertised. *Journal of Real Estate Portfolio Management* 7:99–124.

Graham, J.R., Harvey, C.R. 2001. The Theory and Practice of Corporate Finance: Evidence from the Field. *Journal of Financial Economics* 60:187–243.

Hardin, W.G., Wolverton, M.L. 1999. Equity REIT Property Acquisitions: Do Apartment REITs Pay a Premium? *Journal of Real Estate Research* 17:113–126.

Hartzell, J.C., Kallberg, J.G., Liu, C.H. 2005. The Role of the Underlying Real Asset Market in REIT IPOs. *Real Estate Economics* 33:27–50.

Hartzell, J.C., Sun, L., Titman, S. 2006. The Effect of Corporate Governance on Investment: Evidence from Real Estate Investment Trusts. *Real Estate Economics* 34:343–376.

Howe, J.S., Shilling, J.D. 1988. Capital Structure Theory and REIT Security Offerings. *Journal of Finance* 43:983–993.

Jensen, M.C. 1986. Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. *American Economic Review* 76: 323–329.

Lambson, V.E., McQueen, G.R., Slade, B.A. 2004. Do Out-of-State Buyers Pay More for Real Estate? An Examination of Anchoring-Induced Bias and Search Costs. *Real Estate Economics* 32:85–126.

Ling, D.C., Petrova, M. 2011. Why Do REITs Go Private? Differences in Target Characteristics, Acquirer Motivations, and Wealth Effects in Public and Private Acquisitions. *Journal of Real Estate Finance and Economics* 43:99–129.

Ling, D.C., Petrova, M. 2012. Heterogeneous Investors, Negotiation Strength & Asset Prices in Private Markets: Evidence from Commercial Real Estate. *Aestimum* 5–40.

Liow K.H. 2003. Property Company Stock Price and Net Asset Value: A Mean Reversion Perspective. *Journal of Real Estate Finance and Economics* 27:235–255.

Liu, Y., Gallimore, P., Wiley, J.A. 2015. Nonlocal Office Investors: Anchored by their Markets and Impaired by their Distance. *Journal of Real Estate Finance and Economics* 50:129–149.

Loughran, T., Ritter, J.R. 1995. The New Issues Puzzle. *Journal of Finance* 50:23–51.

Masulis, R.W., Korwar, A.N. 1986. Seasoned Equity Offerings: An Empirical Investigation. *Journal of Financial Economics* 15:91–118.

McIntosh, W., Ott, S.H., Liang, Y. 1995. The Wealth Effects of Real Estate Transactions: The Case of REITs. *Journal of Real Estate Finance and Economics* 10: 299–307.

McMillen, D.P. 2012. Repeat Sales as a Matching Estimator. *Real Estate Economics* 40:745–773.

Modigliani, F., Miller, M.H. 1958. The Cost of Capital, Corporation Finance, and the Theory of Investment. *American Economic Review* 48:655–669.

Modigliani, F., Miller, M.H. 1963. Corporate Income Taxes and the Cost of Capital: A Correction. *American Economic Review* 53:433–443.

Myers, S.C. 1984. The Capital Structure Puzzle. *Journal of Finance* 39:575–592.

Myers, S.C., Majluf, N.S. 1984. Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have. *Journal of Financial Economics* 13:187–221.

Mühlhofer, T. 2013. Why Do REIT Returns Poorly Reflect Property Returns? Unrealizable Appreciation Gains due to Trading Constraints as the Solution to the Short-Term Disparity. *Real Estate Economics* 41:814–857.

North, D.S. 2001. The Role of Managerial Incentives in Corporate Acquisitions: the 1990s Evidence. *Journal of Corporate Finance* 7:125–149.

Ong, S.E., Ooi, J.T.L., Kawaguichi, Y. 2011. Seasoned Equity Issuance by Japan and Singapore REITs. *Journal of Real Estate Finance and Economics* 43:205–220.

Ott, S.H., Riddiough, T.J., Yi, H. 2005. Finance, Investment and Investment Performance: Evidence from the REIT Sector. *Real Estate Economics* 33:203–235.

Patel, K., Pereira, R.A.M.G., Zavodov, K.V. 2009. Mean-Reversion in REITs Discount to NAV & Risk Premium. *Journal of Real Estate Finance and Economics* 39:229–247.

Riddiough, T.J., Wu, Z. 2009. Financial Constraints, Liquidity Management and Investment. *Real Estate Economics* 37:447–481.

Rock, K. 1986. Why New Issues Are Underpriced. *Journal of Financial Economics* 15:187–212.

Rosen, S. 1974. Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *Journal of Political Economy* 82:34–55.

Rosenbaum, P.R., Rubin, D.B. 1983. The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika* 70:41–55.

Rosenbaum, P.R., Rubin, D.B. 1984. Reducing Bias in Observational Studies Using Subclassification on the Propensity Score. *Journal of the American Statistical Association* 79:516–524.

Spiess, D.K., Affleck-Graves, J. 1995. Underperformance in Long-Run Stock Returns Following Seasoned Equity Offerings. *Journal of Financial Economics* 38:243–267.

Tobin, J. 1969. A General Equilibrium Approach to Monetary Theory. *Journal of Money, Credit, and Banking* 1:15–29.

Welch, I. 1989. Seasoned Offerings, Imitation Costs, and the Underpricing of Initial Public Offerings. *Journal of Finance* 44:421–449.

Wiley, J.A. 2012. Buy High, Sell Low: Corporate Investors in the Office Market. *Real Estate Economics* 40:843–860.

Wiley, J.A. 2013. REIT Asset Sales: Opportunistic Versus Liquidation. *Real Estate Economics* 41:632–662.

