




Mitigating local bias in equity crowdfunding: a financial ecology perspective

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Abstract

This study analyses the relationship between geographic space, social networks, and financial knowledge in interregional equity crowdfunding flows based on the concept of financial ecology. Using data from a leading Dutch equity crowdfunding platform, we find that interregional crowdfunding investment decreases with geographic distance. Furthermore, the negative effect of distance is weaker if interregional social networks are strong and if the investor region has a high concentration of the financial industry. The results extend the conceptual foundation of financial ecology by explaining how individual behaviors affect the macro-level output of a financial ecology.

Keywords: financial ecology; equity crowdfunding; local bias; social networks; financial knowledge

JEL classifications: D83, G18

1. Introduction

Economic geographers have proposed the concept of financial ecology to explore the relationship between knowledge, trust, and geographic space in financial activity (Leyshon et al. 2004). On the one hand, financial activity is said to be spatially constrained because of information asymmetry in financial markets (Garmaise and Moskowitz 2004; Agarwal and Hauswald 2010). On the other hand, trust (Hain et al. 2016; Hellmank and Schmitz 2017) and financial knowledge (Lachance 2014; Gallemore et al. 2019; Breznitz and Noonan 2020) enable financial activity to occur at a distance. The concept of financial ecology enables a better understanding of how economic actors interact within their economic environments, especially how financial activity is constrained by space and how spatial constraints are shaped by other characteristics (including interregional social networks and regional financial knowledge) within the ecology.

Despite the applications of financial ecology in different contexts (Langley and Leyshon 2017; Burton 2020; Lai 2020), its theoretical foundation remains underdeveloped. Researchers mainly use the term “ecology” as a metaphor to indicate the complex relationships between economic actors and their economic environments. Studies have relied mainly on narrative methods to depict how economic actors behave within a financial ecology. However, how the output of financial ecologies is quantified and how economic actors’ actions affect the output remain unclear. We aim to contribute to the financial ecology literature by answering the following interrelated questions:

Received: 10 August 2021. **Editorial decision:** 12 March 2024. **Accepted:** 19 March 2024

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How does the economic environment shape economic actors' behaviors? How do these behaviors jointly affect the output of a financial ecology?

In line with [Leyshon et al. \(2004\)](#), we explore how the effect of spatial distance interacts with social networks¹ and financial knowledge, thereby shaping monetary transactions within an equity crowdfunding ecology. The finance literature documents that investors' decision making is influenced by the economic environment (e.g., distance, social networks, and knowledge) ([Garmaise and Moskowitz 2004](#); [Agarwal and Hauswald 2010](#)). Thus, economic actors' behaviors in a financial ecology are influenced by geographic distance. Furthermore, the influence of distance is affected by social networks and financial knowledge ([Leyshon et al. 2004](#)). Financial ecologies are considered constitutive parts of the entire financial system ([Lai 2016](#); [Leyshon 2020](#)). We follow related previous studies on entrepreneurial ecosystems ([Stam 2015](#); [Acs et al. 2017](#); [Sorenson 2017](#)) to analyze financial ecologies' output by aggregated financial investments. Sociologists argue that macro-level relationships are facilitated through multilevel transformational mechanisms; that is, numerous economic actors' behaviors jointly lead to macro-level output ([Coleman 1994](#); [Hedstrom and Swedberg 1998](#)). In this regard, the present study provides a framework to explain how economic actors behave in a financial ecology and affect regional-level output.

Equity crowdfunding provides an ideal context for examining the inner workings of a financial ecology. Equity crowdfunding allows small investors to participate in equity investment ([Ahlers et al. 2015](#)). Compared to traditional private equity investors, such as venture capitalists (VCs) and business angels (BAs), equity crowdfunders are normally nonsophisticated investors who are allowed to invest in private companies.² We expect that equity crowdfunders are more likely to be influenced by their economic environments than VCs and BAs because equity crowdfunders more often lack the capability to make independent decisions ([Tversky and Kahneman 1991](#)). We test our hypotheses using data from a leading Dutch equity crowdfunding platform. In line with previous regional-level crowdfunding research ([Burtch et al. 2014](#); [Dejean 2020](#)), we aggregate the transactions into funding flows between pairs of regions³ in the Netherlands to proxy the output of the equity crowdfunding ecology.

The results suggest that crowdfunding flows between pairs of regions decrease with their geographic distances. Furthermore, we analyze the moderating effects of regional social networks and financial knowledge in the investing regions in this relationship. The results suggest that the negative effect of distance on crowdfunding flows is weaker if the interregional social networks between the two regions are strong and if the investing region has a higher spatial concentration of the financial industry.

This article contributes to research on the geography of finance in several ways. First, analyzing the equity crowdfunding ecology, this study develops our understanding of financial ecology, both theoretically and empirically ([Leyshon et al. 2004](#)). Second, previous research has found contradictory results regarding the influence of the concentration of the finance industry on investors' preferences for nearby investments ([Klagge and Martin 2005](#); [Chen et al. 2010](#); [Cumming and Dai 2010](#)). Our analysis supports the argument that regions with higher concentrations of the finance industry are more likely to overcome this *local bias*. We also contribute to the geography of crowdfunding literature ([Agrawal et al. 2011, 2015](#); [Burtch et al. 2014](#); [Dejean 2020](#)). To the best of our knowledge, this is one of the first studies of equity crowdfunding at an aggregated level ([Laporte and Lester 2023](#)). It also provides practical implications for mitigating regional disparities in financial investments.

2. Conceptual background and hypotheses

2.1 Individual behaviors and financial ecology's output

Ecology is a concept that originates from environmental science, defined as a scientific endeavor "primarily concerned with the non-human world and, more specifically, with the complex relations between organisms and their environment[s]" ([Gregory et al. 2011](#): 175). Similarly, the connection

¹ We focus on social networks instead of trust for two main reasons. First, social networks are essential in creating trust ([Nahapiet and Ghoshal 1998](#); [Cai et al. 2021](#)). Second, social networks represent the social connections among human actors, which is a key component of an ecology ([Gregory et al. 2011](#)).

² As is the case in European Union countries: the most recent law on equity crowdfunding is available at <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R1503&rid=4>.

³ With a total 40 of regions (EU Nomenclature of Territorial Units for Statistics (NUTS) level 3 regions) in the Netherlands.

between individuals and financial markets depends on their economic, social, and geographic locations (Leyshon et al. 2004). Therefore, economic geographers have proposed the financial ecology approach to explain how firms, institutes, and other economic actors located in an economic environment interconnect and interact to adapt to variations in regulation, culture, and infrastructure (Leyshon 2020).

