University of Reading

# *Does asset location and concentration explain REIT IPO valuation?*

Article

Published Version



Ling, D. C., Marcato, G. and Zheng, C. (2020) Does asset location and concentration explain REIT IPO valuation? Real Estate Economics. ISSN 1540-6229 doi: https://doi.org/10.1111/1540-6229.12327 Available at http://centaur.reading.ac.uk/91245/

DOI: 10.1111/1540-6229.12327

ORIGINAL ARTICLE

# Does asset location and concentration explain REIT IPO valuation?

David C. Ling[1,2] | Gianluca Marcato[1,2] | Chen Zheng[1,2]

[1] Department of Finance Insurance and Real Estate, University of Florida, Gainesville, Florida

[2] Department of Real Estate and Planning, Henley Business School, University of Reading, Reading, UK

**Correspondence**
Chen Zheng, Department of Real Estate and Planning, Henley Business School, University of Reading, Reading, RG6 6UD, UK.
Email: chen.zheng@henley.ac.uk

**Abstract**

Following recent developments in the asset pricing literature on geographic concentration, we complement classic theories based on information asymmetry and explain the short-run performance of real estate investment trust (REIT) initial public offerings (IPOs) through an investor base mechanism. We analyze the U.S. market and show that issuers are more likely to underprice when a REIT is more geographically concentrated. In particular, by adopting an identification strategy of pre- and post-IPO returns, we find evidence for an investor base channel rather than a diversification discount channel. In addition, geographic portfolio concentration has a stronger impact on the initial returns of REIT IPOs than property type concentration. Finally, we find that lower deadweight costs at the time of an IPO weaken the influence of geographic concentration on initial returns. Our results are robust to the firm's geographic concentration in economically defined regions, different measures of deadweight costs, the control of information environment of the portfolio and headquarters markets, and to controlling for the REIT's property type focus.

**KEYWORDS**
asset type, geographic concentration, Herfindahl index, investor base, IPOs, REITs

## 1 INTRODUCTION

This paper examines the extent to which the location and concentration of a company's underlying assets affect its initial public offering (IPO) valuation using U.S. real estate investment trust (REIT) data. Although the asset type concentration of public companies has been extensively explored, studies on the geography of firm assets have been limited by a lack of data (Bernile, Kumar, & Sulaeman, 2015; García & Norli, 2012). The regulatory environment and corporate governance of U.S.-listed real estate companies allow us to accurately measure the level of asset and geographic portfolio concentration.

The IPO short-run performance is notably different for real estate companies and tends to show significantly lower, and sometimes negative, underpricing compared to industrial firms. In this study, we argue that widely accepted theories of IPO underpricing based on information asymmetry are often unable to explain IPO performance in the real estate industry. The unique characteristics of an equity REIT,[1] specifically its real asset holdings, play an important role in its IPO valuation. We find that the geographic concentration of a REIT's initial property portfolio better explains its IPO performance than traditional theories based on asymmetric information.

Much of the limited literature on the initial returns of real estate IPOs is focused on why they are, on average, much lower than the first-day returns of industrial IPOs. For example, we find a 3.5% average initial return (with a standard deviation of 9.2%) for the 183 IPOs in our broad sample from 1995 to 2017, with a minimum of −13.2% and a maximum of 45.8%. In contrast, the average initial return of U.S. industrial IPOs is 17.9% between 1980 and 2018 (Ritter, 2018). Using the same sample period as our study, Marcato, Milcheva, and Zheng (2018) record an even higher initial return of 24.0% for U.S. industrial IPOs. This study investigates the determinants of variation in IPO valuations within the REIT industry, focusing on the unique characteristics of public real estate companies, including their underlying real asset portfolio holdings. In particular, our study extends the literature on the impact of underlying real assets on REITs IPO performance via a geographic concentration channel. We build on two strands of the literature: the effect of concentration or diversification on firm performance and real estate IPO valuation. We propose a new valuation approach for real estate IPOs, which does not require the assumption of information asymmetry.

Commercial real estate (CRE) markets are decidedly local in nature, which may provide an information advantage to firms and individuals who invest time and resources to obtain local market knowledge (Ling, Naranjo, & Scheick, 2018; Vannieuwerburgh & Veldkamp, 2009). Furthermore, most real estate companies focus their portfolios on one, or a few, property type with a clear description of their concentration strategy disseminated to investors prior to their IPO. These concentrated investment strategies, in addition to greater homogeneity in firm structure and corporate governance than most other industries, make REITs a suitable laboratory to disentangle the effects of geographic concentration on IPO initial returns from other cross-firm characteristics (Hartzell, Sun, & Titman, 2014).

Overall, we find that geographic concentration strategies have a significant impact on the IPO valuation of REITs. This result is robust to alternative regression specifications, to controlling for the property type focus of the REIT, and to controlling for variation in the information environment of the markets in which the IPO firm's properties are located and the market in which the firm is headquartered.

[1] Equity REITs mainly invest in private real estate as opposed to mortgage REITs, which invest in mortgage debt.

Our contributions to the literature are fourfold. First, we find empirical evidence that more geographically concentrated REITs experience higher IPO initial returns. We propose both a primary and an alternative channel through which property asset locations could affect the IPO valuation. The primary channel is built on the Merton (1987) investor base argument and is closely related to the findings of García and Norli (2012). Merton (1987) argues that stocks with less investor recognition must offer higher expected returns to compensate investors for increased risk. García and Norli (2012) study the geographic concentration of corporate business activities and show that "local" firms have smaller investor bases and higher stock returns to compensate investors for the concentrated risk of their asset portfolios. As sufficient interest from investors (i.e., IPO subscription) is a key to the success of an IPO (Beatty & Ritter, 1986; Benveniste & Spindt, 1989; Rock, 1986), we argue that more geographically focused firms have less investor recognition; therefore, issuers and underwriters need to underprice shares to attract sufficient awareness and participation from investors. Although information asymmetry-based theories are unable to explain the negative initial returns sometimes observed for REIT IPOs, the investor base argument does not assume the existence of information asymmetry and can also account for IPO overpricing. This is particularly relevant for the real estate industry where governance is very transparent and asset-level information is widely available.

Second, we confirm that geographic location impacts IPO valuations via the investor base channel rather than the alternative diversification discount channel. A large corporate finance literature focuses on the impact of asset concentration on asset valuations as well as returns across different industries and consistently finds support for the existence of a diversification discount.[2] In other words, higher expected returns are required by investors to compensate for the increased risk associated with focused strategies (Montgomery, 1994). In a real estate context, the negative effects of diversification across property types are well-documented by Campbell, Petrova, and Sirmans (2003), Cronqvist, Högfeldt, and Nilsson (2001), and Capozza and Seguin (1999). The diversification discount (or concentration premium) argument suggests that more geographically concentrated REITs should experience higher initial returns due to higher required returns by investors after the listing. However, Ritter and Welch (2002) conclude that IPOs are one-off agency-based events in which initial returns are heavily dependent on the valuation of the IPO by underwriters and investors. Therefore, fundamental market valuation, asset pricing, and liquidity theories based on risk profiles are unlikely to explain short-run performance. Our findings support this argument as we only identify a significant impact of geographic concentration on the pricing of IPOs prior to the beginning of trading.

Third, we identify a moderating effect of the deadweight costs associated with a REIT IPO on the relationship between the geographic concentration of underlying properties and IPO valuation. Chan, Wang, and Yang (2009) argue that tangible and marketable real estate holdings give entities more bargaining power when they go public. If IPO companies can sell real estate portfolios/assets quickly and cost effectively in the parallel private commercial real estate market, issuers have less incentive to underprice shares. Should an IPO fail (i.e., be undersubscribed), the assets can be sold in the well-functioning private CRE market. Thus, when the deadweight cost of the IPO is relatively low, the impact of geographic concentration on IPO valuation is moderated. We are the first to empirically test this moderating effect and find evidence that when companies can liquidate properties quickly and cost effectively, the negative effect of geographic concentration on IPO initial returns is weakened.

[2] See, for example, Berger and Ofek (1995), Comment and Jarrell (1995), and Hund, Monk, and Tice (2010).

Finally, this study is the first to use a more precise method of calculating an IPO firm's geographic concentration and to test its impact on corporate finance activities. Despite the varying effects that a concentration strategy may have on a company's performance and the mechanisms through which these effects are transmitted, measuring the (geographic) concentration of a company's business activities is not straightforward. Although a growing literature investigates the role of geographic factors in corporate activities, these studies typically measure geographic proximity or dispersion based on the location of the companies' headquarters relative to their investors rather than on the locations of the firm's actual business activities or assets (García & Norli, 2012). Real estate companies with tangible, immovable, and relatively easy to value assets offer the opportunity to examine the geographic dimensions of corporate finance issues and the ability to construct measures of geographic concentration based on the holdings of physical assets in different locations.

The remainder of the paper is structured as follows. The next section briefly summarizes the literature on IPO underpricing and its usefulness in explaining REIT IPO performance. We also develop our testable hypotheses in this section. Section 3 presents a detailed description of our sample selection, variable construction, and estimation methodology. We discuss our results and robustness tests in Section 4. Section 5 provides concluding remarks.

## 2 | LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Ibbotson (1975) first brought attention to the underpricing of IPOs, an anomaly that has been observed across multiple industries and countries (Loughran, Ritter, & Rydqvist, 1994). Explanations for underpricing in the well-developed IPO literature can be generally categorized into two groups: information asymmetry-based theories and behavioral arguments (Ritter & Welch, 2002). The former posits that issuers, underwriters, and investors have varying amounts of information about the intrinsic value of an IPO. Therefore, for the success of the offering, underpricing is required by the relatively uninformed investors to compensate them for their perceived information disadvantage relative to informed investors in the IPO. The greater the level of the information asymmetry surrounding an IPO, the higher is the underpricing (Allen & Faulhaber, 1989; Beaty & Ritter, 1986; Benveniste & Spindt, 1989; Grinblatt & Hwang, 1989; Rock, 1986; Welch, 1989). In the absence of information asymmetry, the IPO offer price would be set to produce a zero (market-adjusted) return on the first day of trading.

Despite the substantial theoretical and empirical literature on IPO underpricing for industrial companies, real estate and, more generally, financial IPOs are underresearched as they are normally excluded from general IPO studies. Nevertheless, the literature on real estate IPOs is evolving with the recent growth of listed real estate markets across the world. The interest in this specific industry is partially attributable to the relatively low level of average IPO underpricing; moreover, overpricing is observed, on average, during some sample periods. For example, Wang, Chan, and Gau (1992) find an average initial return of −2.82% (i.e., overpricing) for U.S. REIT IPOs between 1971 and 1988. Chan, Chen, and Wang (2013) refer to these overpricing periods as "a puzzle within the puzzle."[3] After 1990, average initial returns turned positive (Ling & Ryngaert, 1997), but remained substantially lower than industrial IPOs. More recently, U.S. REIT IPOs experienced negative initial returns once more during the 2007–2010 financial crisis (Bairagi & Dimovski, 2011). Several studies focused on real estate IPOs in other markets, such as Australia,

[3] See Chan, Chen, and Wang (2013) for a detailed literature review of real estate IPO studies.

Canada, Hong Kong, Japan, Singapore. and Europe, also find abnormally low initial returns, with several companies reporting negative returns (Brounen & Eichholtz, 2002; Dimovski & Brooks, 2006; Londerville, 2002; Wong, Ong, & Ooi, 2013). Because information asymmetry-based theories are unable to account for negative initial returns, we adopt a new theoretical approach that supports and partly explains this phenomenon.

Wang et al. (1992) suggest that the unique features of listed real estate companies, such as their pre-1992 fund-like structure, the low involvement of institutional investors, and their tangible underlying real assets, offer a plausible explanation for overpricing. However, in the late 1980s, U.S. REITs started to function more as operating companies than passive investment vehicles, such as closed-end funds (Ling and Ryngaert, 1997). Thus, the (closed-end) fund-like structure of early REITs cannot explain the negative initial returns observed during the most recent financial crisis (2007–2010).

