Quality of Real Estate Crowdfunding

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ABSTRACT

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Crowdfunding has prospered in recent years because of regulation adjustments. It provides new opportunities for entrepreneurs and investors. This thesis presents the first-ever empirical examination of the quality of real estate crowdfunding projects and primarily addresses two questions. First, due to relatively less sophisticated small investors, herd effect, group cognitive bias, and the non-tradability of crowdfunding, real estate crowdfunding properties could be worse than other real estate properties in terms of property characteristics, leasing, and sales transactions. Empirical results indicate that real estate crowdfunding properties are not evidently worse within the metropolitan statistical area (MSA) and neighborhood, but they do fare more poorly than their comparables in sales transactions. Second, this thesis suggests that failed real estate crowdfunding projects are riskier, are managed by less qualified sponsors, and are located in less attractive areas.

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List of Abbreviations

Adjusted funds from operations (AFFO)
All-or-Nothing (AON)
Capitalization rate (cap rate)
Comparables (Comp)
Crowdfunding (CF)
Debt-service coverage ratio (DSCR)
Federal Information Processing Standard (FIPS)
Funds from operations (FFO)
Gross Domestic Product (GDP)
Individual social capital (ISC)
Jumpstart Our Business Startups Act (JOBS Act)
Keep-it-All (KIA)
Loan-to-value ratio (LTV Ratio)
Metropolitan Statistical Area (MSA)
Mortgage-backed securities (MBS)
Net asset value per share (NAVPS)
Real estate investment trusts (REITs)
Real estate operating companies (REOCs)
Square Feet (SF)
Territorial social capital (TSC)
US Securities and Exchange Commission (SEC)

1. Introduction

With the passage of the Jumpstart Our Business Startups (JOBS) Act in April 2012, crowdfunding was substantially facilitated. Crowdfunding is the practice of funding projects or ventures by raising contributions from a large number of people via specific Internet platforms. It simplifies funding seeking procedures and allows more investors to participate. It can be divided into non-equity crowdfunding (donation-based and reward-based) and equity crowdfunding. Investors of equity crowdfunding aim to receive equity shares, profits, or revenue. Prior researchers have discussed the economic mechanisms, motivations, determinants, and disadvantages of crowdfunding.

Crowdfunding benefits many fields such as music, art, technology, and games. Real estate crowdfunding has emerged as one of the hottest crowdfunding categories. Real estate plays an integral role in the economy. Commercial real estate creates jobs opportunities in retail, offices and manufacturing and thus stimulates consumption. In 2015, real estate construction contributed USD $990 billion to the US economic output, taking up 6% of the US Gross Domestic Product (GDP). According to the Chinese National Bureau of Statistics, ceteris paribus, 1% change of real estate investment results in 0.22% change of GDP in 2007.

As a novel means of real estate investments, real estate crowdfunding allows more entrepreneurs and investors to participate, breaks geographic restrictions, and simplifies transactions by online platforms. It gradually becomes an important and promising part of real estate sector. In 2015, the Crowdfunding for Real Estate Report conducted a global analysis of the market landscape based on data collection from approximately 75 real estate crowdfunding platforms. In addition, another 15 platforms are currently under development. CrowdExpert.com tracked about USD $2 billion in US crowdfunding investment activity in 2015, approximately half of which was from real estate and half of which was from start-ups. According to CFX Alternative Investing Crowdfunding Statistics, as of January 2016, the total size of the US commercial real estate market was estimated at USD $7 trillion. Crowdfunding makes up only USD $2.5 billion of this market, indicating that there is much room for growth. Despite increased attention from regulators and researchers on crowdfunding in general, the mechanisms and performance of real estate crowdfunding are not well understood. This thesis presents the first-ever empirical examination of the quality of real estate crowdfunding projects from US crowdfunding platforms.

Unlike the situation in the traditional real estate market, the real estate crowdfunding market has many small investors, and investors cannot trade in the secondary public market. Although investors from crowdfunding are accredited investors who are arguably wealthier, they are smaller and clearly less experienced than institutional investors. Crowds of investors can easily cause the herd effect and group cognitive bias, reducing monitoring and leading to irrational decisions. Non-tradability and lack of liquidity impede market efficiency. Thus, the real estate crowdfunding market could perform worse, and the quality of the projects could be worse than that of other real estate properties, for instance, in property characteristics, leasing, and sales transactions.

For this study, projects are manually collected from seven US real estate crowdfunding platforms, starting in March 2015 and ending at the end of February 2016. Other data sources are Costar and census datasets. Empirical analysis indicates real estate crowdfunding properties are not obviously worse within the metropolitan statistical area (MSA) and neighborhood in terms of property characteristics, leasing, and sales transactions. However, they do fare more poorly than their comparables in sales transactions, having lower prices and higher financing payment risks. Moreover, previous research has found that failed projects usually have higher risks and less qualified sponsors. In real estate, census and location factors also make a difference. Compared with successful real estate crowdfunding projects, failed cases are riskier, are managed by less qualified sponsors, and are located in less attractive areas, which is consistent with the findings of previous research.

This thesis provides important implications for real estate entrepreneurs and policy makers. For real estate entrepreneurs, using moderate risk management, being experienced, and emphasizing locations can enhance the likelihood of funding success. For policy makers, proper supervision and further requirements of information disclosure would be helpful for the long-term development of the crowdfunding industry.

The remainder of the thesis is structured as follows. Section 2 is background discussion about general crowdfunding, recent regulation changes, and real estate crowdfunding (traditional real estate investments, development and characteristics, format and types, and investment process). Section 3 summarizes prior crowdfunding literature. Section 4 illustrates the study's theoretical foundation and presents its hypotheses. Section 5 presents data and methodology. Section 6 offers empirical results. Section 7 states conclusions, implications, and limitations.

2. Background of real estate crowdfunding

2.1. Crowdfunding in general

Crowdfunding can be described as an unconventional method of raising funds from individuals via an online portal. It has diversified forms: donations, philanthropy, and sponsorship; reward-based; lending; and investment in exchange for equity shares, profits, or revenue. Current literature distinguishes among different models (De Buysere, Gajda, Kleverlaan, Marom, & Klaes, 2012; Lambert & Schwienbacher, 2010). The donation-based model offers a donor contract without any physical or monetary rewards, while the reward-based model offers non-pecuniary tangible (e.g., product) or intangible (e.g., reputation) rewards in exchange. In comparison, the lending model provides a credit contract without financial intermediaries. Ahlers, Cumming, Günther, and Schweizer (2015) define equity crowdfunding as a method of financing whereby an entrepreneur sells a specified number of equity- or bond-like shares in a company to a group of (small) investors through an open call for funding on Internet-based platforms.

In contrast to other crowdfunding forms, such as reward-based crowdfunding, the risks can be measured more precisely in real estate crowdfunding because the underlying asset is tangible and not a vision. Compared with minimal investment amount in other crowdfunding forms, such as donations, investment amount in real estate crowdfunding is as large as thousands of dollars and thus investors will care about returns. Furthermore, compared with evaluating quality of other crowdfunding categories, such as music and art, quality of real estate properties can be assessed more objectively and directly. These characteristics make the research of real estate crowdfunding more feasible.

Some crowdfunding platforms experience great success. For instance, founded in April 2009, Kickstarter was the largest crowdfunding platform by early 2014, exceeding USD $1 billion in contributions, supporting more than 50,000 successfully funded projects, and having 5.7 million people pledging on their site. Kickstarter funders have come from 214 countries and all seven continents. Other crowdfunding platforms are also active across the world, such as IndieGoGo, EquityNet, CrowdCube, and FundedByMe.

2.2. Recent regulation changes

Signed into law by President Barack Obama on April 5, 2012, the Jumpstart Our Business Startups (JOBS) Act is a law aiming to revitalize opportunities for entrepreneurs, start-ups, and small businesses (i.e., America's main job creators). By easing various securities regulations, the

JOBS Act has given rise to a proliferation of new crowdfunding entrants in various business sectors, including the commercial real estate arena.

Divided into seven titles, the US Securities and Exchange Commission (SEC) is progressively introducing the JOBS Act section by section. Only Titles I, V, and VII went into effect immediately after the passage of the bill. Title II of the Act came into effect on September 23, 2013. It modifies Regulation D's 506(c) exemption to allow start-ups to solicit accredited investors and accept funds from them prior to being in a substantial and pre-existing relationship. In the first year of equity crowdfunding under Title II, this new capital market grew from nothing to greater than USD $250 million in funding raised publicly online. On June 19, 2015, new rules for Title IV Small Company Capital Formation were made through Regulation A+ investment offerings. This change created a framework allowing companies to engage in a “Mini-I.P.O.”, which costs the issuer about USD $100,000 to file and takes about 6 months to push through the SEC, but allows the issuer to raise up to USD $50 million per year.

One of the most interesting sections of JOBS Act, the Title III Crowdfunding Act, experienced lengthy discussion and was eventually approved by the SEC on October 30, 2015, with an effective date of May 16, 2016. Title III opens up a tremendous amount of capital available to early-stage companies by including unaccredited investors with the purpose of monetary return. The rules limit the amount of funds that capital issuers solicit via crowdfunding and impose disclosure requirements on issuers, creating a regulatory framework to facilitate the crowdfunding transactions.

The majority of online marketplaces, including the real estate crowdfunding platforms in this thesis, launched their projects or fund offerings in 2014 and 2015 using the Regulation D structure, which only allows companies to market offerings to accredited investors. According to SEC regulations, an investor must accomplish at least one of the following to qualify as accredited:

1) Earn an individual income of more than USD $200,000 per year, or a joint spousal income of more than USD $300,000 per year, in each of the last two years, and expect to maintain the same level of income.

2) Have a net worth exceeding USD $1 million, either individually or jointly with his or her spouse (excluding a primary residence).

3) Be a bank, insurance company, registered investment company, business development

company, or small business investment company.

4) Be a general partner, executive officer, director, or a related combination thereof for the issuer of a security being offered.

5) Be a business in which all the equity owners are accredited investors.

6) Be an employee benefit plan, a trust, charitable organization, partnership, or company with total assets in excess of USD $5 million.

