# Distance to Headquarter and Real Estate Equity Performance

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## Abstract

We study the effect of geographic portfolio diversification of real estate firms on their investment performance before and after the global financial crisis (GFC). In addition to previously used dispersion metrics, we also account for the distance of the properties to the corporate headquarters. We document a notable shift in the non-market performance of real estate companies after the crisis. Pre-GFC, we do not find a difference in non-market performance across equities based on geographic diversification. Post-GFC, equities with high geographic dispersion significantly outperform the market, while firms with concentrated property holdings do not deliver a significant alpha. Increased real estate equity market sophistication and strong institutional presence can explain why this effect is only observed for dispersed small firms, those invested outside gateway metro areas, or companies with low institutional ownership.

**Keywords**: Distance to headquarter, real estate returns.

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## 1 Introduction

To what extent does geographic diversification affect the performance of real estate firms? There is a vast amount of literature in finance which studies the impact of a firm's diversification on its value and performance; however, the evidence is still not conclusive. For example, Garcia and Norli (2012) show that stock returns of local firms exceed returns on geographically dispersed firms, which is associated with a premium for insufficient diversification. More recently, Ling et al. (2018) explore the effects on real estate firms and show that higher home market concentration is associated with higher returns, confirming an information-based channel of asset concentration similar to Van Nieuwerburgh and Weldkamp (2009). More broadly, such findings have led researchers to assume that diversification of a firm's assets destroys value and that conglomerates are inefficient. However, Feng et al. (2019) find a non-linear relationship between geographic diversification (concentration) of real estate firms and firm value. While they find that concentration of properties has a positive effect on firm value of real estate companies, it is only true if those firms are less transparent. Operating efficiency stemming from increased firm transparency plays an important role in what direction the relationship can take. More transparent firms can increase their revenue generation through diversification and achieve higher firm value.

We add to the existing literature by studying the role of geographic portfolio dispersion (concentration) within real estate firms for equity performance before and after the Global Financial Crisis (GFC). The increase in transparency and familiarity of institutional investors with real estate investment trusts (REITs) as an investment vehicle and the increase in sophistication of REITs over the last decade could have led to changes in investor risk attitudes towards real estate firms. Investors may not perceive property concentration as risky as before, especially if those investors have a well-diversified portfolio of real estate firms. The majority of the REITs in the U.S. are owned in large proportion by the largest institutional investors. As Ling et al. (2020) demonstrate, more than 75% of institutional owners hold more than one REITs during the period from 2010 to 2015, which is 1.5 times higher than before 2008. Increased interest from institutional investors increases market transparency, as documented by Feng et al. (2019), and hence lower the required risk premium.

García and Norli (2012) show that if there is low investor recognition, as is the case with local firms, investors receive a non-market return of 70 basis points per month to compensate investors

for taking that risk. Lehavy and Sloan (2008) also find that firm value increases with investors' recognition leading to lower future returns. We double-sort portfolios based on various dispersion metrics and firm characteristics to find out which firms deliver an excess return and how this has changed following the GFC.

In addition to the standard measures of portfolio diversification used in real estate studies, such as the Herfindahl Index (HHI) or the number of properties nearby firm's headquarters, we also look at dispersion or diversification as measured by the distance of the properties to firm's headquarters. Figure 1 shows the average of the square root distance to headquarters (DHQ), the HHI, and the proportion of properties located outside the home MSA across the companies in our sample. Starting in 2004, the average DHQ strongly increases over time. During the global financial crisis (GFC) it stabilizes, and following the GFC, it again strongly rises. Although based on averages, this pattern suggests that real estate firms have changed the way they allocate capital across space and over time. It is, therefore, the objective of this paper to look at how this pattern affects the firm's investment performance.

<< Figure 1 about here >>

The increase in average DHQ, as well as in the share of properties outside of the home MSA, could be a sign of a systematic move of real estate companies towards more geographic diversification over time. This can be caused by the increased sophistication of the real estate markets and investors. We see that the investment in properties further away from the HQ is not only focussed on small properties in terms of square feet or in terms of property value. Real estate managers have increased their risk appetite and started exploring more distant investment opportunities. On the one side, the argument goes that firms that have a geographically more diversified portfolio of properties should be exposed to less idiosyncratic risk, resulting in insignificant alpha. On the other side, high DHQ can be associated with managers going outside of their areas of expertise and specialization and taking more risk. This can lead to agency costs if, for example, managers overinvest and grow their firms beyond the optimal size even though such investments are not necessarily value-maximizing. Even if this is not be the case, investing in properties further away from the firm's HQ has been associated with lower operating efficiency, i.e., higher management costs. Therefore, investors would request a risk premium, i.e., higher alpha, for investing in companies with high DHQ.

There are a few studies that support this line of thought. Aggarwal and Samwick (2003) did not find evidence to show that managers diversify their firms to reduce their exposure to risk. Instead, the motive is to capture private benefits, such as prestige or better career prospects managing a more diversified portfolio. Hartzell et al. (2014) looked at whether diversification of assets of real estate firms across geography and over property types can add or destroy firm value. They found that diversification across locations lowers firm value. Using real estate investment trusts (REITs) between 2010 to 2016, Feng et al. (2019) find that property and firm operating efficiencies generally decrease with diversification.

REITs have more comprehensive external monitoring compared to other companies. First of all, REITs have to pay out 90% taxable income as a dividend, which can mitigate agency conflicts by restricting managers' access to free cash flow (Ghosh and Sun, 2014). Second, REITs have had fairly high leverage[4] and have a high degree of institutional ownership. It suggests that they are scrutinized by both debt and equity investors and have high exposure to fluctuations on the equity markets. Therefore, firms with high institutional ownership can have fewer agency problems and managers would be less prone to trade-off alpha for property portfolio dispersion.

We find supporting evidence for the above considerations. Firms with high DHQ are associated with a significantly higher alpha as compared to firms with low DHQ since 2010. Pre-GFC, the relationship between geographic dispersion and equity performance is weak. Using double-sorted portfolios, we show that of the dispersed equities, only small firms, firms with little exposure to the top 25 MSAs, or firms with low institutional ownership outperform the market after the GFC. The increased sophistication of the real estate equity market leads to better information dissemination and less opportunities for outperformance. Geographic dispersion metrics, in addition to company characteristics of market sophistication, can be a good way to sift through REITs and identify winners and losers. We show that a long-short strategy based on property dispersion metrics can lead to a significant non-market return between 6 and 9 percent per year.

[4] Real estate companies have considerable decreased their leverage following the GFC.

The remainder of the paper proceeds as follows. Section 2 summarizes the literature review. Section 3 describes our data and discusses the methodology used. Section 4 describes our findings. Section 5 concludes.

## 2 Literature review

The literature has explored this topic from many different angles. One strand of research has focussed on dispersed firms in the sense of operations being in multiple industries, which are having lower tax burdens than stand-alone firms (Kim et al. (2017)). Another strand of research examines the impact of diversification on a firm's stock returns concluding that, due to information asymmetries, investors in concentrated firms would be rewarded with significant non-market returns (Aarland et al. (2007); Gacial and Norli (2012); Giroud (2013); Hartzell et al. (2014)). With regards to performance, several studies (Bernie et al. (2015), Coval and Moskowitz (1999, 2001), and Malloy (2005) amongst others) look at geographic proximity effects documenting the existence for home bias for stock returns. Malloy (2005) documents that geographically proximate analysts possess an information advantage and impact prices more than distant analysts, which suggests that there is a geographic dimension to the agency problems in equity analysis.

Previous literature often shows that dispersed firms are traded at a discount compared to the concentrated firms. These findings have led researchers to assume that diversification destroys value. One key conjecture is that geographical distribution of firms' activities generates location-based information asymmetry among investors, which in return influences the portfolio decisions and performance of those investors. This is due to several related reasons. The first is related to how efficiently the firm can aggregate and report value-relevant information. Geographically concentrated firms are able to collect and report data in a more efficient way than dispersed firms (e.g., Aarland et al. 2007; Giroud 2013).

Consequently, some local information can be lost in the aggregation process, giving investors near economically relevant non-headquarters locations a potential informational advantage. Besides, local firms also enjoy local social networks, resulting in local informational advantages. Local social ties brought by firms' activities provide access to local agents, for example, employees, customers, and suppliers, who are most likely to possess value-relevant information (e.g., Cohen, Frazzini, and Malloy 2008; Hong, Kubik, and Stein, 2008). As a result,

local investors perceive an informational advantage where, in fact, there is none. Using a 10K based localization measurement, Bernile et al. (2015) show that firm-level information is geographically distributed and institutional investors can exploit the resulting information asymmetry. Geographical variation in firm-level information generates economically significant location-based information asymmetry. This pattern is stronger among hard-to-value firms. By extracting the state, name counts on 10-K, Garcia and Norli (2012) distinguish firms with business operations in only a few states compared to firms with operations in multiple states. They find that stocks of truly local firms have returns that exceed the return on stocks of geographically dispersed firms by 70 basis points per month.

Similar conclusions are also found in real estate firms. Focusing on REITs, Hartzell et al. (2014) show a negative relationship between REITs' value and diversification. However, they find that the diversification discount is lower for firms with more institutional ownership, especially institutional types that tend to be more active monitors. In their paper, diversification is measured as the Herfindahl index of the concentration of the weight regions and MSAs. Ling et al. (2018) focus on the home market concentration of real estate firms. They measure the concentration as the proportion of properties of a firm located in the same MSA as the firm's headquarters. Their results show a significant positive relationship between home market concentration and firm returns, consisting of the conjecture that managers perceive information advantage by their exposure to local markets.

In addition to informational considerations, previous literature also shows that social factors work alongside to make geography an essential dimension for corporate decisions. Landier et al. (2009) propose that geographical dispersion decreases the value of firms because 1) they are less employee-friendly; 2) they are more likely to be subjected to dismissals of divisional employees and 3) they appear to divest out-of-state entities before those in-state. Therefore, stock markets respond favorably to divestitures of in-state division. By investigating asset sell-offs by REITs, Wang et al. (2017) find supportive evidence for above managerial alignment effects. In particular, they find a negative relationship between distance sales and post-sell-off stock market reaction, which is measured as a cumulative abnormal return. This finding implies that the managerial alignment hypothesis dominates the information asymmetry hypothesis in REITs' asset sell-offs. They also show that the social interaction effect exists for those HQs located in less populated areas.

