Geographical Distance to Headquarter and Firm Performance before and after the GFC

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Abstract

This paper investigates the role of geographical distance of firm's real assets to its headquarters on firm's performance. We find that geographical distance contains important information not captured by classic measures of asset concentration documented in previous research. We show that geographical distance to headquarter changes significantly over time, with distance in steep upward trend around the GFC period. We show that post-GFC, real estate firm managers make investment decisions based on asset distance from firm's headquarter but this is not driven by concerns about geographic diversification. Instead firms with high asset distance to headquarter are associated with significant positive non-market returns. This aligns with the agency theory of managers portfolio allocation choices. Investors interested in alpha can use firm's average asset distance to headquarter as an information tool to construct a long-short investment portfolio of real estate firms and can achieve significant non-market performance of 6-9 percent per annum.

Keywords: Geographic asset dispersion, agency problems, real estate returns, firm size, sector specialisation, trading strategies.

JEL Classification: G12, R3

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1 Introduction

There is a vast amount of literature in finance studying the impact of firm's diversification. Previous literature often shows that dispersed firms are traded at a discount compared to a portfolio of comparable concentrated firms. These findings have led researchers to assume that diversification destroys value and that conglomerates are inefficient. While some investigate firms operating in multiple industries having lower tax burdens than standalone firms (Kim et al., 2017), others examine the impact of diversification on firm's stock returns arguing that due to information asymmetries, investors in concentrated firms would be rewarded with significant non-market returns (Aarland et al. 2007; Giroud 2013; Hartzell et al. 2014). With regards to performance, a number of studies (Bernie et al. (2015), Coval and Moskowitz (1999, 2001), and Malloy (2005)) look at geographic proximity effects documenting the existence for home bias for stock returns. Malloy (2005) document that geographically proximate analysts possess an information advantage and impact prices more than distant analysts suggesting that there is a geography dimension to the agency problems in equity analysis.

This paper studies real assets' location in relation to firm's headquarter to firm performance. Figure 1 shows that firm's average asset distance to headquarter drastically increases over time with distance much higher after the global financial crisis (GFC) than before the GFC. We see that since 2007 average distance to headquarter is higher than any previous period and gradually increases starting in 2004. Real estate firms clearly have changed the way the allocate their capital across space over time and it is important to look how this would affect firm's performance.

<< Figure 1 about here >>

On the one hand, high geographic distance to headquarters may be a tool for asset diversification and it can be perceived as a good management practice. Managers may argue that firms with assets with high average distance to headquarter are more diversified and hence exposed to less idiosyncratic risk. Given this diversification argument, firms should then not be expected to deliver significant alpha which is not what managers would prefer to do. Therefore, managers of real estate firms face the trade of between more diversification and or significant non-market performance

which may lead to firms being dispersed but not really diversified. Hence, firms with high average distance to headquarters may indeed be associated with significant non-market performance.

On the other hand, distance may be perceived as bad management practice as argued by firm agency theory. Agency theory implies that mangers generally overinvest and grow their firms beyond the optimal size even though such investments may not be necessarily value maximizing. In a real estate context, investing in properties which are far away from where the managers are located – may not bring the promised diversification benefits. Instead, it may be more likely that such a strategy may be perceived risky if associated with low knowledge and control of distant assets. Therefore, investors may request a risk premium for investing in such companies which may justify a significant alpha for firms with high average distance to headquarter.

Aggarwal and Samwick (2003) do not find evidence that managers diversify their firms to reduce their exposure to risk, but instead due to private benefits. In a similar vein, Hartzell et al. (2014) look at whether diversification of assets of real estate firms across geographies and over property types can add or destroy firm value. They find that diversification across locations indeed lowers firm's value.

We argue that in the case of real estate firms such as real estate investment trusts (REITs), there may be a greater external monitoring than in typical corporations as, first, REITs are highly leveraged and, second, have a very high degree of institutional ownership. This suggests that they are scrutinised by both debt and equity investors and have high exposure to the capital markets. Therefore, firms with high institutional ownership may have less agency problems and managers would be less prone to trade off alpha to diversification. We show that not every firm with high average distance to headquarter would be associated with significant non-market performance. It is only the firms with low institutional ownership for which we report a significant alpha which aligns with above arguments.

We use US real estate firms as a natural laboratory to identify the level of dispersion of firm's assets – their properties. We begin our analysis by tracking down the location of firms' properties and use the information of their geographic allocation to provide a trading strategy.

We find that the firms with high asset distance to headquarter are associated with a significant alpha as compared to firms with low distance. In particular it is only small firms and firms with

little exposure to the top 25 MSAs for which we observe the significant non-market return. This aligns with the agency theory that managers may decide to invest in distant assets not out of diversification reasons but to increase their non-market performance. However, this is the case for small firms and firms with assets outside core MSAs which provide a risk reward to non-institutional investors. Prior to the GFC, the relationship between distance and performance is either non-existent or opposite to post-GFC findings. This can be due to the fact that distance was fairly stable up until 2006 and has only been gradually increasing since 2004. We argue that while institutional investors may not be interested in a non-market return, small investors interested in alpha can use distance to headquarter to construct a long-short strategy and can achieve significant returns of 6-9 percent.

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

2 Literature review

Previous literature often shows that dispersed firms are traded at a discount compared to a portfolio of comparable concentrated firms. These findings have led researchers to assume that diversification destroys value and that conglomerates are inefficient. One key conjecture is that geographical distribution of firm's activities generates location-based information asymmetry among investors, which in turn influences the portfolio decisions and performance of those investors. This could be due to several related reasons. The first issue is related to how efficiently the firm can aggregate and report value-relevant information. Previous literature shows that geographically concentrated firms may be able to collect and report information in a more efficient way than dispersed firms (e.g. Aarland et al. 2007; Giroud 2013). Consequently, some local information may be lost in the aggregation process, giving investors near economically relevant non-headquarters locations a potential informational advantage. Besides, local firms may also enjoy local social network which may result in local informational advantages. Local social ties brought by firm activities may provide access to local agents, for example, employees, customers, and suppliers, who are likely to possess value-relevant information (e.g. Cohen, Frazzini, and Malloy 2008; Hong, Kubik, and Stein, 2008). As a result, local investors may 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 are able to 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 from firms with operations in multiple states. They find that stocks of truly local firms have returns that exceed the return on stocks of geographic 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 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 concertation of the weight regions and MSAs. Ling et al. (2017) focuses on 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 headquarter. Their results show a significant positive relationship between home market concentration and firm returns, consisting with 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 important dimension for corporate decisions. Landier et al. (2009) propose that geographical dispersion may decrease 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 favourably 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 cumulative abnormal return. This finding implies that the managerial alignment hypothesis dominants 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 on the diversification discount includes agency considerations. Agency theory indicates that mangers generally tend to overinvest and grow their firms beyond the optimal size. Such investments are not necessarily value maximizing, which is likely to diminish 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 does support the notion of private benefits. Agency issues can also result in 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 (a) division manager's ability to skew information, (b) division manager compensation incentives, and (c) the public image of the investment opportunity. However, agency problems do not seem to seriously affect REITs, which could be due to the fact that the real estate industry is more transparent and easy to manage as compared to other industries, such as high technology firms. Capozza and Seguin (1999) actually 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 higher liquidity premium is due to the informational asymmetries or transparency costs.