In the late 1980s, the U.S. REIT sector also saw a significant increase in the presence of institutional investors. Ling and Ryngaert (1997) argue that the shift from pre-1990 negative initial returns to positive returns in the early-to-mid 1990s was due to the increased uncertainty of IPO valuations introduced by a growing number of institutional investors in the REIT market. According to Ling and Ryngaert (1997), the involvement of institutional investors in REIT IPOs was similar to industrial IPOs in the 1990s; however, the average 3.6% underpricing reported by Ling and Ryngaert (1997) was still considerably lower than the average underpricing of industrial IPOs.[4]

To examine the influence of underlying real assets on IPO pricing, Chan, Stohs, and Wang (2001) compare the initial returns of 56 real estate operating companies' (REOCs) IPOs in Hong Kong with 343 non-real estate IPOs over the period 1986–1997 and find no significant difference. Therefore, they argue that portfolios of tangible real estate assets do not explain the unusual IPO performance of real estate companies. However, unlike U.S. equity REITs, the assets of most real estate operating companies are not primarily investment properties; rather, many REOCs are involved in the real estate development and service businesses. Thus, their findings do not eliminate the potential influence of underlying real asset holdings on the IPO return performance. Marcato, Stanimira, and Zheng (2018) argue that the geographic location of underlying assets matters to real estate IPO valuations as it links the regional economic conditions to the corporate performance.

Furthermore, the findings of Chan et al. (2001) do not hold in other real estate markets. For example, Brounen and Eichholtz (2002) find an average IPO initial return for U.K. and French property companies of 4.1% and 0.8%, respectively, over their 1984–1999 sample period. In contrast, Levis (1995) observes an average underpricing of 14.2% for industrial IPOs from 1980 to 1988 in the United Kingdom, whereas Derrien and Womack (2003) report an average underpricing in the French IPO market of 13.2% between 1992 and 1998. Although the sample periods in these comparison studies vary, the consistent differences between REIT IPOs and industrial IPOs on average initial-day returns are too large to ignore. Therefore, we argue that evidence on the impact of underlying real assets on the IPO performance of real estate companies remains inconclusive and worthy of further investigation.

Our study fills a gap in the literature by examining the potential influence of underlying asset holdings on IPO performance through a geographic concentration channel. In addition, we propose a new explanation for why the nature of a REIT's assets affects IPO valuations. The impact of the geographic locations of a firm's real estate assets on business activities and performance has received increasing attention in the general finance literature. However, studies on the impact

[4] According to table 1 in Ritter (2018), the average underpricing for U.S. industrial IPOs from 1991 to 1994 was above 10%.

of geographic concentration remain scarce due to data availability. García and Norli (2012) analyze the geographic concentration of corporate business activities by using the number of times a state's name is mentioned in a firm's 10-K report to proxy for the geographic dispersion of a firm's business interest. They find that companies with more geographically concentrated business activities have less investor recognition, hence higher expected (and realized) returns. This supports the investor recognition argument by Merton (1987), which may also play a key role in the success of an IPO because it directly influences the subscription process. Following these two streams of literature, we formulate our first hypothesis: more geographically concentrated REITs have a greater need to underprice IPOs in order to overcome a lack of investor recognition and to obtain sufficient subscriptions. More specifically:

**Hypothesis 1**: REITs with more geographically concentrated underlying assets experience higher IPO initial returns.

As previously discussed, diversification stock price discounts have been documented in multiple industries. Montgomery (1994) suggests that diversification across assets does not positively affect firm performance and, in fact, it may reduce expected returns by decreasing the investment risk. Therefore, a concentrated portfolio strategy is normally associated with a return premium. A growing literature examines how investment and corporate activities are influenced by the geographic location of a firm's assets and business interests, including geographic concentration. Coval and Moskowitz (2001) document that investors prefer firms with headquarters in the city where managers live. Similar "home bias" results suggest that investing in local firms provides investors with informational advantages.[5] For example, Landier, Nair, and Wulf (2009) find that human capital and asset management decisions are significantly affected by geographic dispersion, whereas Kang and Kim (2008) provide evidence that geographic proximity affects corporate acquisition decisions. Although geographic concentration could refer to the level of concentration or dispersion in business lines, asset types, or geographic locations, its measurement is difficult, particularly for firms with a larger percentage of intangible assets such as patents, licenses, and intellectual capital.

A diversification discount is also documented in a number of empirical CRE studies (Campbell et al., 2003; Capozza & Seguin, 1999; Cronqvist et al., 2001; Hartzell et al., 2014; Ling, Naranjo, & Scheick, 2019), which find that returns are lower for REITs with more geographically diversified portfolios—that is, a strategy of concentrated underlying assets contributes to a return premium.

Following this stream of literature, one might also argue that, other than the investment recognition channel, geographic locations could also affect IPO performance via a diversification discount channel. Investors in the secondary market would require higher returns for REIT IPOs with higher geographic concentrations to compensate for increased investment risks. However, Ritter and Welch (2002) argue that IPO underpricing is an anomaly observed on the first day of trading, not on the second day and thereafter. Fundamental valuation or asset-pricing theories based on risk premia are unlikely to explain excess initial returns. If investors on the first day of trading require higher returns for bearing greater risks associated with geographic concentration, why would investors on the second, third, and following days of trading not require the same return premium? Therefore, our second hypothesis argues that the positive effect of geographic concentration on REIT IPO returns is unlikely to be driven by a diversification discount effect:

[5] See García and Norli (2012) for a list of related studies.

**Hypothesis 2**: Geographic concentration affects the initial returns of REIT IPOs via an investor recognition rather than a diversification discount channel.

Chan et al. (2013) conduct the first cross-country study of REIT IPOs using a sample of 370 REIT IPOs from 14 countries. Using univariate tests, they identify several factors related to initial returns. However, their univariate tests are not robust enough to identify the underlying dynamics of real estate IPO pricing. Furthermore, as all previous explanations seem insufficient to explain REIT IPO performance, Chan et al. (2013) argue that the deadweight cost model proposed by Chan et al. (2009) represents the most suitable explanation because it does not require an assumption of information asymmetry and is consistent with competing theories. When U.S. REITs became more similar to typical operating companies in the late 1980s, the deadweight costs of IPOs also increased and this may at least partially explain the shift from negative average returns to positive initial returns. Chan et al. (2009) do not empirically test the impact of deadweight costs on IPO underpricing because of the challenge of finding an adequate proxy.

It is important to note that our investor base argument is consistent with the deadweight cost theory. If the investor base (recognition) of REIT IPOs increases with increased geographic diversification, selling underlying assets in the private market becomes easier and cheaper (as search costs are reduced). However, we argue that, holding the level of geographic concentration and other factors constant, REITs investing in more liquid private real estate markets could underprice shares less because they are able to sell their underlying assets in the private market relatively quickly and cost effectively should the IPO fail. Therefore, we formulate our third testable hypothesis:

**Hypothesis 3**: The impact of geographic concentration on IPO initial returns is weakened when returns and liquidity (transaction turnover) in the private market are higher (i.e., the deadweight cost is lower).

## 3 | DATA AND SUMMARY STATISTICS

Our sample includes 183 U.S. equity REIT IPOs issued from 1995 to 2017 and is collected from the Security Data Company (SDC) New Issues database.[6] We only include IPOs with information on the offer price and first-trading-day closing price as both are required to calculate initial returns. Firm- and issuing-level characteristics (e.g., venture capital status, pricing technique, and offer size) are also sourced from the SDC New Issues database. Control variables for general market conditions at the time of the IPO (e.g., pre-IPO market return and turnover) are obtained from Thomson Reuters DataStream. The total return on the NCREIF Property Index (NPI) is included to control for conditions and returns in the private CRE market.[7] The NCREIF quarterly transaction database is also used to compute volume- and size-based turnover as proxies for liquidity in the private CRE market. Our property type and geographic concentration variables are

[6] Mortgage REITs are not included in this study because they have very different IPO valuation and performance.

[7] Established in 1982, NCREIF (National Council of Real Estate Investment Fiduciaries) is a not-for-profit institutional real estate industry association that collects, processes, validates, and disseminates information on the risk/return characteristics of commercial real estate assets owned by institutional (primarily pension and endowment fund) investors. The property composition of the NPI changes quarterly as data contributing NCREIF members buy and sell properties. However, all historical property-level data remain in the database and index.

manually extracted from the IPO prospectus, the 10-K fillings for the IPO year, or the S&P Market Intelligence (formerly SNL Financials Property) database.

The IPO initial return (*IR*) is computed as the difference between the closing price on the first trading day (hereafter the close price) and the IPO offer price, as a percentage of the offer price. To control for general movements in the stock market, we adjust the initial return by subtracting the market return on the first day of trading[8]:

$$\text{Initial return} = \frac{(\text{Close price} - \text{Offer price})}{\text{Offer price}} - \text{Market return}\,(\%)\,. \tag{1}$$

We construct two Herfindahl indexes to measure geographic and property type (or sector) portfolio concentration. We first calculate the share of each firm's properties in each state by manually extracting information on the size (square footage) of CRE holdings in that state at the time of its IPO. For asset types (e.g., hotels, healthcare centers and multifamily communities) where the property size is not reported in square feet, other size measurements (e.g., number of rooms or units) are used. Similarly, we collect information on the value of each property and calculate the percentage of assets in each state for each property type.[9] For hotel assets (where property values are not reported), we use the product of the average daily room rate, the number of rooms, and the average occupancy rate as weights.[10] The Herfindahl index for geographic and property type concentration (*HHI_GEO* and *HHO_ASSET*, respectively) is computed as the sum of the squared proportions:

$$\text{Herfindahl index (HHI)} = \sum_{i}^{n} P_i^2, \tag{2}$$

where $P_i$ represents the proportion of properties the company owns in a state or of an asset type and $n$ is the total number of states or property types in which the company invests. The Herfindahl index can range from 0 to 10,000, with higher values representing higher levels of concentration. For estimation purposes, we scale both indexes by 10,000, leaving a possible range between 0 and 1.

We also construct a Herfindahl index for each IPO company by grouping properties into the eight economic regions defined by Hartzell, Shulman, and Wurtzebach (1987).[11] This alternative concentration index allows us to test the robustness of our state-based measure of geographical concentration.

[8] Unlike studies of industrial IPOs, the subtraction of the market return has a greater impact on REIT IPO returns because of the relatively low underpricing of REIT IPOs. We also estimate models without adjusting for the market return and the results hold.

[9] The data on property size and value are manually collected from the IPO Prospectuses. Given that not all IPO companies reports detailed information on their initial property portfolios, we lose some observations. Our final sample contains 137 IPOs that report geographic information and 118 IPOs that report property type information.

[10] Values by property type are not reported for Select Income REIT; thus, we divide the total value of properties by the number of property types and use the average to calculate Herfindahl index. We use the size of properties for Boston Properties Inc. and Prime Group Realty Trust because the value of portfolio properties is not reported. We also estimate our models excluding these three IPOs and find that the results do not change significantly.

[11] Hartzell, Shulman, and Wurtzebach (1987) divide the 50 US states into eight regions according to their underlying economies: New England, Mid-Atlantic Corridor, Old South, Industrial Midwest, Farm Belt, Mineral Extraction Area, South California and North California.

As a further robustness check, we use alternative measures of geographic and property type concentration. First, we include the total number of states in which the IPO company holds properties. The use of state-counts of investment activities (*LSTATES*) to determine the extent to which a firm's economic interests are concentrated is consistent with similar variables constructed by Bernile et al. (2015) and García and Norli (2012), who count the number of times a state is mentioned in a firm's annual financial statements. We also create a dummy variable, *HEAD*, which is set equal to 1 if the headquarters state of the company is also home to the largest share of properties. This variable therefore also proxies for a REIT's "home bias" (García & Norli, 2012 and Ling et al., 2019). Note that, unlike *HHI_GEO*, *LSTATES* measures diversification, not concentration.

Finally, we compute the average distance between each state in which the company owns properties and its headquarters state. We construct both a simple and weighted average distance (*DIST* and *DIST_W*, respectively); for the latter, the share of the total size of properties in each state is used to weight the distance. More specifically,

$$DIST = \text{Geographic distance}_j = \frac{1}{n}\sum_{i}^{n} d_{ij}, \tag{3}$$

$$DIST\_W = \text{Weighted geographic distance}_j = \sum_{i}^{n} p_{ij} d_{ij}, \tag{4}$$

where $d_{ij}$ is the distance (in miles) between state $i$ in which company $j$ owns properties and the headquarters state of company $j$, $n$ is the total number of states where company $j$ holds properties, and $p_{ij}$ is the percentage of the portfolio that company $j$ owns in state $i$. Similar to *LSTATES*, *DIST* and *DIST_W* are measures of geographic dispersion (rather than concentration).

As far as property type concentration is concerned, we construct two alternative measures to the main Herfindahl index (*HHO_ASSET*): a dummy variable (*FOCUSED*) that is set equal to 1 if the firm invests in just one property type (and 0 otherwise), and the total number of property types owned by the REIT (*LASSET*), which proxies for portfolio diversification.