The concept of financial ecology was initially established to explore “the relationship between knowledge, trust, and space in the production and consumption of retail financial services” (Leyshon et al. 2004: 625). Leyshon et al. identified two idealized financial ecologies in the UK: middle-class suburbs and poor inner cities (Leyshon et al. 2004, 2006; Leyshon 2020). A middle-class suburb is a *prime* financial ecology consisting of retail consumers, who produce the feedstock of the global financial system in the form of mortgages, loans, savings, and investments. This ecology shows a high level of aggregate knowledge about financial services, with strong connections with the overall financial system. Furthermore, residents in this ecology have strong credit ratings, thereby receiving favorable financial services from local providers. This high level of interpersonal trust and financial knowledge allow financial activity to take place at a distance. By contrast, a poor inner city is a *subprime* ecology in which residents have lower scores in the credit system and are less knowledgeable about the financial system. Geographic proximity is essential in this ecology, as residents rely largely on financial delivery systems, such as door-to-door money lending and household insurance. The concept of financial ecology is a useful tool for exploring how economic actors interact within the economic environment to affect financial activity more broadly.

Subsequent research has applied this concept in a range of contexts, such as the financial advice industry (Lai 2016), wealth management (Beaverstock et al. 2013), crowdfunding (Langley and Leyshon 2017), consumer overindebtedness (Burton 2020), and fintech (Lai 2020). However, the application of ecology largely remains metaphorical. For instance, Langley and Leyshon (2017) used the term “financial ecology” to study crowdfunding because ecology represents complex relationships among economic actors, thereby avoiding the binary opposition of capitalist versus alternative economic forms to describe new financial practices. Burton (2020) adopted the concept of financial ecology to explain differential access to finance and varying spatial effects of digital debts. However, how the output of financial ecologies can be quantified and how economic actors’ actions affect the output remain unclear.

Financial ecology is a constitutive part of the whole financial system, which also originates from natural science, and has been introduced into economic geography (Lai 2016; Leyshon 2020). In line with other systems approaches to local and regional development (e.g., entrepreneurial ecosystems and innovation systems), we measure the system’s outcomes and output at an aggregate level (Stam 2015; Acs et al. 2017; Sorenson 2017). We consider the output of the ecology of equity crowdfunding to be the aggregate crowdfunding investment, which is enabled by the financial ecology. Sociologists argue that multilevel transformational mechanisms generate macro-level relationships. Coleman (1994) proposed a framework for macro–micro–macro level interactions to relate theoretical mechanisms spanning the macro-level and microlevel of analysis. Generally, three types of mechanisms exist in this framework (see Fig. 1): (1) *situational mechanisms* (A–B), which explain how macro-environments

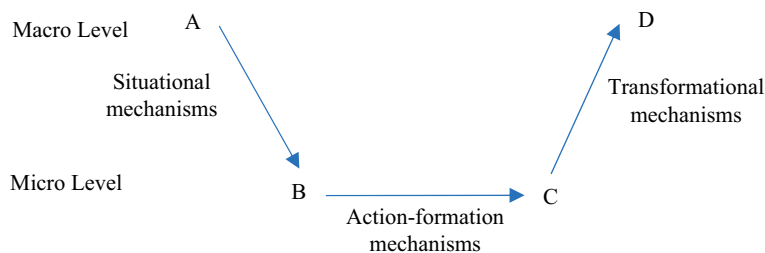


Figure 1. Macro–micro–macro-model.

Source: Coleman (1994).

influence individuals' opportunities, beliefs, values, and goals; (2) *action-formation mechanisms* (B–C), through which these beliefs and values shape individuals' behaviors; and (3) *transformational mechanisms* (C–D), which discuss how numerous individuals' behaviors jointly lead to macro-level outcomes (Hedstrom and Swedberg 1998).

Based on Coleman's macro-micro model, we propose that the output of financial ecology is generated through the aforementioned mechanisms. First, the economic environment (e.g., space, financial knowledge, and interregional social networks) affects crowdfunders' decision making (A–B). For instance, investors rely on geographic proximity to obtain information advantages because of information asymmetries in financial markets (Coval and Moskowitz 1999; Cumming and Dai 2010). Second, crowdfunders' evaluations of a project affect their investment behaviors (B–C). When crowdfunders evaluate the quality of crowdfunding campaigns better, they are more likely to invest in high-quality campaigns. Finally, crowdfunders' investments jointly affect the output of the financial ecology (C–D). In the following subsections, we elaborate on how crowdfunders interact with the economic environment, which eventually affects the output of the crowdfunding ecology.

2.2 Distance and interregional investment

Crowdfunding is a platform-mediated fundraising strategy that allows entrepreneurs to raise funding from a large pool of investors (Mollick 2014). There are four main types of crowdfunding: donation, reward based, lending, and equity (Belleflamme et al. 2014). Langley and Leyshon (2017) identified different types of crowdfunding ecologies based on this classification. In the equity crowdfunding ecology, start-ups sell their equity shares to small investors through crowdfunding platforms. We quantitatively study the role of space in equity crowdfunding ecology by analyzing the relationship between distance and interregional investment.

Financial ecology research has described how economic actors rely on face-to-face interactions to deliver financial services (Leyshon et al. 2004, 2006). This argument is supported by the finance literature, which demonstrates that investors exhibit preferences for local projects, a phenomenon called *local bias* (Coval and Moskowitz 1999; Cumming and Dai 2010). Local bias may be triggered by potential economic benefits because of the information advantages caused by geographic proximity (Lewis 1999; Martin et al. 2005) and screening and monitoring costs (Cumming and Dai 2010). Another stream of literature explains local bias as the result of behavioral bias regardless of economic benefits. Huberman (2001: 659) suggested that local bias is caused by familiarity: "People root for the home team, and feel comfortable investing their money in a business that is visible to them." In line with previous economic geography studies (Mason and Harrison 2003; Martin et al. 2005), we mainly analyze local bias from the perspective of information costs. This framework is reasonable because familiarity is also triggered by information, especially nonfinancial information about the project as a result of geographic proximity.

The influence of geographic distance on crowdfunding investment is ambiguous. On the one hand, the development of information may reduce information asymmetry in the crowdfunding market. Fundraisers post extensive information about the campaign online, which can send credible signals to alleviate information asymmetries (Ahlers et al. 2015). In addition, fundraisers can communicate with investors through updates and replies to comments, providing investors with further information about the campaign (Block et al. 2018). Equity crowdfunders are less likely to have face-to-face communication with fundraisers to make decisions, so they may rely less on geographic proximity. Previous research suggests that equity crowdfunding has a *long tail* effect, which refers to the ability to aggregate geographically distributed resources and assets (Langley and Leyshon 2017). Some economists and business scholars have argued that the development of information and communication technology has led to the *end of geography* or the *death of distance* (O'Brien 1992; Cairncross 1997; Petersen and Rajan 2002). The rise of crowdfunding platforms is one example of this distance-liberating development of information and communication technology, explaining that local bias may not exist in the equity crowdfunding market.