2.3. Real estate crowdfunding

2.3.1. Traditional real estate investments

Real estate investments involve purchase, ownership, management, rental, and sale of real estate for profit. Commercial properties generate income in the form of either rent paid by tenants or appreciation in sale. Returns are realized based on the property's income, less its operating, financing, and maintenance costs. Commercial real estate is fueling a fire that has already been burning for years. US commercial real estate sales topped USD $435 billion in 2015, according to JLL (a financial and professional services firm that specializes in commercial real estate services and investment management).

Commercial properties usually include multifamily buildings or apartments, retail buildings, offices, industrial facilities, and hospitality buildings. Multifamily or apartments are classified as residential use. The main economic determinants for residential market development are population growth and job creation. Leases are typically short-term, but demand is usually stable.

Retail properties include properties ranging from small neighborhood grocery stores to large shopping malls. They are most broadly influenced by economy, employment growth, consumption, and traffic. Leases often have long terms. Retail store leases frequently contain a base rent plus a percentage rent based on the tenant's gross sales figures.

Office buildings range from large multi-tenant structures in city business districts to single-tenant buildings. Rents and valuations are influenced by job creation, regional economic focus, and productivity rates. Desirability of locations and conditions of building are also important. Length of leases varies globally.

Industrial properties include manufacturing facilities, warehouses, distribution centers, and research and development space. Industrial property leases tend to have long terms, and are sensitive to shifts in the composition of local and national industrial bases and trade. In contrast, hospitality properties are characterized by variable income and business cycles since they are not

protected by long-term leases.

The real estate sector provides unique reasons to invest. Investors may expect to earn income from collecting rents and property appreciation. Both rents and property values can function as hedges against inflation. Returns of real estate investments are less than perfectly correlated with returns of stocks and bonds so it can be added into portfolios for diversification. In some countries, real estate investors receive favorable tax treatment. On the other hand, risks of real estate investments cannot be ignored. Similar to other investments, overall business conditions exert profound impacts. The effect of demographic factors can be enlarged. Lack of liquidity, environmental issues, property defects, and so on should be identified.

The real estate market is divided into private and public sectors. Private real estate emphasizes valuation due to the lack of open and frequent transactions. Common valuation methods are the income approach, cost approach, and sales comparison approach. Investors also count on financial ratios to make decisions, such as the debt-service coverage ratio (DSCR) and loan-to-value ratio (LTV Ratio).

The public real estate market can take different forms, such as real estate investment trusts (REITs), real estate operating companies (REOCs), and residential or commercial mortgage-backed securities (MBS). A REIT is a type of security that invests in real estate through property or mortgages and often trades on major exchanges like a stock. A business will be established as an REOC if it is ineligible to organize as an REIT. REITs provide investors with an extremely liquid stake in real estate, and benefit from active professional management and low volatility. In addition, they receive special tax considerations and typically offer high dividend yields. However, REITs have some specific drawbacks, including structural conflicts of interest (e.g., different tax implications for REIT shareholders and for general partners) and lack of flexibility (e.g., prohibitions on certain kinds of investments and on retaining most of income). Net asset value per share (NAVPS) and a discounted cash flow approach are frequently used to value REITs. Funds from operations (FFO) and adjusted funds from operations (AFFO) are also sometimes used.

2.3.2. Development and characteristics

Historically, commercial real estate investments were the exclusive domain of institutional investors and wealthy private investors. Following the regulation change, more investors have access to these potentially profitable assets. As a novel approach, real estate crowdfunding has

obvious advantages.

First, diversification can be realized from different property types and investment types. Property types include residential, retail, office, industrial, and hospitality. Investment types include equity, preferred equity, senior debt, and subordinated debt.

Second, real estate crowdfunding projects are geographically varied and allow online transactions, thus breaking geographic restrictions. Agrawal, Catalini, and Goldfarb (2011) highlight the relevance of distance in transactions and point out that online platforms eliminate most distance-related economic frictions.

Third, investors can access this market with small amounts of money and avoid high fees. For instance, the minimum investment in Fundrise and iFunding is typically USD $5,000. Investors on CrowdStreet do not pay any fees or load to register, but investors will be charged for their investments. Take RealtyShares as an example. Once an equity investment has been made, RealtyShares will usually charge investors an annual fee, typically 1% of the aggregate invested amount, to be paid periodically to cover ongoing investor reporting and communications relating to the investment. On debt investments, RealtyShares typically takes a servicing fee in the form of a spread between the interest rate paid by a borrower and that paid to investors. In contrast, REITs require fees from investors, and in particular, non-traded REITs have been widely criticized for their egregious front-end loads. The average total upfront fees charged to non-traded REITs' investors (13.2%) is a full 5.0% greater than the maximum allowable mutual fund front-end load (Henderson, Mallett, & McCann, 2016).

Fourth, transaction processing is convenient and can be entirely completed online, including digital legal documentation, funds transfer, and ownership recordation. Entrepreneurs benefit from the quicker, more transparent underwriting process and flexibility in product offerings and capital structures. For instance, most transactions in RealtyMogul are funded within 45-60 days of submission.

Fifth, platforms also offer valuable branding and networking opportunities. Property information and discussions are open and free in real estate crowdfunding platforms. In REITs, most investors have little or no information regarding actual properties they have invested in because REITs are essentially securitizations of real estate properties.

However, real estate crowdfunding is not without limitations. For example, lack of liquidity restricts investor selling. Therefore, the risk supervision of crowdfunding must be tested further.

2.3.3. Formats and types

Different types of commercial properties are listed on crowdfunding platforms, such as Prospect Heights (Brooklyn, New York) Multifamily Rehab, Starbucks Anchored Retail Development Tempe, South Bay Office Repositioning Loan, Jackson Industrial Park, and Route 66 Ramada Hotel.

From another perspective, investments can be grouped as either equity or debt. Equity interest is a portion of ownership interest in a property. Equity holders have a chance to earn relatively larger returns on their investment than do debt holders, but debt must be repaid first and thus equity holders bear a heavier risk. Investors are typically entitled to a share of the cash flow from rents, as well as a share of the proceeds when the property is eventually sold. Some projects offer preferred equity positions, which have a senior priority return over all other equity investments in the deal, but are still junior to the senior debt. Representative cases are Colorado Springs 2-Asset Cash-Flowing Multifamily Acquisition and DC Boutique Retail Rehab.

Debt is the second investment type. Here, investors purchase a specific loan or a pool of loans with the underlying loan tied to a commercial property, and the loan is secured by property until the borrower repays in full. Senior debt must be repaid first and carries less risk than other portions of the capital stack. Mezzanine debt (i.e., subordinated debt) is an effective tool to provide sponsors with higher levels of leverage at lower cost than pure equity. In return, investors get a higher yield for their additional risk. Representative instances are Rogers Avenue Mixed Use Redevelopment, Charlotte Land Acquisition and Pre-Development Loan, and Whispering Oaks Apartments.

Other investment types include real estate crowdfunding portfolio funds and eREITs. Examples are Food Lion Grocery Anchored Portfolio II, WCCG New York Self-Storage Portfolio, and Global Sky Fund. Also, an eREIT has been newly offered in Fundrise. Both accredited and unaccredited US residents can invest as long as the investment does not exceed more than 10% of the investor's gross annual income or net worth. It is non-traded and designed to take advantage of inefficiency in the small balance commercial market. This thesis excludes portfolios, funds and eREITs because they have distinct characteristics from single projects and it is difficult to find comparables to execute forward analysis.

2.3.4. Investment process

The crowdfunding process is typically divided into three phases. The first phase begins with

the initial procedure by which the funding seekers (i.e., sponsors) apply on the real estate crowdfunding platforms. Sponsors are professional real estate investment companies that acquire and manage properties. They are also known as borrowers in debt investment and developers when the aim of a project is construction. Crowdfunding platforms will then run background, criminal, and credit checks. If the funding seekers meet the established criteria, projects will be listed, and this listing will include their concrete idea, project timeline, funding objective, distribution notes, and risk exposure. Also, the sponsors must pay a fee to the crowdfunding websites. For example, Fundrise charges sponsors a one-time 1% to 2% origination fee and a USD $5,000 due diligence and closing cost. iFunding collects an administrative fee and a listing fee from sponsors after all funds are raised. In the second phase, potential investors gather information, evaluate projects, and make their decisions. Entrepreneurs may advertise their projects among families and friends to increase the success rate. The final phase occurs when the initiators fulfill their contracted promise. If full funding is raised and projects are completed successfully, investors receive the predetermined financial payment. However, if the offering targets fail to be achieved, funders are reimbursed and the projects will not be implemented.

3. Literature review on crowdfunding

Some papers have revealed the economic mechanisms and theoretical interpretations of crowdfunding. In comparison with traditional situations where orders are placed and fulfilled individually, crowdfunding changes the optimal product line design and shrinks the product line quality gap (Hu, Li, & Shi, 2015). Crowdfunding capitalizes on the innovative power of large groups, such as crowdsourcing (Poetz & Schreier, 2012) and innovation tournaments (Boudreau, Lacetera, & Lakhani, 2010).

Motivations for selecting crowdfunding models have been studied. Belleflamme, Lambert, and Schwienbacher (2014) compare two forms of crowdfunding: pre-ordering the product or paying a fixed amount in exchange for future equity share or profits. Their paper shows that entrepreneurs prefer pre-ordering if the initial capital requirement is relatively small compared with market size, and that they prefer profit sharing otherwise. Cumming, Leboeuf and Schwienbacher (2015) divide rewards-based crowdfunding into two models, the Keep-It-All (KIA) and All-or-Nothing (AON) models. The usage of AON is a reliable signal to the crowd and reduces risk to the crowd, thereby enabling entrepreneurial AON firms to raise more money and thus ensuring that they will more likely reach their goals. In contrast, KIA projects tend to be less

successful.

Factors that impact the success of crowdfunding are also important. The most common factors to consider are the family and friend circle, social and human capital, gender gap, as well as geographic distinctions. Ahlers, Cumming, Günther, and Schweizer (2015) find that human capital positively affects the success of equity crowdfunding platforms while the level of uncertainty negatively affects funding success. Retaining equity and providing more detailed information about risks reduce information asymmetry, and therefore can be interpreted as effective signals. However, social capital and intellectual capital make little difference in funding success. Giudici, Guerini, and Rossi Lamastra (2013) divide social capital and conclude that individual social capital (ISC) is positively and significantly correlated with the success of crowdfunding projects, while territorial social capital (TSC) is not. By combining the impact of ISC and TSC, TSC weakens the signal provided by ISC, which can be put down to adverse selection. In addition, Marom, Robb, and Sade (2015) focus on gender dynamics in crowdfunding. They claim men seek significantly higher levels of capital than women, but women outperform in success rate.

