Platforms' partner networks: the missing link in crowdfunding performance

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Received 19 June 2020
Revised 21 October 2020
17 December 2020
Accepted 25 January 2021

Abstract

Purpose – A network of partners helps and assists a crowdfunding platform (CFP) in scouting, assessing and selecting projects. This cooperation increases the number of successful projects by attracting a sizable number of investors, proponents and attracting marginal investors when a campaign falls short of the threshold for success. This study examines the role of partner networks in a platform ecosystem, specifically in terms of number of different partners and their diversity in the performance of the crowdfunding campaign.

Design/methodology/approach – Using logistic and linear regressions, we analyze a sample of 233 projects, both funded and not funded, launched by 10 Italian equity CFPs between 2014 and 2018.

Findings – Our findings indicate that the variety of partners in a platform's network influence the probability of campaign success and how much capital the proponent company raises. CFPs are resource-constrained new ventures, and a network with a wider variety of partners ensures the strategic resources and competencies that are required in an early stage market, thus facilitating campaign funding.

Practical implications – The variety of partner networks could help CFPs to offer unique and strategic value propositions and define the competitive positioning of platforms.

Originality/value – This study provides a deeper understanding of the determinants of equity crowdfunding campaign performance by emphasizing the role of CFP's network of partners on the entire crowdfunding ecosystem and its underlying organizational elements.

Keywords Crowdfunding, Financial innovations, Partnership, Entrepreneurial finance, Networks

Paper type Research paper

1. Introduction

New sources of financing have emerged in recent years for early stage companies with new actors juxtaposed against some traditional ones. Equity crowdfunding is an innovative funding channel for entrepreneurial ventures and an alternative market for funders who look for new investment opportunities (Block *et al.*, 2018, 2020; Bonini *et al.*, 2019; Cumming and Groh, 2018). Equity crowdfunding offers an equity stake to a large number of individuals (i.e., investors). Traditionally, this is possible through the initial public offering (IPO) process; however, in this case, the ability of pooling investors is mainly based on the marketing efforts of investment banks acting as coordinators, whereas in equity crowdfunding, it is based on crowdfunding platforms (CFPs) and their functionalities.

European Journal of Innovation Management
Emerald Publishing Limited
1460-1060
DOI 10.1108/EJIM-06-2020-0230

CFPs disrupt traditional financial intermediation schemes because they use new technologies to connect investors to entrepreneurs who need funds in an innovative form of intermediation that combines both money and knowledge (Cai, 2018; Lee and Shin, 2018). For entrepreneurs, CFPs should not be viewed only as a source of capital for product development, but treated as a new intermediary that contributes toward the open innovation paradigm (Bigliardi *et al.*, 2020). The presence of blogs, comments and other instruments on the CFP creates space for interaction, where different subjects with knowledge and skill diversity can communicate with entrepreneurs, provide suggestions and criticism and thus contribute to product development (Bigliardi *et al.*, 2020; Chu *et al.*, 2019; Di Pietro *et al.*, 2018; Stefani *et al.*, 2019). These innovative characteristics distinguish crowdfunding from traditional sources of finance, such as banks and professional equity investors (business angels and venture capitalists), and help in the development of a new entrepreneurial culture that allows companies to face a digital marketplace (Song, 2019). CFPs play a central role in shaping the value and advancing the entire crowdfunding ecosystem (Fehrer and Nenonen, 2020; Lehner and Harrer, 2017, 2019; Schwienbacher, 2019).

Although CFPs are critical to the entire crowdfunding process and campaign success, their contributions tend to be overshadowed. In fact, few studies analyze how this subject contributes toward campaign performance. Previous studies on the determinants of campaign success mainly considered company-related issues (Lukkarinen *et al.*, 2016; Cosma *et al.*, 2019; Ralcheva and Roosenboom, 2020), founder profiles such as gender, social capital and intellectual background (Duan *et al.*, 2020; Piva and Rossi-Lamastra, 2018; Skirnevskiy *et al.*, 2017), and campaign characteristics (Lagazio and Querci, 2018; Vismara, 2016b; Wang *et al.*, 2020). Further, closely related to the role of CFPs and crowdfunding performance, few studies have examined how CFPs' characteristics influence investor participation and campaign dynamics. They include the positive role of CFPs' due diligence process (Cumming and Zhang, 2017), platform's number of social links (Vrontis *et al.*, 2020), adoption of different campaign mechanisms (Hornuf and Schwienbacher, 2018) and number and type of post-campaign services (Rossi and Vismara, 2018). Evidence has been found that platforms delivering individual voting rights are commonly associated with less successful offerings (Rossi *et al.*, 2019). Complementing prior literature, this study intends to combine CFPs' features with issuer and project characteristics as determinants of campaign performance.

According to a resource-based view (RBV) of the firm (Grant, 1991; Rumelt, 1997), among the potential determinants of a firm's growth, the combination of networking partnerships and strategic alliances plays a positive role (Powell *et al.*, 1996). Organizations with a more diversified resource base of partners may benefit from a wider network of contacts, knowledge and skills and therefore grasp business opportunities. Once a campaign is launched, CFPs may receive strong support from their network of partners, which include institutional, incubator and quasi-professional investors (Agrawal *et al.*, 2016). A network of partners helps and assists a CFP in scouting, assessment, selection of projects and facilitates the pulling-in of marginal investors when a fundraising campaign falls short of the success threshold (Belleflamme *et al.*, 2015). This cooperation contributes toward attracting many investors, proponents and high-quality projects to facilitate efficient matching between ideas and capital and reduces rationing and the risk of fraud (Agrawal *et al.*, 2015). Thus, the main research question that we address in this study is: Do platform partner networks influence campaign performance? In our study, we consider the CFP's network of partners in terms of dimension, number of partners in the platform's network and diversity, that is, various types of partners and their diversification.

We believe that our findings will improve on the previous literature for multiple reasons. First, the diversity of partners involved in the platform's network is shown to have a positive effect on the CFP. As a new venture, it requires an array of resources and capabilities to compete in an innovative context and early stage market. Second, by adding the CFP's

network of partners to the analysis, we contribute to a deeper understanding of the determinants of equity crowdfunding campaign performance by emphasizing the role of this subject on the entire crowdfunding ecosystem and its underlying organizational elements. Finally, another novelty lies in the observed sample: despite the progress made toward understanding the dynamics of campaign performance and how they are explored and exploited, most prior research is based on just one platform at time. Our research is conducted on an original dataset that covers all equity crowdfunding campaigns launched in Italy from 2014 to 2018. The effective sample for our analysis includes 233 projects, both funded and not funded, launched by 10 different platforms in the Italian market. This sample enables us to explicitly account for the differences among CFPs and their impact on crowdfunding processes within the ambit of a homogeneous legal and regulatory framework.