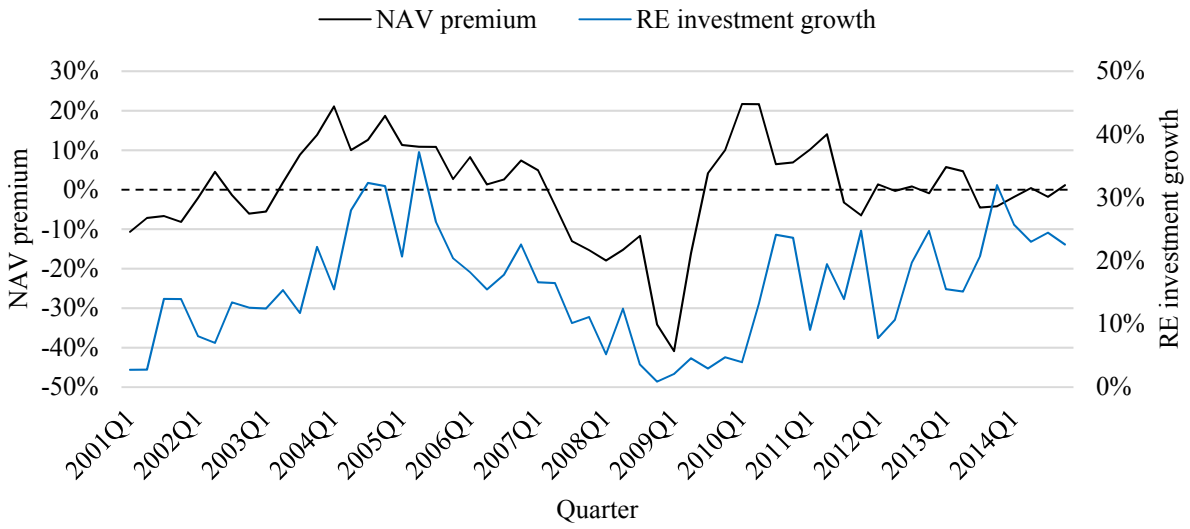
Wiley, J.A. 2014. Gross Lease Premiums. *Real Estate Economics* 42:606–626.

Wiley, J.A., Liu, Y., Kim, D., Springer, T. 2014. The Commercial Office Market and the Markup for Full Service Leases. *Journal of Real Estate Research* 36:319–340.

Wruck, K.H. 1990. Financial Distress, Reorganization, and Organizational Efficiency. *Journal of Financial Economics* 27:419–444.

Figure 1

NAV Premiums & Real Estate Investment Growth

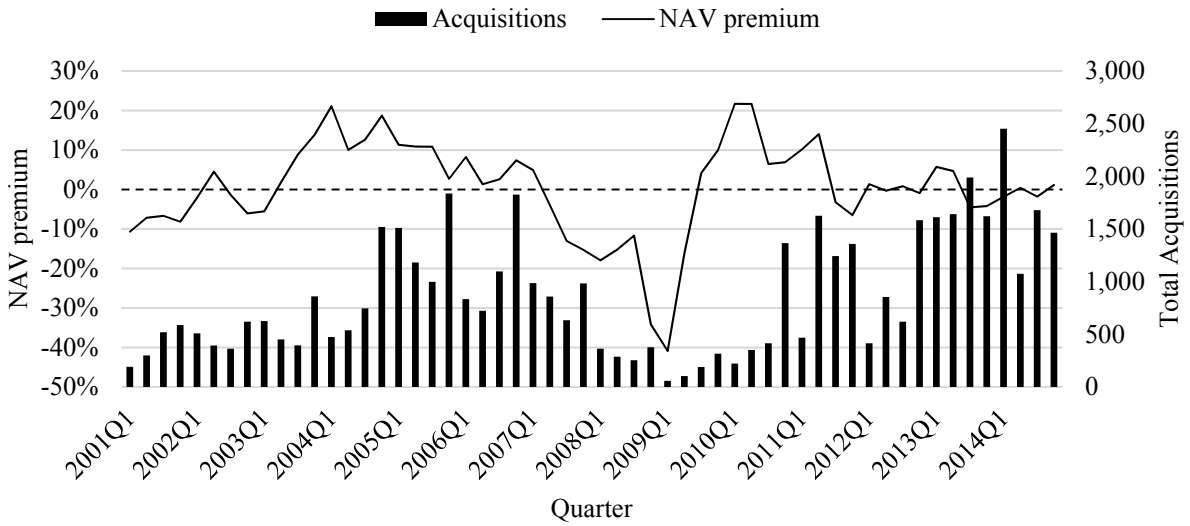


Notes: Figure 1 displays the quarterly average for NAV premium (solid black line; values on left-axis) and real estate investment growth (blue line; values on right-axis) during 2001 thru 2014. NAV premiums for the REIT sector are collected from Green Street Advisors. Real estate investment growth (RE investment growth) is a weighted average for firms in the REIT sector, constructed from SNL Financial data.