3 Data and Methodology

The data regarding the individual company characteristics including the concentration measures is collected from SNL Financial. The returns and the market capitalization data are from Thomson Reuters Datastream. We collect data for all available US listed real estate companies between 1996 and 2015. We collect data for 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 locational information. Furthermore, we exclude those firms holding real estate assets internationally (including Hawaii) in order to enable a reasonable calculation of average distance between property pairs. Furthermore, REITs that invest internationally are subject to different market dynamics and require the use of different factors in the asset pricing analysis. This leaves us with 162 firms.

Figure 2 shows the number of firms with complete observations in our sample over the study

period as well as the market capitalization in each year. Up until 2015, the number of listed real estate companies has steadily increased from 70 to 162 and the average firm size has increased by over 10 times, from $94 billion to over $461 billion. During the GFC, real estate companies experienced a large drop in size and shrunk to $165 billion as of 2008. Starting in 2010, real estate stocks have recovered to their pre-crisis values. 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 the firm characteristics of the real estate companies, averaged across time, from 1996 to 2015, and across the 162 companies. The average annual return across all companies is 6.1%, with a standard deviation of 41.9%. The volatility of stocks is measured as the standard deviation of daily return during that year. The average volatility is 2.3% with a maximum of 46.7% and minimum of 0.1%. The average age of the companies is 9.46 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 $1,813 million. The average M/B ratio is 1.081. It is slightly higher than the average ratio of 0.8 across all types of industries. We also include 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. In addition, we see that, on average, 86% of REIT's ownership consists of institutional investors. This ratio is considerably higher than the average in other industries or in other countries for the same industry. It highlights that institutional investors may play an important role for REITs performance overall which we will investigate in the Results Section.

We follow Ling et al. (2017) and create a variable that measures the expose of each REIT to the 25 key MSAs. The 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. The 25 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 REIT locate in the 25 MSAs.

<< Table 1 about here >>

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

$$r_{p,t} - r_{f,t} = \alpha_p + \beta_{p,1} MKT_t + \beta_{p,2} SMB_t + \beta_{p,3} HML_t + \beta_{p,4} MOM_t + \beta_{p,5} LIQ_t + \beta_{p,6} RE_t + \varepsilon_{p,t}. \quad (1)$$

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 US market return index (MKT), the difference between the returns on diversified portfolios of small stocks and big stocks (SMB) and the difference between the returns on diversified portfolios of high book-to-market (value) stocks, low book-to-market (growth) stocks (HML), the difference between the monthly returns on diversified portfolios of winners and losers over the past year (WML) and the difference between the monthly returns on portfolios of the most liquid and illiquid stocks (LIQ). In order to control for the real estate market exposure, we also include both listed real estate returns (NAREIT)[1]. 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 headquarter is defined as

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

[1] 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 significant negative, which might be caused by the multicolinearity between NCRIEF return, NAREIT return and stock market return.

where $sqrt(Dist_{t,n,i})$ is the square root of the distance of property *n* of firm *i* from the headquarter, 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 which have previously been used to account for market concentration. The classic way to account for market power or market concertation is to construct the Herfindahl-Hirschman Index (HHI). We construct the HHI at the MSA level. The HHI measures the geographic the 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 firm's properties across the MSAs are. The HHI is calculated as

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

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 concertation is to measure the proportion of properties located in the MSA where the headquarter locates. This measure has been used by Ling et al. (2017). We define a variable HOME for time *t* and company *i* so that:

$$HOME_{t,i} = \frac{1}{\mathrm{N_{t,1}}} \sum_{n=1}^{N} D_{t,n,i},$$

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 average distance, the HHI for geographic concentration and proportion of properties located in home MSA held by each firm across time (Panel A) and across firm size (Panel B). The information in Table 3 provides comprehensive overview of the geographic scope

of U.S. REIT holdings. Panel A presents summary statistics of all firms in the sample. Focusing on the first row, the average distance of firm's properties to the headquarter is 1,125 km (27 km in terms of the average of squared root of distance). Based on average distance, the geographic dispersion shows some variations. The maximum average distance is 1,277 km (31 km in terms of the average of squared root of distance) in 2015, and the minimum average distance is 1,051 km (25 km in terms of the average of squared root of distance). As shown in Figure 2, after 2006, the average distance increases, implying that firms have invested in properties further away from the headquarters. Overall, from 1996 to 2015, with the maturity of REITs industry, U.S. REITs have become more dispersed. This finding is also confirmed by the HHI and HOME. The average HHI is 0.21 between 1996 and 2015 (Table 3, row 1 for HHI concentration of MSAs) and the average proportion of home assets is 16%. From Figure 1, the concentration indicator decreases 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 the crisis period, the share of home assets dropped to 0.14 in 2015 again.

The finding for standard deviation of the average distance to headquarter shows that there is significant variation in our measure of geographic dispersion across firms. The cross-sectional standard deviation of average distance to headquarter is 728 km (13 km in terms of the average of squared root of distance), the standard deviation of HHI value is 0.242 and the standard deviation of 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 average distance to headquarter, 0.199 for HHI MSA concentration and 0.166 for share of home assets, respectively.

Panel B 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 average distance to headquarter for big firms is 1,438 km, while only 832 km (23 km in terms of the average of squared root of distance) for small firms. The HHI concentration indicator and share of assets located in the headquarter MSA is 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.