The direct measurement of the deadweight cost of an IPO is not straightforward. Therefore, to control for general conditions in the private property market, we use the one-quarter lag of the quarterly NCREIF NPI return (*NCREIF*) and private market liquidity (*LIQUIDITY*) as proxies for the IPO's deadweight costs. *LIQUIDITY* is defined as the transaction value (in dollar terms) of properties sold from the NCREIF index in a quarter as a share of the market value in the quarter before the IPO. Furthermore, to test the robustness of our results, we also use alternative measures of private market conditions, including annual NCREIF returns, a 4-quarter moving average of turnover, and portfolio-weighted state-level liquidity.

The IPO market in states where the underlying properties of an IPO are located could also affect company valuations in at least two ways: First, the information environment of the property portfolio may affect the uncertainty of the overall valuation of an IPO. Second, the overall availability of IPO investment opportunities could impact investor demand. Therefore, we construct *DENSITY*, which measures the weighted state-level IPO investment environment for REIT companies in our sample. The weights are the geographical composition of each REIT's real estate portfolio. Specifically, *DENSITY* is set equal to the number of IPO firms that are headquartered in each state in its IPO year divided by the state population in that year, and then weighted by the proportion of the real estate portfolio in each state.

We also include firm- and market-level control variables in our estimations. To capture information asymmetry in IPO valuation, we use the IPO proceeds as a proxy for firm size, as suggested by Beaty and Ritter (1986). We also include a dummy variable that indicates the use of a book-building pricing technique (*BB*) and a dummy variable that is set equal to 1 if the IPO is backed by a venture capital firm (*VB*).[12] To control for general stock market movements, we use the 3-month cumulative market return (based on the DataStream all-stock market index) prior to the IPO date.[13] We also alter the measure developed by Banerjee, Dai, and Shrestha (2011) to construct *HOTRATIO*, which is computed as the ratio of the number of IPOs in the IPO year to the total number of IPOs across the sample period. *HOTRATIO* represents another control for current market conditions.[14] For ease of reference, Table 1 contains the definitions of all variables included in this study and associated data sources.

Table 2 presents summary statistics. The average market-adjusted initial return for our full sample (183 IPOs) is 3.48%. This is slightly greater than the average initial return of 2.79% for REIT IPOs reported by Chan et al. (2013) for 1996–2010 and less than the 5.34% average initial return between 1993 and 2007 documented by Gokkaya, Highfield, Roskelley, and Steele (2015). These relatively low average initial returns support the notion that REIT IPOs are materially different from industrial IPOs. For example, according to Ritter (2018), the average initial returns of U.S. industrial IPOs are above 0 across our sample period, with a minimum of 6.4% in 2008 and a maximum of 56.4% in 2000. In contrast, the minimum initial return in our sample is –12.7%, whereas the maximum is 45.8%, with a standard deviation of 9.3%.

As expected, only a few REIT IPOs are backed by venture capital firms and the majority of REIT IPOs use a bookbuilding technique to price their shares. The average total IPO proceeds (*LSIZE*, log-transformed) is \$265.85 million, a value similar to the average industrial IPO size reported in Ritter (2018) for the 1999–2015 period. Furthermore, 21 of the 137 companies with available geographic information hold all their investments in one state, producing a *HHI_GEO* of 1. In contrast, only six IPO companies invest in more than half of the U.S. states. In addition, among the 137 REITs, 61 companies hold the largest percentage of their portfolios in the state where they are headquartered, indicating a substantial home bias. Finally, 96 of 118 REITs with available asset type data invest solely in one property type.

Following the IPO literature, we first conduct a multivariate analysis to test the effects of geographic and property type concentrations on initial returns by estimating the following models:

$$IR_i = \alpha + \beta_1 HHI\_GEO_i + \sum_{j=i}^{m} \lambda_j V_{ji} + \epsilon_i, \tag{5}$$

$$IR_i = \alpha + \beta_1 HHI\_ASSET_i + \sum_{j=i}^{m} \lambda_j V_{ji} + \epsilon_i. \tag{6}$$

[12] Most U.S. studies published in the 1990s find that IPOs backed by venture capital firms experience lower levels of IPO underpricing. However, more recent U.S.-based studies, as well as many international studies, such as Guo, Lev, and Shi (2006), have recorded mixed results.

[13] According to Prospect Theory (Loughran & Ritter, 2002), the initial return is positively related to the pre-IPO market return, which captures market sentiment.

[14] The "Hot Issue" theory, first proposed by Ritter (1984), posits that IPOs issued in a period of rising stock prices experience higher initial returns.

**TABLE 1** Variable definitions and data sources

| Variables | Definition |
|---|---|
| *IR* | Market-adjusted IPO initial return, which is the difference between the IPO offer price and the first-trading-day closing price, excluding the market return on the IPO day. Source: SDC Database and CRSP. |
| *VB* | A dummy variable that equals 1 if the IPO is venture capital-backed; 0 otherwise. Source: SDC Database. |
| *BB* | A dummy variable that equals 1 if the IPO uses bookbuilding as the pricing technique; 0 otherwise. Source: SDC Database. |
| *LSIZE* | Log-transformed total proceeds of the IPO. Source: SDC Database. |
| *MRETURN* | Three-month cumulative market return before the IPO date. Source: DataStream. |
| *HOTRATIO* | The number of IPOs in a certain year divided by the total number of IPO across the sample period, presented in percentage. Source: SDC Database. |
| *NCREIF* | One-quarter lagged quarterly NCREIF Property Index Return. Source: NCREIF. |
| *NCREIF_W* | One-quarter lagged quarterly NCREIF Property Index Return, weighted by the size of the property assets that the IPO company has in each of the four geographical regions by NCREIF definition, which are East, West, South, and Midwest. Source: NCREIF. |
| *NCREIF_ROLL* | One-quarter lagged annual (4-quarter cumulative) return of the NCREIF NPI Index Return. Source: NCREIF. |
| *LIQUIDITY* | Transaction turnover that is the percentage of the market value of properties sold from the NCREIF NPI Index in the quarter before an IPO as a measure of private market liquidity. Source: NCREIF. |
| *LIQUIDITY_AVG* | One-quarter lagged four-quarter moving average of turnover based on the market value of properties sold from the NCREIF NPI Index. Source: NCREIF. |
| *LIQUIDITY_W_V* | State-level transaction turnover based on the dollar transaction values, weighted by the shares of property assets of the IPO company in each state. Source: NCREIF and IPO Prospectus. |
| *LIQUIDITY_W_N* | State-level transaction turnover based on the transaction numbers, weighted by the shares of property assets of the IPO company in each state. Source: NCREIF and IPO Prospectus. |
| *DENSITY* | The IPO density that is, for a given REIT in its IPO year, the number of all IPOs that headquartered in the state divided by the population in this state, weighted by the shares of property assets of the IPO company in each state. Source: SDC Database and The United States Census Bureau. |
| *LSTATES* | Log-transformed number of states where the IPO company's property assets are located. Source: IPO Prospectus and 10-K File. |
| *HEAD* | A dummy variable that equals 1 if the company has the largest share of its properties in its headquarters state. Source: IPO Prospectus and 10-K File. |
| *DIST* | Unweighted average geographic distance, which measures the distance between the state where the IPO company's property assets are located and the state where the company's headquarters is located. Source: IPO Prospectus and 10-K File. |

(Continues)

**TABLE 1** (Continued)

| Variables | Definition |
|---|---|
| *DIST_W* | Weighted average geographic distance, which measures the distance between the state where the IPO company's property assets are located and the state where the company's headquarters is located, weighted by the size of the property assets that the IPO company has in each state. Source: IPO Prospectus and 10-K File. |
| *HHI_GEO* | Geographic Herfindahl index computed as the sum of the squared shares of property size that the IPO company has in each state, scaled by 10,000, ranging from 0 to 1 with higher values representing higher geographic concentration. Source: IPO Prospectus and 10-K File. |
| *HHI_GEO_ECO* | Geographic Herfindahl index computed as the sum of the squared shares of property size that the IPO company has in each of the eight economic regions defined by Hartzell et al. (1987), scaled by 10,000, ranging from 0 to 1 with higher values representing higher geographic concentration. Source: IPO Prospectus and 10-K File. |
| *FOCUSED* | A dummy variable that equals 1 if it is a focused REIT; 0 otherwise. Source: CRSP and SNL. |
| *LASSET* | Log-transformed number of asset types that the IPO company has. Source: IPO Prospectus and 10-K File. |
| *HHI_ASSET* | Property type Herfindahl index computed as the sum of the squared shares of property value that the IPO company has in each property type, scaled by 10,000, ranging from 0 to 1 with higher values representing higher property type concentration. Source: IPO Prospectus and 10-K File. |
| *URBAN* | A dummy variable that equals 1 if the headquarters MSA of the REIT is one of the top 10 MSAs ranked by total population based on 2010 Census data; 0 otherwise. Source: IPO Prospectus and US Census. |
| *GATEWAY* | A dummy variable that equals 1 if the headquarters MSA of a REIT is one of the six "gateway" MSAs: Boston, Chicago, Los Angeles, New York, San Francisco, and Washington, D.C.; 0 otherwise. Source: IPO Prospectus. |
| *TRANSPARENT* | A dummy variable that equals 1 if the headquarters MSA of a REIT is considered as highly transparent according to the JLL Global Real Estate Transparency Index; 0 otherwise. Source: IPO Prospectus and JLL Website. |
| *CORE* | A dummy variable that equals 1 if the main property type in which the REIT invests belongs to one of the four core property types: office, industrial, retail, and residential; 0 otherwise. For each diversified REIT, *CORE* equals 1 if the overall weight of office, industrial, retail and residential properties in its portfolio is greater than 50%. Source: IPO Prospectus. |

**TABLE 2** Summary statistics

| Variables | Mean | Median | Min | Max | *SD* | *N* |
|---|---|---|---|---|---|---|
| *IR* | 3.48 | 0.74 | −13.21 | 45.84 | 9.21 | 183 |
| *VB* | 0.02 | 0.00 | 0.00 | 1.00 | 0.15 | 137 |
| *BB* | 0.99 | 1.00 | 0.00 | 1.00 | 0.12 | 137 |
| *LSIZE* | 5.22 | 5.33 | 1.61 | 7.88 | 1.03 | 137 |
| *MRETURN* | 5.23 | 4.77 | −15.84 | 34.35 | 6.23 | 137 |
| *HOTRATIO* | 5.20 | 5.34 | 1.16 | 10.50 | 2.08 | 137 |
| *NCREIF* | 2.77 | 2.76 | −7.33 | 5.34 | 1.47 | 137 |
| *NCREIF_W* | 2.78 | 2.90 | −7.42 | 5.62 | 1.50 | 137 |
| *NCREIF_ROLL* | 10.10 | 10.61 | −21.29 | 18.07 | 5.93 | 137 |
| *LIQUIDITY* | 2.79 | 2.63 | 0.46 | 5.80 | 1.34 | 137 |
| *LIQUIDITY_AVG* | 2.54 | 2.34 | 0.44 | 4.30 | 0.99 | 137 |
| *LIQUIDITY_W_V* | 2.06 | 1.72 | 0.00 | 9.52 | 1.67 | 113 |
| *LIQUIDITY_W_N* | 2.33 | 2.24 | 0.00 | 10.71 | 1.74 | 113 |
| *DENSITY* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 137 |
| *HEAD* | 0.45 | 0.00 | 0.00 | 1.00 | 0.50 | 137 |
| *LSTATES* | 1.69 | 1.79 | 0.00 | 3.76 | 1.00 | 137 |
| *DIST* | 972.10 | 1029.00 | 0.00 | 2913.00 | 625.50 | 137 |
| *DIST_W* | 885.60 | 941.50 | 0.00 | 3161.00 | 646.00 | 137 |
| *HHI_GEO* | 0.40 | 0.29 | 0.05 | 1.00 | 0.31 | 137 |
| *HHI_GEO_ECO* | 0.47 | 0.38 | 0.05 | 1.00 | 0.30 | 137 |
| *FOCUSED* | 0.81 | 1.00 | 0.00 | 1.00 | 0.39 | 118 |
| *LASSET* | 0.18 | 0.00 | 0.00 | 1.61 | 0.40 | 118 |
| *HHI_ASSET* | 0.93 | 1.00 | 0.33 | 1.00 | 0.16 | 118 |
| *URBAN* | 0.38 | 0.00 | 0.00 | 1.00 | 0.49 | 116 |
| *GATEWAY* | 0.31 | 0.00 | 0.00 | 1.00 | 0.47 | 116 |
| *TRANSPARENT* | 0.41 | 0.00 | 0.00 | 1.00 | 0.49 | 116 |
| *CORE* | 0.62 | 1.00 | 0.00 | 1.00 | 0.49 | 103 |

*Note*. This table presents descriptive statistics of firm-, issuing-, and market-level characteristics as well as the concentration measures for geographic locations and property types for the full sample of equity REITs during the 1995–2017 sample period. Variable definitions and data sources are contained in Table 1.