A further explanation of the diversification discount includes agency considerations. Agency theory indicates that managers generally tend to over-invest and grow their firms beyond the optimal size. Such investments are not necessarily value-maximizing, which is likely to diminish the firm value. Aggarwal and Samwick (2003) integrate the two agency explanations of diversification – private benefits and risk reduction – into a single combined model. Their evidence does not show that managers diversify their firms to reduce their exposure to risk, but their evidence does support the notion of private benefits. Agency issues can also result in the inefficiency of internal capital markets, which challenges the motive of diversification – creating an internal capital market. For instance, in a moral hazard model, Wulf (2009) shows that investment inefficiency depends on 1) division managers' ability to skew information, 2) division managers' compensation incentives, and 3) the public image of the investment opportunity. However, agency problems do not seem to seriously affect REITs, which could be since the real estate industry is more transparent and easy to manage as compared to other sectors, such as high technology firms. Capozza and Seguin (1999) find that diversified REITs have slightly higher cash flows than focused REITs. However, they also show that the benefits of diversification are offset by higher administrative costs and a higher liquidity premium. They conclude that a higher liquidity premium is due to the informational asymmetries or transparency costs.

More recently, Feng et al. (2019) find a nonlinear relationship between geographic concentration and REIT firm value. Geographic diversification (concentration) is associated with higher REIT values for firms being more (less) transparent. The transparency is defined as a high level of institutional ownership or investing in core property type. Generally, operating inefficiency, both at the property level and the firm level, decreases with diversification. However, the relationship becomes insignificant when firm's transparency improves.

## 3 Data and Methodology

The data regarding the individual company characteristics, including the concentration measures, are collected from SNL Financial. The returns and the market capitalization data are from Thomson Reuters Datastream. We collect data for all available U.S. listed real estate companies between the years 1996 and 2015. Data were collected from a total of 223 real estate firms. However, not all of the firms report the location of their properties; therefore, we only use those firms which provide

property level information[5]. We also exclude firms holding real estate assets internationally. REITs that invest internationally are subject to different market dynamics and require the use of international Fama-French factors instead. The above considerations leave us with 162 unique firms for which we have data at least for some of the years above. We do not have162 firms in 1996, which marks the beginning of our sample period, as the real estate market is growing rapidly during the 1990s and 2000s and more firms enter the sample as times goes by. We start off with 70 firms in 1997 and gradually add more and more firms throughout the sample period.[6] That is displayed in Figure 2.

Figure 2 shows the number of firms over time with complete data as well as their market capitalization. Up until 2015, the number of listed real estate companies with available data has steadily increased from 70 to 162. The average firm size has also increased by over fivefold, from $94 billion to over $461 billion. During the GFC, real estate companies experienced a large drop in market capitalization and shrunk from $350 billion in 2006 to $165 billion in 2008. The market cap has quickly recovered over the following years surpassing the pre-crisis levels in 2013. Between 2010 and 2015, real estate companies showed the highest increase in market capitalization across the entire sample period.

<< Figure 2 about here>>

Table 1 summarizes firm characteristics of the real estate companies. The average annual return is 6.1%, with a high standard deviation of 41.9%. The daily volatility is a time series of the standard deviation of daily return for a given year. The average daily volatility is 2.3% with a maximum of 46.7% and a minimum of 0.1%. We report the age of the company since its initial public offering (IPO). The average age in our saomple is 9.46 years. However, some firms are as old as 63 years. We also see a large variation across the size of the companies in terms of market capitalization with the highest being $2,074 million and the lowest $9 million. On average, a company has a market capitalization of $1.81 billion. The average market-to-book (M/B) ratio is 1.08. It is slightly higher than the average ratio of 0.8 across all types of industries. We also include

[5] At the property level, we exclude properties located outside mainland U.S. – that means properties located in states like Alaska or Hawaii, for example, are not included to enable a reasonable calculation of the average distance between property pairs.

[6] None of the firms exits the sample period once they have entered. This is a standard way of constructing a data sample in asset pricing model.

the turnover ratio as a measure of liquidity. Barinov (2014) shows that the turnover ratio is negatively related to liquidity, and that relationship is stronger for firms with option-like equity due to bad credit ratings. We calculate the turnover ratio as the total value of the trading volume of a company for a given year divided by the end-of-year outstanding value of the common stocks. The higher the turnover ratio, the more liquid the company is. On average, each common share is traded 2.76 times a year. Also, we see that, on average, 86% of real estates' equity is owned by institutional investors. This ratio is considerably higher than the average in other industries or other countries for the same industry. It highlights the important role of institutional investors play for information dissemination, pricing and valuation.

We follow Ling et al. (2018) and create a variable that measures the exposure of each REIT to the 25 key MSAs. The 25 MSAs are Atlanta, Boston, Chicago, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Miami, Minneapolis, New York, Orlando, Philadelphia, Phoenix, Portland, Sacramento, Saint Louis, San Antonio, San Diego, San Francisco, Seattle, Tampa, and Washington, D.C. These MSAs have the highest population and complete NCREIF total return indices for each of the four core property types since 1996. On average, 48% of properties owned by a real estate company are located in the 25 MSAs.

<< Table 1 about here >>

We examine the non-market returns (or alphas) on REITs portfolios using an asset pricing model:

$$r_{p,t} - r_{f,t} = \alpha_p + \beta_{p,1} Market_t + \beta_{p,2} Size_t + \beta_{p,3} Value_t + \beta_{p,4} Momentum_t + \beta_{p,5} Liquidity_t + \beta_{p,6} RE_t + \varepsilon_{p,t}, \quad (1)$$

where $r_{p,t}$ is the equally-weighted monthly return on a given portfolio and $r_{f,t}$ is the corresponding risk-free rate as measured by the yield on the 1-month Treasury bill. We use two sets of factors. The first set are the two Fama-French factors, the Carhart momentum factor, and the Pastor and Stambaugh liquidity factor. The data is obtained from Ken French's website. Specifically, the factors comprise a U.S. market return index (Market), the difference between the returns on diversified portfolios of small stocks and big stocks (Size) and the difference between the returns

on diversified portfolios of high book-to-market (value) stocks, low book-to-market (growth) stocks (Value), the difference between the monthly returns on diversified portfolios of winners and losers over the past year (Momentum) and the difference between the monthly returns on portfolios of the most liquid and illiquid stocks (Liquidiry). To control for the real estate market exposure, we also include both listed real estate returns from the FTSE EPRA/NAREIT index[7]. As shown in Table 2, REITs are more volatile than general stock markets over the period from 1996 to 2015. Direct real estate investment exhibits the highest return but lowest volatility among the three sectors.

<< Table 2 about here>>

The distance of the properties of a firm from its headquarters is defined as

$$DHQ_{it} = \frac{1}{N_{t,i}} \sum_{n=1}^{N} sqrt(Dist_{t,n,i}), \quad (2)$$

where $sqrt\,(Dist_{t,n,i})$ is the square root of the distance of property $n$ of firm $i$ from the headquarters, with $n$ =1, 2,…, $N$. $N$ is the total number of properties held by firm $i$.

For robustness purposes, we also apply two other measures that have previously been used to account for market concentration. The traditional way to account for market power or market concentration is to construct the Herfindahl-Hirschman Index (HHI). We construct the HHI at the MSA level. The HHI measures the geographic concentration of properties of one firm across the MSAs. It is calculated by squaring the market share of properties that locate in each MSA with respect to the total number of properties for the given firm $i$ in a given MSA $l$ in a given year $t$, and then summing the resulting shares across the MSAs. The HHI ranges from close to 0 to 1. When the HHI equals 1, it means that all properties of the firm are located in the same MSA and the concentration is highest. The lower the HHI value, the less concentrated a firm's properties across the MSAs are. The HHI is calculated as

$$HHI_{it} = \sum_{l=1}^{L} \left(\frac{P_{t,i,l}}{N_{t,i}}\right)^2, \quad (3)$$

[7] Alternatively, we also used NCRIEF total return indicator as additional measure for real estate market performance, the results remain robust. However, the beta for NCREIF total return index is significantly negative, which might be caused by the multicollinearity between NCRIEF return, NAREIT return, and stock market return.

where $P_{t,i,l}$ is the number of properties of firm *i* with *n*=1, 2,…, *N* that locate in MSA *l* with *l*=1, 2,…, *L* in year *t.*

An alternative measure to account for asset concentration is to measure the proportion of properties located in the MSA where the headquarters are located. This measure has been used by Ling et al. (2018). We define a variable HOME for time *t* and company *i* so that:

$$HOME_{t,i} = \frac{1}{N_{t,1}} \sum_{n=1}^{N} D_{t,n,i}, \quad (4)$$

where $D_{t,n,i}$ is the dummy variable with the value of 1 if the property is located in the home MSA and 0 otherwise.

<< Table 3 about here >>

Table 3 reports the DHQ, the HHI for geographic concentration, and the proportion of properties located in home MSA held by each firm across time (Panel A) and firm size (Panel B). The information in Table 3 provides a comprehensive overview of the geographic scope of U.S. REIT holdings. Panel A in Table 3 presents the summary statistics of all firms in the sample. Focusing on the first row, the DHQ is 1,125 km (27 km in terms of the average of the squared root of distance). Based on that, the geographic dispersion shows some variations. The maximum DHQ was 1,277 km (31 km in terms of the average of the squared root of distance) in 2015, and the minimum DHQ is 1,051 km (25 km in terms of the average of the squared root of distance). The finding for the standard deviation of DHQ shows that there is a significant variation in our measure of geographic dispersion across firms. The cross-sectional standard deviation of DHQ is 728 km (13 km in terms of the average of the squared root of distance), the standard deviation of HHI value is 0.242, and the standard deviation of the share of home assets is 0.252. Moreover, the cross-sectional variation does not change much over time. The maximum standard deviation is 700 km for DHQ, 0.199 for HHI MSA concentration and 0.166 for the share of home assets, respectively.