To study how stock returns vary by geographic dispersion, we require cross-sectional variation in dispersion that is independent of other firm characteristics known to be related to returns. Panel B shows that even within size terciles, there is a significant amount of variation in geographic dispersion. Taking the average distance to headquarter 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 squared root of distance). For small firms, the 75% quantile of the distance is 1,184km (41 km in terms of the average of squared root of distance) while the 25% quantile is only 348 km (23 km in terms of the average of squared root of distance). For large firms, the 75% quantile of average distance is over 3 times of 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 is significant variations within each size tercile.

In summary, Table 3 shows significant cross-sectional variation in geographic dispersion. The geographic dispersion increases over time and remain large even when breaking down the cross-section by size as shown in Figure 1.

4 Results

4.1 Portfolio Construction and Non-Market Return

The regressions are based on portfolios of US 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 real estate factor, which is measured as the NAREIT excess return, has the highest sensitivity. The beta coefficient is always above 0.5. Market beta can also significantly explain the return of REITs, especially after 2007. We also see after 2007, size factor and high minus low factor become critical. The change in the pattern is also confirmed by the structural break test, which is shown in Table 6 column 1. The five portfolios as well as the portfolio based on the run-short trading strategy show a significant break on June 2007.

More importantly, during 1996 to 2006, concentrated firms are associated with a significant alpha

while the most dispersed firms are not. The difference in the alpha for the most concentrated and dispersed portfolios is also significant. This confirms the previous finding by Ling et al., (2017). Using the sample of US REITs between 1996 and 2013, they show that firms with properties in their home MSA are associated with higher returns and find no significance in portfolios of low home market concentration. While they document significant positive alphas for portfolios with high home MSA concentration they do not find significant negative alphas for portfolios with low concentration in any of the specifications.

However, over the period from 2007 to 2015, the results show that dispersed firms are associated with a significant positive alpha while concentrated portfolios are not associated with a significant alpha. During and after the crisis, investors perceive a higher risk for REITs, especially for diversified REITs. Because of the perception of management inefficiency by the investors, investors require rewards to compensate this risk. Investors perceive dispersed firms may be more likely to be subjected to management inefficiency, which can be related to two issues: (1) agency problems and (2) the manager alignment hypothesis. In terms of the agency issues, agency theory indicates that mangers generally tend to overinvest and grow their firms beyond the optimal size driven by personal monetary incentives. Such investments are not necessarily value maximizing, which is likely to diminish firm value. While diversification should be good as it helps to reduce risk, Aggarwal and Samwick (2003) show evidence that managers do not diversify across assets to reduce idiosyncratic risk exposure but instead to increase private benefits. Agency issues can then result in firm inefficiency.

An alternative theory with similar implications would be the manager alignment hypothesis. Landier et al. (2009) argue that managers align with the social interests of local communities. They argue that geographical dispersion may decrease 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 favourably to divestitures of in-state division.

If investors perceive a higher risk for dispersed REITs, which are more likely to be subjected to information disadvantage and management misalignment, we would expect higher returns on portfolios with a high dispersion relative to those with a low dispersion. In other words, portfolio

managers with an information advantage are able to "buy low" before positive information has been incorporated into asset valuations and "sell high" before negative information has been fully reflected into falling asset prices. Firms with the 20th quantile longest distance experience an average monthly return of 0.41%. Firms with 20th quantile shortest distance experience an average monthly return of -0.29%, which is insignificantly different from zero. This implies 70 basis point monthly (8.4 percent annually) return difference, which is also statistically significant.

<< Table 4 about here>>

We also substitute average distance to headquarter by other dispersion measurements, including proportion of properties locating in the same MSA as their headquarter and the HHI MSA concentration indicator. In general, the results show higher alpha for concentrated portfolios over the period from 1996 to 2006 and a higher alpha for dispersed portfolios after 2007. However, the difference isn't always significant when alternative dispersion measurement is used. The structural break test also confirms significant break on June 2007 for most of the portfolios. However, the break test for the long and short portfolio based on Herfindal concentration indicator isn't significant.

<< Table 5 about here >>

<< Table 6 about here >>

4.2 Cross-sectional Fama-MacBeth regression results

The results by Fama MacBeth cross-sectional regressions also confirm univariate portfolio analysis. For each year of our sample period, we estimate the following cross-sectional regression:$R_{i,t} - R_{f,t} = c_0 + \sum_{m=1}^{M} c_{i,m} X_{m,i,t-1} + e_{i,t}$

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-differenced firm's aggregate market capitalization; M/B, defined as the market value of assets divided by the book value of assets; LEV, defined as 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 property type dummy variables.

<< Table 7 about here>>

The results confirm that before crisis period, with an increase in dispersion, which can be measured as decrease in the proportion of properties in home MSA and increase in the average distance of properties to the headquarter, returns increases significantly. Apart from that, younger firms, firms with increasing size, firms with lower debt ratio and higher institutional ownership have a higher excess return.

However, for the panel using sample period from 2007 to 2015, with the increase in average distance to headquarter, with the decrease in HHI MSA concentration, or with the decrease in home assets, excess return increases significantly. This confirms with our conclusion that after financial crisis, firms with dispersed assets show higher excess return. A one percent increase in average squared root of distance to headquarter is associated with an increase in the return by 0.5% on average.

4.3 Further evidences on the perceived risk for REITs.

We further test our assumption that after the crisis, investors perceive higher risk in dispersed REITs and therefore require higher return to compensate for this risk by double sorting portfolios. We independently sort stocks according to their distance and other firm characteristics, such as size, exposure to 25 gateway MSAs and institutional ownership. For each category, we sort the firms into three equal quantiles which leaves us with a total of nine (3×3) portfolios. We also divide the sample period into pre-GFC and post-GFC. We see a different pattern in these two samples.

The difference between small and large REITs is counted, as smaller REITs may be less capable in efficiently correcting and transforming information and therefore more likely to be subjected to management inefficiency. Small firms with distant assets may particularly struggle to manage their

property holdings in the distant areas and are therefore exposed to the highest risk. Consequently, investors would require the largest reward to invest in them. Our double-sorting results based on size and distance during the period between 2007 and 2015 (Table 8) confirms this assumption. The highest alpha is found for the smallest REITs with the most dispersed assets. The difference in alpha between the most concentrated and most dispersed portfolio is significant only for small REITs.