The dependent variable in both equations is the IPO firm's initial return ($IR_i$) and $\beta_1$ captures the effect of either geographic ($HHI\_GEO_i$) or property type ($HHI\_ASSET_i$) concentration. $V_i$ represents a vector of $m$ control variables as outlined above.

We next include both dimensions of concentration and estimate our model using both 3-year (to save degrees of freedom) and 1-year time fixed effects as follows:

$$IR_i = \alpha + \beta_1 HHI\_GEO_i + \beta_2 HHI\_ASSET_i + \sum_{j=i}^{m} \lambda_j V_{ji} + \epsilon_i. \tag{7}$$

As discussed above, the investor recognition channel suggests that excess initial returns are the result of the underpricing of offering shares, whereas the diversification discount channel suggests that excess initial returns are driven by investor demand in the aftermarket. Therefore, to test our second hypothesis that geographic concentration affects initial IPO returns through an investor recognition rather than diversification discount channel, we compute both pre- and post-IPO returns around the issuance. The pre-IPO return is measured as the difference between the opening price on the first trading day and the offer price as a percentage of the offer price. The post-IPO return is measured as the difference between the closing and opening prices of the first trading day as a percentage of the opening price. Following Equation (1), both pre- and post-IPO returns are adjusted by the corresponding market return, as presented in Equation (8) and (9):

$$\text{pre-IPO} = \frac{(\text{Open price} - \text{Offer price})}{\text{Offer price}} - \frac{(\text{Market at open} - \text{Market at offer})}{\text{Market at offer}}, \tag{8}$$

$$\text{post-IPO IR} = \frac{(\text{Close price} - \text{Open price})}{\text{Open price}} - \frac{(\text{Market at close} - \text{Market at open})}{\text{Market at open}}. \tag{9}$$

If the pricing effect of geographic concentration is transmitted via the investor recognition channel, we should observe its impact on *pre-IPO IR*. However, if a diversification discount channel exists, we should observe its impact on *post-IPO IR*. We test this hypothesis by estimating Equations (10) and (11):

$$pre\text{-}IPO\ IR_i = \alpha + \beta_1 HHI\_GEO_i + \beta_2 HHI\_ASSET_i + \sum_{j=i}^{m} \lambda_j V_{ji} + \epsilon_i, \tag{10}$$

$$after\text{-}IPO\ IR_1 = \alpha + \beta_1 HHI\_GEO_i + \beta_2 HHI\_ASSET_i + \sum_{j=i}^{m} \lambda_j V_{ji} + \epsilon_i. \tag{11}$$

As a final step, we test whether less underpricing occurs in periods when the underlying real estate assets can be sold more easily and efficiently (*Hypothesis 3*) by interacting the geographic concentration measure with each of the deadweight cost indicators. Therefore, the variable of interest in this specification is the interaction between geographic concentration (*HHI_GEO*) and the private CRE market performance, which is proxied for by the lagged private real estate market return and liquidity (*NCREIF* and *LIQUIDITY*, respectively). Positive conditions in the underlying CRE market should moderate the impact of geographic concentration on REIT IPO initial returns (i.e., $\beta_3$ is expected to be negative). The augmented specifications are presented in Equations (12a) and (12b).

$$IR_i = \alpha + \beta_1 HHI\_GEO_i + \beta_2 HHI\_ASSET_i + \beta_3 GEO_i\ X\ NCREIF_i + \sum_{j=i}^{m} \lambda_j V_{ji} + \epsilon_i, \tag{12a}$$

$$IR_i = \alpha + \beta_1 HHI\_GEO_i + \beta_2 HHI\_ASSET_i + \beta_3 GEO_i\ X\ LIQUIDITY_i + \sum_{j=i}^{m} \lambda_j V_{ji} + \epsilon_i. \tag{12b}$$

## 4 | EMPIRICAL RESULTS AND ROBUSTNESS TESTS

Table 3 reports the results from estimating the baseline model and Equation (5). Property type concentration is excluded in this initial set of estimations. Robust standard errors are reported

**TABLE 3** Results on the effect of geographic concentration

| Dependent variable: *IR* | (Baseline) | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| *VB* | −5.372** | −4.390* | −5.115*** | −4.445* | −5.196** | −4.800* |
| | 2.288 | 2.473 | 1.949 | 2.494 | 2.462 | 2.656 |
| *BB* | −8.995 | −9.019 | −8.682 | −8.883 | −9.682 | −9.641 |
| | 7.746 | 8.117 | 6.687 | 8.123 | 6.034 | 6.861 |
| *LSIZE* | 1.364 | 1.630 | 1.344 | 1.642 | 1.471 | 1.576 |
| | 1.207 | 1.172 | 1.192 | 1.177 | 1.182 | 1.211 |
| *MRETURN* | 0.414** | 0.448*** | 0.421** | 0.447*** | 0.420** | 0.432*** |
| | 0.161 | 0.154 | 0.164 | 0.156 | 0.163 | 0.158 |
| *HOTRATIO* | −0.172 | −0.453 | −0.659 | −0.560 | −0.585 | −0.676 |
| | 0.690 | 0.558 | 0.563 | 0.576 | 0.550 | 0.574 |
| *NCREIF* | 1.064** | 1.151** | 1.243** | 1.209*** | 1.017** | 1.082** |
| | 0.482 | 0.446 | 0.483 | 0.458 | 0.485 | 0.49 |
| *LIQUIDITY* | −0.600 | −0.468 | −0.324 | −0.519 | −0.331 | −0.380 |
| | 0.755 | 0.744 | 0.734 | 0.754 | 0.749 | 0.764 |
| *DENSITY* | −5,258* | −6,533** | −5,861** | −5,844** | −5,177** | −4,975* |
| | 2695 | 2567 | 2543 | 2504 | 2612 | 2590 |
| *HHI_GEO* | | 5.075*** | | | | |
| | | 1.831 | | | | |
| *HEAD* | | | 2.322* | | | |
| | | | 1.387 | | | |
| *LSTATES* | | | | −1.291** | | |
| | | | | 0.619 | | |
| *DIST_W* | | | | | −0.002** | |
| | | | | | 0.001 | |
| *DIST* | | | | | | −0.002* |
| | | | | | | 0.001 |
| Constant | 4.003 | 2.217 | 4.627 | 6.216 | 7.012 | 6.029 |
| | 9.379 | 9.578 | 8.383 | 9.759 | 8.190 | 8.656 |
| Time fixed effect | Y | Y | Y | Y | Y | Y |
| Observations | 141 | 137 | 137 | 137 | 137 | 137 |
| *R*-squared | .203 | .267 | .249 | .255 | .254 | .245 |

*Note*. The table reports ordinary least squares (OLS) regressions for a cross section of real estate IPOs between 1995 and 2017 in the United States. Dependent variable *IR* is the market-adjusted initial return of the IPO. Other variable definitions and data sources are in Table 1. Three-year time fixed effects are included. Standard errors are corrected for robustness and presented below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

below the coefficients. With 137 IPOs in our sample, we first use 3-year time fixed effect to preserve degrees of freedom. The use of annual market-level control variables (e.g., equity return, hot ratio, real estate returns, and liquidity) also helps to control for unobservable time-dependent factors.[15]

[15] We also estimate the model with 1-year time fixed effects and present our findings in the robustness tests section. Results are largely unchanged.

The results for the baseline model that includes only firm-, issuing-, and market-level variables are reported in the first column of Table 3 (Baseline). As expected, we find that real estate IPOs backed by venture capital firms (*VB*) are associated with significantly lower initial returns. This is consistent with Megginson and Weiss (1991) who argue that venture capitalists play a certification role that reduces IPO valuation uncertainty. We find no evidence that initial returns are associated with the size of the offering (*LSIZE*) or the use of book building (*BB*), which is in sharp contrast to the findings of most empirical studies on industrial IPOs. As both firm size and the book building method are commonly used proxies for information asymmetry, this result is consistent with our argument that classic information asymmetry-based theories have little ability to explain the cross-sectional variation of initial returns of REIT IPOs (Brounen & Eichholtz, 2002; Wong et al., 2013). This result further confirms our motivation to explore the relation between REIT IPO performance and real estate-specific factors.

The estimated coefficient on the broad-based stock market return in the 3 months prior to the IPO (*MRETURN*) is positive and highly significant, indicating higher initial returns in rising markets. This finding supports behavioral explanations of IPO underpricing (Ljungqvist, Nanda, & Singh, 2006; Loughran & Ritter, 2002), which argue that IPO short-run performance is driven, at least in part, by investor sentiment. However, we find no evidence that IPO returns are associated with IPO waves (*HOTRATIO*). Although classic IPO theories are unable to account for the performance of REIT IPOs, the explanatory power of behavioral arguments appears strong.

The inclusion of *MRETURN* controls for the recent performance of the general stock market. However, we also examine whether REIT IPO performance is driven by the recent performance of the underlying private real estate market by including the total return of the NCREIF Property Index (*NCREIF*) in the quarter prior to the IPO. The estimated coefficient on *NCREIF* is positive and significant at a 5% level, suggesting that the recent performance of the private real estate market is predictive of higher first-day IPO returns, even after controlling for recent stock market returns. This implies that the REIT IPO market is affected by industry-related investor sentiment (general real estate market conditions under which the company is listed). A 10% increase in the broad stock market return or the private real estate market return over the prior quarter is associated with a 4.14% and 10.64% increase in the IPO initial return, respectively. The estimated coefficient on *LIQUIDITY* is not significantly different from 0 in any specification, suggesting that liquidity in the underlying private market is not, at the margin, associated with initial IPO returns.

Our first explanatory variable related to geography—*DENSITY*—proxies for the REIT-level information environment where a REIT's IPO properties are located. Increased *DENSITY* indicates more IPO investments (i.e., greater investors base) in areas where the REIT holds its properties and a better information environment for its real estate portfolio. We find that information sharing among investors—through a higher concentration of IPOs in the portfolio states—becomes more efficient, therefore reducing IPO initial returns. This also supports Altı's (2005) information spillover argument, with the revelation of an unknown common factor in previous IPOs being reflected in subsequent IPO valuations.

We now turn to the results for our primary variable of interest, geographical concentration. Estimation results using primary and alternative measures of geographic concentration are presented in Models (1) to (5). The estimated coefficient on our primary proxy, *HHI_GEO*, is positive and highly significant in Model (1). Economically, a 10% increase in *HHI_GEO* leads to a 0.51% increase in underpricing, a significant portion of the overall average of 3.48%. Models (3), (4), and (5) use different measures of dispersion (rather than concentration) and the significantly negative coefficients confirm that geographic diversification may improve investor recognition, allowing IPO companies to underprice less. These three models use the number of states in which the IPO firm owns properties (*LSTATES*), the weighted average distance (*DIST_W*) between each asset's location and the company's headquarters state, and the unweighted (*DIST*) average distance. Finally, the Model (2) results reveal a weakly significant home bias, with investors requiring REITs with concentrations in their headquarters states to underprice more to attract a larger pool of investors. Overall, the results reported in Table 3 support the existence of an investor recognition channel. Highly concentrated REITs suffer from a smaller pool of investors and need to underprice more to increase investor recognition (García & Norli, 2012). Note that this result does not assume information asymmetry within the real estate industry, where the phenomenon of overpricing may often occur. When a real estate company's portfolio is highly geographically diversified with a more dispersed investor base (i.e., it is well-recognized), the issuer has less incentive to underprice the IPO.

Table 4 reports the impact of property type concentration on IPO initial returns (with geographic concentration excluded from the analysis). Model (1) reports results using the Herfindahl index as a proxy for asset type concentration (*HHI_ASSET*). The positive and significant (10% level) coefficient provides some support for the notion that increased property type specialization is associated with greater underpricing. On average, a 10% increase in property type concentration results in a 0.58% increase in first-day IPO returns. The estimated coefficients on *FOCUSED* in Model (2) and *LASSET* in Model (3) confirm our main result that increased portfolio concentration requires issuers to underprice more, which is consistent with the findings of Brounen and Eichholtz (2002). The impact of stock market returns (*MRETURN*) on initial returns is still positive and significant in all three specifications, whereas the effect of market waves on REIT underpricing (*HOTRATIO*) remains insignificant. IPO initial returns in high-performing CRE markets (*NCREIF*) continue to be higher and IPOs still generally benefit from venture capital backing. The density of IPO activity within the headquarters state (*DENSITY*) is associated with reduced underpricing.