Although crowdfunding seems a gift to entrepreneurs and investors, its risks and criticisms cannot be ignored. Agrawal, Catalini, and Goldfarb (2013) remind us that ideas and intellectual property can be stolen due to early-stage public disclosure. Also, the growing pains experienced by the equity-based crowdfunding industry will be more dramatic and severe than those experienced in the non-equity setting. Hildebrand, Puri, and Rocholl (2014) provide evidence of perverse incentives in crowdfunding and suggest that sophisticated investors may take advantage of unsophisticated investors.

Despite the existence of literature regarding the economic mechanisms, motivations, determinants, adversities, and other aspects of crowdfunding, there is no literature available concerning real estate crowdfunding. This thesis presents a first-ever empirical examination of the quality of real estate crowdfunding projects and promotes understanding of the real estate crowdfunding market.

4. Hypotheses development

Compared with traditional real estate investments, real estate crowdfunding has three important features: small investors, the large number of investors, and non-tradability. First, unlike with traditional public real estate investments (REITs and REOCs), the expertise of

investors is required in real estate crowdfunding, in particular, because there is no formal financial intermediary. Although investors from crowdfunding are accredited investors who are arguably wealthier and presumably have financial advisors, they are clearly less experienced, smaller, and weaker than institutional investors and experts. As experts within a tightly knit community (Wenger & Snyder, 2000), venture capitalists are generally highly knowledgeable about valuing start-up projects and assessing founding teams. In contrast, small investors in real estate crowdfunding platforms are loosely organized and likely lack financial sophistication and experience (Freear, Sohl, & Wetzel, 1994). Also, it is more difficult for small investors to do due diligence and determine the values of real estate crowdfunding projects by comparing them with other real estate investments. Thus, initiators can take advantage of this lack of experience or professional knowledge.

Second, there are many investors in real estate crowdfunding, instead of only one or a few when institutional investors are in place. In comparison to institutional investors, crowds invest small amounts of money in individual projects, and thus they may have less incentive to gather information. In this case, the possibility of the herding effect arises and leads to less monitoring and the free ride problem (Cipriani & Guarino, 2005). Due to the large number of small investors, group cognitive biases can undermine the quality of crowd decision-making (Frith & Frith, 2012; Raafat, Chater, & Frith, 2009). For instance, groups of small investors can be subject to emotional contagion (Barsade, 2002) and hysterical reaction (Balaratnasingam & Janca, 2006).

Herding effect and group cognitive biases could happen in real estate crowdfunding. The funding schedule of projects is open online and early investors have a significant influence on later investors (Kim & Viswanathan, 2013). Kuppuswamy and Bayus (2015) find that investors are more likely to contribute to a crowdfunding project in the first and last week as compared to the middle period of the funding cycle. Therefore, crowdfunding investors may simply mimic others or be affected by the funding schedule in the process of monitoring, governance and screening of projects, which may lead to collective irrationality. In addition, considering prior findings that some crowdfunding is based on the support of friends and family (Agrawal, Catalini, & Goldfarb, 2011), it could be reasonably concluded that the crowd primarily focuses on supporting popular or specific individuals, rather than quality projects.

Third, unlike with traditional public real estate transactions and prediction markets (Ray, 2006; Wolfers & Zitzewitz, 2004), there are no buyers and sellers trading contracts in an efficient

manner in crowdfunding. For example, Fundrise explicitly states that there is no secondary public market for the resale of securities purchased through the platform, and that none is expected to develop. Yet, the secondary public market is crucial in many aspects, such as pricing on the basis of supply and demand factors (Kakarot-Handtke, 2011), allocating scarce capital efficiently, and reducing the agency costs of management (Fox, Morck, Yeung, & Durnev, 2003). Also, real estate crowdfunding is not tradable and lacks liquidity, which restricts competition and market efficiency (Chordia, Roll, & Subrahmanyam, 2008). These three factors have negative effects on the development of the real estate crowdfunding market and the quality of real estate crowdfunding properties offered. Based on these concepts and factors, a hypothesis can be formulated.

Hypothesis 1: Real estate crowdfunding properties are worse than other real estate properties.

In the real estate sector, the poor quality of investment properties is mainly reflected in the properties' characteristics, leasing, and sale transactions. For example, the less desirable properties are older, are less renovated, have a lower price, demand less rent, have a less stable occupancy rate and a higher vacancy rate, require more concessions from the landlord, have a lower sales volume, have a higher capitalization rate (cap rate), and present a higher payment risk. Furthermore, location is important for real estate (Kain & Quigley, 1970; Malpezzi, Chun, & Green, 1998). The less desirable properties are usually located in less favorable areas, such as areas with improper population density, sex unbalance, unreasonable age structure, heavy mortgage burden, high level of unemployment, and inconvenient traffic patterns.

Not all real estate crowdfunding projects achieve funding success. Failed projects usually have poorer risk management (Morris & Hough, 1987) and a higher level of uncertainty (Ahlers, Cumming, Günther, & Schweizer, 2015). The Ellsberg paradox (1961) indicates that, compared to ambiguous information and future uncertainty about investment opportunities, investors prefer projects for which all outcomes and probabilities are known. With regard to real estate crowdfunding projects, existing properties are viewed with more certainty and lower risk than properties under construction. More target funding from the crowd means relatively less funding from traditional channels. Traditional channels, like bank loans and other financial intermediaries, can play the role of monitors, thus reducing risk (Diamond, 1984, 1991). Less funding from traditional channels could suggest that projects have difficulty meeting requirements of these

channels, which is a signal of risk. Entrepreneurs who are confident about their projects are willing to state details of return distribution. Additionally, a capital structure with a high degree of leverage is indicative of a high degree of risk (Baxter, 1967; Leland, 1994).

It is also important to point out that the qualifications of entrepreneurs are crucial to the success of their projects (Bradford, 2012; Giudici, Guerini, & Rossi Lamastra, 2013). Venture capitalists indicate that experience and management skills are among their most important selection criteria (Zacharakis & Meyer, 2000). The more qualified entrepreneurs have higher capabilities and richer experience. They make contributions to the project's success by identifying and exploiting business opportunities (Shane & Venkataraman, 2000), defining and realizing a venture's strategy (Baum, Locke, & Smith, 2001), acquiring additional resources (Brush, Greene, & Hart, 2001), and building a positive basis for future learning (Ackerman & Humphreys, 1990). Education degrees also make a difference, for example, for high-technology venture founders (Levie & Gimmon, 2008). Likewise, an MA or PhD degree could be regarded as bona fide expertise of real estate crowdfunding entrepreneurs or sponsors. Network and social connections can provide additional solicitation resource possibilities for firms (Baum & Silverman, 2004). Given that the applications of most MBA programs require work experience, an MBA degree could be regarded as evidence of professional experience and social maturity. Ahlers, Cumming, Günther, and Schweizer (2015) use the share of board members holding MBA degrees as an indicator for human capital. Analogically, for real estate crowdfunding projects, the share of executives holding a higher education degree than a BA (i.e., MBA, MA, JD, or PhD) can be an indicator of human capital.

Last, but not least, the real estate sector emphasizes the importance of project locations (Kain & Quigley, 1970; Malpezzi, Chun, & Green, 1998). Unattractive locations hinder the success and development of real estate projects. As previously mentioned, adverse location factors include improper population density, sex unbalance, unreasonable age structure, heavy mortgage burden, high level of unemployment and poverty, deficient education attainment, and traffic inefficiency. Based on above discussion, a hypothesis can be formulated.

Hypothesis 2: Failed real estate crowdfunding projects are riskier, are managed by less qualified sponsors, and are located in less attractive areas.

5. Data and methodology

5.1. Real estate crowdfunding projects

I manually collect 135 real estate crowdfunding projects from seven US real estate crowdfunding platforms, beginning in March 2015 and culminating at the end of February 2016. Non-commercial projects (i.e., single family dwellings) are excluded. The seven crowdfunding platforms involved are Fundrise, RealtyMogul, CrowdStreet, Patch of Land, AssetAvenue, RealtyShares, and iFunding.

1) Fundrise (www.fundrise.com) was founded in 2012, and its offerings provide shares or equity ownership in various properties, including public offerings available to local investors and private offerings available to accredited investors. It currently has more than 80,000 members and attracts nearly USD $3 billion worth of real estate investments.

2) RealtyMogul (www.realtymogul.com) provides a marketplace for accredited investors to pool money online and buy shares of prescreened real estate investments. This platform was launched in 2013 and in its first year, claimed to have invested over USD $14 million from 6,000 members in projects worth more than USD $100 million. To date, investors have invested over USD $196 million and financed 330+ properties valued at over USD $700 million.

3) CrowdStreet (www.crowdstreet.com) was founded in 2013 by a team with more than 80 years of combined experience in commercial real estate, software development, online marketing, and private equity. In addition to traditional direct investments, its first project was a senior housing initiative in Bloomington, Indiana which raised USD $218,000 within days of its listing.

4) Patch of Land (www.patchofland.com) offers various typologies of secured real estate debt on assets backed by first position liens and personal guarantees. Through April 2016, 241 loans totaling more than USD $109 million have been funded. Total funds returned to investors are more than USD $28 million.

5) AssetAvenue (www.assetavenue.com) is one of the leading online platforms for commercial real estate investors. It offers rehab and rental property loans.

6) RealtyShares (www.realtyshares.com) is an online investment platform that uses crowdfunding to pool investors into private real estate investments. In its first year of operation, the company claimed to have helped fund 26 projects valued at around USD $70 million in eight different states.

7) iFunding (www.ifunding.com), headquartered in New York, is a real estate crowdfunding

platform that allows individual investors to select and make investments in pre-vetted institutional real estate assets.

To get a general impression of the distribution of the sample projects, I map their locations and corresponding MSA (Figure 1). MSA is a geographical region with a relatively high population density at its core and close economic ties throughout the area. It is often used for compilation of related statistical data. MSA information is provided by CoStar. CoStar is a leading provider of commercial real estate information, analytics, and online marketplaces. Clients can gain insights about property statistics, sales records, and market conditions. From the map, most crowdfunding projects are near MSA. And, they are distributed primarily on the east and west coasts, as well as in the northeastern US around the Great Lakes. It is commonly acknowledged that these areas are major economic centers and have broad markets.