Panel B in Table 3 breaks down the averages from the first row of Panel A by the size of firms. As one would expect, big firms are more geographically dispersed and hold more properties. The DHQ for big firms is 1,438 km, while only 832 km (23 km in terms of the average of the squared root of distance) for small firms. The HHI concentration indicator and share of assets

located in the headquarters MSA are also higher for small firms, vary from 0.13 (HHI) and 0.108 (HOME) for big firms to 0.243 (HHI) and 0.230 (HOME) to small firms. However, the difference is not as remarkable as the number of properties each firm holds. Big firms hold an average of 347 properties for each firm, while small firms hold only around 20% of that amount. Even within size terciles, there is a significant amount of variation in geographic dispersion. Taking DHQ, for example, the cross-sectional standard deviation for the three groups of firms is similar to the overall sample, which is over 700km (12 km in terms of the average of the squared root of distance). For small firms, the 75% quantile of DHQ is 1,184km (41 km in terms of the average of the squared root of distance) while the 25% quantile is only 348 km (23 km in terms of the average of the squared root of distance). For large firms, the 75% quantile of DHQ is over 3 times the 25% quantile of average distance. This conclusion is also confirmed by using the HHI MSA concentration indicator and share of properties located in the home MSA. There are significant variations within each size tercile.

As shown in Panel C in Table 3, after 2006, DHQ increases, implying that firms have invested in properties further away from the headquarters. Overall, from 1996 to 2015, with the maturity of the REITs industry, U.S. REITs have become more geographically diversified. The average distance to headquarter increases from 1,065km before 2006 to 1,209 km during the period between 2010 to 2015. The increase in the distance is also statistically significant at the 1 percent significance level. Figure 1 also confirms the increase in the distance of assets to the headquarters over time.

A similar trend can also be found for HHI and HOME. The average MSA concentration rate (HHI) is 0.21 between 1996 and 2015 (Table 3, row 1 for HHI concentration of MSAs), and the average proportion of properties located in the MSA of the HQ (HOME) is 16%. From Figure 1, the HHI decreased continuously from 0.21 in 1996 to 0.17 in 2015. The highest concentration appears in 1998, with a value of 0.24. The proportion of assets located in the home MSA also slightly decreases from 0.17 in 1996 to 0.15 in 2006, but slightly increases to 0.17 again during the crisis period. After GFC, the share of home assets drops to 0.14 in 2015 again. However, as shown in Table 3 Panel C, there is no statistically significant difference in HHI and HOME before and after the GFC.

In summary, Table 3 shows a significant cross-sectional variation in geographic dispersion.

The geographic dispersion increases over time and remains large even when breaking down the cross-section by size, as shown in Figure 1. There is a significant increase in the average distance of assets to headquarter before and after the crisis.

## 4 Results

### 4.1 Portfolio Construction and Non-Market Returns

The regressions are based on portfolios of U.S. REITs' daily returns between 1996 and 2015. The baseline results present alphas of portfolios sorted five quantiles, from into the bottom 20th percentile of concentrated and the upper 20th percentile of dispersed firms. Table 4 reports alpha and beta for each portfolio based on Equation 1. Among the six factors, the stock market factor, which is measured as the Fama-French market risk, and the orthogonal real estate factor, which is measured as the spread of NAREIT excess return and market factor, have the highest sensitivity.[8] The beta coefficient is always above 0.5. We also see after 2007, size factor and high minus low factor become critical.

More importantly, from 1996 to 2006, both concentrated and dispersed firms are associated with a significant alpha. Although the difference in the alpha between the most concentrated and dispersed portfolios is significant (Table 4-A, Panel B) the difference becomes insignificant when other measurements for dispersion/concentration are used (Table 5). During the GFC, alpha for the five portfolios is insignificant. What is behind the return dynamics is rather an increased sensitivity to market risk.

Over the period from 2010 to 2015, the results show that dispersed firms are associated with a significantly positive alpha while concentrated portfolios are not associated with a

[8] We have performed additional robustness for our result of Table 4: (1) There were 41 firms in our sample of 223 firms that were acquired during our sample period. The concern arises that the acquirer may not purchase all the properties, even though SNL keeps the records of the firms and the changes in the headquarter/assets. We rerun Table 4 excluding the 41 firms, and the findings are robust as shown in Appendix Table A1; (2) To address the concern of couple firms driving our findings and causing the results being biased, we winsorize the returns at 95 percentile. The results are still robust as documented in Appendix Table A2; (3) Lastly, we use the adjusted-cost weighted distance measured by is the maximum of the reported book value, the initial cost of the property, and the historical cost of the property, including capital expenditures and tax depreciation. The results are relatively robust, as in Appendix Table A3.

significant alpha. This is in line with results in Feng et al. (2019). They show that more diversified REITs have higher firm value if they are more transparent and are able to improve operating efficiency using a sample of REITs between 2010 and 2016. One of the reasons of the insignificance in the concentrated portfolio could be the increased transparency and familiarity of institutional investors with REITs leading to changes in investor risk attitudes towards real estate equities. Investors do not need to be rewarded for investing in real estate stocks with high geographic concentration anymore, especially if those investors have a well-diversified portfolio of real estate firms – the funds of funds effect. The majority of the REITs in the U.S. are owned in large proportion by the largest institutional investors.

However, it could also be that real estate managers have increased their risk appetite and started exploring more distant investment opportunities. Figure 1 shows that since 2010, the average DHQ has increased furthermore which is a sign of a change in the manager's attitudes towards geographic diversification.

On the one side, firms that have a geographically more diversified portfolio of properties should be exposed to less idiosyncratic risk, leading to insignificant alpha. On the other side, high DHQ can be associated with managers going outside of their areas of expertise and specialization and taking on more risk. Agency costs can rise if, for example, managers overinvest and grow their firms beyond the optimal size even though such investments may not be necessarily value-maximizing. Therefore, investors may request a risk premium, i.e. higher alpha, for investing in companies with high DHQ or more diversified firms. Risk attitudes of institutional investors buying REITs could have also shifted after the GFC, so that an investment in concentrated or less geographically diversified REITs is not considered risky anymore. That could be due to the fact that most large institutional investors hold a large number of the REITs already and would not be exposed to geographic risks stemming from underlying property exposures. That can explain why alpha of concentrated (low DHQ) firms is not significant after 2010.

Firms with the $20^{th}$ quantile largest DHQ experience an average monthly return of 44 basis points. Firms with $20^{th}$ quantile smallest DHQ experience an average monthly return of 6 basis points, which is insignificantly different from zero. This implies 38 basis points monthly (4.56 percent annually) return difference, which is also statistically significant. During the crisis period, the return difference between the dispersed and concentrated REITs is even larger, amounting to

1.48 percent per month (17.76 percent annually).

<< Table 4 about here>>

For robustness purposes, we substitute the DHQ by other dispersion metrics, including the proportion of properties locating in the same MSA as their headquarters and the HHI MSA concentration indicator. The results in Table 5 show that alpha is significant in both cases, a high DHQ and a low DHQ portfolio between 1996 and 2006 and the difference isn't significant in most cases. We also replace the equally-weighted DHQ by a size-weighted or a value-weighted DHQ and the results remain robust.

<< Table 5 about here >>

**4.2 Cross-sectional Fama-MacBeth regression results**

As a further robustness check of above results, we estimate Fama-MacBeth cross-sectional regressions. The results confirm the findings from the univariate portfolio analysis. For each year of our sample periods, we estimate the following cross-sectional regression:

$$R_{i,t} - R_{f,t} = c_0 + \sum_{m=1}^{M} c_{i,m} X_{m,i,t-1} + e_{i,t}, \quad (5)$$

where $R_{i,t} - R_{f,t}$ is the firm's annual excess return with respect to the yield on the 1-month Treasury bill. $X_{m,i,t-1}$ is one of the following $M$ firm characteristics: the natural log of age; the change in size defined as the log-difference in firm's aggregate market capitalization; the market-to-book ratio; total debt divided by the book value of equity; volatility, defined as annual standard deviation of the daily return; stock turnover; and the institutional ownership ratio. We also include a dummy for the predominant property type.

<< Table 6 about here>>

Before the GFC, diversified firms do not seem to show significantly different returns from non-diversified firms for two out of the three metrics. Only for firms with high HHI (low diversification), returns are significantly higher, suggesting that concentration within fewer MSAs leads to significantly higher returns. We document that in Figure 1, the average concentration pattern over time varies depending on which diversification/concentration metric we will use. The

different metrics can, therefore, be associated with different dynamics, and it is important to use various measures of diversification to assess the overall effects on performance.

Between 2010 to 2015[9], all metrics are significant with the expected signs. Firms with higher DHQ, firms with lower HHI concentration, or firms with fewer assets in home MSA would have a significantly higher excess return. This confirms our finding that after the GFC, firms with dispersed assets show higher excess returns. A one percent increase in the average square root of distance to headquarters is associated with a 0.6% increase in returns.

### 4.3 Double-sorted portfolios

We investigate further what is behind the outperformance of geographically diversified real estate firms. We independently double-sort stocks according to their DHQ, and one of the three firm characteristics: size, exposure to the top 25 gateway MSAs and institutional ownership. For each category, we sort the firms into three equal quantiles, which leave us with a total of nine (3×3) portfolios. We also divide the sample period into pre-GFC and post-GFC.

Table 7 shows the results of a double sorting on size and DHQ. We choose to look into firm size as small firms that decide to diversify geographically, choosing to invest far away from their HQ, may struggle to manage their property holdings in the distant areas and raise some questions as to what the motivation behind this is. Wether due to agency costs or operational inefficiencies, investors would expect a risk premium to invest in those firms. Our results confirm this assumption. The highest and the only significant alpha is found for the smallest REITs with the most dispersed assets. The concentration of properties is not associated with outperformance since 2010.

<< Table 7 about here >>

[9] The period between 2007 to 2009 is too short to run a Fama-MacBech regression.

Table 8 shows double-sorted portfolios based on geographic dispersion and exposure to the 25 getaway MSAs. For the latter, we look at the bottom 33 percent and the top 33 percent of exposure to 25 gateway markets. The 25 gateway markets are the most populated areas with the higher transaction volume and most information available. For instance, NCRIEF published total return indices for the core types of property investments for these markets since 1996. Therefore, we would expect that in those markets, there would be less degree of information asymmetry. In other words, investing in these gateway markets can be perceived as less risky than investing in other markets. Our findings confirm this assumption. After 2010, the highest alpha is found only for diversified REITs with the lowest exposure to the 25 top MSAs. These firms, while geographically diversified, may be seen as higher risk (and hence higher return) and only geographic diversification is not enough but the right diversification matters. That is only true for firms that have geographically dispersed portfolios and not for firms that have the lowest exposure to the top 25 MSAs but are concentrated. Investing far away from the HQ is expected to deliver outperformance and compensate for potential information asymmetries.