<< Table 8 about here >>

Tables 9 shows double-sorted portfolios based on geographic dispersion and the 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 most populated area with a higher transaction volume and more information available. For instance, NCRIEF published total return indices for core type of property investments for these markets since 1996. Therefore, there is less degree of information asymmetry if investors invest in gateway markets. In other words, investing in these gateway markets can be perceived as less risky than investing in other markets. Our findings on the double-sorted portfolios confirm this assumption. After 2007, highest alpha is found for REITs with the lowest exposure to 25 MSAs but the highest degree of distance. These firms are perceived most risky because the information inefficiency associated with those markets only seems to materialize if the firm has assets away from firm's headquarter and it is hard to manage the information flow. Therefore, investors require the highest reward for them to investing in these stocks. The difference in the alpha between concentrated firms and dispersed firms is significant for firms with the lowest level of gateway market exposure. Longing dispersed firms with low gateway market exposure and shortening concentrated firms with low gateway market exposure will generate a non-market return by 11% annually.

<< Table 9 about here >>

Table 10 reports double-sorted portfolios by distance and institutional ownership. Before the crisis, REITs with higher institutional ownership outperform those with lower institutional ownership, although the difference is insignificant. Firms with most concentrated assets tend to perform better than dispersed assets. However, the difference in the non-market return is again insignificant. Over

the period between 2007 and 2015, highest alpha appears for portfolio with most dispersed assets and lowest institutional ownership ratio. These results are similar to the findings in Hartzell et al. (2014). We can see that REITs with greater institutional ownership tend to be better managed as they are subject to more shareholder scrutiny. Therefore, investors perceive may perceive REITs with lower institutional ownership as being at risk from agency problems. As we argued before, investors tend to perceive higher risk of management inefficiency for REITs with most distanced assets. As a result, investors perceive the highest risk for REITs with a low institutional ownership and a large distance and therefore request the greatest reward for investing in them. As a result, we see a significant difference in the alpha between the most concentrated REITs and most dispersed REITs for REITs with the lowest institutional ownership ratio. A long-short portfolio yields a significantly positive alpha by 6.48% annually.

<< Table 10 about here>>

5 Conclusion

This paper studies the role of geography on equity performance from the point of view of agency theory. We look at the impact of geographic asset dispersion on the returns of real estate firms. Agency theory is be associated with mangers generally overinvesting and growing their firms beyond the optimal size event though such investments may not be necessarily value maximizing. Having dispersed assets may not bring the promised diversification benefits for a firm. Instead, it may be more likely that such a strategy diminishes firm value – the diversification discount. Therefore, holding dispersed assets may result in a higher perceived risk by investors. We use US real estate firms as a natural laboratory to identify the degree of dispersion of firm's assets – their properties. We quantify annual dispersion of assets in an innovative way by estimating the distance of each property to firm's headquarters.

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. This aligns with the agency theory that managers may decide to invest in distant assets not out of diversification reasons but to increase their non-market performance. Prior to the GFC, the relationship between distance and

performance is either non-existent or opposite to post-GFC findings. This can be due to the fact that distance was fairly stable up until 2006 and has only been gradually increasing since 2004. We argue that while institutional investors may not be interested in a non-market return, small investors interested in alpha can use distance to headquarter to construct a long-short strategy and can achieve significant returns of 6-9 percent.

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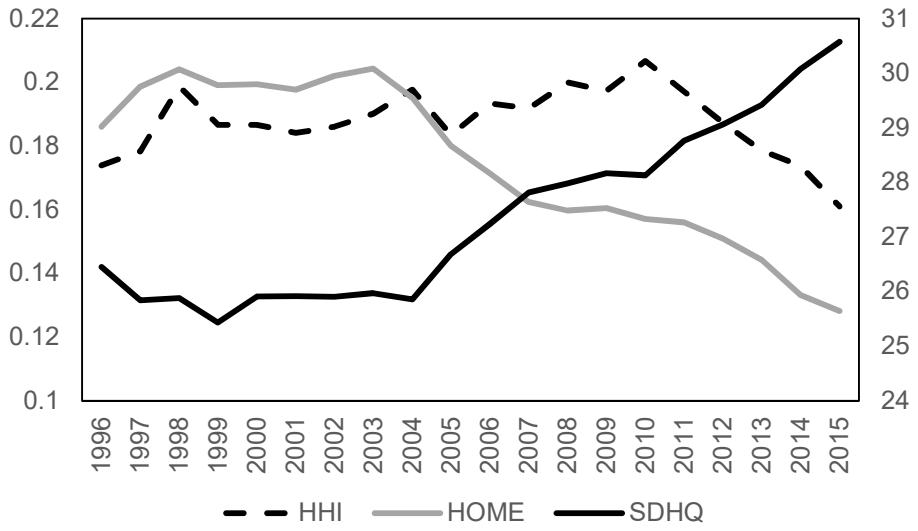
Figure 1: Average square root distance to headquarter (SDHQ), HHI and proportion of home assets (HOME) between 1996 and 2015

Panel A: Equally-weighted



Panel B: Property Value-weighted

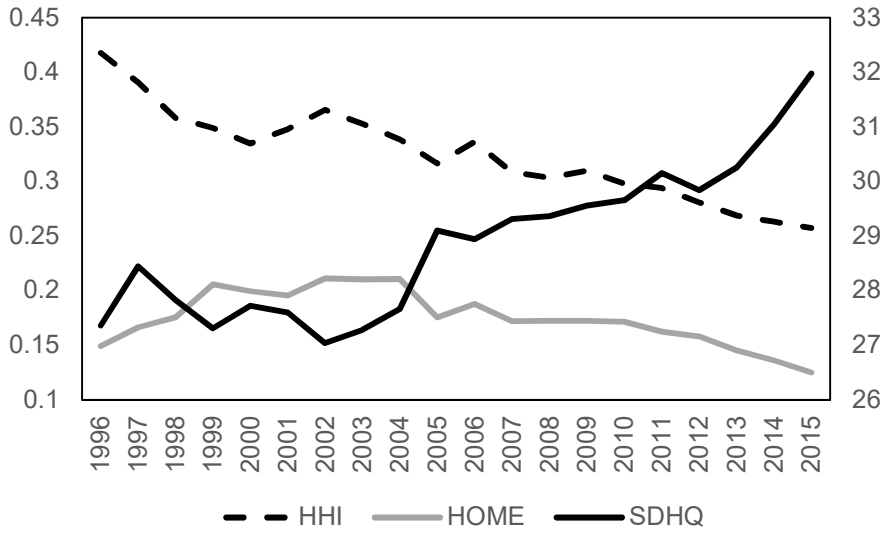


Figure 2: Number of US real estate firms with complete observations and their market capitalization between 1996 and 2015