Although our property type results are robust to the use of alternative measures, they are slightly weaker than our corresponding findings for geographic concentration. Because the Herfindahl index is a more precise measure of concentration, we will report results using this measure in the remainder of the paper. We have also estimated models using other measures and our findings are consistent.

Table 5 reports the main results for model specifications including both geographic and property type concentration (*HHI_GEO* and *HHI_ASSET*). Three-year time fixed effects are included in Models (1) and (2); 1-year fixed effects are included in Models (3) and (4). We also introduce a second measure of underlying private market returns (*NCREIF_W*) to account for variation in the location of portfolio properties. NCREIF produces total private market return indices for U.S. properties located in four geographic regions: East, West, South, and Midwest. To create *NCREIF_W*, we weight the total returns in these four NCREIF regions by the distribution of the firm's IPO assets across these regions to obtain a firm-specific measure of the strength of the private CRE markets in which the company invests. We confirm our main results as both the magnitude and statistical significance of the coefficient estimates on *NCREIF_W* in Models (2) and (4) are similar to the results obtained with our original proxy for private market returns (*NCREIF*) in Models (1) and (3).

We find consistent evidence of an economically meaningful relation between geographic concentration and IPO underpricing. A 10% increase in the Herfindahl index is associated with a 0.59-0.77% increase in IPO initial returns. The estimated coefficients on *HHI_ASSET* are slightly larger in magnitude, although less statistically significant than the corresponding estimates for *HHI_GEO*. Lagged private market returns have a positive and significant impact on initial returns for the specifications with 3-year time fixed effect. However, they become insignificant when

**TABLE 4** Results on the effect of property type concentration

| Dependent variable: *IR* | (1) | (2) | (3) |
|---|---|---|---|
| *VB* | −4.808* | −5.047* | −4.768* |
| | 2.842 | 2.750 | 2.776 |
| *BB* | −9.172 | −9.150 | −9.122 |
| | 7.931 | 7.852 | 7.875 |
| *LSIZE* | 1.582 | 1.599 | 1.571 |
| | 1.313 | 1.311 | 1.316 |
| *MRETURN* | 0.451** | 0.437** | 0.444*** |
| | 0.173 | 0.168 | 0.169 |
| *HOTRATIO* | −0.258 | −0.270 | −0.282 |
| | 0.698 | 0.699 | 0.699 |
| *NCREIF* | 1.249** | 1.229** | 1.242** |
| | 0.604 | 0.615 | 0.607 |
| *LIQUIDITY* | −0.811 | −0.783 | −0.741 |
| | 0.985 | 0.984 | 0.985 |
| *DENSITY* | −5,143* | −5,393* | −5,191* |
| | 2927 | 2914 | 2939 |
| *HHI_ASSET* | 5.841* | | |
| | 3.256 | | |
| *FOCUSED* | | 2.439* | |
| | | 1.393 | |
| *LASSET* | | | −2.636** |
| | | | 1.237 |
| Constant | −0.484 | 2.888 | 5.268 |
| | 10.53 | 10.19 | 10.21 |
| Time fixed effect | Y | Y | Y |
| Observations | 118 | 118 | 118 |
| *R*-squared | .243 | .244 | .246 |

*Note*. The table reports OLS regressions for a cross section of real estate IPOs between 1995 and 2017 in the United States. Dependent variable *IR* is the market-adjusted initial return of the IPO. Variable definitions and data sources are in Table 1. Three-year time fixed effects are included. Standard errors are corrected for robustness and presented below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

1-year time fixed effects are included because the time variation of conditions in the underlying market is already captured. The equity market return over the previous 3 months—*MRETURN*—remains positive and highly significant even when 1-year time fixed effects are included. This supports the argument that the listed stock market has a stronger influence on short-term movements in REIT share prices than the private CRE market. A greater *DENSITY* of IPOs in states where a REIT invests remains predictive of lower first-day returns. The effect of market waves on REIT underpricing (*HOTRATIO*) is negative and highly significant in the specifications with 1-year time fixed effects, which supports the information spillover explanation of IPO underpricing proposed by Altı (2005). The use of 1-year time fixed effects increases the *R*-squared by approximately five percentage points.

**TABLE 5** Results on the effects of geographic and property type concentration, annual fixed effect

| **Dependent variable: *IR*** | **(1)** | **(2)** | **(3)** | **(4)** |
|---|---|---|---|---|
| *VB* | −3.324 | −3.151 | −2.262 | −2.157 |
| | 3.080 | 3.042 | 3.407 | 3.441 |
| *BB* | −8.707 | −8.710 | −7.723 | −7.812 |
| | 8.072 | 8.192 | 9.169 | 9.259 |
| *LSIZE* | 1.719 | 1.704 | 1.502 | 1.495 |
| | 1.266 | 1.260 | 1.254 | 1.251 |
| *MRETURN* | 0.481*** | 0.474*** | 0.656*** | 0.650*** |
| | 0.167 | 0.164 | 0.243 | 0.246 |
| *HOTRATIO* | −0.541 | −0.555 | −3.999*** | −4.010*** |
| | 0.573 | 0.558 | 0.640 | 0.641 |
| *NCREIF* | 1.252** | | 0.031 | |
| | 0.533 | | 1.306 | |
| *NCREIF_W* | | 1.261*** | | 0.473 |
| | | 0.478 | | 1.006 |
| *LIQUIDITY* | −0.428 | −0.487 | −0.602 | −0.679 |
| | 0.936 | 0.931 | 0.962 | 0.990 |
| *DENSITY* | −5,899** | −6,140** | −7,695*** | −7,661*** |
| | 2598 | 2586 | 2862 | 2785 |
| *HHI_ASSET* | 7.496** | 7.376** | 6.639* | 6.744* |
| | 3.233 | 3.228 | 3.485 | 3.452 |
| *HHI_GEO* | 5.454*** | 5.307*** | 6.293*** | 6.260*** |
| | 1.992 | 1.965 | 2.316 | 2.305 |
| Constant | −5.305 | −4.863 | −22.35 | −18.79 |
| | 10.44 | 10.55 | 17.35 | 16.01 |
| Time fixed effect (3-year) | Y | Y | N | N |
| Time fixed effect (1-year) | N | N | Y | Y |
| Observations | 116 | 116 | 116 | 116 |
| *R*-squared | .298 | .301 | .373 | .374 |

*Note*. The table reports OLS regressions for a cross section of real estate IPOs between 1995 and 2017 in the United States. Dependent variable *IR* is the market-adjusted initial return of the IPO. Variable definitions and data sources are in Table 1. Three-year time fixed effects are included in Models (1) and (2). Annual fixed effects are included in Models (3) and (4). Standard errors are corrected for robustness and presented below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

## 4.1 | Investors recognition versus diversification discount channel

To test our second hypothesis that the positive effect of geographic concentration on IPO initial day returns is transmitted via an investor base channel rather than a diversification discount effect, we divide the initial returns of IPOs into pre- and post-listing returns and estimate Equations (10) and (11). These results are reported in Table 6. Models (1) and (2) use raw returns; Models (3) and (4) use market-adjusted returns.

**TABLE 6** Results on the effect of geographic concentration on pre- and post-IPO initial returns

| Dependent variable: *IR* | Pre-IPO IR (1) | Post-IPO IR (2) | Adjusted pre-IPO IR (3) | Adjusted after-IPO IR (4) |
|---|---|---|---|---|
| *VB* | $-3.485^{*}$ | −0.139 | $-2.907^{*}$ | −0.329 |
| | 1.896 | 1.438 | 1.668 | 1.534 |
| *BB* | −14.20 | 2.082 | −14.43 | 1.724 |
| | 8.841 | 1.294 | 8.876 | 1.474 |
| *LSIZE* | $2.856^{***}$ | −0.022 | $2.875^{***}$ | −0.025 |
| | 0.562 | 0.282 | 0.563 | 0.300 |
| *MRETURN* | $0.190^{**}$ | 0.049 | $0.195^{**}$ | 0.052 |
| | 0.091 | 0.046 | 0.091 | 0.050 |
| *HOTRATIO* | −0.386 | 0.067 | −0.392 | 0.069 |
| | 0.465 | 0.226 | 0.464 | 0.238 |
| *NCREIF* | $0.753^{***}$ | 0.156 | $0.770^{***}$ | $0.349^{*}$ |
| | 0.284 | 0.175 | 0.276 | 0.197 |
| *LIQUIDITY* | 0.447 | −0.144 | 0.440 | −0.139 |
| | 0.547 | 0.253 | 0.546 | 0.260 |
| *DENSITY* | $-4,163^{**}$ | −175.5 | $-4,126^{**}$ | 104.0 |
| | 1,987 | 966.0 | 1,971 | 1,004 |
| *HHI_ASSET* | 2.067 | 0.619 | 2.041 | 0.340 |
| | 2.445 | 1.466 | 2.474 | 1.540 |
| *HHI_GEO* | $4.642^{**}$ | −1.132 | $4.709^{***}$ | −1.247 |
| | 1.769 | 0.784 | 1.765 | 0.838 |
| Constant | −1.963 | −1.824 | −1.791 | −1.806 |
| | 9.920 | 2.512 | 9.962 | 2.847 |
| Time fixed effect | Y | Y | Y | Y |
| Observations | 109 | 109 | 109 | 109 |
| *R*-squared | .417 | .130 | .422 | .114 |

*Note*. The table reports OLS regressions for a cross section of real estate IPOs between 1995 and 2017 in the United States. The dependent variable in Models (1) and (3) is *Pre-IPO IR*, which is the return between the offer price and first-trading day opening price and its market-adjusted form (*Adj Pre-IPO IR*), respectively. The dependent variable in Models (2) and (4) is *After-IPO IR* which is the return between the first-trading day opening and closing price and its market-adjusted form (*Adj Pre-IPO IR*), respectively. Other variable definitions and data sources are in Table 1. Three-year time fixed effects are included. Standard errors are corrected for robustness and presented below the coefficient estimates. $^{***}$, $^{**}$, and $^{*}$ denote significance at 1%, 5%, and 10%, respectively.

Overall, the results for our control variables are consistent with our main findings. The degree of geographic concentration (*HHI_GEO*) has a significant impact on pre-IPO initial returns in Models (1) and (3); however, no significant relation is observed in the post-IPO regressions in Models (2) and (4). These results strongly support our second hypothesis that the geographic concentration of a firm's underlying assets impacts IPO returns by affecting the pre-IPO pricing/valuation via an investor base channel rather than affecting aftermarket trading via a diversification discount channel.

## 4.2 | The moderation effect of deadweight costs

We next test the moderating effects of lower deadweight costs associated with an IPO on the relationship between geographic concentration and IPO performance. This test is performed by including an interaction term between *HHI_GEO* and a proxy for the ease with which underlying real estate assets can be sold in the private market—lagged NCREIF returns in Models (1) and (2) and real estate market liquidity in Models (3) and (4) of Table 7.[16] The coefficient estimates on our control variables remain largely unchanged and the coefficient estimate on *HHI_GEO* remains positive and highly significant. Moreover, a consistently negative and significant interaction term (*HHI_GEO* × *NCREIF* and *HHI_GEO x LIQUIDITY*) suggests that high-performing and liquid private real estate markets offer companies the opportunity to underprice less because of a reduction in deadweight issuing costs. The use of either lagged returns or liquidity to signal the presence of a strong underlying private market does not affect our findings, which are also robust to the use of either 3- or 1-year time fixed effects. Overall, these results provide support for our third hypothesis that reduced deadweight costs have a both economically and statistically significant moderating effect on the relationship between geographic concentration and REIT IPO returns.

## 4.3 | Alternative definition of geographic concentration

The possibility that variation in underlying regional economies could affect asset values and IPO valuations may represent a potential concern with our main results. To examine whether the impact of geographic concentration on IPO valuations is channeled through the underlying economic structure of geography rather than an investors base recognition, we construct an alternative Herfindahl index (*HHI_GEO_ECO*) based on the eight economic regions defined by Hartzell et al. (1987). We then re-estimate our baseline regressions and report the results in Table 8. The estimated impact of the geographic concentration on IPO initial returns remains positive, although statistical significance is slightly reduced when 3-year time fixed effects are included. However, when 1-year time fixed effects are included—Models (3) and (4)—property type concentration (*HHI_ASSET*) is no longer significant, suggesting that the performance of underlying property types may be correlated with the performance of the regional economies where properties are located. Overall, we conclude that controlling for the underlying economic structure of geographical areas does not weaken our investor base argument.