<< Table 8 about here >>

Table 9 reports double-sorted portfolios by DHQ and institutional ownership. Before the crisis, both REITs with higher institutional ownership and those with lower institutional ownership outperformed the market. Also, there is no difference across top and bottom DHQ portfolios with all alphas being significant, and the differences in the portfolio alphas not significant. Over the period between 2010 and 2015, we see mild significance for diversified firms with low institutional ownership, albeit at 10%. A portfolio of firms that have low institutional ownership and distant properties is associated with a significantly positive alpha of 0.56% per month. The alphas of the other portfolios are insignificant. Previous research by Hartzell et al. (2014) that had explored the shareholder composition in real estate firms argues that companies with greater institutional ownership tend to be better managed as they are subject to more shareholder scrutiny. Therefore, investors may perceive REITs with lower institutional ownership as bearing risks related to agency costs as they are scrutinized less, especially when the REIT assets are far away from the HQ and therefore the firm is subject to operational inefficiencies.

<< Table 9 about here>>

## 5 Conclusion

This paper studies the role of geographic portfolio diversification (concentration) within real estate firms for their performance before and after the GFC. The increase in transparency and familiarity of institutional investors with REITs and the increase in sophistication of REITs over the last decade could have led to changes in investor risk attitudes towards real estate firms. Investors may not perceive asset concentration as risky as before, especially if the investors hold a well-diversified portfolio of real estate companies. We document that real estate firms with dispersed assets would be associated with positive non-market returns after the crisis period. In particular, for small firms, firms with lower institutional ownership, firms with lower exposure to the top 25 MSAs, the non-market return increases significantly with the increase in the degree of dispersion of assets.

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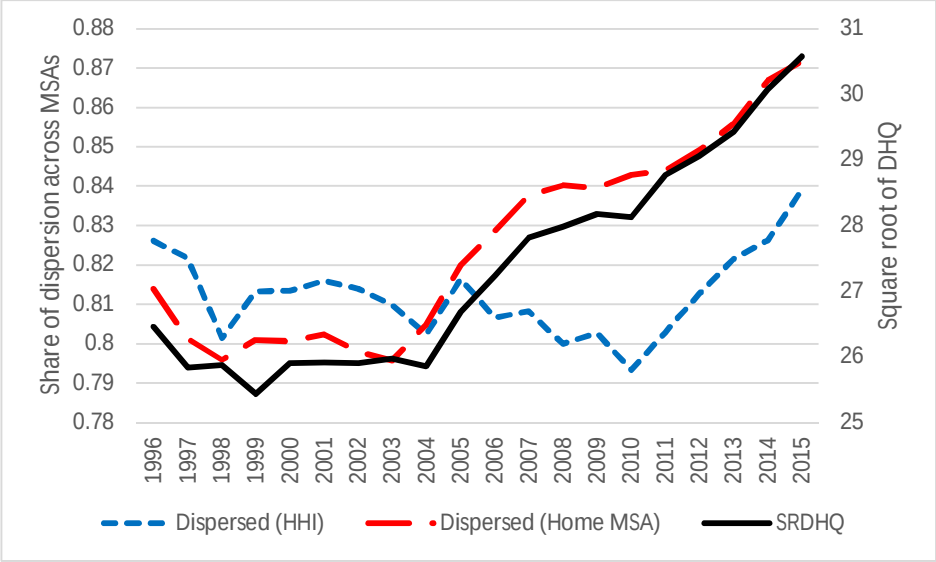
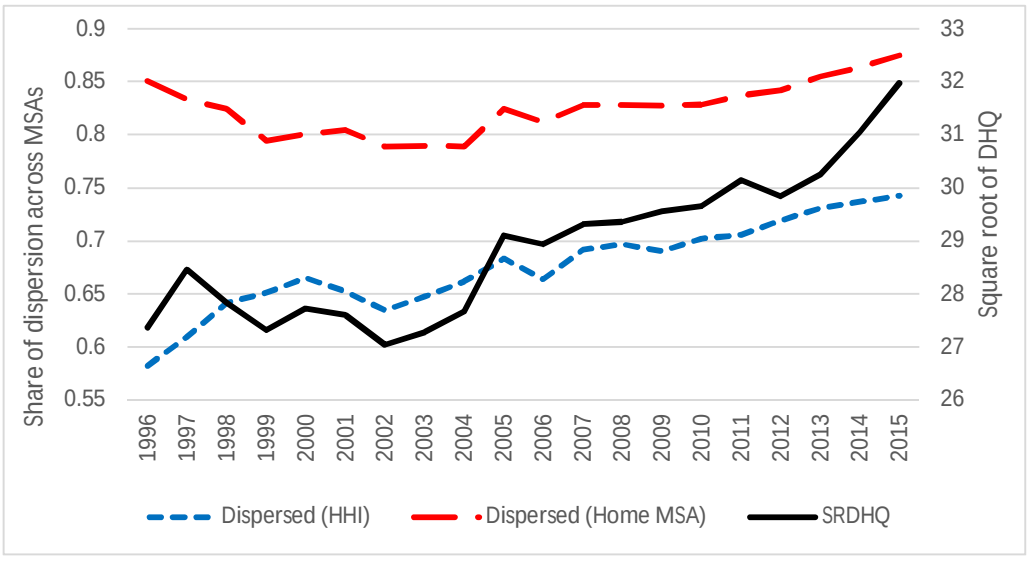
**Figure 1: Average geographic portfolio diversification for real estate firms between 1996 and 2015**

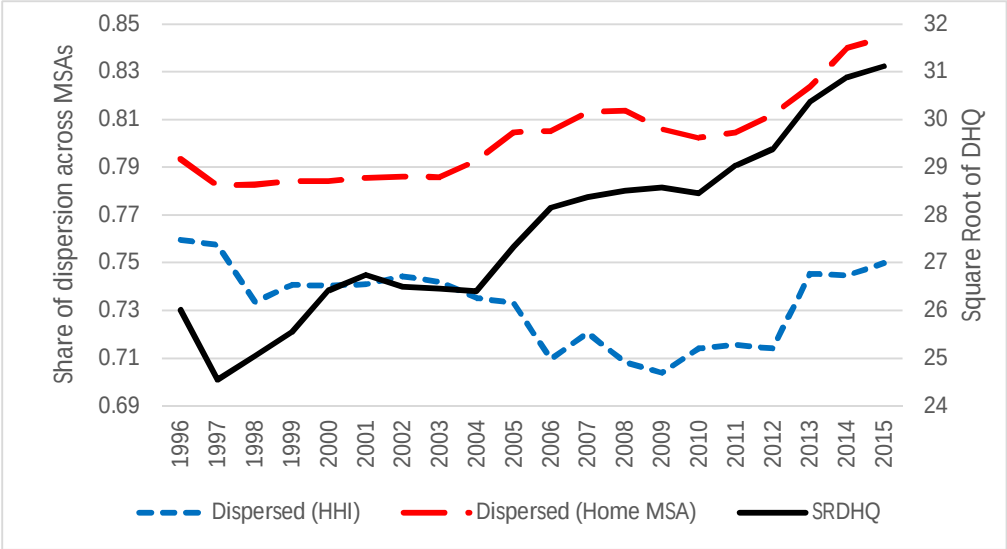
**Panel A: Equally weighted**




**Panel B: Value weighted**



**Panel C: Size weighted**




*Note: The averages are based on our estimation sample of real estate firms only. DHQ stays for the average square root distance of the properties to the headquarters of a firm which in the text. Dispersed (HHI) is a ratio between 0 and 1. It stays for the 1 minus the Herfindahl index (HHI). The HHI is calculated at the MSA level and is a measure of concentration. The higher the value for dispersed (HHI), the higher the dispersion/diversification, meaning that properties are spread across more MSAs. Dispersed (Home MSA) is proportion of properties located outside the MSA of firm's headquarters. All figures are averages across all firms in each year. The values vary year-on-year as firms rebalance their property portfolios.*

**Figure 2: Number of US real estate firms and average market capitalization between 1996 and 2015 for the sample of firms**

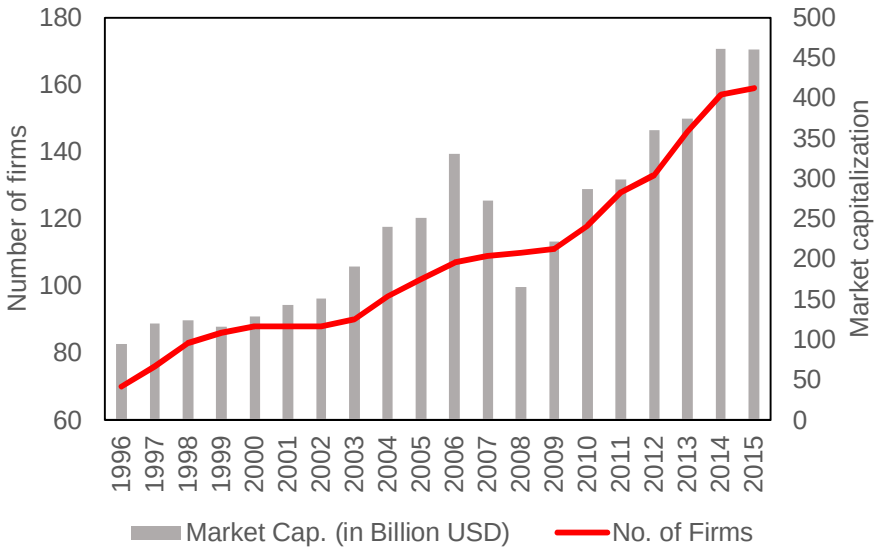


**Table 1: Descriptive statistics for firm characteristics (averages 1996–2015)**

| | Mean | Std. Dev. | Max | Min |
|---|---|---|---|---|
| Annual equity return | 0.061 | 0.419 | 5.213 | -5.122 |
| Daily volatility | 0.023 | 0.025 | 0.467 | 0.001 |
| 25 gateway MSAs | 0.48 | 0.24 | 1 | 0 |
| Age | 9.5 | 11.8 | 63 | 0 |
| Size (USD billion) | 1,813 | 2,743 | 16,696 | 9 |
| Change in size | 0.023 | 0.107 | 3.426 | -0.898 |
| Debt-to-equity ratio | 1.48 | 2.39 | 14.21 | -9.88 |
| Market-to-book ratio | 1.08 | 4.36 | 100 | 0 |
| Turnover ratio | 1.44 | 1.66 | 51.47 | 0 |
| Share of institutional ownership | 0.56 | 0.34 | 2.22 | 0.001 |