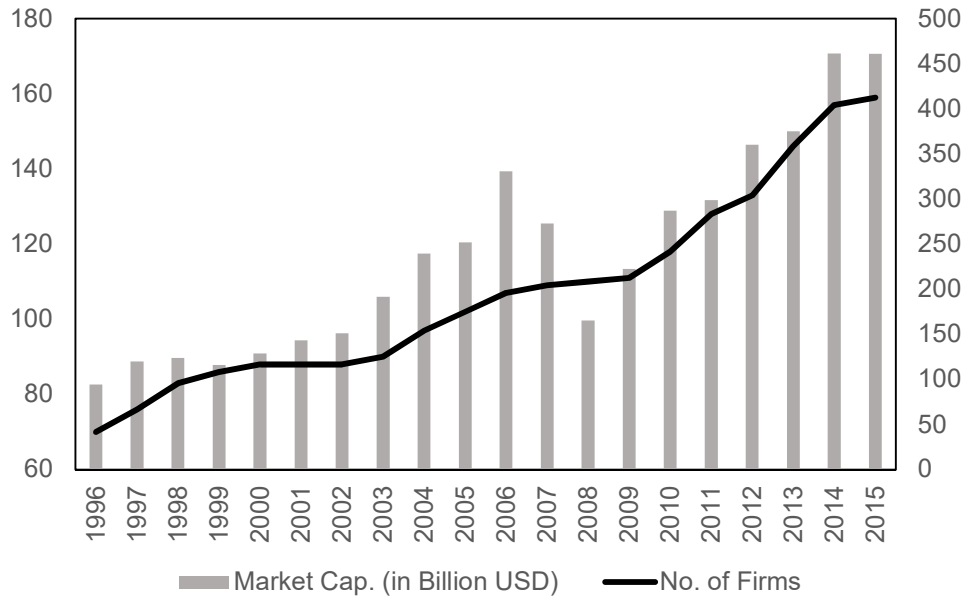


Figure 3: Sample distribution and local asset concentration by headquarter location

Note: This figure plots the sample distribution of firms by headquarter location. Headquarter location is defined at the MSA level. Home Concentration is defined as the percentage of a firm's total property portfolio located in the headquarter market. The sample period is 1996-2015.

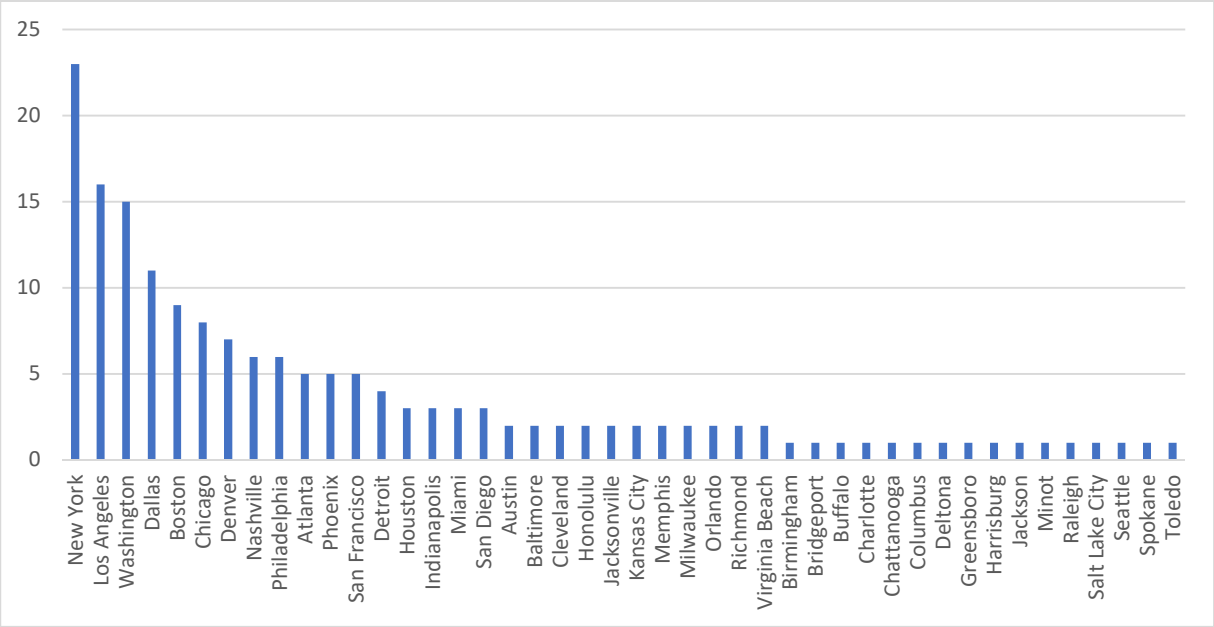


Figure 4: Average local asset concentrations by headquarter MSA

Note: This figure plots the sample distribution of average local asset concentrations by headquarter location. This means, what is the proportion of the firms' portfolio in an MSA if the headquarter is in that MSA. Home Concentration is defined as the percentage of a firm's total property portfolio located in the headquarter market. The sample period is 1996-2015.