Figure 1 Locations of real estate crowdfunding and MSA

The map shows locations of real estate crowdfunding projects and MSA. MSA is a geographical region with a relatively high population density at its core and close economic ties throughout the area. Star symbolizes crowdfunding projects and circle symbolizes MSA.

5.2. Real estate crowdfunding within MSA and neighborhood

To test Hypothesis 1 that real estate crowdfunding properties are worse than other real estate properties, I first compare real estate crowdfunding properties within MSA. That consists of comparing real estate properties in crowdfunding neighborhood with those across neighborhood within the same MSA. I then examine real estate crowdfunding properties within the neighborhood. Next, analysis is narrowed down to comparisons between real estate crowdfunding properties and matched comparable properties. Currently, real estate crowdfunding platforms do not disclose information or statistics about investors. Thus, I only use variables such as the properties themselves and the leasing and sale transactions to reflect the quality of the real

estate crowdfunding investments.

First, data of real estate crowdfunding within MSA (i.e., crowdfunding neighborhood and MSA) are collected from CoStar. Since CoStar is missing some information, the total sample size is 164, which includes 82 observations of crowdfunding neighborhood and 82 MSA. For example, for the crowdfunding project, East Village Mixed-Use Renovation, its neighborhood is East Village, and its MSA is New York. A full description of variables is provided (Appendix I Table i). Variables are classified into three groups: property, leasing, and sales in the past year. Rent, absorption, sales volume, sale price per square feet (SF), and cap rate are calculated for all properties. Absorption measures change of occupancy in the past 12 months. Cap rate is the income rate of return for a total property calculated by dividing the annual net operating income by the sale price or value. Average building SF price and vacancy are only for retail, office, and industrial properties. Average unit SF prices and concessions are only for multifamily properties. Concessions from a landlord aim to attract tenants, and they can take the form of free rent, moving allowances, and the like.

As for methodology, the univariate test consists of a parametric test (*t*-test) and a nonparametric test (median test). The median test is used for crowdfunding neighborhood and MSA because they have different size ranges. Both tests are one-sided since the purpose is not only to compare the equality, but also to evaluate the better or worse quality of the crowdfunding

Table 1 Descriptive statistic of real estate crowdfunding within MSA

The two panels provide descriptive statistics of MSA and crowdfunding neighborhood. MSA is a geographical region with a relatively high population density at its core and close economic ties throughout the area. Summary statistics include the number of observations, mean, minimum, maximum and standard deviation.

	Panel A: MSA					**Panel B: Crowdfunding neighborhood**				
Variables	Obs.	Mean	Min	Max	SD	Obs.	Mean	Min	Max	SD
Average building SF	37	16.57	8.49	45.03	8.977	37	15.926	3.92	75.97	15.026
Average unit SF	45	874.73	810	1096	63.6	42	806.929	625	1046	96.55
Rent	82	1.5	0.37	2.86	0.659	79	1.83	0.37	4.67	1.062
Vacancy	37	6.16	3.1	13.3	2.497	37	6.711	0.1	16.4	3.903
Concessions	45	1.15	0.2	2.7	0.661	42	1.64	0	8.4	1.907
Absorption	82	12.92	-27.1	54.56	10.871	79	18.4	-15	148.1	33.386
Sales volume	82	3385.8	0	17087.9	5016.3	78	5166.94	0	32104.1	8220.86
Sale price per SF	81	194.23	31.51	465	113.66	73	237.093	23.09	963.92	198.042
Cap rate	79	6.72	5	9.7	1.081	62	6.4	3.7	9.3	1.282
Total observation	82					82				

neighborhood. In multivariate analysis, logit models are used. The dependent variable is *group*, and it equals 1 if it is crowdfunding neighborhood or equals 0 if it is MSA. Model 1 is for all properties, and the property type fixed effect is used for unobserved heterogeneity resulting from different types. Independent variables in model 1 include rent, absorption, sales volume, sale price per SF, and cap rate. Models 2 and 3 are for different types of properties. Given the sample size, not all independent variables in model 1 are shown in models 2 and 3. Model 2 is for retail, industrial, and office, and property type fixed effect is used for unobserved heterogeneity resulting from different types. Independent variables in model 2 include absorption, sales volume, sale price per SF, cap rate, average building SF, and vacancy. Due to multicollinearity, the variable of rent is not included. Model 3 is for multifamily properties and independent variables include absorption, sales volume, sale price per SF, cap rate, average unit SF, and concessions. Again, the variable of rent is not included due to multicollinearity. The general regression model is expressed as following equation. Variables in the parenthesis are added in models part by part.

$$Group = a_1 Absorption + a_2 Sales\ volume + a_3 Sale\ price\ per\ SF + a_4 Cap\ rate + a_i(Rent,\ Average\ building\ SF,\ Vacancy,\ Average\ unit\ SF,\ Concessions) + \varepsilon \quad (1)$$

After this, I narrow down analysis within the neighborhood to test Hypothesis 1. Properties are grouped based on a star rating system. Assigning stars is a method used in the CoStar Building Rating System, a national rating for commercial buildings on a universally recognized 5 star scale. The 5 star designation is the best, and the 1 star is the worst. The general building criteria are architectural design, structure/systems, amenities, site/landscaping/exterior spaces, and certifications. *Neighborhood all* includes all properties in this neighborhood regardless of the star rating. *Neighborhood same* is a subset of neighborhood all. Properties in neighborhood same have similar star ratings as the crowdfunding properties. Take the crowdfunding project, East Village Mixed-Use Renovation, as an example. It is a 2 star property and neighborhood all is East Village; neighborhood same is East Village 1-3 stars. Data are from seven real estate crowdfunding platforms and Costar. Full sample size is 164, with 82 observations of neighborhood same and 82 of neighborhood all. The same variables are used within neighborhood as in MSA.

I use the same empirical methods and the same logit models within neighborhood as those within MSA, except that in multivariate regressions, the dependent variable of group equals 1 if it is neighborhood same, or equals 0 if it is neighborhood all.

Table 2 Descriptive statistic of real estate crowdfunding within neighborhood

The two panels provide descriptive statistics of neighborhood all and neighborhood same. Neighborhood all includes all properties in this neighborhood regardless of star. Neighborhood same is a subset of neighborhood all. Properties in neighborhood same have similar star with crowdfunding properties. Summary statistics include the number of observations, mean, minimum, maximum and standard deviation.

	Panel A: Neighborhood all					**Panel B: Neighborhood same**				
Variables	Obs.	Mean	Min	Max	SD	Obs.	Mean	Min	Max	SD
Average building SF	37	15.97	3.92	75.97	15.03	37	18.53	3.63	90.46	20.51
Average unit SF	42	806.92	625	1046	96.55	42	805.86	578	1046	105.87
Rent	79	1.83	0.37	4.67	1.06	79	1.79	0.37	4.53	1
Vacancy	37	6.71	0.1	16.4	3.9	37	6.63	0.1	16.9	3.97
Concessions	42	1.64	0	8.4	1.91	42	1.63	0	8.1	1.82
Absorption	79	18.4	-14.96	148.1	33.39	79	17.23	-16.79	201.27	40.69
Sales volume	78	5167	0	32104	8221	77	5457	0	29589	8484
Sale price per SF	73	237.09	23.09	963.9	198	72	232.6	23.09	763.82	174.98
Cap rate	62	6.4	3.7	9.3	1.28	59	6.41	3.3	9.3	1.28
Total observation	82					82				

5.3. Real estate crowdfunding and comparables

More specific analysis between real estate crowdfunding properties and their comparables is made to test Hypothesis 1. Some crowdfunding projects have more than one comparable in CoStar. To get one-to-one match, I calculate the equal average of comparables. Due to missing values in CoStar, the total sample size is 221 observations, including 135 crowdfunding projects and 86 equal average comparables. Additionally, I use size-weighted average and value-weighted average of comparables as robust tests. Size-weighted average uses property size as weight; value-weighted average uses sale price as weight. In total, I have 85 size-weighted comparables and 86 value-weighted average comparables.

I list related variables and definitions (Appendix I Table ii). Property and sale variables include property age, renovation, property size, property price, land size, land price, vacancy, star, financing, sale condition, and cap rate. Financing measures payment risk; the lower the value of the financing means a lower proportion of down payment and thus a higher risk. Higher value of sale condition means properties are more likely to be in bad condition, such as up for auction sale, in distress, having deferred maintenance, etc. Census variables can reflect location characteristics and include population density, sex ratio, age dependency, household mortgage, unemployment, and travel time to work. Sex ratio describes the balance between males and females and is defined as the number of males per 100 females. Age dependency is defined by dividing the combined ages of those under 18 years old and those over 65 years old by the 18-64 year-old

Table 3 Descriptive statistics of real estate crowdfunding and comparables

The four panels provide descriptive statistics of real estate crowdfunding properties, equal average comparables, size-weighed average comparables and value-weighted average comparables. Comparables are from CoStar. Summary statistics include the number of observations, mean, minimum, maximum and standard deviation.