Our findings offer practical contributions to market development, providing important insights for platform managers, entrepreneurs, investors and regulators.

The remainder of this paper is organized as follows. In Section 2, we discuss the theoretical framework and research hypothesis. Section 3 presents the data, sample and methodology. Section 4 explains our empirical results. Section 5 concludes and discusses the implications of our findings.

2. Theoretical background and hypotheses development

Even though equity crowdfunding shares a few similarities with other sources of entrepreneurial finance that operate in the company's growth phase, it clearly presents unique characteristics that distinguish it from other forms. Equity crowdfunding peculiarities refer to campaign goals, processes and the generation of network effects. The goals of a crowdfunding campaign are a combination of both funds and crowd support. Funds allow innovative startups to reduce the funding gap (Hervé and Schwienbacher, 2019; Stanko and Henard, 2017), while the crowd represents a potential source of ideas and knowledge for product development. In this sense, crowdfunding is also crowdsourcing, in which an organization outsources activities, such as product development, to a large group of people. This type of contribution is unusual for venture capitalists (VCs) and business angels (BAs) that often have a passive role with the company. About processes, compared with IPOs, crowdfunding is a "going public funding process," because CFPs allow public visibility of the funding process, where prospective investors are able to see in real-time the total amount already committed, number of potential investors and, in some case, also who are the backers (Ahlers *et al.*, 2015; Hornuf and Schwienbacher, 2018). Finally, one of the most important characteristics connoting crowdfunding is the generation of a network effect around CFP. Most CFPs operate as two-sided markets, meaning that they combine distinct groups of participants in a network and mediate interactions between them. The group of actors involved in CFP networks are entrepreneurs, investors and others such as incubators, associations and professional investors who generate new externalities from the connection with the other groups. Network dynamics seem to be exacerbated in the crowdfunding ecosystem, consequentially to the use of technology, and characterize it from traditional and well-known entrepreneurial financial players. In recent years, considerable research has argued that network dynamics have assumed significance for their importance in platform evolution and growth (Thies *et al.*, 2018). For these reasons, we chose to focus our research interest on a group of actors involved in a CFP's network dynamics, such as the platform's partners, and how this group of agents affects campaign performance.

Drawing on the RBV of companies, competitive advantage and primary sources of profit are obtained from either internal or external resources and capabilities; when external resources are often gathered through alliances and partnerships (Baum *et al.*, 2000; Henderson and Cockburn, 1994). Alliances and partnerships, which are motivated by

complementary know-how and skills, support the development of resources and capabilities that firms seek to overcome their internal resource constraints (Frenken, 2000; Marion and Fixson, 2014; Piva *et al.*, 2012). There is a growing consensus that alliances and partnerships have a significant impact on the performance of new ventures (Baum *et al.*, 2000; Stuart, 2000) and organizational learning (Anand and Khanna, 2000; Kale *et al.*, 2000; Kraatz, 1998; Oliver, 2001).

CFPs are innovative fintech companies that operate in an early stage market. Partnerships in CFPs may support platform activities at different levels, compensating for the lack of market experience (Stuart *et al.*, 1999), marketing skills (Marion and Fixson, 2014) and social capital (Aspelund *et al.*, 2009), which are typical of new ventures. Also, CFPs may use alliances and partnerships to reduce a firm's exposure to uncertainty, risk and opportunism (Gulati *et al.*, 1994), obtain legitimacy and overcome the "liability of newness" (Stinchcombe, 2000; Stuart, 2000), improve response capacity (Hotz-Hart, 2000) or provide access to information and knowledge resources that are difficult to obtain by other means (Oliver, 2001; Rosenkopf and Nerkar, 2001).

In the crowdfunding process, CFPs' partners operate by scouting for new projects, conducting a due diligence process, selecting and evaluating quality ventures that may perhaps match the interests of potential investors and, finally, producing information and signals about the quality of the projects offered (Belleflamme *et al.*, 2015; Bessiere *et al.*, 2018; Maier, 2016; Zhang *et al.*, 2018). BAs also collect investment proposals from informal or professional networks, such as VCs, banks and investment clubs (Brettel, 2003; Croce *et al.*, 2017), and the selection procedures of CFPs share major similarities with the way these early stage actors involve their personal networks. Salomon (2016) argues that platforms ground their selection on the "social proof principle" where many different stakeholders (e.g. industry experts and professional investors) evaluate startups according to collective judgments. The platform preselection procedure is regarded as a significant success factor for CFPs (Löher, 2017; Yang *et al.*, 2016). Another selection strategy for CFPs is involvement of sophisticated investors (e.g. VCs, BAs and institutional investors) in their networks with significant capabilities and experience in assessing the reliability and probability of success of the proposed campaigns (Belleflamme *et al.*, 2015). Loher (2017), drawing on 21 in-depth interviews investigating the processes and activities of nine German CFPs, shows that the deals they select derive either from direct applications, without a prior relationship between the venture and the platform, or network applications, that is deals suggested by third-party intermediaries or actors – namely universities, incubators, BAs, BAs' networks, VCs or banks – or active searches by CFPs themselves. In fact, CFPs consider the deals generated, engendered or referred by their networks to be superior. A network of partners can also enhance a platform's reputation and legitimacy and may thus serve as a signal of quality for both companies and investors (Baum and Silverman, 2004; Hoang and Antoncic, 2003; Stuart *et al.*, 1999).

To investigate our hypothesis that a network of partnerships and campaign performance are related (Athanassiou and Nigh, 1999), we focus on the size and diversity of a CFP's network partners as the two explanatory dimensions that illustrate how network ties function. A network of partners is a form of collaboration among multiple companies in which members are typically specialized and bring unique value-adding resources to the network. Usually, network members include some of their activities in the network but maintain their autonomy in other matters. Numerous studies in this stream reveal that a network structure differentially influences the flow of financial resources, capabilities and opportunities that become available to the focal actor (Ahuja, 2000; Stuart, 1998). We adopt a network- or group-level analysis because structural explanations are much more likely to scale than individualist explanations (Barabási and Albert, 2011). For the reasons mentioned above,

we examine if platforms with a large network of partners positively affect the equity crowdfunding process and thus, test the following hypothesis.

H1. The size of a CFP's network of partners improves campaign performance in terms of capital raised, relative success and probability of success.