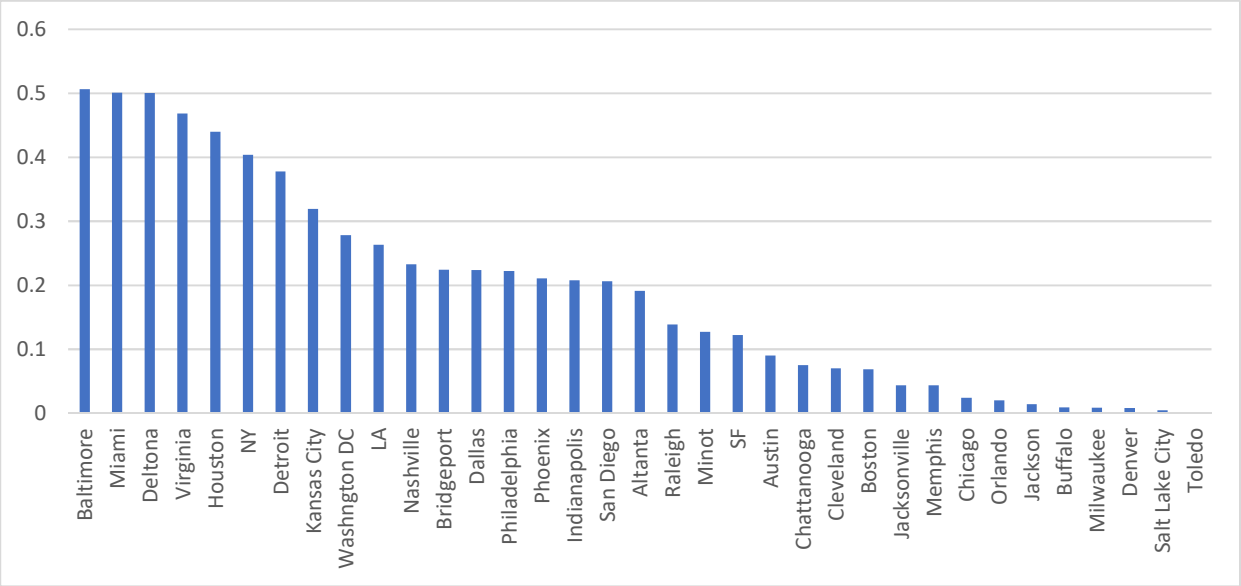


Figure 5: Average local asset concentrations by year

Note: This figure plots the time series variation in the mean portfolio concentrations held in the firm's home market by year. Home Concentration is defined as the percentage of a firm's total property portfolio located in the headquarter market.

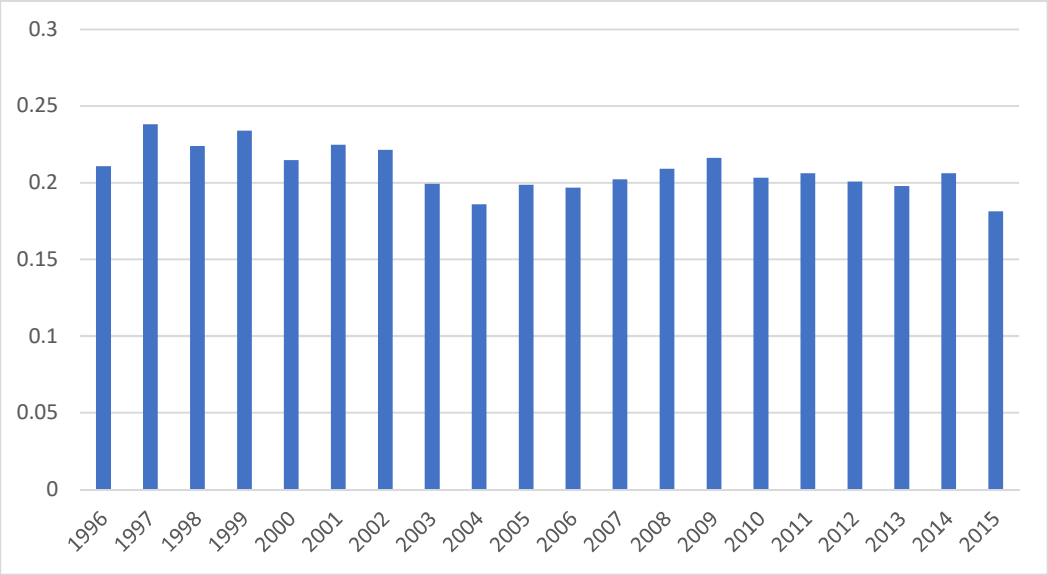


Table 1: Descriptive statistics for firm characteristics (averages 1996–2015)

	Mean	Std. Dev.	Max	Min
Annual Return	0.061	0.419	5.213	-5.122
Volatility of Return	0.023	0.025	0.467	0.001
25 MSA	0.479	0.240	1.000	0.000
Log of Age	9.468	11.778	63.000	0.000
Size (USD billion)	1,813	2,743	16,696	9
Change in Size	0.023	0.107	3.426	-0.898
Debt to Equity	1.483	2.394	14.211	-9.884
Market to Book Ratio	1.081	4.364	100.000	0.000
Turnover	2.765	4.297	0.095	0.000
Prop. of Inst. Owners	0.827	0.261	1.311	0.001

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

	Mean	Std. Dev.	Max	Min
MR	0.0003	0.0124	0.1135	-0.0895
SMB	0.0010	0.0062	0.0448	-0.0432
HML	0.0001	0.0066	0.0483	-0.0422
WML	0.0002	0.0052	0.0452	-0.0303
LIQ	0.0003	0.0019	0.0055	-0.0062
RE	0.0004	0.0176	0.1685	-0.2169

Table 3: Descriptive statistics of distance to headquarter

Note: Distance to headquarter is measured as average square root distance to headquarter of properties held by each firm. In Panel A, 'Mean' summary statistics are computed for each year in the sample period between 1996 and 2015. This gives a time series of annual average. Using the time series of the mean, the rows report the average, the median, the minimum, the maximum, the 75% quantile, the median and 25% quantile. Panel B breaks down the 223 firms by market capitalization.