## 4.4 | Alternative proxies for deadweight costs

The performance of private real estate markets can be seasonal. To test whether our quarterly measures of private market conditions capture the latent deadweight costs associated with REIT IPOs, we use alternative proxies for private market returns and liquidity. Specifically, we use an annual (four-quarter cumulative) return of the NCREIF NPI Index Return (*NCREIF_ROLL*) and a four-quarter moving average of turnover in the NCREIF NPI property database (*LIQUIDITY_AVG*) to account for seasonality. The results reported in Table 9 confirm the robustness of our finding

[16] Models (1) and (2) estimate Equation (12a) with 3-year and annual time fixed effects, respectively, whereas Models (3) and (4) estimate Equation (12b) with 3-year and annual time fixed effects, respectively.

**TABLE 7** Results on the moderation effect of the deadweight cost indicators

| Dependent variable: *IR* | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| *VB* | −3.813 | −2.993 | −2.414 | −1.378 |
| | 3.517 | 3.989 | 2.615 | 3.126 |
| *BB* | −8.857 | −7.889 | −8.192 | −6.918 |
| | 8.302 | 9.380 | 8.211 | 9.295 |
| *LSIZE* | 1.880 | 1.690 | 1.824 | 1.594 |
| | 1.239 | 1.253 | 1.224 | 1.218 |
| *MRETURN* | 0.513*** | 0.678*** | 0.490*** | 0.653*** |
| | 0.169 | 0.241 | 0.162 | 0.237 |
| *HOTRATIO* | −0.447 | −4.049*** | −0.495 | −4.294*** |
| | 0.583 | 0.644 | 0.587 | 0.679 |
| *NCREIF* | 2.163** | 0.777 | 1.069** | −0.369 |
| | 0.836 | 1.150 | 0.456 | 1.232 |
| *LIQUIDITY* | −0.431 | −0.566 | 1.112 | 0.935 |
| | 0.937 | 0.983 | 1.066 | 1.277 |
| *DENSITY* | −6,275** | −7,834*** | −5,613** | −7,553*** |
| | 2631 | 2832 | 2595 | 2815 |
| *HHI_ASSET* | 8.328** | 7.477** | 9.648*** | 8.868** |
| | 3.374 | 3.632 | 3.457 | 3.707 |
| *HHI_GEO* | 15.77** | 16.55** | 15.74*** | 16.94*** |
| | 6.261 | 6.401 | 5.760 | 6.105 |
| *HHI_GEO* × *NCREIF* | −3.687* | −3.656* | | |
| | 2.063 | 2.113 | | |
| *HHI_GEO* × *LIQUIDITY* | | | −3.801** | −3.858* |
| | | | 1.893 | 1.942 |
| Constant | −14.75 | −9.562 | −17.28 | −11.43 |
| | 10.66 | 11.10 | 10.43 | 11.19 |
| Time fixed effect (3-year) | Y | N | Y | N |
| Time fixed effect (1-year) | N | Y | N | Y |
| Observations | 116 | 116 | 116 | 116 |
| *R*-squared | .312 | .385 | .324 | .398 |

*Note*. The table reports OLS regressions for a cross section of real estate IPOs between 1995 and 2017 in the United States. Dependent variable *IR* is the market-adjusted initial return of the IPO. The variables of interest are *HHI_GEO* × *NCREIF* and *HHI_GEO* × *LIQUIDITY*. Variable definitions and data sources are in Table 1. Three-year time fixed effects are included in Models (1) and (3). Annual fixed effects are included in Models (2) and (4). Standard errors are corrected for robustness and presented below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

of a moderating effect of deadweight costs on the investors base recognition channel. The interaction term between geographic concentration and the two new proxies of deadweight costs (*NCREIF_ROLL* and *LIQUIDITY_AVG*) remain statistically and economically statistically significant. Finally, in Model (3) the magnitude of the coefficient on the interaction term is smaller than in Models (1) and (2) from Table 7, but this is because the new proxy is represented by an annual rather than quarterly return. In fact, its economic significance does not change.

**TABLE 8** Results on the effect of geographic concentration by economic regions

| Dependent variable: *IR* | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| *VB* | −3.994 | −3.820 | −3.054 | −2.885 |
| | 3.087 | 3.066 | 3.450 | 3.503 |
| *BB* | −9.149 | −9.146 | −8.639 | −8.748 |
| | 6.973 | 7.126 | 7.886 | 8.007 |
| *LSIZE* | 1.734 | 1.717 | 1.584 | 1.579 |
| | 1.324 | 1.316 | 1.299 | 1.296 |
| *MRETURN* | 0.468*** | 0.464*** | 0.641** | 0.632** |
| | 0.170 | 0.167 | 0.250 | 0.253 |
| *HOTRATIO* | −0.585 | −0.604 | −3.947*** | −3.976*** |
| | 0.583 | 0.567 | 0.634 | 0.638 |
| *NCREIF* | 1.260** | | 0.278 | |
| | 0.580 | | 1.405 | |
| *NCREIF_W* | | 1.302** | | 0.832 |
| | | 0.507 | | 1.056 |
| *LIQUIDITY* | −0.408 | −0.479 | −0.472 | −0.569 |
| | 0.954 | 0.951 | 0.951 | 0.979 |
| *DENSITY* | −5,488** | −5,748** | −6,935** | −6,945** |
| | 2617 | 2578 | 2876 | 2777 |
| *HHI_ASSET* | 5.830* | 5.771* | 4.863 | 5.004 |
| | 3.108 | 3.099 | 3.277 | 3.258 |
| *HHI_GEO_ECO* | 3.895* | 3.826* | 5.193** | 5.252** |
| | 2.027 | 2.001 | 2.273 | 2.250 |
| Constant | −3.367 | −3.016 | −18.25 | −13.72 |
| | 10.12 | 10.24 | 17.50 | 15.60 |
| Time fixed effect (3-year) | Y | Y | N | N |
| Time fixed effect (1-year) | N | N | Y | Y |
| Observations | 116 | 116 | 116 | 116 |
| *R*-squared | .276 | .281 | .353 | .355 |

*Note*. The table reports OLS regressions for a cross section of real estate IPOs between 1995 and 2017 in the United States. Dependent variable *IR* is the market-adjusted initial return of the IPO. Variable definitions and data sources are in Table 1. Three-year time fixed effects are included in Models (1) and (2). Annual fixed effects are included in Models (3) and (4). Standard errors are corrected for robustness and presented below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

As market conditions differ by region, the deadweight cost of an IPO might be sensitive to the geographic distribution of its portfolio. Therefore, we create a measure of liquidity by location as a robustness test. We use a company-specific deadweight cost proxy (instead of *LIQUIDITY*) by weighting the state-level market liquidity based on either the value of the properties sold or the number of sold properties. Specifically, for a given IPO, we weight state-level transaction turnover based on the dollar transaction values by the shares of property assets of the IPO company in each state (*LIQUIDITY_W_V*). Similarly, we create another weighted liquidity measure (*LIQUIDITY_W_N*) by weighting state-level turnover based on the number of transacted properties by the shares of property assets of the IPO company in each state. The results are reported in Table 10.

**TABLE 9** Alternative proxies for deadweight costs: Averaged market performance

| **Dependent variable: *IR*** | **(1)** | **(2)** | **(3)** | **(4)** |
|---|---|---|---|---|
| **NCREIF measure** | ***NCREIF_ROLL*** | ***NCREIF*** | ***NCREIF_ROLL*** | ***NCREIF*** |
| **Liquidity measure** | ***LIQUIDITY*** | ***LIQUIDITY_AVG*** | ***LIQUIDITY*** | ***LIQUIDITY_AVG*** |
| *VB* | −3.026 | −3.637 | −3.115 | −2.506 |
| | 2.700 | 2.918 | 2.945 | 2.721 |
| *BB* | −8.097 | −9.002 | −8.278 | −8.209 |
| | 7.631 | 8.000 | 7.862 | 8.315 |
| *LSIZE* | 1.818 | 1.836 | 1.867 | 1.780 |
| | 1.264 | 1.138 | 1.249 | 1.107 |
| *MRETURN* | 0.429** | 0.472*** | 0.472*** | 0.514*** |
| | 0.166 | 0.164 | 0.174 | 0.163 |
| *HOTRATIO* | −0.334 | −0.569 | −0.327 | −0.419 |
| | 0.563 | 0.587 | 0.563 | 0.589 |
| *NCREIF Measure* | 0.172 | 1.453** | 0.364** | 1.212** |
| | 0.127 | 0.667 | 0.173 | 0.592 |
| *Liquidity Measure* | −0.245 | −1.341 | −0.288 | 1.126 |
| | 0.913 | 2.020 | 0.920 | 1.672 |
| *DENSITY* | −5,991** | −6,148** | −5,969** | −6,291** |
| | 2627 | 2578 | 2635 | 2676 |
| *HHI_ASSET* | 7.368** | 7.004** | 8.586** | 9.132*** |
| | 3.167 | 3.086 | 3.394 | 3.292 |
| *HHI_GEO* | 5.646*** | 5.399*** | 11.78*** | 19.55*** |
| | 2.045 | 1.967 | 3.687 | 7.240 |
| *HHI_GEO* × *NCREIF_ROLL* | | | −0.595** | |
| | | | 0.291 | |
| *HHI_GEO* × *LIQUIDITY_AVG* | | | | −5.533** |
| | | | | 2.505 |
| Constant | −6.037 | −3.680 | −14.02 | −17.34 |
| | 10.23 | 11.41 | 10.34 | 10.97 |
| Time fixed effect | Y | Y | Y | Y |
| Observations | 116 | 116 | 116 | 116 |
| *R*-squared | .283 | .302 | .296 | .336 |

*Note*. The table reports OLS regressions for a cross section of real estate IPOs between 1995 and 2017 in the United States. Dependent variable *IR* is the market-adjusted initial return of the IPO. The variables of interest are *HHI_GEO* × *NCREIF_ROLL* and *HHI_GEO* × *LIQUIDITY_AVG*. Variable definitions and data sources are in Table 1. Three-year time fixed effects are included. Standard errors are corrected for robustness and presented below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Models (1) and (3) use the dollar-based measure of turnover; Models (2) and (4) use the proxy based on the number of transacted properties. Overall, we find confirmation (both statistically and economically[17]) of the existence of an investor recognition channel and a moderating effect

[17] Only in Model (3), the statistical significance is at the 11% level, whereas for all other coefficients the significance is at least at the 10% level.

**TABLE 10** Alternative proxies for deadweight cost: Geographically weighted turnover

| **Dependent variable: *IR*** | **(1)** | **(2)** | **(3)** | **(4)** |
|---|---|---|---|---|
| **Liquidity measure** | ***LIQUIDITY_W_V*** | ***LIQUIDITY_W_N*** | ***LIQUIDITY_W_V*** | ***LIQUIDITY_W_N*** |
| *VB* | −4.179 | −4.192 | −2.890 | −3.153 |
| | 3.193 | 3.246 | 2.107 | 2.068 |
| *BB* | −6.616 | −6.633 | −5.898 | −6.272 |
| | 8.898 | 8.886 | 8.519 | 8.411 |
| *LSIZE* | 1.308 | 1.315 | 1.139 | 1.184 |
| | 1.691 | 1.687 | 1.752 | 1.731 |
| *MRETURN* | 0.535** | 0.533** | 0.475** | 0.489** |
| | 0.203 | 0.203 | 0.187 | 0.186 |
| *HOTRATIO* | −1.714 | −1.719 | −1.943 | −1.944 |
| | 1.330 | 1.354 | 1.386 | 1.391 |
| *NCREIF* | 2.446** | 2.454** | 1.165* | 1.220** |
| | 0.974 | 1.003 | 0.598 | 0.601 |
| *Liquidity Measure* | 0.142 | 0.088 | 1.517 | 1.319 |
| | 0.842 | 0.701 | 1.434 | 1.247 |

(Continues)

**TABLE 10** (Continued)

| **Dependent variable: *IR*** | **(1)** | **(2)** | **(3)** | **(4)** |
|---|---|---|---|---|
| **Liquidity measure** | ***LIQUIDITY_W_V*** | ***LIQUIDITY_W_N*** | ***LIQUIDITY_W_V*** | ***LIQUIDITY_W_N*** |
| *DENSITY* | −5,845** | −5,933** | −4,896 | −4,712 |
| | 2892 | 2826 | 3057 | 2937 |
| *HHI_ASSET* | 8.000** | 7.982** | 9.001** | 9.032** |
| | 3.776 | 3.821 | 3.690 | 3.641 |
| *HHI_GEO* | 19.23** | 19.31** | 9.556** | 9.570** |
| | 7.562 | 7.730 | 3.944 | 3.864 |
| *HHI_GEO* × *NCREIF* | −5.172** | −5.193* | | |
| | 2.517 | 2.635 | | |
| *HHI_GEO* × *Liquidity Measure* | | | −2.320+ | −2.091* |
| | | | 1.399 | 1.168 |
| Constant | −7.755 | −7.722 | −6.161 | −6.647 |
| | 13.11 | 13.15 | 12.82 | 12.90 |
| Time fixed effect | Y | Y | Y | Y |
| Observations | 93 | 93 | 93 | 93 |
| *R*-squared | .331 | .331 | .322 | .322 |

*Note*. The table reports OLS regressions for a cross section of real estate IPOs between 1995 and 2017 in the United States. Dependent variable *IR* is the market-adjusted initial return of the IPO. The variables of interest are *HHI_GEO, HHI_GEO* × *NCREIF*, *HHI_GEO* × *LIQUIDITY_W_V*, and *HHI_GEO* × *LIQUIDITY_W_N*. Variable definitions and data sources are in Table 1. Three-year time fixed effects are included. Standard errors are corrected for robustness and presented below the coefficient estimates. ***, **, * and + denote significance at 1%, 5%, 10%, and 15%, respectively.

of the NCREIF return (*NCREIF*) on IPO valuation after accounting for the regional differences between state-level private real estate markets.