Furthermore, as we believe that size is not the only potentially important network characteristic, we also consider network diversity. Network diversity is a combination of two features: (1) variety, commonly defined in economic, social and statistical studies as the number of different types of members represented in a given network and (2) balance, relating to the extent of a network's diversification (vs specialization) across its members (Leydesdorff, 2018; Stirling, 1998). In the economics literature, diversity is commonly associated with positive organizational performance, as it affects group dynamics, improves group decision-making and generates a greater knowledge base as well as creativity, thus fostering competitive advantage (Murray, 1989; Siciliano, 1996; Timmerman, 2000; Watson *et al.*, 1993, 1998). Different types of ties in a network have various capacities for extracting resources (Borgatti and Foster, 2003). Interacting with diverse network partners can help firms to collect a broader range of information from external sources, providing broader learning that goes beyond existing cognitive horizons and may better "prepare" the company for new business opportunities (Martinez and Aldrich, 2011; Pangarkar and Wu, 2013; Taheri and van Geenhuizen, 2019). New ventures benefit more from knowledge exploration when engage in a diversity of cooperation activities because they spread the risks involved in opportunity recognition and exploitation (Gimenez-Fernandez *et al.*, 2019) and enhance innovation processes (Ferreira *et al.*, 2020; Hagedoorn *et al.*, 2018; Shiri *et al.*, 2015). Especially for small and technological new ventures, partner diversity affects market potential and the firm's financial value (Cisi *et al.*, 2020; Parida *et al.*, 2016; Swaminathan and Moorman, 2009). With regard to CFPs, a heterogeneous network of partners may help not only to identify opportunities and develop knowledge but also to implement better project assessment and selection procedure. To check the importance of diversity, we formulate our second hypothesis:

H2. The diversity of a CFP's network of partners improves campaign performance in terms of capital raised, relative success and probability of success.

3. Research methodology

In this section, we describe the sample and the variables used in our analysis. To set the context of our study more effectively, we also sketch the evolution of the Italian equity crowdfunding market from 2014 to 2018.

3.1 Sample

We focus on the Italian equity crowdfunding market. We hand-collected data on all equity crowdfunding campaigns launched in Italy from 2014 to 2018, constantly monitoring campaigns published on all Italian platforms. The effective sample for our analysis includes 233 campaigns, funded and not funded, out of a total of 237 launched between 2014 and 2018. We eliminated two campaigns proposed by PE funds and two others that were influential outliers in regression analysis.

The platforms in our sample comprise 10 out of 15 incumbents in one or more years of the observation period. Since 2013, when the Italian equity crowdfunding market originated, 28 platforms have been authorized, but only 17 have actually operated in the market, with 15 still working by the end of 2018.

There are 169 single company issuers with widely varying characteristics. Five issuers in the sample run more than one campaign. Consistent with the evolution of Italian legislation, 151 issuers are startups, 14 are innovative SMEs and 4 are special purpose acquisition companies. The majority of our sample (97%) consists of innovative projects (i.e. innovative startups and innovative SMEs) defined by Italian legislation (DL 179/2012, art. 25), as projects put forward by companies that have relatively high R&D and innovation costs and a high level of human capital (PhDs, researchers, master degrees) and own patents or registered software.

On average, when companies decide to launch a crowdfunding campaign, they are relatively young: the average age from the foundation is 2.4 years.

3.2 Evolution of the Italian equity crowdfunding market

Equity CFPs began to operate in Italy in 2013, after a legislation was introduced in 2012 allowing innovative start-ups to raise capital through this channel. Italy was the first country in Europe to regulate equity crowdfunding investment and CFP activities. Under the Italian Consolidated Law on Banking (Legislative Decree No. 58 of 24 February 1998), only authorized entities such as banks, investment companies and platform managers specifically authorized via a register maintained by the public authority responsible for regulating the Italian financial markets – Commissione Nazionale per le Società e la Borsa (Consob) – can engage in equity crowdfunding.

Since 2012, there have been two major reviews of the Italian legislation in 2015 and 2017, widening the range of firms permitted to raise equity capital through this channel. In 2015, innovative SMEs were admitted, and in 2017, access to equity crowdfunding was extended to all legally incorporated Italian firms. From our sample, it is possible to identify three distinct phases of evolution of the Italian equity crowdfunding market from 2014 onwards (Figure 1 and Table 1 on the next page).

Phase 1. Early start: Between 2014 and 2015, a few platforms started to operate in the market. They launched 21 campaigns involving 20 firms. However, the success rate was quite low (50% or less) and fundraising was below expectation (less than stated targets, totaling

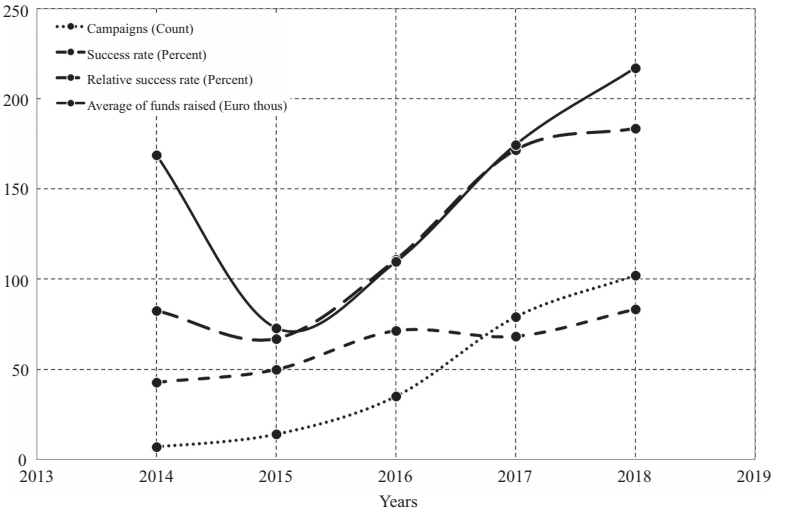

Figure 1.
Evolution of the Italian equity crowdfunding market from 2014 to 2018

Year	Active platforms (count)	Equity issuers (count)	Campaigns (count) Launched	Successful	Success rate (percent)	Relative success (percent)	Funds raised (euro thous.) Total	Average
2014	2	7	7	3	42.9	82.5	1,181	168.8
2015	5	13	14	7	50.0	67.0	1,021	72.9
2016	8	35	35	25	71.4	110.9	3,841	109.7
2017	9	78	79	54	68.4	171.7	13,798	174.7
2018	8	100	102	85	83.3	183.7	22,161	217.3
Total	10	233	237	174	73.4	615.8	42,002	177.2

Note(s): Success rate is the ratio of campaigns that reached their fundraising targets to all campaigns. Relative success rate is the ratio of total funds raised to the total of fundraising targets, calculated on the subset of 216 campaigns that had a fundraising target. The average of funds raised is calculated on the total number of campaigns

Table 1. Evolution of the Italian equity crowdfunding market from 2014 to 2018

about € 1 million per year). From 2014 to 2015, the relative success rate and average funds raised declined sharply (from 83 to 67%; from € 169 thousand to € 73 thousand, respectively).