	Panel A: Crowdfunding properties					**Panel B: Equal average comparables**				
Variables	Obs	Mean	Min	Max	SD	Obs.	Mean	Min	Max	SD
Age	106	62.73	0	2016	194.33	85	50.53	10.25	148.75	29.43
Renovation	135	0.07	0	1	0.25	86	0.07	0	1	0.14
Property size	105	104540	903	2861402	286269.7	85	118910.8	1468.72	552038.3	110898.2
Price	76	184.41	16.34	1003.95	187.19	86	237.69	19.2	1625.21	300.8
Land size	99	209423.5	1400	1738305	304239.2	86	376937.5	2755.65	2030419	429266.3
Land price	71	195.33	0.11	1736.96	353.28	86	480.55	1.06	5248.98	1062.82
Vacancy	94	11.47	0	100	21.38	83	13.54	0	100	16.97
Star	106	2.82	1	5	0.77	86	2.72	1	4	0.68
Financing	35	0.31	0.03	1	0.29	60	0.52	0.12	1	0.24
Sale condition	21	0.43	0	1	0.51	81	0.27	0	1	0.26
Cap rate	29	7.74	4	14.7	2.53	76	7.17	3.6	13.26	1.89
Population density	132	3164.31	2.19	19545.24	4653.95	86	3059.65	342.13	15392.08	3264.09
Sex ratio	132	102.4	66.1	295.3	32.92	86	99.52	81.39	253.47	20
Age dependency	132	52.71	6.4	105.1	17.76	86	55.06	31.9	85.8	10.44
HH mortgage	109	2.89	1	7.52	1.31	86	3.29	1.12	17.66	2.1
Unemployment	132	8.68	1.3	29.6	5.99	86	8.66	4.03	19.35	3.06
Travel time to work	132	24.87	9.6	40.3	5.94	86	25.76	17.3	35.55	4.63
Full sample size	135					86				

	Panel C: Size-weighted average comparables					**Panel D: Value-weighted average comparables**				
Variables	Obs.	Mean	Min	Max	SD	Obs.	Mean	Min	Max	SD
Age	85	50.35	9.53	173.84	32.32	85	50.06	8.99	192.72	33.35
Renovation	85	0.08	0	1	0.15	86	0.09	0	1	0.18
Property size	85	201888.9	1498.1	1202263	239272.9	85	193143.2	1499.2	1126128	221942.2
Price	85	195.13	18.32	1250.44	210.19	86	311.11	21.64	2034.12	395.46
Land size	85	626844.8	3264.46	6600022	1080948	86	578441.4	4040.01	5566303	929747.9
Land price	85	427.06	1.06	4547.26	879.77	86	639.74	1.06	7156.42	1381.36
Vacancy	82	14.12	0	69.28	15.64	83	14.72	0	100	19.85
Star	85	2.72	1	4	0.68	86	2.72	1	4	0.68
Financing	60	0.51	0.12	1	0.26	60	0.53	0.13	1	0.27
Sale condition	80	0.29	0	1	0.29	81	0.22	0	1	0.28
Cap rate	76	7.1	2.92	13.26	1.89	76	6.93	3.07	13.26	1.88
Population density	85	3013.38	342.13	15806.83	3251.08	86	3078.49	291.56	13953.04	3296.15
Sex ratio	85	99.87	67.74	253.5	21.35	86	100.97	46	286.23	25.77
Age dependency	85	55.26	34.02	91	10.7	86	54.67	23.3	86.01	10.91
HH mortgage	85	3.4	1.12	31.93	3.35	86	3.39	1.12	25.91	2.73
Unemployment	85	8.82	3.94	20.87	3.18	86	8.52	3.62	24.1	3.4
Travel time to work	85	25.79	17.3	36.14	4.73	86	25.83	17.3	38.37	4.81
Full sample size	85					86				

population and multiplying by 100. Household mortgage measures mortgage burden; a higher value means a heavier burden. Property and sale variables are from CoStar and crowdfunding platforms. Census data are collected from the 2010-2014 American Community Survey 5-Year Estimates (factfinder.census.gov) and obtained by matching geocode (latitude and longitude) and Federal Information Processing Standards (FIPS).

As for methodology, the one-sided *t*-test and Wilcoxon rank sum test are used. The Wilcoxon rank sum test is a nonparametric alternative to the two-sample *t*-test and is based solely on the order in which the observations from the two samples fall. In multivariate analysis, logit models are used to include possible determinants and control factors, simultaneously. The dependent variable is *CF or comp* (CF is short for crowdfunding and comp is short for comparables). It is 1 if the observation is for a crowdfunding project; it equals 0 if it is a comparable. Platform fixed effect is added to account for unobserved heterogeneity due to platform reputation, website design, detailed provisions, and so on. Considering sample size and multicollinearity, variables are added and controlled part by part. Model 1 is the basic model, and the four independent variables are age, renovation, property size, and price. Other models, except model 2, also use the four independent variables and add other variables. Model 2 replaces property size and price with land size and land price, so the independent variables are then age, renovation, land size, and land price. Besides the four basic independent variables, model 3 adds vacancy and star. Models 4, 5, and 6 can be considered together because they are designed to test financing payment risk (financing) and return (cap rate). Model 4 adds star and cap rate. Model 5 adds star and financing. Model 6 adds star, cap rate, and financing. Model 7 adds sale condition. Model 8 adds census variables: population density, sex ratio, age dependency, household mortgage, unemployment, and travel time to work. The general regression model is expressed as the following equation. Variables in the parenthesis are added in models part by part.

$$CF\ or\ comp = b_1 Age + b_2 Renovation + b_3 Property\ size + b_4 Price + b_i \begin{pmatrix} Vacancy,\ Star,\ Cap\ rate,\ Financing,\ Sale\ condition,\ Population\ density,\ Sex\ ratio, \\ Age\ dependency,\ Household\ mortgage,\ Unemployment,\ Travel\ time\ to\ work \end{pmatrix} + \varepsilon \quad (2)$$

5.4. Real estate crowdfunding and failed projects

This section considers the testing of Hypothesis 2 which is that failed real estate crowdfunding projects are riskier, managed by less qualified sponsors, and are located in less attractive areas. Failed cases are defined as projects that cannot raise targeted funding within an

expected period. For instance, the 1706 Park Avenue project is a multifamily property, and the offering size is stated as USD $4,960,000. However, only 87.5% of the funding was achieved in the end. The full sample size is 135 consisting of 124 successful and 11 failed. Fail rate is 8.15%. Variables and definitions are provided (Appendix I Table iii). Variables are classified into four levels: deal level, financial level, sponsor level and census level. Deal level variables and financial level variables can reflect the riskiness of projects. Specifically, deal level variables include development status, offering size, offering size percentage, minimum investment, investment term, CF completion date, and starting distribution date. Development status is a dummy variable and equals 1 if the property is existing, and it equals 0 if the property is under development. Offering size is the amount of target funding. CF completion date is a dummy variable and equals 1 if the platform indicates when to complete the project; otherwise, it is 0. Starting distribution date is a dummy variable and equals 1 if the platform indicates when to start distributing returns; otherwise, it is 0. Financial level variables demonstrate capital constitution, including common equity, preferred equity, total equity, and loan-to-value (LTV) ratio. LTV ratio is defined as the amount of debt divided by the total amount of equity and debt. It measures leverage and lending risk. Sponsor level variables show the qualifications of the sponsor firm and executive team, including executives' university education degrees and experience at the current firm, as well as experience in the real estate and financial industries. The data noted above are collected from seven crowdfunding platforms. The last level is census level variables from the 2010-2014 American Community Survey 5-Year Estimates and CoStar. It can reflect location characteristics and include population density, median age, sex ratio, age dependency, household mortgage, unemployment, education attainment, poverty, walk score, and transit score. Higher walk scores and transit scores mean better traffic accessibility.

As for methodology, the one-sided *t*-test and Wilcoxon rank sum tests are used. Because very few cases are in the failed group, the variances could be different. Thus, the *t*-test assumes unpaired groups and unequal variance. The nonparametric test (Wilcoxon rank sum test) does not require the population's distribution to be characterized by certain parameters, for example normal distribution. Also, I run logit models to control some factors. The dependent variable is the CF status. If the project is successful, it equals 1; if it fails, it equals 0. I only consider variables for which failed projects have at least ten non-missing values, and thus not all variables appear in regressions. Given sample size and multicollinearity, independent variables are added

Table 4 Descriptive statistics of real estate crowdfunding and failed projects

Panel A provides descriptive statistics of successful crowdfunding projects. Panel B provides descriptive statistics of failed crowdfunding projects. Failed cases are defined as projects cannot raise targeted funding within expected period. Summary statistics include the number of observations, mean, minimum, maximum and standard deviation.

	Panel A: Successful crowdfunding projects					**Panel B: Failed crowdfunding projects**				
Variables	Obs.	Mean	Min	Max	SD	Obs.	Mean	Min	Max	SD
Development status	124	0.83	0	1	0.38	10	0.8	0	1	0.42
Offering size	121	1677895	150000	25000000	2574223	10	2689500	275000	6000000	1856452
Offering size percentage	120	25.8	0.08	100	27.99	10	37.15	7.08	100	37.81
Minimum investment	115	31343.36	0	2100000	194982.8	10	12000	0	30000	10852.55
Investment term	115	47.66	9	120	28.35	10	32.9	9	60	20.67
CF completion date	124	0.29	0	1	0.46	11	0.45	0	1	0.52
Starting distribution date	124	0.28	0	1	0.45	11	0.27	0	1	0.47
Common equity	121	26.45	0	100	15.33	10	18.78	0	41.87	11.91
Preferred equity	121	3.07	0	43.09	7.62	10	6.66	0	18.66	7.94
Total equity	123	29.52	0	100	15.39	10	25.43	0	41.87	11.55
LTV ratio	123	70.48	0	100	15.39	10	74.57	58.13	100	11.55
Sponsor age	77	18.02	2	94	18.74	9	13.78	2	36	10.79
Sponsor university	90	20	0	100	32.59	5	20	0	100	44.72
Sponsor education degree	83	50.4	0	100	39.47	5	20	0	50	27.39
Sponsor experience current firm	83	18.46	1	73	15.02	5	13.6	2	23	7.89
Sponsor experience real estate industry	91	80.4	0	100	33.11	6	100	100	100	0
Sponsor experience finance industry	86	61.24	0	100	37.79	6	58.33	0	100	49.16
Population density	122	3308.92	2.19	19545.23	4803.62	10	1400.06	162.09	3166.01	1137.05
Median age	122	38.12	21.4	57.2	6.44	10	37.3	25.7	47.1	6.65
Sex ratio	122	103.13	66.5	295.3	33.92	10	93.57	66.1	118.4	14.44
Age dependency	122	52.1	7.6	105.1	17.05	10	60.2	6.4	97.3	24.79
Household mortgage	101	2.85	1	6.23	1.25	8	3.44	1.45	7.52	1.91
Unemployment	122	8.65	1.3	29.6	5.94	10	9.1	2.4	26.1	6.81
Education attainment	122	0.57	0.26	0.77	0.08	10	0.5	0.36	0.6	0.07
Poverty	122	13.84	0.4	45.2	12.24	10	19.55	2.4	57.5	19.28
Walk score	94	64.1	0	99	28.61	8	54.75	1	91	27.94
Transit score	85	48.01	0	100	32	6	26.17	0	76	31.47
Total observations	124					11				

and controlled part by part. Model 1 includes deal level variables: development status, offering size, minimum investment, investment term, CF completion date, and starting distribution date. Model 2 adds financial variables, so independent variables include development status, offering size, minimum investment, investment term, CF completion date, and LTV ratio. Model 3 adds census variables, so independent variables include development status, offering size, minimum investment, investment term, population density, sex ratio, age dependency, education attainment, and unemployment. The general regression model is expressed as follows. Variables in the parenthesis are added in models part by part.

$$CF\ status = c_1 Development\ status + c_2 Offering\ size + c_3 Minimum\ investment + c_4 Investment\ term + c_i \begin{pmatrix} CF\ completion\ date,\ Starting\ distribution\ date,\ LTV\ ratio,\ Population\ density, \\ Sex\ ratio,\ Age\ dependency,\ Education\ attainment,\ Unemployment \end{pmatrix} + \varepsilon \quad (3)$$

6. Empirical result

6.1. Real estate crowdfunding within MSA and neighborhood

6.1.1. Univariate analysis within MSA

Table 5 provides the results of univariate analysis within MSA. For leasing conditions, all properties in crowdfunding neighborhood have higher rent but larger absorption (unstable change in occupancy). For sales in the past year for crowdfunding neighborhood, higher sales volume and lower cap rates are preferred by sellers because they indicate more active markets and higher deal prices. However, sale price per SF has a higher mean but a lower median. Multifamily properties in crowdfunding neighborhood have smaller average unit sizes and more concessions from landlords. However, univariate tests cannot lead to definite conclusions because some variables indicate positive conditions of crowdfunding neighborhood while others indicate negative conditions.