*Note: 25 gateway MSAs stays for the share of firms that have properties which fall within the 25 gateway MSAs.*

**Table 2: Descriptive statistics for the factors (averages 1996–2015)**

| | Mean | Std. Dev. | Max | Min |
|---|---|---|---|---|
| Market | 0.0003 | 0.0124 | 0.1135 | -0.0895 |
| Size | 0.0010 | 0.0062 | 0.0448 | -0.0432 |
| Value | 0.0001 | 0.0066 | 0.0483 | -0.0422 |
| Momentum | 0.0002 | 0.0052 | 0.0452 | -0.0303 |
| Liquidity | 0.0003 | 0.0019 | 0.0055 | -0.0062 |
| RE | 0.0004 | 0.0176 | 0.1685 | -0.2169 |

*Note: Market is the market return factor based on the Fama and French factors. RE is a real estate factor. Check the data section for further information on the factors and sources of data.*

**Table 3: Descriptive statistics of distance to headquarters metrics**

| | Number of firms | Mean | Std. Dev. | Max | Min | 75th | 50th | 25th |
|---|---|---|---|---|---|---|---|---|
| | | | **Average *square-root* distance to headquarters** | | | | | |
| Panel A: Summary statistics for full sample | | | | | | | | |
| Mean | 107 | 27 | 13 | 54 | 3 | 38 | 29 | 17 |
| Max | 159 | 31 | 14 | 56 | 4 | 39 | 33 | 21 |
| Min | 70 | 25 | 12 | 49 | 1 | 36 | 25 | 15 |
| Median | 107 | 27 | 13 | 56 | 3 | 38 | 29 | 17 |
| Panel B: Summary statistics by firm size | | | | | | | | |
| Large | 55 | 30 | 14 | 53 | 4 | 40 | 34 | 20 |
| Small | 53 | 25 | 13 | 50 | 4 | 35 | 23 | 15 |
| **Difference in Mean** | | **5*** (0.7152)** | | | | | | |
| Panel C: Summary statistics by period | | | | | | | | |
| 1996-2006 | 87 | 26 | 14 | 53 | 3 | 37 | 27 | 16 |
| 2007-2009 | 109 | 28 | 13 | 56 | 4 | 39 | 30 | 17 |
| 2010-2015 | 136 | 29 | 13 | 56 | 3 | 39 | 32 | 19 |
| **Difference in Mean pre and post GFC** | | **-3*** (0.060)** | | | | | | |
| | **Number of firms** | **Mean** | **Std. Dev.** | **Max** | **Min** | **75th** | **50th** | **25th** |
| | | | **Average distance to headquarters** | | | | | |
| Panel A: Summary statistics for full sample | | | | | | | | |
| Mean | 107 | 1125 | 728 | 2870 | 17 | 1699 | 1067 | 497 |
| Max | 159 | 1277 | 770 | 3911 | 23 | 1827 | 1230 | 701 |
| Min | 70 | 1051 | 700 | 2512 | 12 | 1523 | 933 | 397 |
| Median | 107 | 1112 | 725 | 2639 | 19 | 1699 | 1067 | 476 |
| Panel B: Summary statistics by firm size | | | | | | | | |
| Large | 55 | 1335 | 701 | 2733 | 155 | 1862 | 1339 | 726 |
| Small | 53 | 942 | 706 | 2696 | 25 | 1417 | 780 | 380 |
| **Difference in Mean** | | **393*** (31)** | | | | | | |
| Panel C: Summary statistics by period | | | | | | | | |
| 1996-2006 | 87 | 1065 | 716 | 2596 | 15 | 1629 | 980 | 460 |
| 2007-2009 | 109 | 1128 | 728 | 2657 | 19 | 1725 | 1110 | 448 |
| 2010-2015 | 136 | 1209 | 747 | 3352 | 19 | 1787 | 1173 | 570 |
| **Difference in Mean pre and post GFC** | | **-144*** (34)** | | | | | | |
| | **Number of firms** | **Mean** | **Std. Dev.** | **Max** | **Min** | **75th** | **50th** | **25th** |
| | | | **HHI of MSA concentration** | | | | | |
| Panel A: Summary statistics for full sample | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mean | 107 | 0.188 | 0.242 | 1 | 0.012 | 0.215 | 0.091 | 0.038 |
| Max | 159 | 0.207 | 0.264 | 1 | 0.017 | 0.280 | 0.098 | 0.042 |
| Min | 70 | 0.161 | 0.199 | 1 | 0.009 | 0.151 | 0.084 | 0.036 |
| Median | 107 | 0.187 | 0.243 | 1 | 0.012 | 0.203 | 0.091 | 0.038 |
| Panel B: Summary statistics by firm size | | | | | | | | |
| Large | 55 | 0.146 | 0.186 | 1 | 0.014 | 0.152 | 0.071 | 0.032 |
| Small | 53 | 0.218 | 0.260 | 1 | 0.016 | 0.262 | 0.109 | 0.049 |
| **Difference in Mean** | | **-0.072*** (0.010)** | | | | | | |
| Panel C: Summary statistics by period | | | | | | | | |
| 1996-2006 | 87 | 0.187 | 0.245 | 1 | 0.015 | 0.194 | 0.093 | 0.039 |
| 2007-2009 | 109 | 0.195 | 0.259 | 1 | 0.011 | 0.211 | 0.089 | 0.039 |
| 2010-2015 | 136 | 0.186 | 0.232 | 1 | 0.010 | 0.246 | 0.090 | 0.038 |
| **Difference in Mean pre and post GFC** | | **-0.001 (0.010)** | | | | | | |

| | **Number of firms** | **Mean** | **Std. Dev.** | **Max** | **Min** | **75th** | **50th** | **25th** |
|---|---|---|---|---|---|---|---|---|
| **Proportion of properties located in home MSA (HOME)** | | | | | | | | |
| Panel A: Summary statistics for full sample | | | | | | | | |
| Mean | 107 | 0.175 | 0.252 | 1 | 0.000 | 0.233 | 0.062 | 0.009 |
| Max | 159 | 0.204 | 0.283 | 1 | 0.000 | 0.289 | 0.083 | 0.024 |
| Min | 70 | 0.128 | 0.211 | 1 | 0.000 | 0.125 | 0.039 | 0.000 |
| Median | 107 | 0.175 | 0.253 | 1 | 0.000 | 0.246 | 0.062 | 0.009 |
| Panel B: Summary statistics by firm size | | | | | | | | |
| Large | 55 | 0.174 | 0.237 | 1 | 0.000 | 0.227 | 0.064 | 0.018 |
| Small | 53 | 0.241 | 0.299 | 1 | 0.000 | 0.358 | 0.113 | 0.013 |
| **Difference in Mean** | | **-0.067*** (0.012)** | | | | | | |
| Panel C: Summary statistics by period | | | | | | | | |
| 1996-2006 | 87 | 0.223 | 0.288 | 1 | 0.000 | 0.288 | 0.108 | 0.020 |
| 2007-2009 | 109 | 0.209 | 0.287 | 1 | 0 | 0.281 | 0.080 | 0.010 |
| 2010-2015 | 136 | 0.209 | 0.286 | 1 | 0 | 0.262 | 0.076 | 0.013 |
| **Difference in Mean pre and post GFC** | | **0.014 (0.013)** | | | | | | |

*Note: Distance to headquarter is measured as average square root distance to headquarter of properties held by each firm. In Panel A, summary statistics are computed in two steps. First, for each year between 1996 and 2015, the distance metrics are computed. This gives a time series of annual averages. Using the time series, the mean, the median, the minimum, the maximum, the 75th quantile, the 50th and 25th quantile are shown. Panel B breaks down the firms by market capitalization. HHI stays for the Herfindahl index of concentration. A higher HHI value means a more concentrated firm.*

## Table 4: Portfolios based on DHQ

**Table 4-A: 1996M2 to 2006M12**

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0033* | 0.9154*** | 0.1545*** | 0.0594 | 0.0753 | 0.0433 | 0.6896*** | 0.7723 |
| | (1.6563) | (15.5260) | (2.4267) | (0.7217) | (0.9325) | (0.7372) | (11.8378) | |
| | 0.0060*** | 0.8406*** | 0.0125 | -0.0155 | 0.0107 | 0.0127 | 0.8620*** | 0.8375 |
| | (3.7240) | (17.5710) | (0.2421) | (-0.2329) | (0.1630) | (0.2665) | (18.2367) | |
| | 0.0075*** | 0.8032*** | 0.0799* | -0.1003* | 0.0897 | 0.0034 | 0.8467*** | 0.8624 |
| | (5.2549) | (19.0243) | (1.7531) | (-1.7019) | (1.5517) | (0.0800) | (20.2983) | |
| | 0.0038*** | 0.6479*** | 0.1372*** | -0.1050 | 0.1376* | -0.0241 | 0.6174*** | 0.6982 |
| | (2.1104) | (12.0682) | (2.3678) | (-1.4021) | (1.8719) | (-0.4501) | (11.6391) | |
| Close | 0.0067*** | 0.9202*** | 0.2221*** | -0.0226 | 0.2167*** | -0.0159 | 0.6713*** | 0.8684 |
| | (4.8144) | (22.3895) | (5.0059) | (-0.3933) | (3.8495) | (-0.3895) | (16.5306) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | -0.0034* | -0.0048 | -0.0676 | 0.0819 | -0.1414* | 0.0592 | 0.0183 | 0.0377 |
| | (-1.6546) | (-0.0763) | (-1.0033) | (0.9402) | (-1.6529) | (0.9523) | (0.2974) | |