Phase 2. Take off: Between 2016 and 2017, after a tentative start, the market gained momentum. The number of active platforms doubled and firms attempting to tap the market increased fivefold (from 13 to 78). Success rates grew from 50% to approximately 70% when achieving fundraising targets is considered, and from 67 to 172% when capital raised is benchmarked against stated targets in relative terms. Total funds raised grew from about € 1 million to slightly less than € 14 million; average funds raised increased from € 73 thousand to about € 175 thousand.

Phase 3. Current phase: In 2018, the market continued to grow at almost the same pace as in Phase 2. The number of firms joining it grew to 100, while the number of platforms seemed to stabilize. Success rates and capital raised both increased, although not to the same extent as in Phase 2.

3.3 Description of variables

3.3.1 Dependent variables. The three main variables that reflect campaign performance are: (1) the amount of capital raised at the end of the campaign, (2) the ratio of capital raised to the maximum target set by the issuer and (3) whether capital raised exceeded the threshold set by the issuer to successfully close the campaign. These dependent variables represent the final performance of the crowdfunding process and are common in the literature on campaign dynamics (Ahlers *et al.*, 2015; Löher *et al.*, 2018; Lukkarinen *et al.*, 2016; Mamonov *et al.*, 2017; Mamonov and Malaga, 2018; Piva and Rossi-Lamastra, 2018; Vismara, 2016a, b).

3.3.2 Explanatory variables. We focus on explanatory variables that belong to three conceptual classes: platform features, issuing company features and campaign characteristics. These variables are public and commonly available for all the CFPs considered in the sample. The variables related to platforms' networks, which are our primary focus, belong to the first group and are as follows. "Size of the network" represents the number of partners linked to the platform. To identify the platform's partner, we checked the names of partners published on the website. We assume that the presence of a partner's name on the platform's site indicates an established relationship between the two. "Network variety" and "Balance" represent a network's diversity, jointly. We focus on two different aspects of diversity: "type richness" and "type evenness." Richness is a simple count of the different types of members, while evenness quantifies the degree of variation in the number of network members across types. Diversity increases with richness and evenness, which together form what is commonly called "dual concept diversity" in the literature (Rousseau *et al.*, 1999; Stirling, 1998). Following Nijssen *et al.*

(1998) and Leydesdorff (2018), we have chosen to measure richness with relative variety and evenness using the Gini coefficient, which represents balance. To this end, we identified 10 different types of CFP partners according to two criteria: role in the equity crowdfunding process and, within roles, the specific segments of the supply or demand side of the market they target (Table 2). We do not evaluate network diversity with respect to the disparity of types of members (Stirling, 1998) because this would have entailed subjective judgments that we are not yet ready to propose with confidence.

Then, for each campaign, we counted the number of partners in each type for the platform where the campaign was launched. Let $i = 1, 2, \ldots, 10$ be the type indicator for a given platform and $n(i)$ be the number of partners that belong to type i for a given platform, so the total number of partners is:

$$N = \sum_{i=1}^{10} n(i)$$

Variety is defined as the number of types to which partners of a platform belong, divided by 10 (i.e. total number of possible types) and expressed as a percentage:

$$\text{Variety} = \sum_{i=1}^{10} \frac{I(n(i) \neq 0)}{10} \times 100,$$

where $I(\bullet)$ is the indicator function. The closer a variety is to a hundred, the richer a platform is. Balance is defined as the Gini coefficient of a platform, expressed in the [0, 100] scale:

$$\text{Balance} = \frac{\sum_{i=1}^{10}\sum_{j=1}^{10}|n(i) - n(j)|}{20\sum_{i=1}^{10} n(i)} \times 100$$

The closer the balance is to a hundred, the more diversified is the platform, while balance is close to zero for platforms with most partners concentrated in a few types.

Table 2. Synopsys of partners in CFP's networks

Types of partners	Roles
Banks	Promote equity crowdfunding among their customers, either as a funding channel or as an investment opportunity. Provide depository services to platforms
Investment funds	(e.g. Venture-capital funds). Participate to campaigns as professional investors
Associations	(e.g. Industrial associations). Disseminate information about equity crowdfunding to their members
Agencies	(e.g. Chambers of Commerce). Disseminate information about equity crowdfunding to their members
Syndicates	(of firms). Disseminate information about equity crowdfunding to their members
Universities	Disseminate information about equity crowdfunding. Help scouting of innovative investment firms/projects
Advisors	Promote equity crowdfunding as a funding channel to their customers. Help scouting of firms. Support and advise proponents of campaigns (e.g. legal, financial)
Incubators	Disseminate information about equity crowdfunding to their customers. Help scouting of innovative investment firms/projects
Firms	Participate to campaigns as (direct) investors or promote them to raise funds for their own projects
Other	Providers of various business-related non-financial services to firms (e.g. Vocational training, Co-working venues, Smart payment systems). Help in attracting proponents

A last platform-related variable that we add as a control is "Track record", that is, the number of campaigns the platform has run since it started operating. This variable represents a platform's level of expertise and market presence. On average, platforms in the sample launched 20 campaigns, with a minimum of 1 and a maximum of 56 for the most active one.

The second group of variables pertains to the characteristics of the issuing company.

"Geographical distance" is the spatial distance in kilometers (km) between an issuing firm and the CFP on which its campaign is launched. We include this control variable to account for possible factors influencing success related to spatial proximity. As pointed out by Borello *et al.* (2015), Langley (2016) and Zhang *et al.* (2018), proximity may improve screening and reduce a platform's project selection costs, such as the cost of finding potentially successful firms and conducting due diligence. We calculated this variable using the table of driving route distances between Italian provincial capitals published by the Italian Ministry of Transport (Ministero dei Trasporti, 1982), proxying platforms' and firms' locations by the capitals of the provinces where their registered offices are located. As the table does not provide distances between provinces not connected by land routes (i.e. between provinces on Sicily and Sardinia and others not on the island) and between provinces founded after 1982, we used the ViaMichelin route planner as a backup of source data (ViaMichelin, 2019), manually retrieving any distance missing from the Ministerial table. The company furthest away is 1,570 km from the platform, while on average the company-platform distance is 299 km.