6.1.2. Multivariate analysis within MSA

Table 6 provides the results of multivariate analysis within MSA. The dependent variable is group, and it equals 1 if it is crowdfunding neighborhood, or equals 0 if it is MSA. Model 1 uses samples of all properties. For crowdfunding neighborhood, higher rent means relatively strong demand, while lower sale price per SF means weak demand. Model 2 is for retail, industrial, and office properties. Vacancy rate is significantly higher, showing worse leasing conditions. However, larger sales volume is a positive signal. Model 3 is for multifamily properties, and it has smaller average unit size, more concessions from the landlord, and lower sale price per SF. Based on the mixed results of the three models, generally, empirical analysis cannot show

Table 5 Univariate analysis of real estate crowdfunding within MSA

This table shows results of *t*-test and median test between crowdfunding neighborhood and MSA. MSA is a geographical region with a relatively high population density at its core and close economic ties throughout the area. Numbers in table are mean difference and median difference. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

	t-test	Median test
Variables	Mean difference	Median difference
Average building SF	-0.64	-2.61
Average unit SF	-67.804***	-67.5***
Rent	0.328**	0.1
Vacancy	0.5243	0.8
Concessions	0.4826*	0
Absorption	5.474*	-2.735*
Sales volume	1781.17*	6*
Sale price per SF	42.862*	-9
Cap rate	-0.321*	-0.25

Table 6 Multivariate analysis of real estate crowdfunding within MSA

This table shows logit regressions with crowdfunding neighborhood and MSA. MSA is a geographical region with a relatively high population density at its core and close economic ties throughout the area. Prob > chi2 is p value of Chi square test to know significance of coefficients. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

Model	(1)	(2)	(3)
	Group	Group	Group
Rent	1.448**		
Absorption	1.49	-0.77	1.85
Sales volume	0.82*	1.75**	707.79
Sale price per SF	-6.41*	-5.03	-6.55*
Cap rate	-0.033	0.133	-0.152
Average building SF		-0.103	
Vacancy		0.273*	
Average unit SF			-0.015***
Concessions			0.526*
Observations	141	68	73
Property type FE	Yes	Yes	No
Property type	All	Retail, industrial and office	Multifamily
Prob > chi2	0.0204	0.0249	0.002

crowdfunding neighborhood as being consistently worse when compared to MSA in terms of property characteristics, leasing, and sales transactions.

6.1.3. Empirical results within neighborhood

Both univariate (Table 7) and multivariate analyses (Table 8) show insignificant results, even

if it is hard to find models with good fitness. It can be concluded that neighborhood same is not evidently different from neighborhood all. To this point, no evidence can indicate real estate crowdfunding properties are worse than other properties within MSA and neighborhood in terms of property characteristics, leasing, and sales transactions.

Table 7 Univariate analysis of real estate crowdfunding within neighborhood

This table shows results of *t*-test and median test between neighborhood same and neighborhood all. Neighborhood all includes all properties in this neighborhood regardless of star. Neighborhood same is a subset of neighborhood all. Properties in neighborhood same have similar star with crowdfunding properties. Numbers in table are mean difference and median difference. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

	t-test	Median test
Variables	Mean difference	Median difference
Average building SF	2.6	-1.07
Average unit SF	-1.0715	1.5
Rent	-0.044	0
Vacancy	-0.083	0.2
Concessions	-0.0071	0
Absorption	-1.169	-4.13
Sales volume	289.726	-1.095
Sale price per SF	-4.495	0
Cap rate	0.005	0.05

Table 8 Multivariate analysis of real estate crowdfunding within neighborhood

This table shows logit regressions of neighborhood same and neighborhood all. Neighborhood all includes all properties in this neighborhood regardless of star. Neighborhood same is a subset of neighborhood all. Properties in neighborhood same have similar star with crowdfunding properties. Prob > chi2 is p value of Chi square test to know significance of coefficients. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

Model	(1)	(2)	(3)
	Group	Group	Group
Rent	-0.143		
Absorption	-0.11	-0.81	-0.38
Sales volume	0.12	0.61	-479.15
Sale price per SF	0.45	-2.25	0.71
Cap rate	-0.016	-0.04	-0.183
Average building SF		0.061	
Vacancy		-0.069	
Avg unit SF			0.002
Concessions			0.01
Observations	121	62	59
Property type FE	Yes	Yes	No
Property type	All	Retail, industrial and office	Multifamily
Prob > chi2	1	0.9561	0.9668

6.2. Real estate crowdfunding and comparables

6.2.1. Univariate analysis

Table 9 provides the results of the univariate analysis of real estate crowdfunding and comparables. Property size and land size of crowdfunding projects are significantly smaller than those of comparables. Property price and land price are lower. Vacancy is lower according to the Wilcoxon rank sum test. Sales of crowdfunding projects have a higher financing risk due to a auction sale, distress and deferred maintenance). Cap rate is significantly higher, and thus market value is relatively low. The nonparametric test of census data shows significantly lower population density but less mortgage burden and lower unemployment rate. The *t*-test proves significantly lower age dependency than size-weighted comparables and shorter time travel to work than value-weighted comparables. For one thing, univariate tests suggest real estate crowdfunding properties have negative aspects, including lower price, higher financing payment risk, worse sale condition and higher cap rate. For another, they have positive aspects, including lower vacancy and generally better location characteristics. Thus, further analysis is required to come to a conclusion.

6.2.2. Multivariate analysis

Table 10 provides the results of the multivariate analysis of real estate crowdfunding and comparables. The dependent variable is CF or comp and equals 1 if the observation is a crowdfunding project; it equals 0 if it is comparable. Considering sample size, variables are added and controlled part by part. Smaller size, lower property price, and lower land price of crowdfunding projects are shown in models 1 and 2. After controlling other factors, vacancy rate and star are not significant (model 3). Models 4, 5, and 6 are designed to test financing payment risk and cap rate. Crowdfunding properties are riskier, which implies more expected return under the risk-return theory. However, after adding cap rate as a standardized return measure, the financing variable as a risk measure is still significant, and regression models have good fitness with weighted average comparables. This means that the return fails to make up for the risk. After controlling other factors, sales condition (model 7) and census variables are insignificant (model 8). In general, empirical analysis indicates real estate crowdfunding projects fare more poorly than their comparables due to lower price and higher financing payment risk.

Table 9 Univariate analysis of real estate crowdfunding and comparables

This table shows results of *t*-test and median test between real estate crowdfunding properties and comparables. Comparables are from CoStar. Panel A is crowdfunding properties and equal average comparables. Panel B is crowdfunding properties and size-weighted average comparables. Panel C is crowdfunding properties and value-weighted average comparables. Numbers in table are mean difference and median difference. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

	Panel A: Crowdfunding and equal average comparables		**Panel B: Crowdfunding and size-weighted average comparables**		**Panel C: Crowdfunding and value-weighted average comparables**	
Variables	*t*-test Mean difference	Wilcoxon rank sum test Median difference	*t*-test Mean difference	Wilcoxon rank sum test Median difference	*t*-test Mean difference	Wilcoxon rank sum test Median difference
Age	12.193	-10.90	12.37	0.17	12.665	-7.24
Renovation	-0.0025	0.00***	-0.011	0.00***	-0.019	0.00***
Property size	-14370.8	-24434.22***	-97348.9**	-72509***	-88603.2**	-34031.6***
Price	-53.2783	-15.275	-10.7195	1.0687	-126.69***	-28.62
Land size	-167514***	-38029.5***	-417421.3***	-196020.1***	-369017.9***	-56949.75***
Land price	-285.2177**	-16.026***	-231.7276**	-42.19***	-444.41***	-20.46***
Vacancy	-2.068	-1.607***	-2.64	-5.022***	-3.24	-1.771***
Star	0.105	0.00	0.103	0.00	0.105	0.00
Financing	-0.207***	-0.133***	-0.197***	-0.267***	-0.215***	-0.116***
Sale condition	0.155*	0.00	0.1369	-0.227	0.212**	0.00
Cap rate	0.569	0.3025	0.638	0.515	0.811*	0.591
Population density	104.661	-427.445*	150.929	-208.478*	85.825	-326.668*
Sex ratio	2.878	-8.056	2.529	-0.732	1.4289	-7.315
Age dependency	-2.350	-4.13	-2.547*	-2.33	-1.96	-4.797
Household mortgage	-0.398	-0.138**	-0.504*	-0.24**	-0.496*	-0.176**
Unemployment	0.0199	-2.62***	-0.140	-1.38***	0.1550	-2.2059***
Travel time to work	-0.88	-1.2	-0.912	-0.442	-0.958*	-1.228

Table 10 Multivariate analysis of real estate crowdfunding and comparables

This table shows logit regressions of real estate crowdfunding properties and comparables. Comparables are from CoStar. Panel A is logit regressions with crowdfunding properties and equal average comparables. Panel B is logit regressions with crowdfunding properties and size-weighed average comparables. Panel C is logit regressions with crowdfunding properties and value-weighted average comparables. Model in either panel with the same number has the same setting. The first seven models are for property and sale variables. Model 8 adds census variables. All models are controlled for platform fixed effect. Prob > chi2 is p value of Chi square test to know significance of coefficients. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