**Table 4-B: 2007M1 to 2009M12**

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0078 | 0.8397*** | 0.9459*** | 0.0736 | -0.4114 | -0.1573 | 0.5109*** | 0.9306 |
| | (1.0913) | (4.4483) | (2.7491) | (0.2410) | (-0.6957) | (-0.9515) | (8.9936) | |
| | -0.0036 | 1.4057*** | 1.6681*** | 0.0647 | 0.2831 | -0.0947 | 0.6845*** | 0.9137 |
| | (-0.3146) | (4.6763) | (3.0444) | (0.1330) | (0.3006) | (-0.3598) | (7.5664) | |
| | -0.0063 | 1.3078*** | 1.8113*** | 0.5110 | -0.1743 | 0.1038 | 0.6035*** | 0.8714 |
| | (-0.4332) | (3.4093) | (2.5904) | (0.8232) | (-0.1451) | (0.3092) | (5.2274) | |
| | -0.0011 | 0.7707*** | 1.6552*** | 0.0009 | -0.5573 | -0.0018 | 0.4616*** | 0.8921 |
| | (-0.1160) | (3.1776) | (3.7439) | (0.0023) | (-0.7335) | (-0.0087) | (6.3234) | |
| Close | -0.0069 | 1.1131*** | 2.1096*** | 0.1164 | -0.0107 | -0.1905 | 0.5249*** | 0.8843 |
| | (-0.5843) | (3.5772) | (3.7192) | (0.2311) | (-0.0109) | (-0.6991) | (5.6053) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | 0.0148** | -0.2735 | -1.1637*** | -0.0428 | -0.4007 | 0.0332 | -0.0140 | 0.5614 |
| | (2.0366) | (-1.4361) | (-3.3527) | (-0.1388) | (-0.6717) | (0.1993) | (-0.2447) | |

**Table 4-C: 2010M1 to 2015M3**

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0044*** | 0.9044*** | 0.1805** | -0.0078 | -0.2383* | -0.0751 | 0.7480*** | 0.9354 |
| | (2.4339) | (17.4265) | (1.9614) | (-0.0833) | (-1.8323) | (-1.1161) | (17.7057) | |
| | 0.0031* | 1.0586*** | 0.1984*** | 0.0984 | -0.0989 | 0.0051 | 0.8744*** | 0.9631 |
| | (1.9593) | (23.4412) | (2.4781) | (1.2028) | (-0.8739) | (0.0867) | (23.7873) | |
| | 0.0034* | 1.0609*** | 0.3174*** | 0.1566* | -0.0553 | -0.0783 | 0.8501*** | 0.9525 |
| | (1.8546) | (20.4080) | (3.4447) | (1.6632) | (-0.4243) | (-1.1609) | (20.0892) | |
| | -0.0005 | 0.8668*** | 0.2695*** | 0.0844 | -0.1693 | -0.1173 | 0.7406*** | 0.8865 |
| | (-0.2083) | (12.3706) | (2.1694) | (0.6649) | (-0.9641) | (-1.2908) | (12.9853) | |
| Close | 0.0006 | 0.9767*** | 0.2751*** | 0.1831 | -0.4549*** | -0.0528 | 0.6607*** | 0.9142 |
| | (0.2484) | (14.7997) | (2.3514) | (1.5317) | (-2.7504) | (-0.6169) | (12.2998) | |

Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| D-C | 0.0038* | -0.0666 | -0.0782 | -0.1957* | 0.2385 | -0.0222 | 0.0896* | 0.2689 |
| | (1.7989) | (-1.0415) | (-0.6895) | (-1.6887) | (1.4872) | (-0.2681) | (1.7202) | |

*Note: This table presents factor model results of portfolios sorted into 5 groups from the bottom to the top 20$^{th}$ percentile based on the average square root distance of properties to headquarters (DHQ). Alpha stands for non-market returns. Market stands for the market return factor, Size stands for the size factor, Value stands for book to market value factor, Momentum stands for momentum factor and Liquidity stands for the liquidity factor. RE stands for listed real estate returns. The portfolios are constructed based on monthly data. T-statistic is reported in parentheses. ***,** and * stands for significance at 1%, 5% and 10% level, respectively.*

**Table 5: Alphas of portfolios based on alternative diversification metrics**

| | Home MSA | | | HHI (MSA) | | |
|---|---|---|---|---|---|---|
| | **Concentrated** | **Dispersed** | **D-C** | **Concentrated** | **Dispersed** | **D-C** |
| **1996-2007** | | | | | | |
| **alpha** | 0.0076*** | 0.0064*** | -0.0012 | 0.0056*** | 0.0059*** | 0.0003 |
| | (4.1340) | (5.2004) | (-0.5984) | (3.0392) | (3.1999) | (0.1338) |
| **2007-2009** | | | | | | |
| **alpha** | -0.0088 | -0.0087 | -0.0001 | -0.0052 | 0.0023 | 0.0074 |
| | (-0.7008) | (-0.7612) | (-0.0067) | (-0.4528) | (0.1829) | (0.9313) |
| **2010-2015** | | | | | | |
| **alpha** | 0.0009 | 0.0048*** | 0.0039 | -0.0030 | 0.0035*** | 0.0066*** |
| | (0.3597) | (3.0354) | (1.4258) | (-1.0605) | (2.1914) | (2.1962) |

| | Size-Weighted DHQ | | | Value-Weighted DHQ | | |
|---|---|---|---|---|---|---|
| | **Close** | **Distant** | **D-C** | **Close** | **Distant** | **D-C** |
| **1996-2007** | | | | | | |
| **alpha** | 0.0057*** | 0.0037 | -0.0020 | 0.0077*** | 0.0062*** | -0.0016 |
| | (3.4411) | (1.5416) | (-0.7355) | (4.6544) | (4.1240) | (-0.7878) |
| **2007-2009** | | | | | | |
| **alpha** | -0.0068 | 0.0052 | 0.0120* | -0.0096 | 0.0015 | 0.0111 |
| | (-0.5883) | (0.6024) | (1.6488) | (-0.8592) | (0.1508) | (1.2360) |
| **2010-2015** | | | | | | |
| **alpha** | -0.0028 | 0.0043*** | 0.0072*** | -0.0014 | 0.0040*** | 0.0054*** |
| | (-1.0740) | (2.4807) | (3.0348) | (-0.4914) | (2.8882) | (2.0611) |

*Note: The table presents alphas of portfolios sorted into the bottom 20th percentile of concentrated and the upper 20th percentile of dispersed firms. The returns are based on monthly data. Home MSA stays for properties sorted based on whether they are located in the home metropolitan area. HHI stays for properties sorted based on the Herfindahl index of similarity. T statistic is reported in parentheses. ***, ** and * stands for significance at 1%, 5% and 10% level, respectively.*

**Table 6: Fama-MacBeth regression results**

| | Panel A: 1996-2006 | | | | Panel C: 2010-2015 | |
|---|---|---|---|---|---|---|
| | Model 1: | Model 2: | Model 3: | Model 4: | Model 5: | Model 6: |
| DHQ | -0.0155 | | | 0.0603*** | | |
| | (0.0129) | | | (0.0110) | | |
| HOME | | 0.0290 | | | -0.1609*** | |
| | | (0.0221) | | | (0.0567) | |
| HHI | | | 0.0703*** | | | -0.1778*** |
| | | | (0.0167) | | | (0.0403) |
| 25 MSA | 0.0836* | 0.0275 | 0.0099 | 0.0357*** | 0.0857*** | 0.1201*** |
| | (0.0496) | (0.0377) | (0.0418) | (0.0118) | (0.0323) | (0.0404) |
| Log of | -0.0193*** | -0.0249*** | -0.0256*** | -0.0077 | 0.0014 | -0.0001 |
| Age | (0.0064) | (0.0091) | (0.0079) | (0.0085) | (0.0100) | (0.0102) |
| Log of | -0.0021 | -0.0131* | -0.0094 | -0.0210* | -0.0028 | -0.0100 |
| Size | (0.0056) | (0.0091) | (0.0095) | (0.0147) | (0.0094) | (0.0130) |
| Debt to | -0.0125 | -0.0163 | -0.0136 | -0.0109 | -0.0046 | -0.0072 |
| Equity | (0.0094) | (0.0122) | (0.0121) | (0.0087) | (0.0079) | (0.0073) |
| Market to | 0.0137 | 0.0261 | 0.0272 | 0.0083* | 0.0348*** | 0.0183*** |
| Book | (0.0206) | (0.0328) | (0.0310) | (0.0056) | (0.0045) | (0.0075) |
| Volatility | -0.5383 | -1.6992 | -2.9548 | 5.2203*** | 4.7946*** | 5.4608*** |
| | (1.7454) | (4.1099) | (4.0430) | (0.5881) | (0.1273) | (0.4056) |
| Turnover | -0.0518** | -0.0897** | -0.0912** | 0.0216 | 0.0171 | 0.0172 |
| | (0.0293) | (0.0449) | (0.0453) | (0.0165) | (0.0137) | (0.0157) |
| Ownership | 0.0891* | 0.1327*** | 0.1148*** | 0.0703*** | 0.0218** | 0.0770*** |
| | (0.0605) | (0.0455) | (0.0448) | (0.0258) | (0.0107) | (0.0255) |
| Property Type Dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Nr of obs | 342 | 360 | 360 | 391 | 397 | 397 |
| Adj. R2 | 0.7918 | 0.7676 | 0.7683 | 0.6600 | 0.6703 | 0.6515 |

*Note: This table reports the results of Fama-MacBeth regressions. The dependent variable is the annual excess return net of the T-bill rate. First, a cross-sectional regression for each is estimated and, then, the values are averages across the different years. DHQ stands for the average square root distance to headquarters. HOME stands for the proportion of properties located in the same MSA as the headquarters. HHI stands for the Herfindahl centration indicator. Control variables include exposure to the 25 largest MSAs, the log of age of the firm, change in market value of the firm, debt-to-equity ratio, market-to-book ratio, volatility, turnover, institutional ownership ratio and a dummy for predominant property type. Standard errors are reported in parentheses. ***, ** and * denote significant at 1%, 5% and 10% level, respectively.*