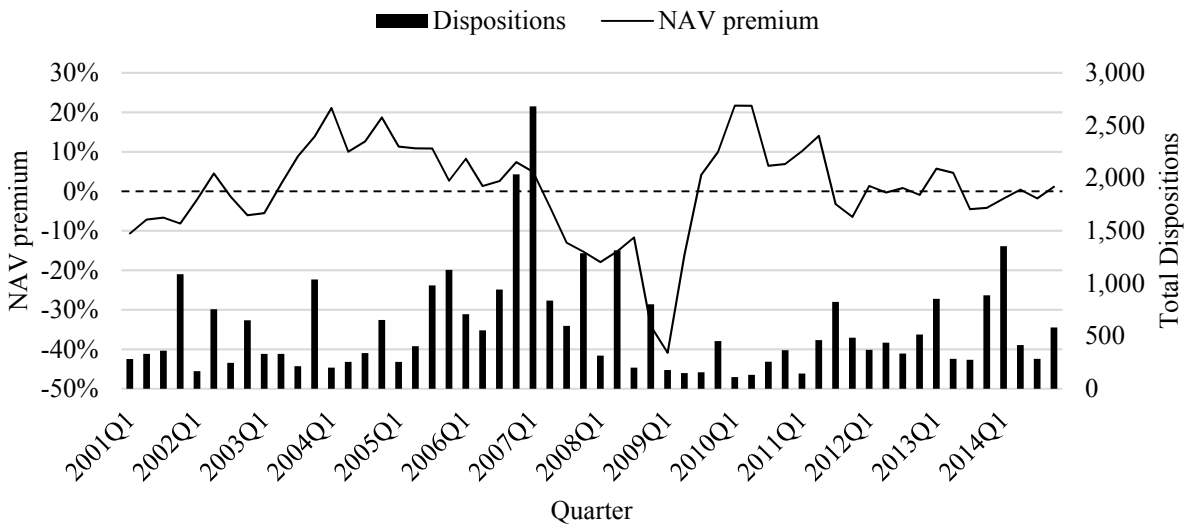
Figure 2

NAV Premiums & Transactions Volume

Panel A. Acquisitions



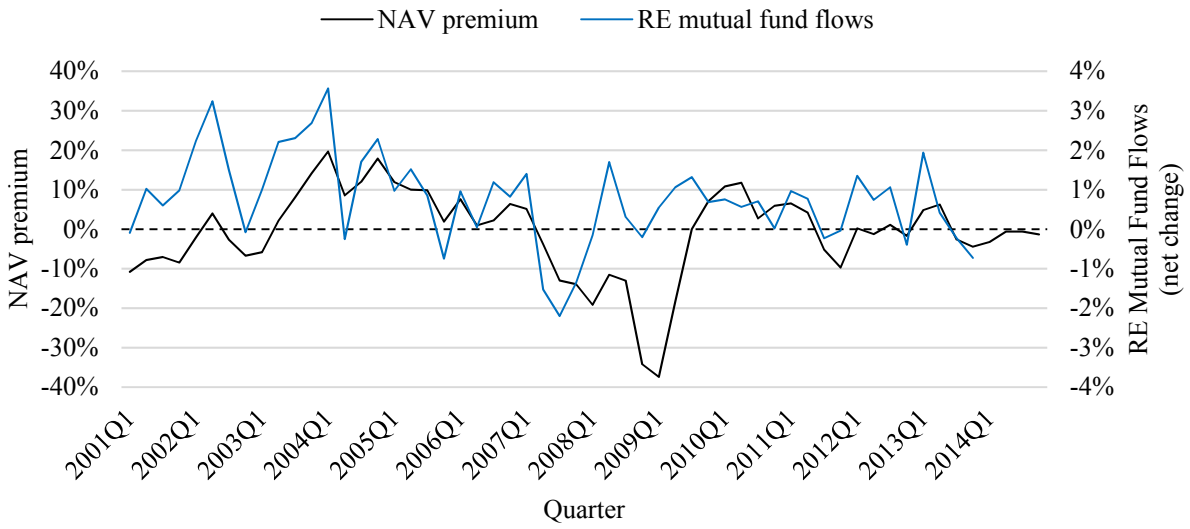
Panel B. Dispositions



Notes: Figure 2 displays the quarterly average for NAV premium (solid black line; values on left-axis) and the quarterly transaction count by REITs (black bars; values on right-axis) during 2001 thru 2014. NAV premiums for the REIT sector are collected from Green Street Advisors. Transaction counts are tabulated from SNL Financial data. Panel A displays acquisitions by REITs. Panel B displays dispositions.

Figure 3

NAV Premiums & Real Estate Mutual Fund Flows



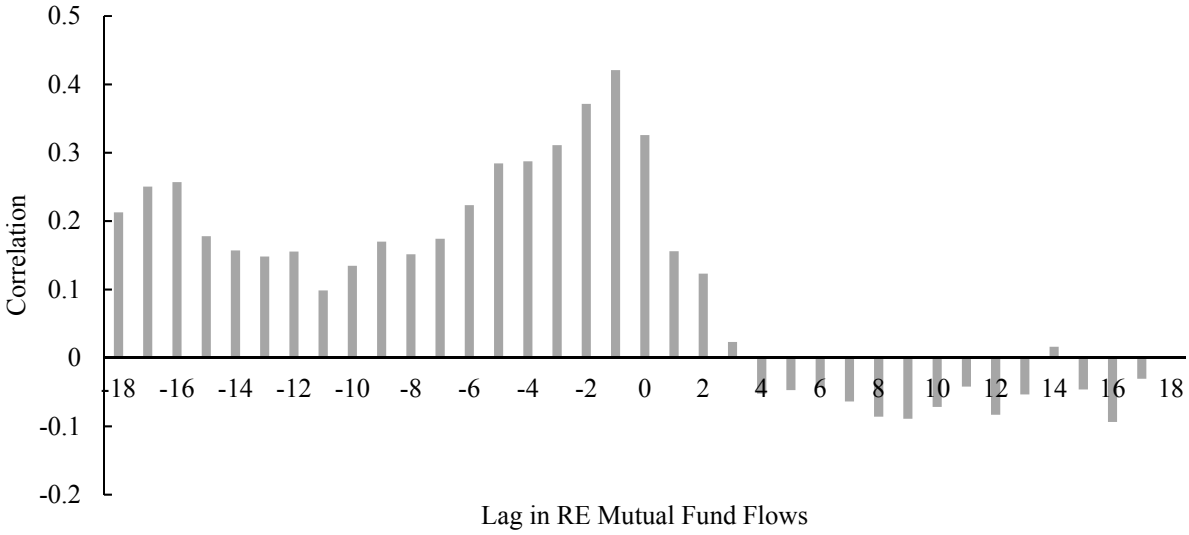
Notes: Figure 3 displays quarterly values for aggregate NAV premiums (depicted by the black line), from Green Street Advisors, and real estate mutual fund flows (depicted by the blue line), calculated from CRSP data. Real estate mutual funds are identified following Cici, Corgel and Gibson (2011) and Chou and Harding (2014) by searching fund names contain key words "Real Estate", "Realty", or "REIT". The set is restricted to include only actively-managed domestic funds. RE mutual fund flow is calculated as

$$RE\ mutual\ fund\ flow_{i,t} = (Fund\ value_{i,t} - Fund\ value_{i,t-1}*(1+r_{i,t}))/\ Fund\ value_{i,t-1}. \quad (3)$$

Fund value is the total net asset value, and $r_{i,t}$ is the fund's return for that quarter. RE mutual fund flow represents the average across all real estate mutual funds, after being Windsorized to eliminate funds with less than 5% or greater than 95% fund flow.

Figure 4

NAV Premiums & Real Estate Mutual Fund Flows



Notes: Figure 4 displays the cross correlation functions of NAV premiums with real estate mutual fund flows based on different choice of lags, ranging from -18 to +18 months. The horizontal axis represents the months lag in the RE mutual fund flows variable. Measurement of RE mutual fund flows is discussed in the notes to Figure 3.