On the other hand, equity crowdfunding is riskier than traditional financing sources. Equity crowdfunding is more attractive to firms that are underrepresented in traditional finance markets, such as those with lower debt capacity, less tangible fixed assets, and more intangible fixed assets (Walthoff-Born et al. 2018); those with younger top management teams; and remotely located companies (Cumming et al. 2021). Policymakers have voiced concerns about equity crowdfunding. The Financial

Conduct Authority in the UK warned equity crowdfunders that “it is very likely you will lose all your money” (Evans and Dunkley 2015). Retail investors also face potential fraud in the equity crowdfunding market (Cummings et al. 2020). These risks may strengthen the concern of information asymmetry. Thus, crowdfunders may rely on geographic proximity to obtain an information advantage to make decisions. Empirical evidence suggests that investors exhibit local bias in the crowdfunding market. Previous research has verified the existence of local bias in lending (Lin and Viswanathan 2015) and equity crowdfunding (Agrawal et al. 2011, 2015; Guenther et al. 2018; Hornuf et al. 2020),⁴ even though less sophisticated crowdfunders exhibit lower local bias than BAs (Hornuf et al. 2020).

Crowdfunding research has also found that the negative relationship between distance and investment remains at the aggregate level in prosocial lending (Burtch et al. 2014) and reward-based crowdfunding markets (Dejean 2020). Some sample issues (e.g., within-area homogeneity) may cause an ecological fallacy, which suggests an incorrect assumption of individual-level relationships based on aggregate-level statistics (Tranmer and Steel 1998). In this study, we are not focused on providing an in-depth discussion of whether our sample has statistical issues that may cause an ecological fallacy, that is, the assumption that the relationships between variables at the aggregate level imply the same relationships at the individual level. In line with our conceptual model, we expect that crowdfunders' dependency on geographic proximity to make decisions is likely to affect the relationship between geographic distance and interregional crowdfunding investment (including intraregional investment) at the aggregate level. Therefore, we propose our baseline hypothesis:

H1: The amount of equity crowdfunding investment flows from one region to another decreases with the geographic distance between these regions.

2.3 The role of interregional social networks

Social networks reflect the interactions among human actors and their environments (Gregory et al. 2011), which are key components of a financial ecology. Previous finance and business research has stressed the role of social networks in reducing investors' local biases (Cumming and Dai 2010; Fritsch and Schilder 2012; Jääskeläinen and Maula 2014; Agrawal et al. 2015). Social networks stretch beyond the home region of actors and can be considered a social infrastructure enabling economic outcomes (Kemeny et al. 2016). In a financial ecology, economic actors' behaviors are shaped by interregional social networks, which reflect the overall communications between residents located in two regions. These may compensate for the disadvantages of physical distance and promote regional crowdfunding transactions. Integrating economic geographies (Wray 2012; Kuebart 2019; Cowling et al. 2021) with finance studies may provide a deeper understanding of how regional social networks influence local bias at the regional level.

Geographic distance, networks, and relationships interact and jointly affect individual actions (Wray 2012; Kuebart 2019; Cowling et al. 2021). Networks, social capital, and relationships are essential elements within geographically bounded spaces (Kemeny et al. 2016). A qualitative study comparing venture capital communities in the North East and the East Midlands of England documents that the East Midlands, which has stronger extra-local connections than the North East, receives more venture capital investments from other regions (Wray 2012). Kuebart (2019) found that VCs rely on their relational proximity to mitigate the influence of geographic distance. Finally, a recent study argued that BAs in the UK no longer have local biases, and the authors suggested that networks partially contribute to this effect (Cowling et al. 2021).

Interregional networks can also facilitate information exchange between investors or between investors and fundraisers (Beyers and Donas 2014), thereby compensating for the role of geographic proximity in mitigating information asymmetry in the crowdfunding ecology. Previous finance research on local bias also emphasizes the role of social networks in obtaining information advantages. As Coval and Moskowitz (1999: 2046) found, “Local investors can talk to employees, managers, and suppliers of the firm; they may obtain important information from the local media; and they may have

⁴ Agrawal et al. (2011, 2015) did not conduct research on a pure-equity crowdfunding platform. Their study focused on Sellaband, in which unsigned musicians raised funding to record and produce an album, and investors benefited from a revenue-sharing model. However, this model is different from those in other equity crowdfunding campaigns because investors do not hold equity in the firm, and the amount of investment is much lower than those in normal equity crowdfunding investments.

close personal ties with local executives—all of which may provide them with an information advantage in local stocks.”

Recent finance research provides direct evidence that regional social networks between a portfolio company and institutional investors contribute to local bias in the public equity market (Kuchler et al. 2020). Geographic distance was found to have an insignificant effect on institutional investors’ investments after controlling for the effects of regional social networks. This suggests that local bias can be largely explained by social networks. Communication among local investors also brings them superior information about local firms, contributing to local bias (Hong et al. 2005; Ivković and Weisbenner 2007). Stronger interregional networks indicate more intense communication between investors (or fundraisers) in two regions. Venture capitalists who can obtain information from a foreign syndicate partner are more likely to invest abroad (Jääskeläinen and Maula 2014). Economic geographers similarly find that VCs’ reliance on geographic distance can be overcome by syndication of investments with a local VC firm (Fritsch and Schilder 2012). Especially in the context of crowdfunding, entrepreneurs commonly raise funding from their families and friends (Agrawal et al. 2015). Thus, the fundraiser’s direct connections are likely to obtain information from the fundraiser directly.

According to our conceptual model (Fig. 1), stronger interregional social networks can reduce information asymmetries between fundraisers and crowdfunders, mitigating investors’ reliance on geographic proximity to obtain an information advantage. Through multilevel transformation (Coleman 1994; Hedstrom and Swedberg 1998), we expect this relationship to hold at the regional level. We, therefore, propose the following hypothesis:

H2: The negative effect of geographic distance on equity crowdfunding flows from one region to another is weaker if the interregional social networks between the two regions are strong.