**Table 7: Alphas of equally-weighted portfolios double-sorted on size and DHQ**

| 1996M2-2006M12 | | | |
|---|---|---|---|
| | | **Close** | **Distant** |
| **Size** | **Large** | 0.0055*** | 0.0034 |
| | | (2.93) | (1.62) |
| | **Small** | 0.0058*** | 0.0082*** |
| | | (2.71) | (2.31) |

| 2010M1-2015M3 | | | |
|---|---|---|---|
| | | **Close** | **Distant** |
| **Size** | **Large** | 0.0020 | 0.0025 |
| | | (0.83) | (1.58) |
| | **Small** | 0.0009 | 0.0063*** |
| | | (0.30) | (2.15) |

*Note: This table reports double-sorted portfolios based on distance and size. Portfolios are double-sorted for the top and bottom 33rd percentile.*

**Table 8: Alphas of equally-weighted portfolios double-sorted on exposure to the 25 gateway MSAs and DHQ**

| 1996M2-2006M12 | | | |
|---|---|---|---|
| | | **Close** | **Distant** |
| **25 MSA exposure** | **High** | 0.0064*** | 0.0082*** |
| | | (3.25) | (4.65) |
| | **Low** | 0.0030 | 0.0007 |
| | | (1.44) | (0.29) |

| 2010M1-2015M3 | | | |
|---|---|---|---|
| | | **Close** | **Distant** |
| **25 MSA exposure** | **High** | 0.0036 | 0.0030 |
| | | (1.15) | (1.55) |
| | **Low** | -0.0044 | 0.0051** |
| | | (-1.30) | (1.96) |

*Note: This table reports double-sorted portfolios based on distance and the proportion of properties located in the 25 gateway MSAs. Portfolios are double-sorted in the top and bottom 33rd percentile.*

**Table 9: Alphas of equally-weighted portfolios sorted on institutional ownership and DHQ**

| 1996M2-2006M12 | | | |
|---|---|---|---|
| | | **Close** | **Distant** |
| **Institutional Ownership** | **High** | 0.0040*** | 0.0053*** |
| | | (2.49) | (3.55) |
| | **Low** | 0.0052*** | 0.0068*** |
| | | (2.35) | (3.03) |

| 2010M1-2015M3 | | | |
|---|---|---|---|
| | | **Close** | **Distant** |
| **Institutional Ownership** | **High** | -0.0012 | 0.0021 |
| | | (-0.49) | (1.30) |
| | **Low** | 0.0001 | 0.0056* |
| | | (0.03) | (1.84) |

*Note: This table reports double-sorted portfolios based on institutional ownership and distance. Institutional ownership is calculated as the percentage of institutional owners for each firm as reported in SNL Financial. Portfolios are double-sorted in the top and bottom 33rd percentile.*

## Appendix

### Table A1: Portfolios based on average distance to headquarters excluding REITs that have been part of a merger or accusation

**Table A1-A: 1996M2 to 2006M12**

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0031 | 0.8974*** | 0.1482*** | 0.0905 | 0.0846 | 0.0221 | 0.6529*** | 0.7181 |
| | (1.3735) | (13.6973) | (2.0950) | (0.9894) | (0.9426) | (0.3387) | (10.0864) | |
| | 0.0063*** | 0.8246*** | 0.0108 | -0.0488 | 0.0184 | 0.0211 | 0.8389*** | 0.8405 |
| | (4.0519) | (17.9370) | (0.2172) | (-0.7606) | (0.2929) | (0.4615) | (18.4694) | |
| | 0.0068*** | 0.8175*** | 0.0885* | -0.0792 | 0.0696 | 0.0193 | 0.8705*** | 0.8694 |
| | (4.7281) | (19.2616) | (1.9318) | (-1.3367) | (1.1982) | (0.4575) | (20.7611) | |
| | 0.0038*** | 0.6695*** | 0.1271*** | -0.0483 | 0.1150 | -0.0267 | 0.6237*** | 0.7157 |
| | (2.1208) | (12.7034) | (2.2333) | (-0.6566) | (1.5938) | (-0.5080) | (11.9784) | |
| Close. | 0.0068*** | 0.9128*** | 0.2407*** | -0.0110 | 0.2158*** | -0.0066 | 0.6464*** | 0.8698 |
| | (4.9060) | (22.4589) | (5.4856) | (-0.1939) | (3.8774) | (-0.1635) | (16.0981) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | -0.0037 | -0.0154 | -0.0925 | 0.1015 | -0.1312 | 0.0287 | 0.0065 | 0.0306 |
| | (-1.6189) | (-0.2277) | (-1.2680) | (1.0759) | (-1.4180) | (0.4267) | (0.0971) | |

**Table A1-B: 2007M1 to 2009M12**

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0048 | 0.8035*** | 1.0176*** | -0.0831 | -0.1793 | -0.1727 | 0.5179*** | 0.9255 |
| | (0.7334) | (4.5341) | (3.1192) | (-0.3056) | (-0.3464) | (-1.0843) | (9.6278) | |
| | -0.0024 | 1.3621*** | 1.9156*** | 0.0294 | 0.3588 | -0.1697 | 0.5923*** | 0.8874 |
| | (-0.2114) | (4.3790) | (3.3452) | (0.0615) | (0.3950) | (-0.6070) | (6.2735) | |
| | -0.0023 | 1.1574*** | 1.9178*** | 0.7183 | -0.5711 | 0.1286 | 0.5822*** | 0.8653 |
| | (-0.1680) | (3.0501) | (2.7453) | (1.2337) | (-0.5153) | (0.3771) | (5.0551) | |
| | -0.0006 | 0.7491*** | 1.6299*** | -0.1056 | -0.6182 | -0.0319 | 0.4724*** | 0.9095 |
| | (-0.0746) | (3.6385) | (4.3004) | (-0.3344) | (-1.0283) | (-0.1726) | (7.5605) | |
| Close | -0.0070 | 1.0200*** | 2.1972*** | 0.2451 | 0.0255 | -0.1466 | 0.5483*** | 0.9077 |
| | (-0.7216) | (3.8541) | (4.5093) | (0.6036) | (0.0329) | (-0.6164) | (6.8253) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | 0.0118* | -0.2166 | -1.1796*** | -0.3282 | -0.2047 | -0.0261 | -0.0304 | 0.6815 |
| | (1.9128) | (-1.2905) | (-3.8183) | (-1.2747) | (-0.4177) | (-0.1728) | (-0.5976) | |

**Table A1-C: 2010M1 to 2015M3**

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0050*** | 0.8896*** | 0.1546 | -0.0152 | -0.1759 | -0.0764 | 0.7344*** | 0.9249 |
| | (2.6448) | (16.3014) | (1.5981) | (-0.1533) | (-1.2861) | (-1.0792) | (16.5332) | |
| | 0.0027* | 1.0378*** | 0.1535* | 0.0597 | -0.2032* | -0.0347 | 0.8702*** | 0.9611 |
| | (1.7009) | (22.7956) | (1.9019) | (0.7238) | (-1.7809) | (-0.5876) | (23.4807) | |
| | 0.0031 | 1.0599*** | 0.3091*** | 0.1733* | -0.0534 | -0.0831 | 0.8266*** | 0.9483 |
| | (1.6329) | (19.7111) | (3.2429) | (1.7794) | (-0.3962) | (-1.1911) | (18.8848) | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0.0003 | 0.8855*** | 0.2418*** | 0.1023 | -0.1278 | -0.0512 | 0.7594*** | 0.9188 |
| | (0.1567) | (14.9352) | (2.3003) | (0.9523) | (-0.8600) | (-0.6660) | (15.7358) | |
| Close | 0.0006 | 0.9554*** | 0.3873*** | 0.1788* | -0.3411*** | -0.1050 | 0.6896*** | 0.9375 |
| | (0.3093) | (17.1338) | (3.9183) | (1.7697) | (-2.4411) | (-1.4525) | (15.1917) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | 0.0044** | -0.0658 | -0.2327*** | -0.1939* | 0.1652 | 0.0287 | 0.0449 | 0.3068 |
| | (2.0224) | (-1.0478) | (-2.0893) | (-1.7036) | (1.0493) | (0.3517) | (0.8770) | |

*Note: This table presents factor model results of portfolios sorted into 5 groups from the bottom to the top 20$^{th}$ percentile based on the average squared root distance of properties to headquarters. Alpha stands for non-market returns. RE stands for listed real estate returns. The portfolios are constructed based on monthly data. T-statistic is reported in parentheses. ***,** and * stands for significance at 1%, 5% and 10% level, respectively.*

## Table A2: Portfolios based on average distance to headquarters using winsorized returns

### Table A2-A: 1996M2 to 2006M12

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0047*** | 0.8090*** | 0.1580*** | 0.0232 | 0.1396*** | -0.0007 | 0.6133*** | 0.8084 |
| | (3.0175) | (17.6672) | (3.1963) | (0.3638) | (2.2253) | (-0.0161) | (13.5545) | |
| | 0.0070*** | 0.7909*** | 0.0234 | -0.0213 | 0.0370 | -0.0120 | 0.8010*** | 0.8329 |
| | (4.5934) | (17.5026) | (0.4788) | (-0.3384) | (0.5981) | (-0.2673) | (17.9414) | |
| | 0.0080*** | 0.7689*** | 0.0924*** | -0.0952* | 0.1058** | -0.0152 | 0.7878*** | 0.8680 |
| | (6.1231) | (19.8443) | (2.2083) | (-1.7603) | (1.9941) | (-0.3939) | (20.5796) | |
| | 0.0033*** | 0.6238*** | 0.1437*** | -0.1005* | 0.1521*** | -0.0406 | 0.5794*** | 0.7687 |
| | (2.3142) | (14.6800) | (3.1337) | (-1.6953) | (2.6142) | (-0.9603) | (13.8019) | |
| Close. | 0.0072*** | 0.8470*** | 0.2051*** | -0.0221 | 0.1919*** | -0.0283 | 0.6307*** | 0.8728 |
| | (5.7038) | (22.7262) | (5.0978) | (-0.4253) | (3.7606) | (-0.7631) | (17.1285) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | -0.0025 | -0.0379 | -0.0471 | 0.0454 | -0.0524 | 0.0276 | -0.0174 | 0.0209 |
| | (-1.5644) | (-0.7978) | (-0.9173) | (0.6837) | (-0.8043) | (0.5825) | (-0.3712) | |