Table 1

Summary Statistics: REIT Characteristics

	Full sample		$NAV_{\pi>0}$		$NAV_{\pi<0}$		*t*-test of
Variable	Mean	Std dev	Mean	Std dev	Mean	Std dev	difference
NAVπ (%)	0.3	15.3	11.5	10.0	-11.5	10.3	36.1***
Relative NAVπ (%)	-5.3	13.5	3.0	10.9	-13.5	10.6	26.1***
RE investment growth (%)	12.0	24.3	16.8	26.4	7.0	20.6	6.6***
Acquisitions	8.5	12.9	10.9	14.0	5.9	11.1	6.3***
Dispositions	5.8	8.4	4.9	7.0	6.7	9.7	-3.2***
Net transactions	2.7	14.9	6.0	14.7	-0.8	14.3	7.3***
Firm age	16.6	10.0	16.4	9.3	16.9	10.6	-0.8
Firm size	$4,365	$4,942	$4,366	$4,886	$4,365	$5,006	0.0
Debt ratio	0.48	0.14	0.47	0.15	0.49	0.14	-2.9***
Cash ratio	0.03	0.03	0.02	0.03	0.03	0.03	-1.3
EBIT ratio	0.05	0.03	0.05	0.02	0.04	0.03	8.0***
Major mkt share	0.26	0.25	0.24	0.25	0.27	0.26	-1.6
Firm-years	1,016		523		493		

Notes: Table 1 provides summary statistics for the sample of REITs used in this study during 2001 to 2014, including the sample mean (Mean) and standard deviation (Std dev). Summarizing statistics are presented for the full sample, along with subsamples for periods when the market-wide NAV premium is positive ($NAV_{\pi>0}$) and negative ($NAV_{\pi<0}$). The final column holds the t-test for difference in means between the two subsamples, with *** indicating significant difference in means at the 1% level of confidence.

Variables: NAVπ is the aggregate premium in net asset values for the REIT sector, collected from Green Street Advisors. The NAV premium for each firm is calculated as the share price divided by NAV per share (which subtracts outstanding debt and other claims), minus one. Relative NAVπ is the NAV premium for the corresponding firm differenced from NAVπ for the REIT sector. RE investment growth is the percentage change in real estate investments from the prior year, collected from SNL. Acquisitions is the number of properties purchased during the year, divided by the average total number of properties in the portfolio at beginning and end of year. Dispositions is the number of properties sold during the year, divided by the average total number of properties in the portfolio. Net transactions equals acquisitions minus dispositions, each from SNL. Firm age equals years since the initial public offering. Firm size is the book value of total assets in $Millions, collected from Compustat. Debt ratio equals total liabilities divided by total assets. Cash ratio equals total cash and cash equivalents divided by total assets. EBIT ratio equals EBIT divided by total assets. Major mkt share is the proportion of assets invested in any of the six premier U.S. markets, which includes Boston, Chicago, Los Angeles, New York City, San Francisco, and Washington, D.C. (following RCA classifications). The sample includes 161 active and historical REITs. All observations are in firm-years.

Table 2

NAV Premiums & REIT Investment Activity

Panel A. Net investment

	RE investment growth				Net transactions			
Variable	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)
Intercept	54.7***	(3.8)	53.1***	(3.6)	32.6***	(3.7)	29.3***	(3.2)
Firm age$_{i,t-1}$	-0.3***	(-3.6)	-0.3***	(-3.7)	-0.3***	(-6.5)	-0.3***	(-6.7)
Firm size$_{i,t-1}$	-5.7***	(-6.7)	-5.6***	(-6.6)	-3.0***	(-5.7)	-2.9***	(-5.5)
Debt ratio$_{i,t-1}$	-1.9	(-0.3)	-1.7	(-0.3)	-7.4**	(-2.0)	-6.9*	(-1.9)
Cash ratio$_{i,t-1}$	115.1***	(5.2)	115.1***	(5.2)	58.8***	(4.3)	59.4***	(4.4)
EBIT ratio$_{i,t-1}$			15.3	(0.5)			30.7	(1.5)
NAV$\pi_{i,t-1}$	0.4***	(5.3)	0.3***	(5.1)	0.3***	(6.2)	0.2***	(5.7)
Prop type FEs	included		included		included		included	
Year FEs	included		included		included		included	
Adj R^2	16%		16%		18%		18%	
Obs	1,016		1,016		988		988	

Panel B. Acquisitions & Dispositions

	Acquisitions				Dispositions			
Variable	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)
Intercept	26.8***	(3.5)	31.5***	(4.0)	-5.8	(-1.1)	2.2	(0.4)
Firm age$_{i,t-1}$	-0.2***	(-4.1)	-0.2***	(-3.7)	0.2***	(4.9)	0.2***	(5.9)
Firm size$_{i,t-1}$	-2.6***	(-5.8)	-2.8***	(-6.0)	0.4	(1.1)	0.1	(0.4)
Debt ratio$_{i,t-1}$	-5.3	(-1.6)	-6.0*	(-1.8)	2.1	(1.0)	0.9	(0.4)
Cash ratio$_{i,t-1}$	70.6***	(5.9)	69.7***	(5.8)	11.7	(1.5)	10.3	(1.3)
EBIT ratio$_{i,t-1}$			-44.6**	(-2.4)			-75.4***	(-6.2)
NAV$\pi_{i,t-1}$	0.1***	(3.7)	0.2***	(4.1)	-0.1***	(-5.0)	-0.1***	(-3.6)
Prop type FEs	included		included		included		included	
Year FEs	included		included		included		included	
Adj R^2	16%		17%		12%		15%	
Obs	988		988		988		988	

Notes: Table 2 reports the estimation results of equation (1).

$$Investment_{i,t} = \beta_0 + \beta_1 \cdot Firm\ age_{i,t-1} + \beta_2 \cdot Firm\ size_{i,t-1} + \beta_3 \cdot Debt\ ratio_{i,t-1} + \beta_4 \cdot Cash\ ratio_{i,t-1} + \beta_5 \cdot EBIT\ ratio_{i,t-1} + \beta_6 \cdot NAV\pi_{t-1} + \gamma \cdot P_i + \delta \cdot Y_t + \varepsilon. \quad (1)$$

Four versions of the dependent variable for $REIT_i$ in $year_t$ are estimated, including RE investment growth and Net transactions in Panel A, along with Acquisitions and Dispositions in Panel B. For each of the four versions, two estimations are provided, one with EBIT ratio suppressed. Firm age and Firm size are logged. The t-1 subscript designates variables that are lagged one year. The estimation includes fixed-effects for eight different property type foci (P_i) and 14 calendar years (Y_t). The reporting includes the estimated coefficient (Coef) and the corresponding *t*-statistic (*t*-stat) in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels of confidence respectively. Observations (Obs) are in firm-years. All variables defined in the notes to Table 1.