2.4 The role of financial knowledge

Financial ecology studies suggest that economic actors with more financial knowledge are more likely to participate in financial activities at a distance (Leyshon and Thrift 1999; Leyshon and Pollard 2000). This argument is also supported by the finance literature. Experimental research has found that when people feel knowledgeable about an area of expertise, they are more willing to make decisions on their own (Tversky and Kahneman 1991). Proxying investors’ human capital by their education, income, and portfolio sizes, Graham et al. (2009) demonstrated that investors with more human capital are willing to invest in foreign securities. As for BAs, Cowling et al. (2021) showed that investors’ financial qualifications, previous investment experiences, and entrepreneurial experiences encourage them to invest remotely.

In contrast to the financial knowledge of professional investors, who are more experienced in financial activity, that of local residents can be represented by certain regional characteristics. For instance, university education is used to represent the knowledge of local residents. A country’s home bias in equity investments can be reduced by university education in that country (Bose et al. 2015). Financial knowledge, instead of general skills, is considered to mitigate information asymmetries in financial markets (Hussain et al. 2018). We, therefore, proxy regional financial knowledge by the development of the finance industry. A more advanced financial industry suggests that more residents have financial knowledge and are capable of evaluating the financial returns or risks of potential projects. Thus, they may rely less on geographic distance to obtain information about the project to make investment decisions.

We proxy local financial knowledge by the concentration of the financial industry. If there is a higher percentage of people working in a region’s financial sector, then there should be higher local financial knowledge as a strong spatial concentration of financial industry suggests intensive knowledge flows about finance within the region (Fritsch and Slavtchev 2010). The finance literature finds contradictory results regarding the effects of the concentration of VC firms on their preferences for nearby investments. For example, Martin (1989) demonstrated that London-based VCs show a significant distance decay in the geographical patterns of their investments—92% of their investments are in the surrounding South East England. By contrast, in a US study, Griffith et al. (2007) showed the declining importance of spatial proximity for VCs in Silicon Valley, where VCs are highly concentrated. Venture capitalists located in hot states (CA, MA, NY, and TX) have stronger local biases than those in other states (Cumming and Dai 2010), while other studies found that cities with higher concentrations

of VC firms receive larger proportions of investments from outside of the city (Chen et al. 2010).⁵ These inconsistent results may be caused by the colocation of entrepreneurial firms and VCs; that is, there are more investment opportunities and investors in the same region, resulting in the majority of local investments. Thus, after controlling for local entrepreneurial activity, the density of VC firms in a region is negatively associated with their local biases (Cumming and Dai 2010).

Based on our conceptual model (Fig. 1), the aggregate level of financial knowledge also affects individual investors' project evaluations. We expect that in regions with stronger financial knowledge, crowdfunders are more likely to invest in long-distance firms, resulting in a weaker influence of distance on interregional crowdfunding investment:

H3: The negative effect of geographic distance on the amount of equity crowdfunding investment flows from one region to another is weaker if the location quotient of the finance industry of the investing region is high.

3. Research design

3.1 Data collection

3.1.1 Equity crowdfunding flows

We obtained transaction data from a leading Dutch investment-based crowdfunding platform (hereafter Platform A, as we cannot disclose the platform's name without its permission), which covers all campaigns that ended between January 2012 and August 2019. Platform A is located in Rotterdam and is the first equity crowdfunding platform in the Netherlands. Entrepreneurs can launch both pure equity and convertible loan campaigns on this platform. The platform adopts an *all-or-nothing* model in which only the campaign that reaches its target can collect funding from investors. Initially, we collected data from 181 successful campaigns because transactions would not occur in failed campaigns. We removed foreign campaigns and those without location information, and 26,152 investments in 164 campaigns remained. Next, we removed investors whose location information was missing and retained 23,921 investments from 13,359 crowdfunders in 163 campaigns for our analyses. We, then, aggregated all investments from one region to the other to obtain our dependent variable—crowdfunding flows.

3.1.2 Distance

In line with Dejean (2020), we used the location of the largest city of a region to represent the region's location. The latitudes and longitudes of these cities were obtained through Google Maps API. Then, we measured the distance between two regions using the R package *geosphere* (Hijmans 2017). We used the logarithms of distance (in kilometers) for our analyses.

3.1.3 Social networks

We used the Social Connectedness Index (SCI) (Bailey et al. 2018a) to measure regional social networks. The SCI is based on aggregated online friend data from Facebook and has been widely applied in finance and economic studies (Bailey et al. 2018a, 2019). The index represents the relative probability that a Facebook user in region i is a friend of a Facebook user in region j :

$$\text{Network}_{i,j} = \frac{\text{Friendship}_{i,j}}{\text{Population}_i \times \text{Population}_j},$$

where $\text{Friendship}_{i,j}$ measures the number of total Facebook friends between regions i and j . Population_i is the number of Facebook users in a given region. It is worth mentioning that the value of the index is a scaled probability rather than a real figure. The maximum value equals 1,000,000, which represents the connections between Los Angeles County–Los Angeles County (i.e., the scaled probability that

⁵ The authors do not claim that the location quotient (LQ) of the VC industry is positively associated with outside-city investments. However, from the descriptive analyses of the geography of VC firms and VC-backed firms, we can observe a significant positive relationship between the LQ and outside investments. For instance, the LQ measured by VC partners and the percentage of the number of outside investments in the San Jose–San Francisco area 10.59% and 16.25%, respectively. By contrast, the same figures for Atlanta are 0.73% and 2.95%, respectively. Thus, cities with high LQs of the finance industry invest higher percentages of funding in nonlocal firms.

people who live in Los Angeles County know one another). This measurement for interregional networks is more accurate than other proxies, such as migration (used in Dejean 2020) for two main reasons. First, it is obtained from Facebook data, which cover most Internet users. There were almost 10 million Facebook users in the Netherlands in 2019, which is equivalent to 57% of the population. Especially in developed countries in which Facebook is prevalent, the index can more precisely measure interregional connections based on actual friendship data. By contrast, other proxies can only represent potential connections. We acknowledge that this proxy may be biased, as Facebook may be more popular among young people. We collected the index updated as of August 2020. As Facebook only provides access to recently updated data, we cannot construct a time-variant interregional social network dataset for the analyses. Given that regional social networks are stable for a short period, the 2020 SCI can still represent interregional social networks from 2013 to 2019. Although the index is collected later than crowdfunding data are, reverse causality is not an issue, as crowdfunders only account for a tiny proportion of Facebook users. Crowdfunding activity is less likely to influence overall Facebook connections.