"Shareholders" is the number of incumbent shareholders related to the governance of the issuing company; on average, the companies have 11. "Board members" is the number of members on the company's board. Previous studies indicate that campaign success is linked to the size and composition of the board (Skirnevskiy *et al.*, 2017; Vismara, 2016a). As Baum and Silverman (2004) argue, larger management teams are not only likely to possess higher human capital but may also have more connections with potential investors. The number of board members correlates positively with campaign outcomes, indicating that outside investors may perceive this as a positive signal of firms' ability to cope with an uncertain market environment (Ahlers *et al.*, 2015; Piva and Rossi-Lamastra, 2018; Vismara, 2016b). The average board size in the sample is two members. A binary variable, "Industrial shareholders", assumes a value of 1 if at least one of the incumbent shareholders has skills and experience in the business or investment project for which equity funding is sought. In this case, investors may be more confident in committing funds to the campaign (Courtney *et al.*, 2017). Seventy-one percent of the sample has some industrial shareholder.

The last set of variables relates to campaign-specific features. Some aspects of a campaign's profile are likely to influence its success because they may provide signals that reduce information asymmetries between ventures and investors; they may also play a significant role in determining investors' willingness to pay (Hornuf and Neuenkirch, 2017). "Business angels" is a binary variable with value of 1 if a BA participates in the campaign. Previous researchers posit that the presence of BAs is an effective signal for retail investors and could influence their participation (Ahlers *et al.*, 2015). Indeed, Kim and Viswanathan (2013) show that less experienced investors are strongly influenced by the investment decisions of experts. BAs were present in 52% of the campaigns. "Prize for subscription" is a binary variable with value 1 if the campaign offers rewards to investors who subscribe equity capital in order to entice them to participate; 85% of projects in the sample have this characteristic. "Equity retention" is the ratio of the issuer company's equity before the campaign was launched to the maximum equity it would have if the campaign had been successfully completed. Signaling theory (Leland and Pyle, 1977) indicates a manager's decision to raise equity as a negative signal for investors, since firms opportunistically choose to raise equity when managers know their shares are overvalued. On average, projects offer 20% new equity. "Fork width" is the range of maximum to minimum fundraising thresholds,

expressed in percentage terms relative to the higher end of the range. On average, the maximum target required is double the minimum. "Maximum target" is the highest value of funds that the issuer is willing to accept before closing subscriptions. In our sample, campaigns require € 338,055 on average, with a maximum of € 4,500,000. "Minimum investment" is the minimum value of capital subscribed that an investor was required to accept in order to join the campaign; if not set by the issuer, this equals the value of one equity capital share. The average minimum investment is € 711. "Share premium account" is the difference between the value at which the shares were issued by the company and their face value. Most projects do not give a share premium account. To control for campaign models, we include the variable "Take-it-all", which is a binary with value 1 if the campaign is finalized provided that any new equity capital is raised, as opposed to cases when positively closing the campaign is tied to raising a minimum amount of capital (also known as "all or nothing"); in our sample, 9% are take-it-all campaigns.

We present the list and the descriptive statistics of all our variables in Tables 3 and 4.

3.4 Methods

We estimate three models to address our research hypotheses. The models differ in their response variables, each corresponding to a specific definition of campaign performance. In Model 1, funding performance is measured in absolute terms; in Model 2, it is evaluated in relative terms with respect to the best possible outcome, and in Model 3, it is defined by the conclusion of the campaign, irrespective of how much capital is raised beyond the minimum

Table 3. Description of variables included in the dataset

Variables	Definition
Dependent variables	
Capital raised (€)	The total amount financed at the end of the campaign
Relative success (percent)	Ratio of capital raised to the maximum target set by the issuer
Success (binary)	Whether or not capital raised met the stated fundraising target
Platform variables	
Size (count)	Number of partners linked with the platform
Variety (index, 0 to 100)	Number of types to which partners of a platform belong, divided by total number of possible types
Balance (index, 0 to 100)	Gini coefficient
Track record (count)	Number of campaigns the platform has run since its beginning
Issuer variables	
Geographical distance (km)	Distance between an issuing company and the platform
Shareholders (count)	Number of previous company's shareholder
Board members (count)	Number of members in the company's board
Industrial shareholders (binary)	If among previous shareholders, one of them has skills and experience in the business
Campaign variables	
Business angels (binary)	If a business angel participates in the campaign
Prize for subscription (binary)	If the campaign offers rewards
Equity retention (percent)	Level of equity offered in the campaign
Fork width (percent)	The range of maximum to minimum fundraising thresholds
Maximum target (€)	Maximum amount of money requested by the company
Minimum investment (€)	Minimum amount of money requested by investor to join the campaign
Share premium (€)	Difference between the value at which the shares were issued by the company and their face value
Take-it-all (binary)	If the campaign has a take-it-all model

Variables (measure)	Minimum	Quarter I	Median	Mean	Quarter III	Maximum
Dependent variables						
Capital raised (€)	0	53,092	131,105	175,839	238,500	1,250,000
Relative success (percent)	0	67	142	1,168	238,500	114,110
Success (binary)	0	0	1	0.730	1	1
Platform features						
Size (count)	2	12	21	22	25	49
Variety (index, 0 to 100)	10	50	70	60	70	80
Balance (index, 0 to 100)	0	59	75	68	83	84
Track record (count)	1	8	17	20	30	56
Issuer features						
Geographical distance (km)	0	50	171	299	434	1,570
Shareholders (count)	1	3	4	11	8	167
Board members (count)	1	1	2	2	3	7
Industrial shareholders (binary)	0	0	1	0.712	1	1
Campaign features						
Business angels (binary)	0	0	1	0.528	1	1
Prize for subscription (binary)	0	1	1	0.854	1	1
Equity retention (percent)	0	3	7	20	17	384
Fork width (percent)	0	50	60	56	73	100
Maximum target (€)	45,000	150,000	300,000	338,055	400,000	4,500,000
Minimum investment (€)	96	250	450	711	500	19,999
Share premium (€)	0	0	0	0.5	0	19
Take-it-all (binary)	0	0	0	0.094	0	1

Table 4. Sample descriptive statistics

fundraising threshold. For each model, we estimate four versions, varying by the sets of variables included on the right-hand side: in version A, only platform features appear; in version B, only issuer features appear; in version C, only campaign features appear; and in version D, all the features are included simultaneously. Therefore, we estimated 12 different models overall. The design of our analysis is intended to make the outcomes of our investigation robust across different meanings of campaign success and to clarify the influence and relative significance of each type of feature.