Table 3

NAV Premiums: Alternate Measures & Sub-periods

A. RE investment growth		NAV premium			NAV premium^{+}			NAV premium^{-}			I{NAV$_{\pi>0}$}		
Sample	Obs	Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2
Full sample	1,016	0.4***	(5.3)	16%	0.5***	(5.4)	16%	-0.3**	(-2.5)	14%	6.2***	(3.5)	15%
2001-2006	282	0.7***	(5.0)	17%	0.7***	(3.7)	14%	-1.3***	(-4.4)	16%	10.8***	(2.7)	12%
2007-2009	249	0.3**	(2.5)	22%	0.5*	(1.7)	21%	-0.3**	(-2.0)	21%	5.7*	(1.7)	21%
2010-2014	485	0.2**	(2.3)	15%	0.4***	(3.1)	16%	-0.1	(-0.3)	14%	4.2*	(1.7)	15%
B. Net transactions		Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2
Full sample	988	0.3***	(6.2)	18%	0.4***	(5.8)	18%	-0.2***	(-3.5)	16%	5.4***	(4.9)	17%
2001-2006	275	0.3***	(3.6)	19%	0.2*	(1.9)	16%	-0.7***	(-4.4)	21%	5.4**	(2.4)	17%
2007-2009	245	0.3***	(4.0)	25%	0.6***	(3.1)	24%	-0.3***	(-3.0)	23%	7.2***	(3.4)	24%
2010-2014	468	0.2***	(2.9)	22%	0.3***	(3.8)	23%	0.0	(-0.5)	21%	4.3***	(2.7)	22%
C. Acquisitions		Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2
Full sample	988	0.1***	(3.7)	16%	0.2***	(4.3)	17%	-0.1	(-1.2)	15%	3.3***	(3.4)	16%
2001-2006	275	0.2***	(3.4)	19%	0.2**	(2.1)	16%	-0.5***	(-3.6)	19%	3.6*	(1.8)	16%
2007-2009	245	0.2**	(2.2)	20%	0.5***	(2.7)	21%	-0.1	(-1.3)	19%	6.3***	(2.9)	21%
2010-2014	468	0.1	(1.2)	17%	0.2***	(2.6)	18%	0.1	(0.8)	17%	2.3*	(1.7)	17%
D. Dispositions		Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2	Coef	(*t*-stat)	Adj R^2
Full sample	988	-0.1***	(-5.0)	12%	-0.1***	(-3.4)	10%	0.2***	(4.2)	11%	-2.1***	(-3.2)	10%
2001-2006	275	0.0	(-1.1)	4%	0.0	(-0.1)	4%	0.2**	(2.0)	5%	-1.7	(-1.5)	4%
2007-2009	245	-0.1***	(-3.1)	17%	-0.1	(-0.8)	14%	0.2***	(3.2)	17%	-0.8	(-0.7)	14%
2010-2014	468	-0.1***	(-2.9)	18%	-0.1**	(-2.5)	18%	0.1*	(1.8)	17%	-2.0**	(-2.0)	18%

Notes: Table 3 presents summary results from the estimated coefficient of $NAV\pi_{t-1}$ in equation (1).

$$Investment_{i,t} = \beta_0 + \beta_1 \cdot Firm\ age_{i,t-1} + \beta_2 \cdot Firm\ size_{i,t-1} + \beta_3 \cdot Debt\ ratio_{i,t-1} + \beta_4 \cdot Cash\ ratio_{i,t-1} + \beta_5 \cdot EBIT\ ratio_{i,t-1} + \beta_6 \cdot NAV\pi_{t-1} + \gamma \cdot P_i + \delta \cdot Y_t + \varepsilon. \quad (1)$$

Four versions of the dependent variable for $REIT_i$ in $year_t$ are estimated, including RE investment growth (Panel A), Net transactions (Panel B), Acquisitions (Panel C), and Dispositions (Panel D). For each version, the columns display results based on alternate measures of the NAV premium. The first column is for $NAV\pi_{t-1}$, consistent with Table 2. The second is NAV premium^{+}, which is non-negative, replacing all negative values for $NAV\pi_{t-1}$ with a value of zero. The third is NAV premium^{-}, which is the absolute value of all negative values for $NAV\pi_{t-1}$, replacing all positive values with value of zero. The fourth, I{NAV$_{\pi>0}$}, applies an indicator variable for positive values of $NAV\pi_{t-1}$. The estimations involve the full sample, along with subsamples for 2001-2006, 2007-2009, and 2010-2014 subperiods. The reporting includes the estimated coefficient (Coef) for the NAV premium variable and the corresponding *t*-statistic (*t*-stat) in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels of confidence respectively. Observations (Obs) are in firm-years.

Table 4

Threshold NAV Premiums

	RE investment growth		Net transactions		Acquisitions		Dispositions	
Variable	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)
$I\{NAV_{-15\% \le \pi < -10\%}\}$	-1.4	(-0.4)	-2.2	(-1.1)	-3.1*	(-1.8)	-0.9	(-0.8)
$I\{NAV_{-10\% \le \pi < -5\%}\}$	2.0	(0.6)	0.4	(0.2)	-1.6	(-1.0)	-2.0*	(-1.8)
$I\{NAV_{-5\% \le \pi < 0\%}\}$	4.2	(1.4)	1.8	(1.0)	-0.7	(-0.4)	-2.6**	(-2.3)
$I\{NAV_{0\% \le \pi < 5\%}\}$	6.3**	(2.0)	4.8**	(2.4)	1.7	(1.0)	-3.1***	(-2.6)
$I\{NAV_{5\% \le \pi < 10\%}\}$	6.0*	(1.8)	5.2**	(2.5)	0.9	(0.5)	-4.3***	(-3.5)
$I\{NAV_{10\% \le \pi < 15\%}\}$	12.0***	(3.3)	7.5***	(3.3)	2.8	(1.4)	-4.7***	(-3.5)
$I\{NAV_{\pi \ge 15\%}\}$	15.6***	(4.2)	9.7***	(4.2)	4.5**	(2.2)	-5.2***	(-3.8)
Firm characteristics	included		included		included		included	
Property type FEs	included		included		included		included	
Year FEs	included		included		included		included	
Adj R^2	16%		18%		16%		11%	
Obs	1,016		988		988		988	