3.1.4 Location quotient

The location quotient (LQ) is a measure of the geographic centralization of a particular industry, and it has been discussed at large in the geography of finance literature (Klagge and Martin 2005; Wray 2012). An LQ greater than one indicates that compared to the average proportion of people working in an industry nationwide, there is a higher percentage of people working in the same industry in that region. We collected the employment information of the Netherlands and each Dutch region from Statistics Netherlands (CBS) open data. The LQ of the finance industry of each region is calculated as follows:

$$LQ_{c,r} = \frac{\text{employee}_{r,fi} / \text{employee}_{r,\text{all}}}{\text{employee}_{\text{NL},fi} / \text{employee}_{\text{NL},\text{all}}},$$

where r and NL represent a given Dutch region and the Netherlands, respectively. $\text{employee}_{r(\text{NL}),fi(\text{all})}$ refers to the number of employees in a given region (or the Netherlands) and in the finance industry (or in all industries), including self-employment. In line with previous research (Burtch et al. 2014; Dejean 2020), we collected only control variables from a single year, as we studied cross-sectional crowdfunding flows. Considering that all campaigns ended between 2013 and 2019, we chose employee information in 2016 to calculate the LQ of the finance industry because this information may proxy the overall LQ during that period.

We depict the geographic distribution of successful campaigns, crowdfunders, interregional social networks with Great Amsterdam, and the LQ of the finance industry in Fig. 2 to provide a more insightful understanding of the geography of the crowdfunding industry and the main moderating variables across the Netherlands. Successful campaigns are unevenly distributed. Only 26 regions have at least one successful campaign, resulting in 1,040 region–region pairs in our analyses; 90 out of 163 campaigns are located in the three most advanced regions, which are Greater Amsterdam, Utrecht, and Rotterdam. Thus, equity crowdfunding may not bridge regional funding gaps. There are 4,619 out of 13,359 crowdfunders from these three regions, indicating a ratio of 34.6%, which is slightly higher than the ratio of employees in these regions to the total number of employees in the entire country (27.3%). We draw the interregional social networks of each region with Greater Amsterdam. The strength of the networks decreases with geographic distance. Finally, the finance industry is more advanced in a few regions (e.g., Greater Amsterdam, Utrecht, and Alkmaar and surrounding areas). These figures generally suggest that the more developed the regional financial market, the more the crowdfunding activities (including the number of both crowdfunders and campaigns).

3.1.5 Control variables

In addition to the aforementioned key variables, we also introduced several regional factors to capture some characteristics that may influence crowdfunding flows between two regions. We included the fixed effects of investee regions to capture all time-invariant variables. We did not control for the investing region effects, as the key moderating variable (LQ) will be absorbed by the fixed effects and to avoid multicollinearity (mainly caused by the correlation between *Networks* and *Distance*). Instead, we controlled for the gross domestic product (GDP), GDP per capita, and the number of successful

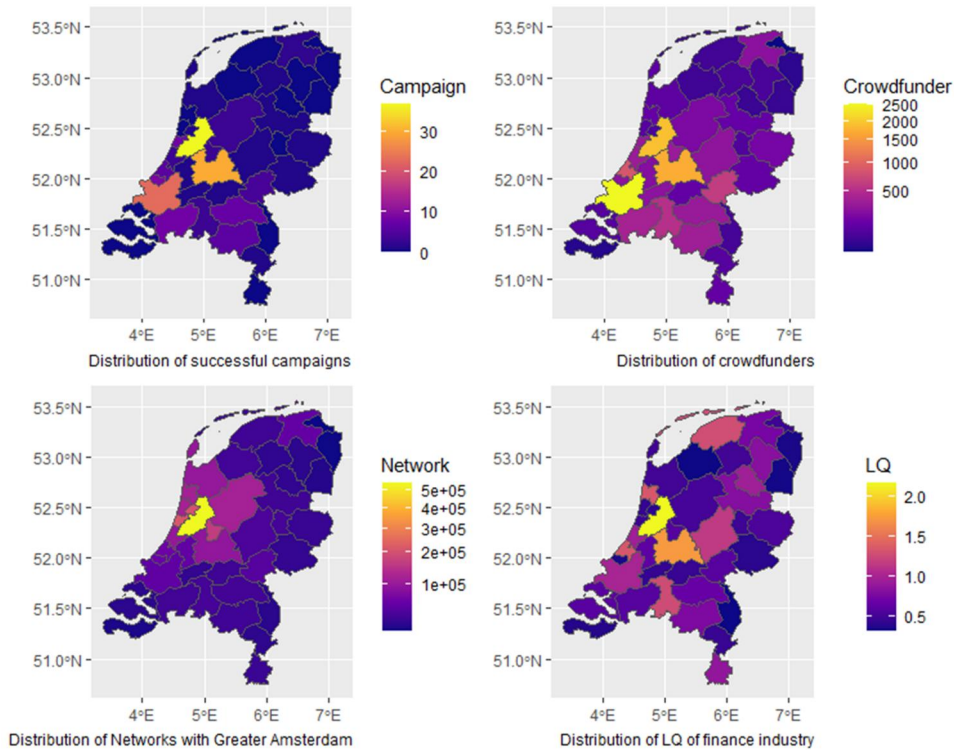


Figure 2. Geographic distribution of campaigns and financial industry employment.

campaigns in the investing region. The GDP reflects the wealth of the region, while the GDP per capita may be positively associated with the LQ of the finance industry. Both the GDP and the GDP per capita were obtained from CBS open data. Again, we used the value from 2016 to represent the value during our observation period. Considering that local investment opportunities also influence investors' local biases (Cumming and Dai 2010), we controlled for the number of successful local campaigns in the investing region. We report the descriptive statistics for all variables and the correlation matrix in Tables 1 and 2, respectively. As Table 1 shows, the standard errors of Inv are still high after logarithmization, indicating strong heterogeneity in the distribution. A concern could be the high correlation between regional social networks and distance (-0.890). Thus, we also report the variance inflation factors (VIFs)⁶ in Table 2. The mean VIF is 2.45, and all VIFs are lower than the conventional threshold of 10, suggesting that multicollinearity is less likely to be a problem in our estimates.

3.2 Empirical model

As the measure of regional social networks is time invariant, we aggregated all transactions into cross-sections rather than panel datasets. Given that the dependent variable is left censored at zero (i.e., we can only observe investments from a region to a project that are greater than zero), we adopted the following Tobit model to test our hypotheses:

$$Inv_{r,j}^* = \beta_1 \text{Distance}_{r,j} + \beta_2 M + \beta_3 M * \text{Dis}_{r,j} + X_r + \eta_j + \epsilon_{i,j}, \quad (1)$$

$$Inv_{r,j} = \max(0, Inv_{r,j}^*), \quad (2)$$

where $Inv_{r,j}^*$ stands for the latent dependent variable, and crowdfunding flows from one region to the other, which could be negative. $Inv_{r,j}$ is observable only if it is greater than zero (i.e., at least one

⁶ In line with our regressions, invested region effects are included in the regression to obtain the VIFs of each variable.