Panel A: Crowdfunding and equal average comparables

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp
Age	-0.03	0.01	0.02	-0.06	-0.08	-0.14	-0.01	-0.08
Renovation	0.46	0.61	0.08	1.34	1	2.82	0.93	0.19
Property size	-0.06***		-0.06***	-0.04	-0.09***	-0.08**	-0.12**	-0.05**
Price	-1.54*		-1.53*	-1.05	-0.67	-0.57	-0.89	-3.31**
Land size		-0.01***						
Land price		-0.92**						
Vacancy			-6.82					
Star			0.28	0.28	-0.5	-0.15		
Cap rate				0.07		0.06		
Financing					-4.27***	-5.00**		
Sale condition							0.72	
Population density								0.95
Sex ratio								-0.01
Age dependency								-0.02
Household mortgage								-0.05
Unemployment								0.04
Travel time to work								0.03
Observation	159	156	147	99	94	68	89	147
Platform FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prob > chi2	0.02	0.00	0.06	0.32	0.00	0.02	0.08	0.04

Panel B: Crowdfunding and size-weighted average comparables

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp
Age	-0.04	0.01	0	-0.04	-0.05	-0.03	-0.01	-0.08
Renovation	0.33	0.51	-0.05	1.17	0.33	1.81	0.56	0.11
Property size	-0.07***		-0.07***	-0.05**	-0.09***	-0.09**	-0.14**	-0.07***
Price	-1.25		-1.21	-1.17	-0.11	-0.78	-0.67	-3.13**
Land size		-0.02***						
Land price		-1.20**						
Vacancy			-8.71					
Star			0.33	0.38	-0.5	0.1		
Cap rate				0.07		0.01		
Financing					-4.37***	-4.98**		
Sale condition							0.76	
Population density								0.71
Sex ratio								-0.03
Age dependency								-0.02
Household mortgage								-0.06
Unemployment								0.03
Travel time to work								0.03
Observation	159	156	147	99	94	68	89	147
Platform FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prob > chi2	0.0000	0.0000	0.0004	0.0525	0.0000	0.0035	0.0089	0.0017

Panel C: Crowdfunding and value-weighted average comparables

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp	CF or comp
Age	-0.02	0.01	0.03	0	-0.03	0	0.01	-0.04
Renovation	0.15	0.42	-0.28	1.07	0.03	1.05	0.73	-0.03
Property size	-0.08***		-0.08***	-0.06**	-0.09***	-0.07**	-0.14**	-0.07***
Price	-2.94***		-2.87**	-3.11*	-1.64	-1.58	-2.47	-5.66***
Land size		-0.02***						
Land price		-1.47***						
Vacancy			-8.68					
Star			0.33	0.42	-0.46	0.13		
Cap rate				0.02		-0.02		
Financing					-3.50***	-3.65**		
Sale condition							0.7	
Population density								0.94
Sex ratio								-0.02
Age dependency								-0.02
Household mortgage								0.01
Unemployment								0.02
Travel time to work								0.03
Observation	159	156	147	99	94	68	89	147
Platform FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prob > chi2	0.0000	0.0000	0.0000	0.0090	0.0000	0.0073	0.0023	0.0000

6.3. Real estate crowdfunding and failed projects

6.3.1. Univariate analysis

Deal level

Table 11 provides the results of the univariate analysis of real estate crowdfunding and failed projects. The mean difference indicates failed projects are more likely to be under development instead of existing ones, suggesting failed cases have more phases to go through and thus greater risk exposure. Offering size of failed cases is significantly larger. Also, relative offering size to total amount of equity and debt is higher, suggesting failed projects rely more on crowd. In other words, these projects have more limited access to traditional capital channels and are therefore riskier. The investment term of failed cases is 15 months shorter than that of successful cases. Some real estate investors prefer a short investment term in an attempt to retain a high level of financial flexibility. Others hold property for longer periods to reduce frequent transaction costs and to forestall depreciation recapture. Furthermore, in the case of failed projects, investors tend to state when to complete fundraising, but are less likely to state when to start distributing returns. Investors care a great deal about return and may view lack of explicit statement of distribution as uncertainty. Based on the above considerations, I can conclude that failed real estate crowdfunding projects have higher risks than successful cases.

Financial level

Failed projects have a significantly higher proportion of preferred equity. Preferred equity has a higher claim on assets and earnings than common equity and pays fixed dividends. With more preferred equity, failed projects may bear more rigid payment pressure, thereby restricting their financial flexibility. Higher LTV ratio is equivalent to higher leverage, and this capital structure is indicative of higher risks.

Sponsor level

Although sample size of sponsors may be defective, I still discuss it because it can provide irreplaceable and valuable information. Sponsor firms of failed projects have shorter histories, and accordingly, they have a weaker foundation and less of an accumulation of resources. In the case of failed projects, executives' universities are not obviously more or less prestigious, but executives' education degrees are significantly lower. A higher education degree can bring abundant social connections (MBA) and provide expertise (MA or PhD). In regard to work experience, key members work in their current sponsor firms for a shorter period, which indicates

Table 11 Univariate analysis of real estate crowdfunding and failed projects

This table shows results of *t*-test and Wilcoxon rank sum test between successful and failed projects. Failed cases are defined as projects cannot raise targeted funding within expected period. Numbers in table are mean difference and median difference. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

	t-test	Wilcoxon rank sum test
Variables	Mean difference	Median difference
Development status	0.0306	0.00
Offering size	-1011605.00*	-1415000.00**
Offering size percentage	-11.346	-3.19
Minimum investment	19343.36	-2500.00
Investment term	14.761**	18.50*
CF completion date	-0.1642	0.00
Starting distribution date	0.0095	0.00
Common equity	7.674**	11.375**
Preferred equity	-3.588*	-3.54**
Total equity	4.086	2.55
LTV ratio	-4.086	-2.55
Sponsor age	4.242	1.00
Sponsor university	-0.0003	0.00
Sponsor education degree	30.40**	50.00**
Sponsor experience current firm	4.858	0.00
Sponsor experience real estate industry	-19.60***	0.00*
Sponsor experience finance industry	2.91	-8.33
Population density	1908.869***	571.51
Median age	0.820	1.65
Sex ratio	9.5562*	2.05
Household mortgage	-0.59	-0.733
Age dependency	-8.1041	-12.30
Unemployment	-0.455	-0.30
Education attainment	0.067***	0.0574***
Poverty	-5.713	-3.55
Walk score	9.346	5.50
Transit score	21.85	27.5*

less understanding of the firms and the relative difficulty in a creating long-term strategy. They have less experience in the financial industry, while, surprisingly, their experience in the real estate industry is richer. Overall, sponsors of failed cases are less qualified in regard to firm history, executives' education, and work experience at the current firm，but real estate experience is an exception.

Census level

Population density in the areas of failed cases is significantly lower according to the *t*-test. People's median age is also somewhat lower. The greater deviation of sex ratio from 100 indicates that the areas of failed projects have a more striking unbalance between males and

females, which can be inferred from descriptive statistics and the *t*-test. Gender balance is advocated in that it alleviates inequality disaffection, inhibits crime, and enhances social welfare (Golley & Tyers, 2012). People bear heavier household mortgage burden and age dependency is higher. The education attainment level is significantly lower. Unemployment rate and poverty level are higher. Walk score and transit score show less efficiency of accessibility for failed projects. In short, failed projects are located in comparatively worse places.

Table 12 Multivariate analysis of real estate crowdfunding and failed projects

This table shows logit regressions of successful crowdfunding projects and failed crowdfunding projects. Failed cases are defined as projects cannot raise targeted funding within expected period. Mean VIF (Variance inflation factor) is measure of multicollinearity. A rule of thumb is that if VIF is greater than 10, multicollinearity need to be cautious. Hosmer Lemeshow test is a statistical test for goodness of fit for logit regression models. P value of Hosmer Lemeshow test is showed in table and large p value is indicative of good fit. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

Model	(1)	(2)	(3)
	CF status	CF status	CF status
Development status	-0.32	-0.42	-0.15
Offering size	-0.02*	-0.02*	-0.01
Minimum investment	0.94	0.28	0.28
Investment term	0.06**	0.05**	0.07**
CF completion date	-1.46*	-1.6*	
Starting distribution date	-1.07		
LTV ratio		0.01	
Population density			2.67
Sex ratio			0.04*
Age dependency			0.03
Education attainment			27.74*
Unemployment			0.11
Observation	114	115	115
Mean VIF	1.23	1.15	1.44
Hosmer Lemeshow test	0.6564	0.8764	0.1971

6.3.2. Multivariate analysis

Table 12 provides the results of the multivariate analysis of real estate crowdfunding and failed projects. The dependent variable is CF status. If the project is successful, it equals 1; otherwise, it is failed and equals 0. I only consider variables for which failed projects have at least ten non-missing values, and thus not all variables appear in regressions. Considering deal

level variables together (model 1), offering size for failed subjects is still significantly larger, confirming higher risks in failed cases. Investors have different preferences for investment terms, so despite its significance, a longer investment term does not have a determining effect. Failed cases intend to state the funding completion date, which may indicate more details, but this exerts pressure on projects. After adding the LTV ratio as a measure of financing risk (model 2), results of offering size, investment term, and funding completion date do not change, but LTV ratio is not significant. Controlling census variables (model 3), the investment term is still significant. In addition, areas of failed projects have significantly lower sex ratio and lower levels of education attainment, which is consistent with characteristics of unfavorable locations.

By combining the univariate and multivariate analyses, Hypothesis 2 is generally supported. Failed real estate crowdfunding projects are less desirable than successful projects in terms of risks, sponsor qualification, and location characteristics.

7. Conclusion

Research on crowdfunding, particularly real estate crowdfunding, is still in its initial stage. This thesis presents the first-ever empirical examination of the quality of real estate crowdfunding projects. It presents and analyzes two hypotheses: first, real estate crowdfunding properties could be worse than other real estate properties; second, failed real estate crowdfunding projects are riskier, are managed by less qualified sponsors, and are located in less attractive areas. I manually collect a unique dataset of real estate crowdfunding projects from seven US crowdfunding platforms. Other data are collected from CoStar and census datasets. To test the first hypothesis, I compare real estate crowdfunding properties within MSA and neighborhood. Then, I narrow down analysis and compare real estate crowdfunding properties with matched comparables. To test the second hypothesis, I contrast failed real estate crowdfunding projects and successful projects in respect to variables of deal level, financial level, sponsor level, and census level.