Notes: Table 4 presents summary results for the estimated coefficients of a set of categorical indicators for the magnitude of $NAV\pi_{t-1}$ in equation (1).

$$Investment_{i,t} = \beta_0 + \beta_1 \cdot Firm\ age_{i,t-1} + \beta_2 \cdot Firm\ size_{i,t-1} + \beta_3 \cdot Debt\ ratio_{i,t-1} + \beta_4 \cdot Cash\ ratio_{i,t-1} + \beta_5 \cdot EBIT\ ratio_{i,t-1} + \beta_6 \cdot NAV\pi_{t-1} + \gamma \cdot P_i + \delta \cdot Y_t + \varepsilon. \quad (1)$$

Four versions of the dependent variable for $REIT_i$ in $year_t$ are estimated across the columns, including RE investment growth, Net transactions, Acquisitions, and Dispositions. The indicator variables are displayed on each row, including for NAV premiums from -15% to -10%, from -10% to -5%, from -5% to 0, from 0 to 5%, from 5% to 10%, from 10% to 15%, and greater than 15%. The estimation includes all firm characteristics in equation (1), along with fixed-effects for eight different property type foci (P_i) and 14 calendar years (Y_t). The reporting includes the estimated coefficient (Coef) for each NAV premium category along with the corresponding *t*-statistic (*t*-stat) in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels of confidence respectively. Observations (Obs) are in firm-years.

Table 5

Determinants of NAV Premiums

	$NAV\pi_{i,t}$		Relative $NAV\pi_{i,t}$	
Variable	Coef	(*t*-stat)	Coef	(*t*-stat)
Intercept	-30.9***	(-4.7)	-32.4***	(-9.3)
Firm $age_{i,t}$	-0.0	(-0.5)	-0.1***	(-3.2)
Firm $size_{i,t}$	3.0***	(8.5)	2.9***	(7.4)
Debt $ratio_{i,t}$	-7.2***	(-2.8)	-4.2	(-1.5)
Cash $ratio_{i,t}$	-4.4	(-0.4)	-5.8	(-0.5)
EBIT $ratio_{i,t}$	91.6***	(6.3)	159.5***	(10.9)
Major $share_{i,t}$	4.8***	(3.4)	3.4**	(2.2)
Prop type FEs	included		included	
Year FEs	included			
Adj R^2	53%		28%	
Obs	1,153		1,153	

Notes: Table 5 presents results from the estimations for the determinants of firm-level NAV premiums in equation (2).

$$NAV\pi_{i,t} = \beta_0 + \beta_1 \cdot Firm\ age_{i,t} + \beta_2 \cdot Firm\ size_{i,t} + \beta_3 \cdot Debt\ ratio_{i,t} + \beta_4 \cdot Cash\ ratio_{i,t} + \beta_5 \cdot EBIT\ ratio_{i,t} + \beta_6 \cdot Major\ share_{i,t} + \gamma \cdot P_i + \delta \cdot Y_t + \varepsilon. \quad (2)$$

Two versions of the dependent variable are used including $NAV\pi_{i,t}$, which is the NAV premium for firm i, and Relative $NAV\pi_{i,t}$, which is the NAV *premium* for firm i differenced from the aggregate NAV premium for the sector. The estimation includes all firm characteristics in equation (2), along with fixed-effects for eight different property type foci (P_i) and 14 calendar years (Y_t). The reporting includes the estimated coefficient (Coef) for each variable and the corresponding *t*-statistic (*t*-stat) in parentheses. *** and ** indicate statistical significance at the 1% and 5% levels of confidence respectively. Observations (Obs) are in firm-years. All variables defined in the notes to Table 1.

Table 6

Causality: Real Estate Mutual Fund Flows vs. NAV Premiums

Lag order	1	2	4	6
NAVπ → RE mutual fund flows	0.1	1.5	1.0	0.9
RE mutual fund flows → NAVπ	14.8***	10.3***	5.5***	3.9***

Notes: Table 6 reports Granger causality test *F*-statistics between two variables for various lag orders of 1, 2, 4, and 6 months. The first row provides the testing for whether aggregate NAV premiums Granger cause real estate mutual fund flows (NAVπ → RE mutual fund flows). The second row provides the testing for whether real estate mutual fund flows Granger cause aggregate NAV premiums (RE mutual fund flows → NAVπ). *** indicates statistical significance in the F-statistic at the 1% level. Measurement of RE mutual fund flows is discussed in the notes to Figure 3.

Table 7

Property Acquisitions: Market Share by Investor Type

	Retail				Office				Multifamily			
Investor type	Obs	Mean Sale price	Mean Bldg size	Mkt share	Obs	Mean Sale price	Mean Bldg size	Mkt share	Obs	Mean Sale price	Mean Bldg size	Mkt share
Individual	5,709	$2,984	24,780	30%	6,199	$3,112	37,919	8%	9,498	$3,354	38,315	24%
Corporate/user	2,539	$4,299	39,421	19%	2,746	$6,779	61,166	8%	762	$5,528	59,763	3%
Equity fund	79	$14,813	73,507	2%	309	$54,319	202,051	7%	409	$23,249	208,564	7%
Pension fund	38	$27,704	86,602	2%	132	$100,919	290,469	5%	79	$70,267	251,925	4%
Insurance	47	$9,070	64,245	1%	180	$66,775	222,166	5%	49	$48,639	221,628	2%
Investment manager	488	$14,209	69,803	12%	1,755	$53,592	211,670	39%	1,735	$30,248	220,057	40%
Private REIT	180	$9,338	60,425	3%	324	$40,202	179,696	5%	131	$13,261	170,517	1%
Non-listed REIT	220	$11,768	73,423	5%	256	$45,827	198,621	5%	175	$45,130	256,939	6%
Listed REIT	775	$18,510	87,319	26%	641	$68,796	228,219	18%	331	$49,113	276,972	12%
Total	10,075				12,542				13,169			

Notes: Table 7 displays the distribution of property transactions in the CoStar data by investor type for the retail, office, and multifamily samples. For each property type, the table reports the number of observations (Obs), the mean sale price (in $Thousands), the mean building size (in square feet), and the market share. Market share is based on the total dollar value of acquisitions for the investor type. The transactions sample covers the period from 2001 to 2014. The dataset is restricted to include only transactions with at least 10,000 square feet building size and at least $50,000 sale price. Submarkets with fewer than 100 transactions are not included in the sample.