Table 1. Descriptive statistics.

| Variable | Description | Obs | Mean | SD | Min | Max |
|----------|---|-------|--------|-------|-------|--------|
| Inv | Log of the investments from a region to the other (€) | 1,040 | 6.652 | 3.719 | 0 | 14.268 |
| Distance | Log of the distance between a region and the project's location (region) (km) | 1,040 | 4.378 | 0.931 | 0 | 5.704 |
| Networks | Log of Social Connectedness Index between two regions | 1,040 | 10.453 | 0.997 | 9.045 | 15.478 |
| LQ | The location quotient of the finance industry of the investing region | 1,040 | 0.715 | 0.412 | 0.308 | 2.160 |
| GDP | Log of the gross domestic product of the investing region (million €) | 1,040 | 9.355 | 0.889 | 7.347 | 11.578 |
| GDPP | Log of the GDP per capita of the investing region (€) | 1,040 | 10.468 | 0.227 | 9.978 | 11.288 |
| Projects | Number of the successful campaign in the investing region | 1,040 | 4.075 | 7.958 | 0 | 37 |

Table 2. Correlation matrix of key variables.

| Variables | VIF | Inv | Distance | Networks | LQ | GDP | GDPP |
|-----------|------|----------|----------|----------|---------|---------|---------|
| Inv | | 1.000 | | | | | |
| Distance | 6.45 | -.336*** | 1.000 | | | | |
| Networks | 6.20 | .259*** | -.890*** | 1.000 | | | |
| LQ | 2.03 | .302*** | -.099*** | .107*** | 1.000 | | |
| GDP | 3.09 | .486*** | -.219*** | .158*** | .634*** | 1.000 | |
| GDPP | 3.08 | .360*** | -.171*** | .131*** | .579*** | .776*** | 1.000 |
| Projects | 2.80 | .361*** | -.190*** | .141*** | .658*** | .705*** | .738*** |

Notes: Investee region fixed effects are included in calculating VIFs.

*** $P < .01$, ** $P < .05$, * $P < .1$.

investor decides to pledge to the campaign). If the latent $Inv_{r,j}^*$ is negative, the manifest variable $Inv_{r,j}$ gets the value of zero.

Distance_{*r,j*} is the physical distance between two regions. *M* represents moderating variables, including interregional social networks (Networks) and the LQ of the finance industry (LQ). The interaction terms between the moderators and geographic distance were included. *X_r* stands for the control variables of the investing regions, including the GDP (GDP), the GDP per capita (GDPP), and the number of successful campaigns (Project). Finally, we included the investee region fixed effects η_j , which captured all unobserved factors of the investee region.

4. Empirical results

4.1 Main analyses

The empirical results with robust standard errors are presented in Table 3. Column (1) shows the baseline regression that only includes Distance, GDP, GDPP, and investee region fixed effects. The results suggest that geographic distance is negatively associated with the investments (coefficient = -0.911, $P < .01$), indicating that the distance between two regions increased by 1%, and investments from one region to the other decreased by 0.915%. In column (2), we include all moderating variables in the regression. The coefficient of distance is still significantly negative. Regional crowdfunding investments are distributed unequally, suggesting that investors prefer nearby firms. Therefore, H1 is supported. However, we find that neither Networks nor LQ has a significant effect on the funding flows.

We further test the moderating effects of Networks and LQ. Column (3) shows that the interaction term of Distance and Networks is positively related to crowdfunding flows and significant at the 5% level, suggesting that the negative effect of distance on investments is weaker when the social networks between two regions are stronger. Therefore, regional social networks can compensate for geographic distance in triggering crowdfunding flows from one region to the other. Column (4) indicates that the coefficient of the interaction term of Distance and LQ is positive and significant at the 1%

Table 3. Results for Tobit regressions.

| | (1) Inv | (2) Inv | (3) Inv | (4) Inv | (5) Inv |
|-----------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| Distance | −.911*** (.081) | −1.124*** (.247) | −2.459*** (.695) | −1.909*** (.287) | −3.417*** (.712) |
| Networks | | −.217 (.240) | −.68** (.314) | −.350 (.235) | −.869*** (.307) |
| LQ | | −.011 (.265) | .026 (.265) | −3.839*** (.609) | −3.902*** (.621) |
| Distance * Networks | | | .101** (.051) | | .112** (.049) |
| Distance * LQ | | | | .902*** (.146) | .927*** (.149) |
| GDP | 2.328*** (.168) | 2.317*** (.174) | 2.269*** (.174) | 2.249*** (.171) | 2.194*** (.171) |
| GDPP | −1.525** (.696) | −1.492** (.699) | −1.435** (.698) | −1.455** (.694) | −1.39** (.693) |
| Project | .013 (.015) | .013 (.016) | .009 (.016) | .024 (.015) | .020 (.015) |
| _cons | 4.84 (6.627) | 7.989 (7.238) | 14.138* (7.775) | 13.007* (7.194) | 19.989** (7.776) |
| Region | Yes | Yes | Yes | Yes | Yes |
| Obs. | 1,040 | 1,040 | 1,040 | 1,040 | 1,040 |
| Pseudo-R ² | .177 | .177 | .178 | .180 | .181 |

Notes: Robust standard errors are reported in parentheses.

*** $P < .01$, ** $P < .05$, * $P < .1$.

level. Thus, geographic distance plays a less important role when the investing region has a higher concentration of the finance industry. We include both interaction terms in Column (5), and their coefficients remain positive and significant. Thus, both H2 and H3 are confirmed. We also visualize the significant interactions with 5% confidence intervals based on Column (5) in Fig. 3. The negative effect of distance on interregional crowdfunding flows is weaker when the interregional social networks are stronger, and the investing region has a higher concentration of the finance industry. The relationship between distance and crowdfunding flows becomes positive when the LQ of the finance industry is one standard error higher than the mean value.