First, empirical results indicate real estate crowdfunding properties are not evidently worse within MSA and neighborhood in terms of property characteristics, leasing, and sales transactions, but they are worse than their comparables in sales transactions (lower price and higher financing payment risk). The potential reasons could be small investors with less experience than institutional investors, irrational decisions due to herd effect and group cognitive bias, and the non-tradable characteristics of real estate crowdfunding. Second, this thesis confirms that failed

real estate crowdfunding projects are riskier, are managed by less qualified sponsors, and are located in less attractive areas.

This thesis provides important implications for real estate entrepreneurs and policy makers. For real estate entrepreneurs, the results suggest that both using moderate risk management and being experienced can enhance the likelihood of funding success. Based on the most recent developments of real estate crowdfunding platforms, portfolios of projects could be a feasible way to diversify and manage risk. In addition, it is recommended that entrepreneurs emphasize the importance of the location of real estate properties. Favorable locations and census characteristics can attract investors. For policy makers, proper supervision and further requirements of information disclosure (e.g., performance of comparable real estate properties) would be helpful to protect investors and boost the sustainable development of the crowdfunding industry.

Although much effort has been made to collect data, limited data availability is the primary problem for this thesis. As more data become available and more information is disclosed, it will be possible to explore more interesting questions. For example, what are the motivations to use either equity real estate crowdfunding or debt real estate crowdfunding? What factors determine the speed of real estate crowdfunding success? Also, additional measurements of real estate crowdfunding may be added in further research. For instance, sponsor equity shares can be added as a measurement of uncertainty, as long as enough data can be collected (now only RealtyMogul lists sponsor equity). With the new implementation of Title III of the JOBS Act, unaccredited investors can participate in crowdfunding with monetary return, providing more space for future research.

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Appendix I Variable Definition

Table i Variable definition for real estate crowdfunding within MSA and neighborhood

Variables	Definition
Group	It is a binary dependent variable in multivariate analysis. In comparison between crowdfunding neighborhood and MSA, if observation is from crowdfunding neighborhood, it equals 1; otherwise, it is from MSA and equals 0. In comparison between neighborhood same and neighborhood all, if observation is from neighborhood same, it equals 1; otherwise, it is from neighborhood all and equals 0.
Property	
Average building SF	Average size of buildings (thousand SF). Only for retail, industrial and office.
Average unit SF	Average size of units (SF). Only for multifamily.
Leasing	
Rent	Rent per SF (USD $). For retail, industrial and office, it is NNN rent. For multifamily, it is asking rent and calculated as asking rent per unit divided by average unit size.
Vacancy	Vacancy rate (%). Only for retail, industrial and office.
Concessions	In a slow market in order to attract tenants, a landlord will sometimes grant concessions (%). These most often take the form of free rent, but may also include lease buyouts, moving allowances, and/or above standard tenant improvements. Only for multifamily.
Absorption	It is a relative measure (‰). For retail, industrial and office, it is the past 12 months absorption SF divided by existing SF. For multifamily, it is the past 12 months absorption units divided by total units. Absorption refers to the change in occupancy over a given time period. It can be positive or negative. Lease renewals are not factored into absorption unless the renewal includes the occupancy of additional space. (In that case, the additional space would be counted in absorption.) Pre-leasing of space in non-existing buildings (e.g., Proposed, Under Construction, Under Renovation) is not counted in absorption until the actual move-in date.
Sales in the past year	
Sales volume	It is a relative measure, sales volume (USD $) divided by existing SF (SF).
Sale price per SF	For retail, industrial and office, it is reported directly. For multifamily, it is sale price per unit divided by average unit size. (USD $)
Cap rate	Also know as capitalization rate. The income rate of return (%) for a total property that calculated by dividing the annual net operating income by the sale price or value. It is a standardized profit measure among real estate properties with different size and magnitude. (%)

Table ii Variable definition for real estate crowdfunding and comparables

Variables	Definition
CF or comp	CF is short for crowdfunding and comp is short for comparables. It is a binary dependent variable in multivariate analysis. If observation is crowdfunding project, it equals 1; otherwise, it is comparable and equals 0.
Property and sale	
Age	Age of properties (year).
Renovation	Dummy variable. If properties have been renovated in the past 10 years (2006-2016), it equals 1; otherwise, it equals 0.
Property size	Size of properties (thousand SF). Based on CoStar glossary, property size refers to building size, Rentable Building Area (RBA), Gross Building Area (GBA), or Gross Building Area (GLA).
Price	Sale price per SF (USD $). Some of them are collected from CoStar directly; others are calculated as sale price divided by property size.
Land size	Size of land (thousand SF)
Land price	Land price per SF (USD $). Some of them are collected from CoStar directly; others are calculated as land value assessed divided by land size.
Vacancy	Vacancy rate of properties (%)
Star	The CoStar Building Rating System is a national rating for commercial buildings on a universally recognized 5 Star scale. The 5 star is the best and the 1 star is the worst. Properties are divided into office, industrial, multifamily, retail, hospitality and land. Each type has different building components. The general building components include architectural design, structure/systems, amenities, site/landscaping/exterior spaces and certifications.
Financing	Proportion of down payment in sale transaction (%).
Sale condition	Dummy variable. If the building is under higher risk (i.e., high vacancy, auction sale, distress or deferred maintenance), it equals 1; otherwise, it equals 0, like bulk/portfolio sale, redevelopment project, recapitalization, estate/probate sale and etc.
Cap rate	See Appendix I Table i.
Platform	Seven real estate crowdfunding platforms: Fundrise, RealtyMogul, CrowdStreet, Patch of Land, AssetAvenue, RealtyShares, and iFunding. Platform Fixed effect is added.
Census	
Population density	Total population within a geographic entity divided by the land area of that entity measured in square kilometers. Density is expressed as "people per square kilometer". Area of land is classified by Federal Information Processing Standard (FIPS).

Sex ratio	A measure used to describe the balance between males and females. It is derived by dividing the number of males by the number of females, and then multiplying by 100. It is defined as the number of males per 100 females.
Age dependency	A measure defined by dividing the combined under 18 years and 65 years and over by the 18-64 years population and multiplying by 100.
Household mortgage	It is calculated as median value of mortgage for owner-occupied housing units with one mortgage divided by median household income in the past 12 months (in 2014 inflation-adjusted dollars). If reflects repaying capability. The higher value means more mortgage burden and weaker repaying capability.
Unemployment	The number of unemployed people as a percentage of the civilian labor force.
Travel time to work	The total number of minutes that it usually takes the worker to get from home to work during the employment status reference week.

Table iii Variable definition for real estate crowdfunding and failed projects

Variables	Definition
CF status	It is a binary dependent variable in multivariate analysis. If crowdfunding project is completed successfully, it equals 1; otherwise, it is failed and equals 0.
Deal level	
Development status	Dummy variable. If property is existing, it equals 1, otherwise it is under development and equals 0.
Offering size	The target amount of fund that platforms raise (USD $).
Offering size percentage	Ratio of offering size to total amount of equity and debt (%).
Minimum investment	Minimum investment required by platforms (USD $).
Investment term	A loan or an investment typically would a have a term (month), at the end of which the loan or investment would be paid back plus any interest or payments owed. It is also known as holding period in some platforms.
CF completion date	Dummy variable. CF is short for crowdfunding. If platform indicates when to complete project, it equals 1; otherwise it equals 0.
Starting distribution date	Dummy variable. If platform indicates when to start distributing return, it equals 1; otherwise it equals 0.
Financial level	
Common equity	Common equity divided by total amount of equity and debt (%).
Preferred equity	Preferred equity divided by total amount of equity and debt (%).
Total equity	Total equity divided by total amount of equity and debt (%).
LTV ratio	The principal amount of debt divided by total amount of equity and debt (%).
Sponsor level	
Sponsor age	How long sponsor company has been established (year).
Sponsor university	Percentage that key three sponsor members graduate from top universities. Top universities refer to top 20 American universities according to the latest US News. For members who do not graduate from American universities, if score of their university in US News is higher than that of University of California Berkeley (the 20th American university), it will be regarded as top university.
Sponsor education degree	Percentage that key three sponsor members who have education degree higher than BA (i.e., MBA, MA, JD, or PhD).
Sponsor experience current firm	Years in total for which key three sponsor members have worked in sponsor firms.
Sponsor experience real estate industry	Percentage that key three sponsor members have work experience in real estate industry.
Sponsor experience finance industry	Percentage that key three sponsor members have work experience in finance industry.

Census level	
Population density	See Appendix I Tabel ii
Median age	The median age is the age at the midpoint of the population. The median age is often used to describe the "age" of a population.
Sex ratio	See Appendix I Tabel ii
Age dependency	See Appendix I Tabel ii
Household mortgage	See Appendix I Tabel ii
Unemployment	See Appendix I Tabel ii
Education attainment	The ratio of educational attainment for population 25 to 64 years to total population. Educational attainment refers to the highest level of education completed in terms of the highest degree or the highest level of schooling completed.
Poverty	Following the Office of Management and Budget's (OMB's) Directive 14, the Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If the total income for a family or unrelated individual falls below the relevant poverty threshold, then the family (and every individual in it) or unrelated individual is considered in poverty.
Walk score	Walk Score is a number between 0 and 100 that measures the walkability of any address. The higher the score is, the more walkable to reach the address. Data source is CoStar.
Transit score	Transit Score is a number between 0 and 100 that measures the convenience of transit of any address. The higher the score is, the more convenient to transit. Data source is CoStar.

Appendix II Declaration of Honour

I hereby confirm on my honour that I personally prepared the present academic work and carried out myself the activities directly involved with it. I also confirm that I have used no resources other than those declared. All formulations and concepts adopted literally or in their essential content from printed, unprinted or Internet sources have been cited according to the rules for academic work and identified by means of endnotes or other precise indications of source.

The support provided during the work, including significant assistance from my supervisors has been indicated in full.

The academic work has not been submitted to any other examination authority. The work is submitted in printed and electronic form. I confirm that the content of the digital version is completely identical to that of the printed version.

I am aware that a false declaration will have legal consequences.

Yao Ding June 14, 2016

(Signature) (Date)