## 4.5 | Information environment of headquarters

Weighted IPO issuance (*DENSITY*) and weighted liquidity (*LIQUIDITY_W_V* and *LIQUIDITY_W_N*) control for the information environment in markets where a REIT's portfolio is located. However, the information environment of the geographic areas where REITs are headquartered might also affect the IPO pricing because the headquarters market is where the principal executives reside and where top management decisions take place. Therefore, we next control for the information environment of the headquarters states as a further robustness check.

Our sample covers a relatively long period (1995–2017); therefore, it is possible that the current headquarters location of a REIT is different from the location at the time of the firm's IPO. To avoid this potential problem, we manually extract the headquarters MSA (metropolitan statistical area) from the IPO prospectuses for each IPO in our sample. We then construct three proxies for the information environment of the headquarters market. First, we follow Wang, Cohen, and Glascock (2018) and create two dummy variables, *URBAN* and *GATEWAY*. *URBAN* equals 1 if the headquarters MSA of the REIT is one of the top 10 MSAs ranked by total population (based on 2010 Census data), and 0 otherwise. *GATEWAY* equals 1 if the headquarters MSA of a REIT is one of the six "gateway" MSAs: Boston, Chicago, Los Angeles, New York, San Francisco, and Washington, D.C., and 0 otherwise. We create a third dummy, *TRANSPARENT*, which equals 1 if the headquarters MSA of a REIT is listed as one of the top 12 highly transparent U.S. MSAs according to the JLL Global Real Estate Transparency Index.[18]

We separately include these three information measures in our main model specification—Model (1) from Table 5. The results from estimating these augmented regressions are reported in Table 11. In the first three models, *URBAN* is used as our information proxy. In Model (1), it enters alone and then with the interaction terms *HHI_GEO* × *NCREIF*—Model (2)—and *HHI_GEO* × *LIQUIDITY*—Model (3). The corresponding results using *GATEWAY* as our information proxy are reported in Models (4) through (6), whereas Models (7) through (9) show the results using *TRANSPARENT* as our information efficiency measure.

The estimated coefficients on *URBAN*, *GATEWAY*, and *TRANSPARENT* are not statistically significantly in any of the nine specifications, whereas the estimated coefficient on *HHI_GEO* remains positive and highly significant, confirming our main finding that the geographic concentration of a REIT's portfolio is positively related to the IPO initial returns. Moreover, the estimated coefficients on the interaction terms (*HHI_GEO* × *NCREIF* and *HHI_GEO* × *LIQUIDITY*) remain negative and significant at the 10% level or better, confirming the presence of a moderating effect of lower deadweight costs on IPO returns.

[18] JLL Global Real Estate Transparency Index is available from http://greti.jll.com/greti. The 12 U.S. MSAs ranked as highly transparent include: Los Angeles, San Francisco, New York, D.C., Boston, Seattle, Miami, Chicago, Dallas, Houston, Atlanta, and Philadelphia.

**TABLE 11** Results on the effect of geographic concentration: Controlling for the information environment

| Dependent variable: *IR* Information environment measure | (1) *URBAN* | (2) | (3) | (4) *GATEWAY* | (5) | (6) | (7) *TRANSPARENT* | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| *NCREIF* | 1.266** | 2.172** | 1.080** | 1.299** | 2.232** | 1.122** | 1.251** | 2.163** | 1.069** |
| | 0.532 | 0.838 | 0.453 | 0.553 | 0.870 | 0.476 | 0.537 | 0.849 | 0.460 |
| *LIQUIDITY* | −0.422 | −0.426 | 1.110 | −0.535 | −0.548 | 1.028 | −0.418 | −0.431 | 1.112 |
| | 0.940 | 0.942 | 1.074 | 0.956 | 0.961 | 1.062 | 0.946 | 0.950 | 1.074 |
| *DENSITY* | −5,614** | −6,017** | −5,408** | −6,969** | −7,452** | −6,933** | −5,773** | −6,278** | −5,615** |
| | 2740 | 2775 | 2671 | 3038 | 3076 | 2902 | 2761 | 2816 | 2692 |
| *HHI_ASSET* | 7.608** | 8.426** | 9.719*** | 7.599** | 8.456** | 9.842*** | 7.496** | 8.329** | 9.648*** |
| | 3.261 | 3.403 | 3.496 | 3.270 | 3.424 | 3.507 | 3.254 | 3.392 | 3.476 |
| *HHI_GEO* | 5.587*** | 15.85** | 15.79*** | 5.087** | 15.57** | 15.61*** | 5.500*** | 15.77** | 15.74*** |
| | 2.060 | 6.350 | 5.832 | 2.120 | 6.206 | 5.808 | 2.042 | 6.294 | 5.792 |
| Information environment measure | −0.480 | −0.431 | −0.347 | 1.230 | 1.344 | 1.527 | −0.197 | 0.005 | 0.003 |
| | 1.332 | 1.301 | 1.281 | 1.758 | 1.763 | 1.677 | 1.347 | 1.342 | 1.322 |
| *HHI_GEO* × *NCREIF* | | −3.673* | | | −3.758* | | | −3.688* | |
| | | 2.079 | | | 2.095 | | | 2.083 | |
| *HHI_GEO* × *LIQUIDITY* | | | −3.784* | | | −3.920** | | | −3.802** |
| | | | 1.908 | | | 1.885 | | | 1.901 |

(Continues)

**TABLE 11** (Continued)

| Dependent variable: *IR* Information environment measure | (1) *URBAN* | (2) | (3) | (4) *GATEWAY* | (5) | (6) | (7) *TRANSPARENT* | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Constant | −8.314 | −15.11 | −17.55 | −7.219 | −14.22 | −16.8 | −7.974 | −14.75 | −17.28 |
| | 11.71 | 10.85 | 10.63 | 11.62 | 10.77 | 10.56 | 11.67 | 10.78 | 10.57 |
| Key IPO control variables | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Time fixed effect | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Observations | 116 | 116 | 116 | 116 | 116 | 116 | 116 | 116 | 116 |
| *R*-squared | .298 | .313 | .324 | .300 | .316 | .328 | .298 | .312 | .324 |

*Note*. The table reports OLS regressions for a cross section of real estate IPOs between 1995 and 2017 in the United States. Dependent variable *IR* is the market-adjusted initial return of the IPO. Variable definitions and data sources are contained in Table 1. *URBAN* equals 1 if the REIT's headquarter is located in any one of the top-10 MSAs ranked by total population (Census 2010), and 0 otherwise; *GATEWAY* equals 1 if the REIT's headquarter is located in any one of the six gateway MSAs including Boston, Chicago, Los Angeles, New York, San Francisco, and Washington, D.C., and 0 otherwise; *TRANSPARENT* equals 1 if the REIT's headquarter is ranked as highly transparent by JLL Global Real Estate Transparency Index 2018. Other control variables are also included and defined as previous tables. Three-year time fixed effects are included. Standard errors are corrected for robustness and presented below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

**TABLE 12** Results on the effect of geographic concentration: Controlling for REIT type fixed effect and core property type

| **Dependent variable: *IR*** | **Panel A: REIT type fixed effect** | | | | **Panel B: Core vs. noncore property type** | | | |
|---|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(1)** | **(2)** | **(3)** | **(4)** |
| *NCREIF* | 1.407** | 1.402** | 2.835** | 1.390** | 1.232** | 1.359** | 2.528*** | 1.210** |
| | 0.693 | 0.704 | 1.222 | 0.638 | 0.598 | 0.612 | 0.920 | 0.552 |
| *LIQUIDITY* | −0.253 | −0.247 | −0.219 | 1.380 | −0.118 | 0.133 | 0.151 | 1.301 |
| | 0.969 | 0.976 | 0.958 | 1.257 | 0.961 | 0.914 | 0.906 | 1.211 |
| *DENSITY* | −5,825** | −5,911** | −6,013** | −5,306* | −5,336** | −4,386* | −4,650* | −4,145 |
| | 2835 | 2827 | 2846 | 2801 | 2646 | 2636 | 2684 | 2667 |
| *HHI_ASSET* | | −1.329 | 3.733 | 5.057 | 7.259** | 7.453** | 8.714** | 9.480** |
| | | 6.432 | 6.615 | 6.888 | 3.484 | 3.448 | 3.598 | 3.742 |
| *HHI_GEO* | 5.157* | 5.208* | 19.70** | 15.85* | 5.184** | 13.30** | 26.29** | 20.15** |
| | 2.643 | 2.666 | 8.372 | 8.198 | 2.392 | 6.458 | 10.32 | 8.957 |
| *HHI_GEO* × *NCREIF* | | | −5.274* | | | | −4.754** | |
| | | | 2.804 | | | | 2.267 | |
| *HHI_GEO* × *LIQUIDITY* | | | | −3.928+ | | | | −3.028 |
| | | | | 2.540 | | | | 2.176 |
| *CORE* | | | | | −0.235 | 3.526 | 3.807 | 2.961 |
| | | | | | 1.729 | 2.466 | 2.519 | 2.353 |
| *HHI_GEO* × *CORE* | | | | | | −11.03 | −10.34 | −8.486 |
| | | | | | | 6.990 | 7.073 | 6.729 |
| Constant | 1.584 | 2.407 | −4.751 | −5.933 | 6.599 | −8.273 | −13.85 | −12.98 |
| | 12.32 | 12.93 | 12.81 | 12.55 | 15.35 | 12.62 | 12.90 | 12.50 |

(Continues)

**TABLE 12** (Continued)

| Dependent variable: *IR* | Panel A: REIT type fixed effect | | | | Panel B: Core vs. noncore property type | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Key IPO control variables | Y | Y | Y | Y | Y | Y | Y | Y |
| REIT type fixed effect | Y | Y | Y | Y | N | N | N | N |
| Time fixed effect | Y | Y | Y | Y | Y | Y | Y | Y |
| Observations | 102 | 102 | 102 | 102 | 103 | 103 | 103 | 103 |
| *R*-squared | .270 | .270 | .296 | .293 | .287 | .316 | .338 | .330 |

*Note*. The table reports OLS regressions for a cross section of real estate IPOs between 1995 and 2017 in the United States. Dependent variable *IR* is the market-adjusted initial return of the IPO. Variable definitions and data sources are in Table 1. Other control variables are also included and defined as previous tables. Three-year time fixed effects are included. Standard errors are corrected for robustness and presented below the coefficient estimates. $^{***}$, $^{**}$, $^{*}$ and $^{+}$ denote significance at 1%, 5%, 10%, and 15%, respectively.

## 4.6 | REIT and core property type

Most REITs going public before the 2000s specialized in core properties, whereas the number of REITs focused on specialty properties (e.g., data centers, cell towers, single-family rental property, casinos, etc.) has increased substantially in recent years. Although we include *HOTRATIO* and time fixed effects in our models to control for IPO waves, it is important to understand whether the geographic concentration of a REIT's portfolio might be related to its property type focus. We therefore perform two additional robustness checks.