4.2 Robustness checks

To check the robustness of our results, we conducted several additional analyses. The reports are reported in [Supplementary Appendix Table A.1](#). First, omitted variables may cause endogeneity problems. Previous research suggests that interregional social networks are correlated with the similarities between two regions (e.g., incomes, political values, religions, and ethnicities) and cross-region activities (e.g., trade flows and patent citations) (Bailey et al. 2018b).⁷ These omitted variables at the region-pair level may be correlated with crowdfunding flows across regions, thereby producing a biased estimate of *Networks*. Thus, we constructed two instrumental variables (IVs) for *Networks*. The first IV is the ratio of the number of people who move into and out of the investing region to the regional population. We only focused on such movements within the Netherlands that reflect the overall interactions of the investing region with other regions but are independent of variables at the region-pair level. The other IV is the product of the percentage of people moving out of the investing region multiplied by the percentage of people moving into the invested region. This IV can also represent the interactions between two regions but is less likely to be correlated with regional similarities and other interregional activities. The results of the IV-Tobit regressions are reported in Columns (1) and (2) of [Supplementary Appendix Table A.1](#). [Supplementary Appendix Table A.2](#) shows the results of the first-stage regressions of the IV-Tobit models. Distance (coefficient = -2.527 , $P < .01$) and the interaction term (coefficient = 2.825 , $P < .01$) are consistent with the main analyses. Again, we only find an insignificant influence of *Networks* on crowdfunding flows in Column (1). The F-statistic is 35.711, suggesting that our model is less likely to have the weak instrumental variable issue. Wald tests cannot reject the null hypothesis of no endogeneity at the 10% level for both models,

⁷ We mainly focus on the endogeneity of interregional social networks because the local human capital of the investing region is fixed across all region-pairs with that region, which is less likely to be correlated with pair-level variables.

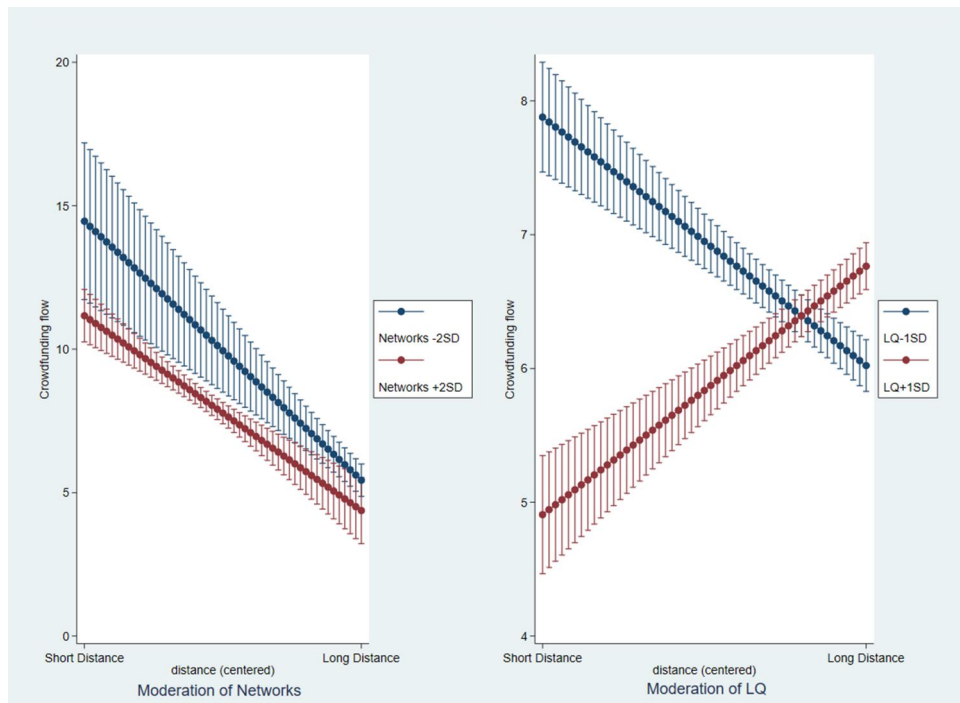


Figure 3. The moderating effects of Networks and LQ.

Notes: The figures are based on the results in Column (5) in Table 3. Both the independent variable (Distance) and the moderating variables (Networks and LQ) are centered for the visualization.

indicating that the IV–Tobit regression is appropriate in our setting. However, the IV approach may not be valid in Column (2) after introducing the interaction term, as the F -statistic is lower than 10, and the Wald test suggests that endogeneity is still present after instrumenting both Networks and the interaction terms.

Second, we include crowdfunders' pledges on failed campaigns in which pledges did not transact successfully in an all-or-nothing crowdfunding model to explore whether including failed campaigns influences the empirical results. After removing foreign campaigns, campaigns with missing location information, and foreign pledges, the combined dataset covers 26,091 pledges from 241 campaigns. We aggregated these pledges at the region-pair level, which resulted in 1,280 observations. Column (3) shows the negative relationship between Distance and lnv (significant at the 1% level). However, compared with the main results in Column (2) of Table 3, the coefficient of Distance decreases from -1.124 to -0.193 . The results suggest that these failed campaigns may largely rely on pledges from (nearby) family and friends (Agrawal et al. 2015) and fail to attract attention of funders in a geographically broad range, resulting in a stronger influence of distance on cross-region investments. Furthermore, Column (4) reports an insignificant interaction term of Distance \times Networks.

We report the total raised capital and the number of funders of successful and failed campaigns, respectively (we include campaigns with missing location information and do not report the funding target because this information is missing for failed campaigns) in Supplementary Appendix Table A.3, to explore potential causes of the change in coefficient of the interaction term. The result shows that failed campaigns attract less than one fifth of funders and one eighth of investments compare to successful campaigns, which may cause significant difference in crowdfunders' communication intensity between successful and failed campaigns. First, fewer crowdfunders pledge in failed campaigns compared to successful ones, thereby limiting the interactions among crowdfunders. Failed campaigns may have also lower quality compared with successful campaigns. Crowdfunders are less likely to share information about low-quality campaigns because their friends may suffer from opportunity costs if investing in these failed campaigns (Zhang and Liu 2012). Finally, previous research has shown that information sharing among crowdfunders becomes stronger when the campaign is approaching

successful completion (Ordanini et al. 2011; Cai et al. 2021). Given that failed campaigns only raise a smaller proportion of funding, the information exchange between crowdfunders is overall weaker. Thus, crowdfunders rely less on social networks to overcome the information barrier caused by geographic distance, resulting in an insignificant moderating effect of interregional social networks.

Third, as most campaigns listed in Platform A are from three major regions (the Greater Amsterdam, Utrecht, and Rotterdam), we removed campaigns from these three regions. Furthermore, to eliminate the influence of the outliers of Distance and Networks in intraregional observations, we only focused on the interregional funding flows. The results of the Tobit regressions on the subsample are reported in Columns (5) and (6) in [Supplementary Appendix Table A.1](#). The findings are largely in line with the main analyses, indicating that our results are not driven by outliers or intraregional investments in the three major regions.