	Avg. nr. of firms	Mean	Std. Dev.	Max	Min	75%	50%	25%
Average squared root distance to headquarter (SRDHQ)								
Panel A: Summary statistics for all firms								
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: Average by firm size								
Large	37	32	13	51	6	41	36	23
Median	36	28	14	52	4	39	31	16
Small	35	23	12	49	4	30	21	14
	Number of firms	**Mean**	**Std. Dev.**	**Max**	**Min**	**75%**	**50%**	**25%**
Average distance to headquarter (DHQ)								
Panel A: Summary statistics for all firms								
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: Average by firm size								
Large	37	1438	658	2615	244	1932	1480	904
Median	36	1176	739	2715	50	1727	1151	498
Small	35	832	669	2581	26	1184	648	348
	Number of firms	**Mean**	**Std. Dev.**	**Max**	**Min**	**75%**	**50%**	**25%**
HHI of MSA concentration								
Panel A: Summary statistics for all firms								
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: Average by firm size								
Large	37	0.130	0.166	0.706	0.015	0.126	0.065	0.030
Median	36	0.182	0.222	0.912	0.015	0.219	0.086	0.041
Small	35	0.243	0.278	0.987	0.019	0.285	0.124	0.060

	Number of firms	**Mean**	**Std. Dev.**	**Max**	**Min**	**75%**	**50%**	**25%**
Proportion of properties located in home MSA (HOME)								
Panel A: Summary statistics on number of assets for all firms								
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: Average number of assets by firm size								
Large	37	0.108	0.155	0.666	0.000	0.118	0.047	0.014
Median	36	0.167	0.255	0.935	0.000	0.189	0.037	0.006
Small	35	0.230	0.277	0.954	0.000	0.315	0.111	0.019

Table 4: Portfolios based on average distance to headquarter

Note: This table presents factor model results of portfolios sorted into 5 groups from the bottom to the top 20th percentile based on the average squared root distance of properties to headquarter. Alpha stands for non-market return. MR stands for the return factor, SMB stands for the size factor, HML stands for book to market value factor, MOM stands for momentum factor and LIQ stands for liquidity factor. RE stands for listed real estate return. 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 4-A: 1996M2 to 2006M12

Portfolio	Alpha	MR	SMB	HML	MOM	LIQ	RE	R2
Panel A Portfolio formed based on SRDHQ								
Disp.	0.0027	0.2907***	0.1050	0.0225	0.0708	0.0036	0.6802***	0.7322
	(1.2921)	(4.3434)	(1.5891)	(0.2606)	(0.8430)	(0.0620)	(10.9670)	
	0.0065***	0.1199***	0.0636	0.0779	0.0684	-0.0528	0.8197***	0.8411
	(4.3018)	(2.4408)	(1.3121)	(1.2282)	(1.1094)	(-1.2260)	(18.0087)	
	0.0076***	-0.0694*	0.0603	-0.0490	0.0116	0.0020	0.8527***	0.8691
	(5.9379)	(-1.6762)	(1.4754)	(-0.9165)	(0.2233)	(0.0540)	(22.2162)	
	0.0044***	0.0659	0.1013*	-0.1642***	0.1813***	-0.0729	0.5889***	0.6215
	(2.3448)	(1.0886)	(1.6946)	(-2.1010)	(2.3881)	(-1.3735)	(10.4982)	
Conc.	0.0067***	0.2528***	0.2381***	0.0002	0.2080***	-0.0366	0.6567***	0.8582
	(5.0952)	(5.8910)	(5.6204)	(0.0036)	(3.8642)	(-0.9738)	(16.5155)	
Panel B: Portfolio long in concentrated firms and short in dispersed firms using all firms								
D-C	-0.0041*	0.0379	-0.1331*	0.0223	-0.1372	0.0403	0.0235	0.0679
	(-1.8270)	(0.5241)	(-1.8638)	(0.2389)	(-1.5123)	(0.6351)	(0.3501)	

Table 4-B: 2007M1 to 2015M3

Portfolio	Alpha	Mkt-Rf	SMB	HML	MOM	LIQ	RE	R2
Panel A Portfolio formed based on SDHQ								
Disp.	0.0041*	0.3460***	0.4898***	-0.0004	0.0176	-0.1287*	0.5565***	0.9129
	(1.6476)	(4.5251)	(4.0588)	(-0.0034)	(0.0993)	(-1.8555)	(18.2571)	
	-0.0010	0.5672***	0.5260***	0.4470***	0.4019	-0.0022	0.7860***	0.8923
	(-0.2391)	(4.4844)	(2.6348)	(2.3715)	(1.3740)	(-0.0189)	(15.5894)	
	-0.0004	0.5010***	0.6983***	0.4388***	0.0862	-0.0506	0.6870***	0.8723
	(-0.0982)	(3.8853)	(3.4312)	(2.2835)	(0.2891)	(-0.4326)	(13.3649)	
	-0.0012	0.3356***	0.6542***	0.1659	0.0597	-0.0320	0.5260***	0.8648
	(-0.3605)	(3.4110)	(4.2129)	(1.1315)	(0.2626)	(-0.3582)	(13.4107)	
Conc.	-0.0029	0.4552***	0.8682***	0.3291*	-0.0357	-0.1125	0.6049***	0.8514
	(-0.6820)	(3.5246)	(4.2593)	(1.7096)	(-0.1194)	(-0.9603)	(11.7486)	
Panel B: Portfolio long in concentrated firms and short in dispersed firms using all firms								
D-C	0.0070***	-0.1092	-0.3784***	-0.3294***	0.0532	-0.0162	-0.0484	0.3623
	(2.2881)	(-1.1675)	(-2.5629)	(-2.3630)	(0.2460)	(-0.1907)	(-1.2981)	

Table 5: Alphas of portfolios based on alternative geographic diversification measures

Note: The table present 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. T statistic is reported in parentheses. ***, ** and * stands for significance at 1%, 5% and 10% level, respectively.

	Home MSA Concentration		
	Concentrated	**Dispersed**	**D-C**
1996-2007			
alpha	0.0083***	0.0068***	0.0015
	(4.84)	(3.11)	(0.57)
2007-2015			
alpha	-0.0048	0.0049	0.0098***
	(-1.17)	(1.38)	(2.92)

	HHI for MSA concentration		
	Concentrated	**Dispersed**	**D-C**
	0.0071***	0.0043***	-0.0028
	(2.91)	(2.53)	(-0.99)
	-0.0016	0.0014	0.0031
	(-0.42)	(0.36)	(1.11)

	Distance to Headquarter		
	Concentrated	**Dispersed**	**D-C**
1996-2007			
alpha	0.0063***	0.0028	-0.0036
	(3.66)	(1.17)	(-1.34)
2007-2015			
alpha	-0.0031	0.0052*	0.0083***
	(-0.81)	(1.83)	(2.89)

	Property Value Weighted Distance to Headquarter		
	Concentrated	**Dispersed**	**D-C**
	0.0083***	0.0072***	-0.0011
	(4.92)	(5.20)	(-0.54)
	-0.0048	0.0013	0.0061***
	(-1.28)	(0.41)	(2.16)

Table 6: Structural break test for portfolios

Note: The table present Chow test statistics for a structural break in January 2007 for five portfolios from the most dispersion (Disp.) portfolio to the most concentrated one (Conc). D-C stands for the portfolio based on the strategy of taking a long position of the most dispersed firms and taking a short position of the most concentrated firms. SRDHQ stands for the square root distance to headquarter, HHI stands for Herfindahl MSA concentration indicator, and Home stands for the proportion of properties located in the home MSA. ***, ** and * stands for significance at 1%, 5% and 10% level, respectively.