First, we include property type fixed effects and rerun our main specifications. Because we have a relatively small sample of IPOs, we are not able to create a property type dummy for each property type. Therefore, based on the distribution of property type focus in our sample, we create six categories: diversified, industrial, office, retail, residential, and others. As we need each REIT's property type focus at the point of issuance, we manually define each REIT according to the focus reported in the IPO prospectus. Results are reported in Panel A of Table 12. The estimated coefficient on *HHI_GEO* remains positive at the 10% level or better—Models (1) to (4). Moreover, the interaction terms (*HHI_GEO* × *NCREIF* and *HHI_GEO* × *LIQUIDITY*) remain negative and significant, which provides additional support for a moderating effect of lower deadweight costs on IPO underpricing.

We next create a dummy variable (*CORE*), which equals 1 if the property type focus of the REIT is one of the four core property types: office, industrial, retail, and residential. More specifically, for each diversified REIT, *CORE* equals 1 if the overall weight of office, industrial, retail, and residential properties in its portfolio is greater than 50%.[19] We then add this variable to our main model specifications. These results are reported in Panel B of Table 12. We initially include *CORE* as an extra control variable—Model (1)—and we further add an interaction between *HHI_GEO* and *CORE* in Models (2) to (4). None of the estimated coefficients on *CORE* or *HHI_GEO* × *CORE* is significant and the estimated coefficient on *HHI_GEO* remains positive and significant. Overall, these findings suggest that our main results are not driven by the property type focus of REITs.

In summary, our robustness tests confirm our main finding that geographically concentrated REITs suffer from a smaller pool of investors and therefore their IPOs must be underpriced more to attract sufficient subscriptions during the IPO process. We also provide some support for the moderating effect played by deadweight costs on the relationship between geographic concentration and REIT IPO returns; that is, geographically concentrated portfolios are associated with less underpricing in high performing real estate markets.

## 5 | CONCLUSIONS

The listed real estate sector has generally experienced low levels of IPO underpricing relative to industrial companies. Importantly, the sector has even produced negative average initial returns over some time intervals. Therefore, underpricing theories based on information asymmetries alone cannot explain the time series and cross-sectional variation in the first-day return of REIT IPOs. Consistent with García and Norli (2012), we find evidence that the shares of geographically focused IPO firms with smaller investor bases need to be underpriced more in order to attract the recognition of (and subscription from) a broader base of investors, which is critical to the success of an IPO.

[19] In fact, the minimum weight of core properties for any diversified REIT in our sample is 64%.

Our primary measure of geographic concentration, computed as Herfindahl index, is positively and significantly related to IPO initial returns. The impact of geographic concentration is stronger when the Herfindahl index is measured using the state-level property holdings of the IPO firm. Our findings are robust to the inclusion of national and geographically weighted private real estate market returns and liquidity, to the inclusion of different measures of geographic concentration (underlying economic regions), to controlling for the information environment of a REIT's headquarters, and to controlling for the property type focus of the REIT. Moreover, unlike information asymmetry-based theories of IPO underpricing, which are unable to explain the negative initial returns sometimes observed for REIT IPOs, our investor base argument can account for the observed overpricing.

Our empirical results also support the deadweight cost theory of Chan et al. (2009), who argue that issuers have less incentive to underprice shares when the underlying properties of the IPO firm can be quickly and cost-effectively sold in the parallel private market, should the IPO fail. If the investor base of an IPO firm increases with increasing geographic diversification, selling the underlying property portfolio in the parallel private market becomes easier, leading to lower (or even negative) initial returns. In support of this argument, we find that more concentrated IPO companies experience higher IPO underpricing.

Finally, we find that our investor base argument and the deadweight cost theory complement each other. When the private real estate market is performing well, lower deadweight costs associated with the IPO tend to weaken the influence of geographic concentration on IPO valuations. More specifically, geographically concentrated IPO companies produce, on average, relatively smaller initial returns if the deadweight cost of IPO failure is low.

## ORCID

*Chen Zheng* https://orcid.org/0000-0002-3480-0167

## REFERENCES


Allen, F., & Faulhaber, G. R. (1989). Signalling by underpricing in the IPO market. *Journal of Financial Economics*, *23*, 303–323.

Altı, A. (2005). IPO market timing. *Review of Financial Studies*, *18*, 1105–1138.

Bairagi, R. K., & Dimovski, W. (2011). The underpricing of US REIT IPOs: 1996–2010. *Journal of Property Research*, *28*, 233–248.

Banerjee, S., Dai, L., & Shrestha, K. (2011). Cross-country IPOs: What explains differences in underpricing? *Journal of Corporate Finance*, *17*, 1289–1305.

Beatty, R. P., & Ritter, J. R. (1986). Investment banking, reputation, and the underpricing of initial public offerings. *Journal of Financial Economics*, *15*, 213–232.

Benveniste, L. M., & Spindt, P. A. (1989). How investment bankers determine the offer price and allocation of new issues. *Journal of Financial Economics*, *24*, 343–361.

Berger, P. G., & Ofek, E. (1995). Diversification's effect on firm value. *Journal of Financial Economics*, *37*, 39–65.

Bernile, G., Kumar, A., & Sulaeman, J. (2015). Home away from home: Geography of information and local investors. *Review of Financial Studies*, *28*, 2009–2049.

Brounen, D., & Eichholtz, P. (2002). Initial public offerings: Evidence from the British, French and Swedish property share markets. *Journal of Real Estate Finance and Economics*, *23*, 103–117.

Campbell, R. D., Petrova, M., & Sirmans, C. F. (2003). Wealth effects of diversification and financial deal structuring: Evidence from REIT property portfolio acquisitions. *Real Estate Economics*, *31*, 347–366.

Capozza, D. R., & Seguin, P. J. (1999). Focus, transparency and value: The REIT evidence. *Real Estate Economics*, *27*, 587–619.

Chan, S. H., Chen, J., & Wang, K. (2013). Are REIT IPOs unique? The global evidence. *Journal of Real Estate Finance and Economics*, *47*, 719–759.

Chan, S. H., Stohs, M. H., & Wang, K. (2001). Are real estate IPOs a different species? Evidence from Hong Kong IPOs. *Journal of Real Estate Research*, *21*, 201–220.

Chan, S. H., Wang, K., & Yang, J. (2009). IPO pricing strategies with deadweight and search costs. *Journal of Real Estate Research*, *31*, 481–542.

Comment, R., & Jarrell, G. (1995). Corporate focus and stock returns. *Journal of Financial Economics*, *37*, 67–87.

Coval, J. D., & Moskowitz, T. J. (2001). The geography of investment: Informed trading and asset prices. *Journal of Political Economy*, *109*, 811–841.

Cronqvist, H., Högfeldt, P., & Nilsson, M. (2001). Why agency costs explain diversification discounts. *Real Estate Economics*, *29*, 85–126.

Derrien, F., & Womack, K. L. (2003). Auctions vs. bookbuilding and the control of underpricing in hot IPO markets. *Review of Financial Studies*, *16*, 31–61.

Dimovski, W., & Brooks, R. (2006). The pricing of property trust IPOs in Australia. *Journal of Real Estate Finance and Economics*, *32*, 185–199.

García, D., & Norli, Ø. (2012). Geographic dispersion and stock returns. *Journal of Financial Economics*, *106*, 547–565.

Gokkaya, S., Highfield, M. J., Roskelley, K., & Steele, D. F., Jr. (2015). An examination of primary and secondary market returns in equity REIT IPOs. *Journal of Real Estate Research*, *37*, 23–64.

Grinblatt, M., & Hwang, C. Y. (1989). Signalling and the pricing of new issues. *Journal of Finance*, *44*, 393–420.

Guo, R. J., Lev, B., & Shi, C. (2006). Explaining the short- and long- term IPO anomalies in the US by R&D. *Journal of Business Finance & Accounting*, *33*, 550–579.

Hartzell, D. J., Shulman, D. G., & Wurtzebach, C. H. (1987). Refining the analysis of regional diversification for income-producing real estate. *Journal of Real Estate Research*, *2*, 85–95.

Hartzell, J. C., Sun, L., & Titman, S. (2014). Institutional investors as monitors of corporate diversification decisions: Evidence from real estate investment trusts. *Journal of Corporate Finance*, *25*, 61–72.

Hund, J., Monk, D., & Tice, S. (2010). Uncertainty about average profitability and the diversification discount. *Journal of Financial Economics*, *96*, 463–484.

Ibbotson, R. G. (1975). Price performance of common stock new issues. *Journal of Financial Economics*, *2*, 235–272.

Kang, J. K., & Kim, J. M. (2008). The geography of block acquisitions. *The Journal of Finance*, *63*, 2817–2858.

Landier, A., Nair, V. B., & Wulf, J. (2009). Trade-offs in staying close: Corporate decision making and geographic dispersion. *Review of Financial Studies*, *22*, 1119–1148.

Levis, M. (1995). Seasoned equity offerings and the short-and long-run performance of initial public offerings in the UK. *European Financial Management*, *1*, 125–146.

Ling, D. C., Naranjo, A., & Scheick, B. (2018). Geographic portfolio allocations, property selection and performance attribution in public and private real estate markets. *Real Estate Economics*, *46*, 404–448.

Ling, D. C., Naranjo, A., & Scheick, B. (2019). Asset location, timing ability and the cross-section of commercial real estate returns. *Real Estate Economics*, *47*, 263–313.

Ling, D. C., & Ryngaert, M. (1997). Valuation uncertainty, institutional involvement, and the underpricing of IPOs: The case of REITs. *Journal of Financial Economics*, *43*, 433–456.

Ljungqvist, A., Nanda, V., & Singh, R. (2006). Hot markets, investor sentiment, and IPO pricing. *Journal of Business*, *79*, 1667–1702.

Londerville, J. (2002). Canadian real estate investment trusts: A review of the IPO literature and preliminary analysis of Canadian REIT IPO pricing. *Canadian Journal of Administrative Sciences*, *19*, 359–368.

Loughran, T., Ritter, J., & Rydqvist, K. (1994). Initial public offerings: International insights. *Pacific-Basin Finance Journal*, *2*, 165–199.

Loughran, T., & Ritter, J. R. (2002). Why don't issuers get upset about leaving money on the table in IPOs? *Review of Financial Studies*, *15*, 413–444.

Marcato, G., Milcheva, S., & Zheng, C. (2018). Market integration, country institutions and IPO underpricing. *Journal of Corporate Finance*, *53*, 87–105.

Marcato, G., Stanimira, M., & Zheng, C. (2018). Urban economic openness and IPO underpricing. *Journal of Real Estate Finance and Economics*, *56*, 325–351.

Megginson, W. L., & Weiss, K. A. (1991). Venture capitalist certification in initial public offerings. *Journal of Finance*, *46*, 879–903.

Merton, R. C. (1987). A simple model of capital market equilibrium with incomplete information. *Journal of Finance*, *42*, 483–510.

Montgomery, C. A. (1994). Corporate diversification. *Journal of Economic Perspectives*, *8*, 163–178.

Ritter, J. R. (1984). The hot issue market of 1980. *Journal of Business*, *57*, 215–240.

Ritter, J. R. (2018). *Initial public offerings: Underpricing (updated statistics)*. Retrieved from https://site.warrington.ufl.edu/ritter/ipo-data/

Ritter, J. R., & Welch, I. (2002). A review of IPO activity, pricing, and allocations. *Journal of Finance*, *57*, 1795–1828.

Rock, K. (1986). Why new issues are underpriced. *Journal of Financial Economics*, *15*, 187–212.

Vannieuwerburgh, S., & Veldkamp, L. (2009). Information immobility and the home bias puzzle. *The Journal of Finance*, *64*, 1187–1215.

Wang, C., Cohen, J. P., & Glascock, J. L. (2018). *Geographically overlapping real estate assets, liquidity spillovers, and liquidity multiplier effects*. University of Connecticut School of Business Research Paper No. 18-18. https://doi.org/10.2139/ssrn.3154088

Wang, K., Chan, S. H., & Gau, W. (1992). Initial public offerings of equity securities: Anomalous evidence using REITs. *Journal of Financial Economics*, *31*, 381–410.

Welch, I. (1989). Seasoned offerings, imitation costs, and the underpricing of initial public offerings. *Journal of Finance*, *44*, 421–449.

Wong, W. C., Ong, S. E., & Ooi, J. T. L. (2013). Sponsor backing in Asian REIT IPOs. *Journal of Real Estate Finance and Economics*, *46*, 299–320.

**How to cite this article:** Ling DC, Marcato G, Zheng C. Does asset location and concentration explain REIT IPO valuation? *Real Estate Econ*. 2020;1–35. https://doi.org/10.1111/1540-6229.12327