Table 8

Property Transactions: Summary Statistics

Panel A. Retail Buyers

	Full sample		Listed REIT		Matched sample		*t*-test of
Variable	Mean	Std dev	Mean	Std dev	Mean	Std dev	difference
Sale price	$5,573	$16,637	$11,826	$16,689	$8,610	$10,667	-3.4***
Bldg size	37,960	70,782	59,690	60,480	44,935	44,355	-4.2***
Land size	170,899	334,404	297,561	361,608	252,623	297,034	-2.1**
Age	36.6	28.2	19.3	11.9	16.7	9.8	-3.7***
Floors	1.3	1.4	1.5	6.1	1.2	1.1	-1.0
Exchange	0.07	0.26	0.02	0.15	0.03	0.18	1.3
Distress	0.09	0.29	0.02	0.13	0.10	0.29	6.6***
Listed REIT	0.08	0.27	1	0	0	0	
$NAV\pi_{t-1}$			7.9%	6.9%			
Obs	10,075		370		848		

Panel B. Office Buyers

	Full sample		Listed REIT		Matched sample		*t*-test of
Variable	Mean	Std dev	Mean	Std dev	Mean	Std dev	difference
Sale price	$19,370	$66,123	$70,541	$180,997	$60,623	$109,531	-0.9
Bldg size	93,336	179,867	217,775	285,617	195,544	215,824	-1.3
Land size	146,552	691,904	212,516	256,488	217,235	305,539	0.3
Age	36.1	28.2	30.5	24.4	29.2	22.6	-0.8
Floors	4.9	7.0	9.1	10.6	8.3	8.4	-1.3
Class B	0.59	0.49	0.44	0.50	0.35	0.48	-2.8***
Class C	0.22	0.41	0.03	0.17	0.01	0.12	-1.6
Exchange	0.05	0.22	0.04	0.19	0.02	0.13	-1.9*
Distress	0.10	0.30	0.02	0.15	0.06	0.23	2.8***
Listed REIT	0.05	0.22	1	0	0	0	
$NAV\pi_{t-1}$			8.4%	7.6%			
Obs	12,542		335		887		

Panel C. Multifamily Buyers

	Full sample		Listed REIT		Matched sample		*t*-test of
Variable	Mean	Std dev	Mean	Std dev	Mean	Std dev	difference
Sale price	$10,014	$24,412	$46,896	$33,091	$51,740	$44,911	1.6
Bldg size	80,970	136,297	292,741	263,973	283,527	176,220	-0.4
Land size	176,311	933,600	448,513	595,784	577,610	1,880,570	1.4
Age	50.0	27.2	20.0	21.5	15.3	18.5	-2.6***
Floors	3.1	3.0	4.4	3.9	4.7	3.7	0.8
Floor size	28,588	47,826	88,528	69,088	76,503	54,063	-2.1**
Units	85.2	132.8	272.50	265.06	276.5	172.8	0.2
Class B	0.24	0.42	0.36	0.48	0.23	0.42	-3.3***
Class C	0.69	0.46	0.07	0.26	0.04	0.20	-1.4
Exchange	0.12	0.33	0.07	0.26	0.02	0.14	-2.7***
Distress	0.09	0.29	0.04	0.20	0.06	0.24	1.3
Listed REIT	0.03	0.16	1	0	0	0	
$NAV\pi_{t-1}$			9.3%	7.8%			
Obs	13,169		176		572		

Notes: Table 8 displays summary statistics for the sample of property transactions from the CoStar data. The transactions sample covers the period from 2001 to 2014. The dataset is restricted to include only transactions with at least 10,000 square feet building size and at least $50,000 sale price. Submarkets with fewer than 100 transactions are not included in the sample. Panel A displays the sample of retail acquisitions, Panel B displays the office sample, and Panel C displays the multifamily sample. For each property type, the table reports the sample mean (Mean) and standard deviation (Std dev) for the full sample, the subsample of listed REIT buyers, and the matched sample. The matched sample is comprised of properties purchased by other institutional investors (i.e., equity funds, insurance companies, investment managers, pension funds, listed REITs, private REITs, or unlisted REITs). In order to be included in the matched sample, the property must be of the same submarket, same property class, property age within five years range, property size within 40% range, and transaction date within two years range. The final column in each panel displays the *t*-test for difference in means between the listed REIT subsample and the matched sample. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels of confidence respectively.

Variables: Sale price is the transaction price, in $Thousands. Bldg size is the rentable building area, in square feet. Land size is the lot size, in gross square feet. Age is the property age, in years. Floors is the number of floors. Floor size is the average floor size, in square feet. Units is the count of individual rental units. Class B and Class C are indicators for the property class. Exchange is an indicator for 1031 exchange sales. Distress is an indicator for distress sales, including REO, auction, short sale, or bankruptcy. Listed REIT is an indicator for transactions where a listed REIT is the buyer. $NAV\pi_{t-1}$ is the NAV premiums for the REIT sector collected from Green Street Advisors, lagged by one year from the transaction date. Each transaction represents one observation.