Fourth, we used the number of investments from one region to another as the dependent variable. As the values of the dependent variable are nonnegative integers, we used a negative binomial regression to estimate the model. Again, the results are consistent with the main analysis [see Columns (7) and (8)].

Finally, we adopted a gravity model by using the share of investment as the dependent variable. The model is estimated using ordinary least squares, and the results are reported in Columns (9) and (10). The results are in line with the main analyses.

5. Discussion and conclusions

5.1 Main results and contributions

This study examines how spatial distance interacts with social networks and financial knowledge to affect monetary transactions at the regional level. By focusing on the equity crowdfunding ecology, we find that financial activity is constrained by spatial distance, as we find that investment from one region to another decreases with geographic distance. Further analyses suggest that interregional social networks and financial knowledge in the investor region can reduce the influence of distance in interregional investments.

This study contributes to several aspects of research on the geography of finance. First, it further develops the concept of financial ecology, both theoretically and empirically. Using the case of the ecology of equity crowdfunding, we explain how crowdfunders' behaviors jointly affect the output of financial ecologies, and we provide an in-depth discussion of how economic actors' behaviors are shaped by their economic environments (e.g., interregional social networks and local financial knowledge). While financial ecology studies remain either narrative (Langley and Leyshon 2017; Burton 2020; Lai 2020) or qualitative (Lai 2016), we quantitatively analyze these relationships. The empirical results suggest that the negative influence of spatial distance on interregional crowdfunding investment can be mitigated by interregional social networks and local financial knowledge in the investor region, thereby providing the first quantitative evidence to support Leyshon et al.'s (2004: 627) argument that "the production of both financial knowledge and trust has become increasingly 'distanced', which has enabled the majority of financial producers and consumers to engage in financial activity 'at-a-distance'."

Second, previous research has found contradictory results regarding the relationship between the concentration of the finance industry and investors' local biases (Martin 1989; Klagge and Martin 2005; Chen et al. 2010; Cumming and Dai 2010). Based on the financial ecology literature, we argue that regions with higher concentrations of the finance industry have more financial knowledge, which helps local investors to overcome information asymmetries, and thus, invest in projects at a distance. We confirm this hypothesis in the equity crowdfunding ecology.

Our study also contributes to crowdfunding research by studying its geography at an aggregate level. Prior crowdfunding research has examined reward-based crowdfunding (Sorenson et al. 2016; Dejean 2020) or prosocial lending crowdfunding (Burtch et al. 2014) at the aggregate level. Although a few studies consider geography in the context of equity crowdfunding, they focus exclusively on the individual level (Agrawal et al. 2011, 2015; Guenther et al. 2018; Hornuf et al. 2020; Estrin et al. 2024). This is also one of the first studies of equity crowdfunding at an aggregated level (Laporte and Lester 2023), thereby improving our understanding of this topic.

This study has practical implications for closing regional funding gaps, which are systematic disadvantages that firms face in particular regions when obtaining capital (Mason and Harrison 1995, 2003; Martin et al. 2005). Research suggests that local bias is the main reason for regional funding gaps

(Martin et al. 2005). However, few studies have explored how local bias can be mitigated. The present study found that interregional social networks and financial knowledge in the investor region can reduce the influence of distance on interregional investments. More specifically, interregional outward investment may be positively associated with distance in countries with higher concentrations of the financial industry (see Fig. 3). Thus, in countries where the financial industry is concentrated in a few areas, developing the equity crowdfunding market may mitigate regional funding gaps because crowdfunders located in these financial centers are more likely to invest in remote areas. More generally, developing strong financial centers in a country may lower funding gaps in more peripheral regions in the same country. This is hardly a new policy insight but—surprisingly—seems to matter in new ways for new types of entrepreneurial finance, including crowdfunding, and perhaps paradoxically seems to make this type of entrepreneurial finance more accessible throughout the whole country. Increasing the (online) social networks between two regions may be a new policy direction, as this also lowers the distance decay between crowdfunding investors and firms looking for crowdfunding, therefore, indirectly stimulating entrepreneurs in more peripheral regions to initiate crowdfunding campaigns, explicitly using their nonlocal social networks.

5.2 Limitations and future research

Our research has several limitations that provide opportunities for future research. First, we found insignificant or even negative correlations between regional social networks and equity crowdfunding flows between regions. These results contradict previous research on reward-based crowdfunding (Dejean 2020). An explanation could be the bias caused by multicollinearity. The VIFs of Distance and Networks were higher than 5. Although they were lower than the conventional threshold of 10, a high correlation between them can still lead to biased results. Further research can test these relationships in a larger dataset to obtain more consistent results.

Second, we examined the crowdfunding flows between regions by aggregating all investments from a Dutch equity crowdfunding platform. The Netherlands has more than 20 platforms that support business crowdfunding campaigns.⁸ Although Platform A was the largest equity crowdfunding platform in the Netherlands, our information does not necessarily cover all equity crowdfunding flows and may not be representative of all crowdfunding flows in the country. We made some efforts to mitigate this concern. For instance, we removed the three major regions (the Greater Amsterdam, Utrecht, and Rotterdam) in which Platform A is located, yielding robust results. Our research is in line with current aggregate-level crowdfunding studies that collect data from only one platform, such as studies based on data from the crowdfunding platforms Kiva (Burtch et al. 2014), Kickstarter (Sorenson et al. 2016), and Ulule (Dejean 2020). As long as the distributions of investors and campaigns in our research are not systematically different from those of the entire equity crowdfunding market in the Netherlands, our results are likely to reflect local bias in the Dutch equity crowdfunding market at large. Further research may collect data from countries in which the financial crowdfunding market is dominated by large platforms (e.g., Crowdcube in the UK). In this way, the transaction data from one platform are representative of the interregional crowdfunding flows nationwide.

Acknowledgements

The authors thank Xing Li and Robert Huggins as well as participants of Academy of Management Annual Conference (2021) and World Finance Conference (2021) for their valuable comments. The authors are also grateful for the editorial guidance of Simona Iammarino, and for the constructive comments and suggestions of three anonymous reviewers.

Supplementary material

Supplementary data for this article are available at *Journal of Economic Geography* online.

Conflict of interest statement. None declared.

⁸ An overview of crowdfunding platforms (for business purposes) is available at <https://www.crowdfundmarkt.nl/platforms/>.

Funding

This research is financially supported by China Scholarship Council (CSC) under Grant No. 201706050160.

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Journal of Economic Geography, 2024, 24, 549–565

<https://doi.org/10.1093/jeg/lbae009>

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