We use linear regression models to investigate the determinants of the amount of capital raised by campaigns (Model 1) and their relative success (Model 2). In such models, we allow for non-constant variance in the error terms, ε, and we assume that these are not cross-correlated across campaigns. Let x_1, x_2, and x_3 be vectors of regressors that represent platform, issuer and campaign features, respectively, as detailed in subsection 3.3, and let β_1, β_2, and β_3 be the matching vectors of regression coefficients, while β_0 is the intercept of the regression equation; also, let y represent either capital raised or the measure of relative success. Then, the linear regression equations follow the form

$$y_i = \beta_0 + x_{1,i}\beta_1 + x_{2,i}\beta_2 + x_{3,i}\beta_3 + \varepsilon_i$$

for $i = 1, 2, \ldots, n$ indexing the n campaigns in our sample, where:

$$E(\varepsilon_i|x) = E(\varepsilon_i\varepsilon_j|x_i, x_j) = 0 \text{ and } \mathrm{Var}(\varepsilon_i|x_i) = \sigma_i^2, \text{for } i \neq j = 1, 2, \ldots, n$$

and $\boldsymbol{x} = [x_1, x_2, x_3]$. For each choice of y, model version D includes all the regressors, while in versions A, B and C, we include x_1, x_2, and x_3 one by one, effectively assuming, respectively, $\beta_2 = \beta_3 = 0$, $\beta_1 = \beta_3 = 0$ or $\beta_1 = \beta_2 = 0$. Model 2 is slightly different from Model 1 because relative success is only meaningful for the subset of campaigns that set a maximum

target. Therefore, the Model 2 sample comprises only "all or nothing" campaigns; these form about 91% of the complete sample, totaling 211 cases; therefore, we drop the "take-it-all" variable from Model 2, which is meaningless in this context. Furthermore, since the response variable's denominator is the maximum fundraising target and this is directly included in the definition of "Fork width," we dropped this variable and "Maximum target" to avoid any spurious correlation that may bias our analysis.

We used the R environment for all computations (R Development Core Team, 2018). Linear regression coefficients are estimated by ordinary least squares, accounting for non-constant variance by computing heteroscedasticity-robust standard errors, as proposed by Long and Ervin (2000). We also check for potential multicollinearity issues by examining pairwise correlations and variance inflation factors (VIFs) of the explanatory variables, as detailed in Appendix, Table A1 and A2; we conclude that our results are not impaired by multicollinearity.

In analyzing the determinants of campaigns reaching the stated fundraising targets (Model 3), we model the binary dependent variable:

$$y = \begin{cases} 0 & \text{if Capital raised} < \text{Target} \\ 1 & \text{if Capital raised} \geq \text{Target} \end{cases}$$

by representing the probability of meeting the target in any single campaign through the logistic function ("logit" for short):

$$\pi_i = \text{Prob}(y_i = 1|x) = \frac{1}{1 + \exp(\beta_0 + x_{1,i}\beta_1 + x_{2,i}\beta_2 + x_{3,i}\beta_3)}$$

for $i = 1, 2, \ldots, n$. The β parameters are estimated by numerically maximizing the log-likelihood function:

$$\mathscr{L}(\beta|x) = \sum_{i=1}^{n} y_i \ln(\pi_i) + (1 - y)_i \ln(1 - \pi_i)$$

with respect to $\beta = [\beta_0, \beta_1, \beta_2, \beta_3]$ by the Newton–Raphson numerical algorithm based on Fisher's scores (Greene, 2003). In order to ensure the robustness of the estimators, we tried several starting values of the β parameters to improve the search of the optimal solution across several areas of the space of parameters. In each instance, the algorithm consistently converged to the same values in less than eight iterations, indicating that the likelihood is highly informative about the investigated effects.

Besides logit parameters, we compute average partial effects (APEs) for all features, their standard errors and p-values with package "margins" (Leeper, 2018); this is because APEs make it easier to evaluate the magnitude of the impact of features on success probabilities (Wooldridge, 2009).

For all models, we compute the appropriate goodness of fit measures: adjusted R-squared for linear regressions and Akaike Information Criteria (AIC) for logit models. Finally, we calculated the Wald test statistics against null models (i.e. models where the response variable depends only on a constant term) as a standard way of evaluating the overall statistical significance.

4. Results

We compare the estimation results in Table 5 and comment on them by sets of variables (row-wise). When appropriate, we refer to some results from different model versions, which appear in Appendix.

The first major result is that platform network size is not statistically significant in any model, a fact that does not support Hypothesis 1. Therefore, we cannot claim that the size of

Table 5. Comparison of regression analyses

Variables (measure)	Model 1 Capital raised (Log of euro) Estimate	Standard error	*p*-value	Model 2 Relative success of campaign (Log of percent) Estimate	Standard error	*p*-value	Model 3 Success of campaign (Binary) Estimate	Standard error	*p*-value
Platform features									
Size (log of count)	0.9	0.754	0.234	−0.463	4.08	0.556	0.004	0.011	0.707
Variety (index, 0 to 100)	*0.313*	*0.001*	*0.006***	*0.232*	*0.782*	*0.033***	*0.047*	*0.019*	*0.016****
Variety^2	*−0.003*	*0.001*	*0.006****	*−0.002*	*0.108*	*0.016***	*0*	*0*	*0.003****
Balance (index, 0 to 100)	*0.079*	*0.034*	*0.021***	−0.015	0.001	0.735	0	0.007	0.986
Track record (log of count)	−0.012	0.251	0.962	−0.023	0.216	0.279	−0.003	0.005	0.568
Issuer features									
Geographical distance (Km)	0.071	0.082	0.392	0.065	0.054	0.228	0.003	0.003	0.318
Shareholders (count)	*0.008*	*0.005*	*0.072**	*0.018*	*0.007*	*0.008****	0.009	0.021	0.667
Board members (count)	0.093	0.093	0.093	0.058	0.079	0.462	0.005	0.003	0.163
Industrial shareholders (binary)	*0.913*	*0.285*	*0.002****	*0.863*	*0.306*	*0.005****	*0.102*	*0.061*	*0.093**
Campaign features									
Business angels (binary)	0.228	0.35	0.515	0.263	0.239	0.273	0.04	0.056	0.47
Prize for subscription (binary)	0.669	0.488	0.172	0.137	0.419	0.774	*0.181*	*0.072*	*0.011****
Equity retention (log of percent)	0.139	0.189	0.464	0.03	0.096	0.751	0.005	0.006	0.456
Fork width (percent)	0.004	0.01	0.683	–	–	–	*0.004*	*0.002*	*0.018***
Maximum target (log of €)	0.083	0.332	0.803	–	–	–	*−0.001*	*0*	*0.022***
Minimum investment (log of €)	*0.389*	*0.192*	*0.045***	0.03	0.232	0.899	0.000	0	0.31
Share premium (log of €)	0.07	0.15	0.642	0.013	0.027	0.619	−0.009	0.023	0.695
Take-it-all (binary)	0.567	1.07	0.595	–	–	–	−0.124	0.092	0.175