### Table A2-B: 2007M1 to 2009M12

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0063 | 0.6732*** | 0.1977 | 0.0147 | 0.2203 | -0.2193* | 0.2225*** | 0.8564 |
| | (1.2485) | (4.9154) | (0.7840) | (0.0697) | (0.5507) | (-1.7818) | (5.3517) | |
| | 0.0009 | 0.8192*** | 0.1882 | 0.0430 | 0.3461 | -0.2405 | 0.2397*** | 0.8331 |
| | (0.1457) | (4.7841) | (0.5971) | (0.1638) | (0.6920) | (-1.5626) | (4.6112) | |
| | 0.0020 | 0.7441*** | 0.1854 | 0.1536 | 0.2853 | -0.2331 | 0.2184*** | 0.8246 |
| | (0.3255) | (4.3752) | (0.5922) | (0.5885) | (0.5744) | (-1.5248) | (4.2313) | |
| | -0.0001 | 0.6018*** | 0.1546 | 0.1060 | 0.1317 | -0.1714 | 0.1528*** | 0.8527 |
| | (-0.0167) | (5.0370) | (0.7031) | (0.5782) | (0.3776) | (-1.5965) | (4.2129) | |
| Close | -0.0011 | 0.7180*** | 0.5439** | 0.1015 | 0.2494 | -0.2536* | 0.1886*** | 0.8592 |
| | (-0.1964) | (4.8305) | (1.9874) | (0.4450) | (0.5746) | (-1.8986) | (4.1807) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | 0.0074*** | -0.0448 | -0.3462*** | -0.0868 | -0.0291 | 0.0343 | 0.0339 | 0.3993 |
| | (2.5537) | (-0.5715) | (-2.3984) | (-0.7219) | (-0.1273) | (0.4870) | (1.4228) | |

### Table A2-C: 2010M1 to 2015M3

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0050*** | 0.8419*** | 0.1633* | -0.0299 | -0.2619*** | -0.1199* | 0.6965*** | 0.9303 |
| | (2.8397) | (16.7968) | (1.8376) | (-0.3290) | (-2.0845) | (-1.8451) | (17.0716) | |
| | 0.0039*** | 0.9410*** | 0.1246 | 0.0391 | -0.1509 | -0.0778 | 0.8047*** | 0.9568 |
| | (2.5776) | (21.7201) | (1.6224) | (0.4981) | (-1.3902) | (-1.3838) | (22.8187) | |
| | 0.0044*** | 0.8870*** | 0.2549*** | 0.0337 | -0.1000 | -0.1146** | 0.7552*** | 0.9507 |
| | (2.8504) | (19.8515) | (3.2179) | (0.4167) | (-0.8929) | (-1.9783) | (20.7660) | |
| | 0.0006 | 0.7529*** | 0.2299*** | 0.0781 | -0.1481 | -0.1532*** | 0.6568*** | 0.9062 |
| | (0.3238) | (13.7352) | (2.3663) | (0.7867) | (-1.0780) | (-2.1546) | (14.7205) | |
| Close | 0.0011 | 0.8088*** | 0.3288*** | 0.1114 | -0.4068*** | -0.1837*** | 0.5588*** | 0.9097 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (0.5684) | (14.1403) | (3.2430) | (1.0753) | (-2.8383) | (-2.4758) | (12.0026) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | 0.0038** | 0.0332 | -0.1655* | -0.1413 | 0.1450 | 0.0637 | 0.1377*** | 0.2656 |
| | (2.0465) | (0.6181) | (-1.7399) | (-1.4533) | (1.0780) | (0.9153) | (3.1531) | |

*Note: This table presents factor model results of portfolios sorted into 5 groups from the bottom to the top 20$^{th}$ percentile based on the average squared root distance of properties to headquarters. Alpha stands for non-market returns. RE stands for listed real estate returns. The portfolios are constructed based on monthly data. T-statistic is reported in parentheses. ***,** and * stands for significance at 1%, 5% and 10% level, respectively.*

**Table A3: Portfolios based on average distance to headquarters using the adjusted cost weighted distance**

**Table A3-A: 1996M2 to 2006M12**

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0014 | 0.7940*** | 0.0948 | -0.1115 | 0.0648 | 0.0551 | 0.7293*** | 0.5540 |
| | (0.4752) | (8.9179) | (0.9860) | (-0.8976) | (0.5313) | (0.6218) | (8.2905) | |
| | 0.0066*** | 0.8726*** | 0.0724 | 0.0710 | -0.0066 | 0.0173 | 0.7827*** | 0.8527 |
| | (4.3137) | (19.3364) | (1.4866) | (1.1270) | (-0.1062) | (0.3857) | (17.5548) | |
| | 0.0057*** | 0.8400*** | 0.0937*** | -0.0741 | 0.0940* | 0.0327 | 0.8838*** | 0.8941 |
| | (4.3237) | (21.7880) | (2.2505) | (-1.3779) | (1.7806) | (0.8521) | (23.2015) | |
| | 0.0058*** | 0.7153*** | 0.1005* | -0.1219* | 0.1383*** | -0.0140 | 0.6028*** | 0.7443 |
| | (3.5066) | (14.6393) | (1.9045) | (-1.7875) | (2.0671) | (-0.2874) | (12.4875) | |
| Close. | 0.0062*** | 0.8595*** | 0.2665*** | -0.0044 | 0.2370*** | -0.0782* | 0.6235*** | 0.8224 |
| | (3.9674) | (18.6694) | (5.3634) | (-0.0682) | (3.7585) | (-1.7057) | (13.7074) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | -0.0048* | -0.0656 | -0.1718* | -0.1071 | -0.1722 | 0.1333 | 0.1057 | 0.0570 |
| | (-1.6481) | (-0.7698) | (-1.8688) | (-0.9015) | (-1.4765) | (1.5722) | (1.2568) | |

**Table A3-B: 2007M1 to 2009M12**

| Portfolio | Alpha | Market | Size | Value | Momentum | Liquidity | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0004 | 0.9390*** | 1.1586*** | -0.2396 | 0.0124 | -0.2519 | 0.5200*** | 0.9229 |
| | (0.0637) | (5.0625) | (3.3928) | (-0.8420) | (0.0229) | (-1.5112) | (9.2366) | |
| | -0.0022 | 1.2878*** | 1.7286*** | 0.1927 | -0.0768 | 0.0442 | 0.6530*** | 0.9127 |
| | (-0.2115) | (4.5263) | (3.3003) | (0.4415) | (-0.0924) | (0.1729) | (7.5617) | |
| | -0.0028 | 1.2051*** | 1.6936*** | 0.4737 | -0.4885 | 0.0495 | 0.5651*** | 0.8765 |
| | (-0.2227) | (3.5413) | (2.7034) | (0.9071) | (-0.4915) | (0.1617) | (5.4708) | |
| | 0.0020 | 0.9333*** | 2.0761*** | -0.0087 | -0.6196 | -0.0986 | 0.4763*** | 0.8998 |
| | (0.2180) | (3.6950) | (4.4645) | (-0.0225) | (-0.8400) | (-0.4343) | (6.2125) | |
| Close | -0.0087 | 0.8953*** | 1.7820*** | 0.0462 | -0.0578 | -0.0550 | 0.5072*** | 0.8688 |
| | (-0.8566) | (3.2443) | (3.5075) | (0.1092) | (-0.0717) | (-0.2218) | (6.0553) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | 0.0091 | 0.0437 | -0.6234* | -0.2859 | 0.0702 | -0.1969 | 0.0128 | 0.2691 |
| | (1.3557) | (0.2387) | (-1.8497) | (-1.0176) | (0.1312) | (-1.1967) | (0.2303) | |

**Table A3-C: 2010M1 to 2015M3**

| Portfolio | Alpha | MR | SMB | HML | MOM | LIQ | RE | R2 |
|---|---|---|---|---|---|---|---|---|
| Panel A Portfolio formed based on DHQ | | | | | | | | |
| Distant | 0.0042* | 0.9880*** | 0.2013 | 0.0078 | -0.2694 | -0.1124 | 0.7958*** | 0.9036 |
| | (1.7263) | (14.1488) | (1.6260) | (0.0618) | (-1.5395) | (-1.2408) | (14.0019) | |
| | 0.0029* | 1.0654*** | 0.1731** | 0.0906 | -0.0077 | 0.0071 | 0.7687*** | 0.9548 |
| | (1.7348) | (22.4302) | (2.0560) | (1.0531) | (-0.0643) | (0.1146) | (19.8820) | |
| | 0.0033* | 1.0027*** | 0.2925*** | 0.1154 | -0.1394 | -0.1000 | 0.8516*** | 0.9458 |
| | (1.7314) | (18.6228) | (3.0642) | (1.1829) | (-1.0334) | (-1.4324) | (19.4304) | |
| | 0.0019 | 0.9044*** | 0.2943*** | 0.1061 | -0.2092* | -0.0518 | 0.7663*** | 0.9454 |
| | (1.1042) | (18.1763) | (3.3364) | (1.1771) | (-1.6775) | (-0.8030) | (18.9194) | |
| Close | -0.0015 | 0.9066*** | 0.2673* | 0.0862 | -0.4511*** | -0.1221 | 0.6708*** | 0.8667 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (-0.5312) | (11.4367) | (1.9020) | (0.6002) | (-2.2705) | (-1.1873) | (10.3954) | |
| Panel B: Portfolio long in dispersed firms and short in concentrated firms using all firms | | | | | | | | |
| D-C | 0.0057** | 0.0814 | -0.0660 | -0.0784 | 0.1817 | 0.0097 | 0.1251* | 0.0910 |
| | (2.0218) | (1.0117) | (-0.4628) | (-0.5378) | (0.9010) | (0.0929) | (1.9102) | |

*Note: This table presents factor model results of portfolios sorted into 5 groups from the bottom to the top 20$^{th}$ percentile based on the average squared root distance of properties to headquarters. Alpha stands for non-market returns. RE stands for listed real estate returns. The portfolios are constructed based on monthly data. T-statistic is reported in parentheses. ***,** and * stands for significance at 1%, 5% and 10% level, respectively.*