	SRDHQ	HHI	HOME
Disp.	1.94*	3.11***	6.09***
	7.11***	5.87***	4.76***
	9.19***	8.23***	10.37***
	6.58***	8.06***	8.92***
Conc.	5.92***	3.79***	3.29***
D-C	5.23***	2.00*	2.31**

Table 7: Fama-MacBeth regression results

Note: This table reports the results of Fama MacBeth cross-sectional regression. The dependent variable is the annual excess return netting of the T-bill rate. SRDHQ stands for the average square root distance to headquarter. HOME stands for the proportion of properties located in the same MSA as the headquarter. HHI stands for the Herfindahl centration indicator. Control variables include exposure to 25 MSAs, log of age of REITs, change in market value, debt to equity ratio, market to book ratio, volatility and turnover, institutional ownership ratio and property type dummy. Standard error is reported in parenthesis. ***, ** and * denote significant at 1%, 5% and 10% level, respectively.

	Panel A: 1996-2006			Panel B: 2007-2015		
	Model 1:	Model 2:	Model 3:	Model 4:	Model 5:	Model 6:
SRDHQ	-0.0547***			0.0504***		
	(0.0092)			(0.0217)		
HOME		0.0694***			-0.1423***	
		(0.0311)			(0.0387)	
HHI			0.0643			-0.1622***
			(0.0628)			(0.0485)
25 MSA	0.0795	0.0737	0.0582	0.0313	0.0647	0.0934
	(0.0682)	(0.0931)	(0.0846)	(0.0484)	(0.0491)	(0.0621)
Log of Age	-0.0291*	-0.0298***	-0.0235***	0.0077	0.0098	-0.0005
	(0.0167)	(0.0111)	(0.0109)	(0.0257)	(0.0255)	(0.0229)
Change in Size	-0.3132	1.0027*	1.0934**	-0.6050	-0.6489	-0.4561
	(0.6587)	(0.5242)	(0.5538)	(0.8519)	(0.8495)	(0.8508)
Debt to Equity	0.0005	-0.0157**	-0.0145*	0.0002	0.0012	0.0064
	(0.0076)	(0.0079)	(0.0076)	(0.0165)	(0.0155)	(0.0075)
Market to Book	0.0269	0.0042	0.0055	-0.0184	-0.0100	-0.0172
	(0.0213)	(0.0173)	(0.0182)	(0.0404)	(0.0392)	(0.0470)
Volatility	-3.7009	-0.9353	-1.3078	-2.8309	-3.7650	-2.5980
	(2.6642)	(3.4613)	(3.4978)	(3.5025)	(3.0060)	(2.4604)
Turnover	-1.6188	-1.2150	-1.2660	-0.7393	-0.5217	-0.3948
	(0.9797)	(0.8796)	(0.8930)	(1.6070)	(1.6477)	(1.6298)
Ownership	0.1286*	0.1604***	0.1424***	0.0028	-0.0171	0.0228
	(0.0691)	(0.0500)	(0.0568)	(0.0562)	(0.0588)	(0.0629)
Property Type Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Nr of obs	435	434	435	724	718	726
Adj. R2	0.7126	0.7118	0.7174	0.7621	0.7565	0.7435

Table 8: Alphas of equally weighted portfolios based on size and distance to headquarter

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

		1996M2-2006M12			2007M1-2015M3		
		Concentrated	**Dispersed**	**D-C**	**Concentrated**	**Dispersed**	**D-C**
Size	**Large**	0.0055***	0.0020	-0.0036	-0.0028	-0.0011	0.0017
		(3.01)	(0.94)	(-1.53)	(-0.67)	(-0.35)	(0.65)
	Small	0.0058***	0.0101***	0.0043	-0.0022	0.0071*	0.0092***
		(2.40)	(3.23)	(1.28)	(-0.63)	(1.68)	(2.37)
	L-S	-0.0002	-0.0081***		-0.0006	-0.0081**	
		(-0.08)	(-2.19)		(-0.15)	(-1.96)	

Table 9: Alphas of equally weighted portfolios based on exposure to the top 25 MSAs and distance to headquarter

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

		1996M2-2006M12			2007M1-2015M3		
		Concentrated	**Dispersed**	**D-C**	**Concentrated**	**Dispersed**	**D-C**
25 MSA proportion	**High**	0.0044**	0.0081***	0.0037	0.0016	-0.0014	-0.0029
		(2.11)	(5.12)	(1.46)	(0.43)	(-0.42)	(-0.95)
	Low	0.0035	0.0030	-0.0005	-0.0042	0.0049*	0.0091***
		(1.63)	(1.26)	(-0.17)	(-0.86)	(1.65)	(2.68)
	H-L	0.0009	0.0051*		0.0057	-0.0063***	
		(0.28)	(1.82)		(1.36)	(-2.28)	

Table 10: Alphas of equally weighted portfolios sorted on institutional ownership and distance to headquarter

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.

		1996M2-2006M12			2006M12-2015M3		
		Concentrated	**Dispersed**	**D-C**	**Concentrated**	**Dispersed**	**D-C**
Institutional Ownership	**High**	0.0082***	0.0049***	-0.0033	-0.0038	-0.0004	0.0034
		(5.37)	(2.17)	(-1.19)	(-0.93)	(-0.11)	(0.97)
	Low	0.0036	0.0047*	0.0011	-0.0011	0.0043*	0.0054*
		(1.50)	(1.90)	(0.35)	(-0.36)	(1.64)	(1.70)
	H-L	0.0045	0.0002		-0.0026	-0.0047	
		(1.61)	(0.05)		(-0.61)	(-1.13)	