Note(s): The table shows estimated average partial effects. Effects of explanatory variables with marginal probability values of 10% or less are typed as italic face and significance is encoded as: "***" 0.01 "**" 0.05 "*" 0.10. The sample size in Models 1 and 3 is 233 cases, since 9 cases were excluded because of missing values on some explanatory variables and 2 more outlying influential cases were dropped from the 244 cases original data set. In Model 2 the sample size is reduced to 211 cases when the response variable is relative success, because in this case only all-or-nothing campaigns are considered

the platform's network of partners has a positive influence on success; indeed, in Model 2, the sign of the coefficient is negative. We notice that the only instance where this variable is significant is in Model 1.A, Appendix Table A3, where campaign and issuer features are not considered; there, the coefficient is quite high and implies that, on average, when the number of partners doubles, expected fundraising increases by almost 1.75 times.

The second result is that partner network diversity has a significant positive effect on the probability of success, relative success and total amount of funds raised, supporting Hypothesis 2. Variety is statistically significant across all models and all versions where it appears. These results suggest that having different partner types in a platform's network not only enhances campaign success but also that very few or too many of them are suboptimal – because the coefficient of variety-squared is negative and significant in Model 1 and 2. A homogenous network of partners does not provide adequate access to external resources, while too much diversity within the network makes it difficult for CFPs to integrate different forms of knowledge and capabilities.

The balance variable, which represents diversification across partner types, positively affects capital raised but is not a determinant for absolute or relative success. Model 1 is the only instance in which balance is statistically significant. Finally, we notice that a platform's track record does not have any significant impact on campaign success or fundraising.

When we consider issuer features, the only significant aspects for campaign performance are the number and profile of incumbent shareholders; the former helps to raise more equity capital and improve relative success (Models 1 and 2), while the latter is a significant driver in all instances. The presence of incumbent industrial shareholders almost doubles the amount of capital raised and increases absolute success by 70% and relative success by 86% (Models 2 and 3); such presence conveys credibility and provide prospective investors confidence to invest and in campaign success and, possibly, in the future outcome of the investment project they are financing. This, along with third-party endorsement, through the platform's network, may reduce the information gap regarding projects, thus attracting funding from established BAs or VCs (Mamonov and Malaga, 2018).

The number of board members at the time the campaign was launched is not statistically significant when jointly considered with other variables; on the other hand, we notice that in models 1.B and 3.B of the Appendix – where the only explanatory variables are issuer features – board members has a positive and moderate significant effect on the probability of success and the amount of capital raised, respectively.

Finally, the geographical distance between the platform and the issuer is never significant. This could provide evidence against the claim that proximity in equity crowdfunding delivers informative advantage or other benefits that are reflected in campaign success and capital raised.

The features of campaigns are significant only in Models 1 and 3, explaining capital raised and likelihood of success. In Model 3, the reward for subscription and fork width improves the probability of success, while the maximum target reduces it. The estimate of the coefficient on the maximum target in Model 3 suggests that small campaigns are more likely to be successful. While Ahlers *et al.* (2015) and Vismara (2016b) claim that relatively smaller projects are more likely to be financed, our analysis indicates that a tradeoff between the size and entry level of campaigns may be relevant. A large minimum investment positively influences the total amount collected in the campaign (Model 1). Large investment thresholds may attract sophisticated investors, whose presence may entice less well-informed (retail) investors to join-in even if they may be discouraged by high entry requirements. The minimum investment size is also affected by the type of investors that the platform wishes to attract (Lukkarinen *et al.*, 2016; Schwienbacher, 2019).

The presence of BAs, type of campaign, equity retention and share premium amount do not affect campaign performance. Meanwhile, the presence of BAs is strongly significant and

positively linked to capital raised and campaign success in all the models that consider only campaign features (Models 1.C, 2.C and 3.C in Appendix). This suggests that the presence of BAs may be related to the features of platform networks.

Thus far, our considerations imply that the platform, issuer and campaign features are somewhat correlated; indeed, if this were not the case, one would not expect to see major differences in the significance of coefficients when comparing different model versions. Therefore, we seek to compare the explanatory power of different versions within any model, since any version consistently emerging as superior suggests that the corresponding set of variables (i.e. platform, issuer or campaign related features) is predominantly significant.

In Table 6, we show a comparison of model versions (across rows) for each model (across panels) based on the metrics explained in subsection 3.4. When one examines Model 1, platform features has the largest explanatory power, as its adjusted R-squared is the highest and its regression standard errors are the lowest for versions A and D. The same conclusion applies to Model 3 with respect to AIC. Model 2 is an exception to this pattern: while version D is the best, version A fares quite poorly compared to both B and C. The best-performing standalone Model is 2.B, where only issuer features are considered. Indeed, it seems that when relative success is at stake, issuer features are very important, and this is more so in

Model versions	Wald statistic	Degrees of freedom	Overall significance (p-value)	Residual standard error	Adjusted R^2 AIC
Model 1 – capital raised					
A. Platform features only	5.4	227	< 0.000	2.3	0.196
B. Issuer features only	8.14	228	< 0.000	2.5	0.065
C. Campaign features only	3.98	224	< 0.000	2.5	0.068
D. All features	4.7	215	< 0.000	2.2	0.258
Model 2 – relative success of campaign					
A. Platform features only	3.21	205	0.008	1.8	0.047
B. Issuer features only	15	204	< 0.000	1.7	0.189
C. Campaign features only	3.81	204	0.001	1.8	0.058
D. All features	3.36	195	< 0.000	1.6	0.256
Model 3 – success of campaign					
A. Platform features only	227	241.91	4.53	0.001	253.9
B. Issuer features only	228	256.71	2.59	0.038	266.7
C. Campaign features only	224	241.4	2.85	0.005	259.4
D. All features	215	210.7	2.11	0.008	246.7

Note(s): The table shows the comparison of models' version. The sample size in Model 1 and 3 is 233 cases, since 9 cases were excluded because of missing values on some explanatory variables and 2 more outlying influential cases were dropped from the 244 cases original data set. In Model 2, the sample size is reduced to 211 cases when the response variable is relative success, because in this case only all-or-nothing campaigns are considered

Table 6. Comparison of models' version

conjunction with platform features. However, again, CFP networks emerge as significant for success (see also Tables A3 to A5 of Appendix).