Table 9

Property Transactions: Clientele Effect Estimation

Panel A. Retail

	Full sample				Matched sample			
Variable	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)
Intercept	2.76***	(16.5)	2.80***	(16.7)	2.80**	(2.0)	3.06**	(2.2)
ln(Bldg size)	0.56***	(37.2)	0.56***	(37.2)	0.62***	(5.5)	0.63***	(5.6)
ln(Land size)	0.08***	(8.7)	0.08***	(8.8)	0.01	(0.4)	0.01	(0.4)
ln(Age)	-0.41***	(-38.5)	-0.41***	(-38.5)	-0.34***	(-3.6)	-0.34***	(-3.6)
Floors	0.01**	(2.3)	0.01**	(2.4)	-0.01	(-1.1)	-0.01	(-1.3)
Exchange	0.34***	(11.6)	0.34***	(11.6)	0.13	(1.2)	0.14	(1.3)
Distress	-0.60***	(-22.8)	-0.59***	(-22.8)	-0.77***	(-9.5)	-0.74***	(-9.1)
Listed REIT	0.15***	(2.7)	0.03	(0.4)	0.01	(0.3)	-0.17**	(-2.3)
$NAV\pi_{t-1}$			1.54***	(3.8)			2.12***	(3.6)
Buyer type FEs	included		included		included		Included	
Property sub-type FEs	included		included					
Submarket FEs	included		included					
Control group FEs					included		included	
Year FEs	included		included		included		included	
Adj R^2	62%		62%		68%		69%	
Obs	10,075		10,075		1,218		1,218	

Panel B. Office

	Full sample				Matched sample			
Variable	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)
Intercept	3.05***	(12.3)	3.11***	(12.5)	-2.12	(-1.5)	-2.05	(-1.4)
ln(Bldg size)	0.47***	(26.9)	0.47***	(26.9)	1.10***	(10.8)	1.10***	(10.8)
ln(Land size)	0.08***	(7.9)	0.08***	(8.0)	-0.13***	(-5.8)	-0.13***	(-5.7)
ln(Age)	0.17***	(10.7)	0.17***	(10.6)	0.00	(0.0)	0.01	(0.1)
Floors	0.02***	(8.6)	0.02***	(8.7)	0.01	(0.9)	0.01	(1.0)
Class B	-0.59***	(-17.5)	-0.59***	(-17.5)				
Class C	-0.71***	(-16.2)	-0.71***	(-16.3)				
Exchange	0.60***	(13.2)	0.59***	(13.1)	0.14	(1.1)	0.10	(0.8)
Distress	-0.26***	(-7.5)	-0.26***	(-7.4)	-0.37***	(-4.1)	-0.35***	(-3.9)
Listed REIT	0.25***	(3.1)	0.07	(0.8)	0.09	(0.9)	-0.02	(-0.1)
$NAV\pi_{t-1}$			2.35***	(4.0)			1.21**	(2.1)
Buyer type FEs	included		included		included		Included	
Submarket FEs	included		included					
Control group FEs					included		included	
Year FEs	included		included		included		included	
Adj R^2	68%		68%		80%		80%	
Obs	12,542		12,542		1,222		1,222	

Panel C. Multifamily

	Full sample				Matched sample			
Variable	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)	Coef	(*t*-stat)
Intercept	2.56***	(17.4)	2.57***	(17.4)	2.88***	(2.8)	2.91***	(2.9)
ln(Bldg size)	0.40***	(24.5)	0.40***	(24.5)	0.48***	(5.3)	0.48***	(5.3)
ln(Land size)	-0.02***	(-3.1)	-0.02***	(-3.2)	-0.04**	(-2.2)	-0.04**	(-2.2)
ln(Age)	-0.23***	(-23.8)	-0.23***	(-23.8)	-0.19***	(-3.7)	-0.19***	(-3.6)
Floors	0.01***	(3.7)	0.01***	(3.6)	0.02***	(4.5)	0.02***	(4.4)
ln(Floor size)	0.01	(1.0)	0.01	(1.0)	-0.05*	(-1.9)	-0.05**	(-2.0)
ln(Units)	0.51***	(35.1)	0.51***	(35.1)	0.51***	(7.8)	0.51***	(7.9)
Class B	-0.30***	(-12.7)	-0.30***	(-12.8)				
Class C	-0.50***	(-19.6)	-0.51***	(-19.7)				
Exchange	0.10***	(6.8)	0.10***	(6.8)	-0.15*	(-1.7)	-0.16*	(-1.8)
Distress	-0.49***	(-27.7)	-0.49***	(-27.6)	-0.32***	(-5.0)	-0.33***	(-5.1)
Listed REIT	0.08*	(1.7)	-0.03	(-0.5)	0.03	(0.5)	-0.07	(-0.9)
$NAV\pi_{t-1}$			1.25***	(3.4)			1.03**	(2.5)
Buyer type FEs	included		included		included		Included	
Submarket FEs	included		included					
Control group FEs					included		included	
Year FEs	included		included		included		included	
Adj R^2	86%		86%		80%		81%	
Obs	13,169		13,169		748		748	

Notes: Table 9 presents results from the estimation of equation (4), the hedonic model for acquisition prices.

$$Price_t = X\beta + M\kappa + \Sigma\, \delta_t T_t + B\theta + \theta_1\, NAV\pi_{t-1} + \varepsilon. \quad (4)$$

The dependent variable is the purchase price, logged. *X* is a vector of physical and transactional characteristics that includes the property size (building and land), age, number of floors, floor size (for multifamily), number of units (for multifamily), property class (for office and multifamily), and 1031 exchange or distress sales. For retail, a set of indicator variables are used to control for property sub-type, including airport retail, community center, lifestyle center, neighborhood center, outlet center, power center, regional mall, strip center, and super-regional mall. *M* is a vector of fixed-effects (FEs) for either the matched sample control group or the geographic submarket (as classified in CoStar). T_t are calendar year fixed-effects. *B* is a vector of investor clienteles, including corporate/user (full sample only), equity fund, individual (full sample only), insurance, investment manager, pension fund, private REIT, unlisted REIT, and listed REIT. The estimation also includes an interaction term, $NAV\pi_{t-1}$, lagged one year, to capture the effect of NAV premiums on prices paid by listed REITs. Panel A displays results for the sample of retail acquisitions, Panel B displays results for the office sample, and Panel C displays results for the multifamily sample. For each property type, the table reports estimation results from the full sample and matched samples, with and without the $NAV\pi_{t-1}$ variable included. Based on the corresponding *t*-statistic in parentheses (*t*-stat), ***, **, and * indicate statistical significance for the estimated coefficient (Coef) at the 1%, 5%, and 10% levels of confidence respectively. The variables and samples are described in the notes to Table 8.