5. Discussion and conclusions

Financial markets are in a dynamic state; new channels with new players are emerging, increasing opportunities for investors and enterprises. Crowdfunding with its different models is considered an example of a financial intermediation scheme that can help develop and scale-up innovations. The equity crowdfunding market is still in its growth phase and is experiencing the entry of new CFPs and financial service providers, alongside growing competition and product diversification. Specifically, CFPs have attracted the attention of researchers and policymakers given their role of financial intermediation between investors and firms seeking capital.

This study analyzes the impact of a CFP's network of partners on campaign performance. Our results support Hypothesis 2 that partner network diversity has a significant positive effect on the probability of success, relative success and total amount of funds raised. This is not the case for network size (Hypothesis 1). The variety of partners in a platform's network is of significance for crowdfunding performance; we believe this is because it relates to the platform's ability to select and offer investment projects perceived by investors as potentially successful. Thus, a variety of partners in the network appears to be a crucial and strategic resource for CFPs, with direct consequences on the effectiveness of their activity. Our findings indicate that the variety of partners in platform networks may improve a platform's capabilities during different process phases: in the screening phase of projects, assessment and evaluation procedure and in attracting professional and nonprofessional investors by signaling the quality of campaigns and information provided. CFPs are new ventures that are resource constrained and the variety of partners involved in the network affords the resources they need, provides new competencies and strengthens business ties in the entire crowdfunding process. As new ventures, CFPs enter into partnerships to achieve goals and/or benefits different from those of established companies: new ventures are more likely to collaborate for cost-economizing and risk-sharing reasons because they face severe resource limitations, while established companies tend to enter into innovation partnerships for a more strategic rationale (Antolin-Lopez *et al.*, 2015). Alliances for new ventures are believed to encourage interactive learning between the participating organizations and sharing of knowledge and information, which is facilitated through trust, shared values and operations. Especially, in the early stage market, alliances begin as learning partnerships, with the intent of discovering new opportunities and seeking to reduce information asymmetry among partners, and also involve in the joint creation of new knowledge (Koza and Lewin, 2000).

Moreover, these findings indicate that CFP's partners are important contributors for establishing and organizing the entire equity crowdfunding ecosystem. In particular, consistent with Nielsen (2018), crowdfunding is specifically characterized by codependent subjects where diversity is implemented to organize interactions that are central to the crowdfunding process and to blur the boundaries between the various actors within it. Various partner networks may merge social relationships and generate a complex array of new additional network relationships. In this regard, other studies indicate that the success of CFPs seems to depend strongly on how network effects emerge and who manages them, both inside and outside platforms (Belleflamme *et al.*, 2018; Kuppuswamy and Bayus, 2017; Vismara, 2016b). The network effects of CFPs involve different actors: investors, entrepreneurs and as shown in our work, partner networks that may interact with both investors and entrepreneurs influencing campaign performance. Managing network effects allows CFPs to move up the learning curve and improve their operations and services, thus attracting new investors (Belleflamme *et al.*, 2018).

Our findings have implications for CFP managers involved in decision-making, entrepreneurs seeking equity through crowdfunding, investors and regulators.

Platform managers could derive several benefits from building a varied network of partners because this may help at different stages of the crowdfunding process, as it improves intermediary functions and performance. Firstly, the positive effects of a varied network of partners could leverage positive network effects to improve CFPs' marketing capabilities, enabling them to grow within the crowdfunding ecosystem. Secondly, CFP network variety offers a unique, strategic value proposition for the CFP business model. For CFP managers, the challenge in achieving these benefits is not only to access diverse forms of knowledge and capabilities in the network but also to successfully integrate them and evolve best practices for creating synergies in their business strategy. In this area, other studies reveal an apparent competitive tension between models involving a high degree of homogeneity in the network structure, which prevents access to new external resources and, on the other hand, extreme diversification, with greater potential for conflict (Cisi *et al.*, 2020; Martinez and Aldrich, 2011; Parida *et al.*, 2016). CFPs need knowledge management capabilities and network capabilities (Fehrer and Nenonen, 2020) to explore and exploit the diverse knowledge that may be generated by external sources such as partners and enable effective operation within different partner networks.

For entrepreneurs seeking to run an equity crowdfunding campaign, the choice of a platform for launching projects may be critical for the success of the campaign, possibly even more so than the features of the campaign itself. CFPs exhibit positive cross-group external effects between funders and fundraisers, so fundraisers attributing importance to the composition of a platform's network may directly influence the chances of campaign success and achievement of the target equity-raising amount. In addition, the variety of partners in a platform's network affects not only the money raised but also the potential to develop a co-creation mechanism before and during the campaign. If entrepreneurs select CFP with a low varied network of partners, they may not have the valuable contributions that are required for supporting the proposed business idea. The diversity of knowledge among partners could help entrepreneurs to better structure their firm, prepare it for the campaign and in future product development.

The benefits of the diversity of the CFP network may also be extended to investors, when it comes to assessing and evaluating their financial decisions. Since partner network diversity may improve the project assessment and selection procedure, this could be reflected in a better ability to manage the risk associated with campaigns.

For the regulator, it is important to support the development of the crowdfunding ecosystem, provide measures that encourage the actions of operators involved in implementing the campaign. Presently, the legislation has focused on supporting, with tax breaks, both proposers and investors. In the current economic scenario, exacerbated by the COVID-19 pandemic, policymakers must foster investors' and entrepreneurs' participation in this alternative financing scheme. During economic crises, public institutions tend to protect established organizations by reducing the risk of bankruptcies, while sidelining innovation support or entrepreneurial activity (Giones *et al.*, 2020). New ventures may find it challenging to raise funds during these critical times and it is expected to take longer than usual; therefore, crowdfunding could be a quicker and easier way to overcome credit rationing. Moreover, since innovation is becoming increasingly complex and expensive for individual businesses, governors must emphasize on developing consultancy services that can support entrepreneurs and CFPs in terms of searching and coordinating with partners possessing complementary competencies and technologies with the aim to transform ideas that emerge from the environment into innovations.

From a theoretical perspective, in relation to the crowdfunding literature, this study investigates the impact of a partner network structure on the performance of a crowdfunding

campaign which, to the best of our knowledge, has not been previously considered. Our results highlight that CFPs are resource-constrained entities holding a variety of partner networks as a strategic asset, generating efficiency gains reflected in campaign funding dynamics.

From a social perspective, CFPs and their partner networks are important factors for improving the financing of startups and supporting entrepreneurship. In financial markets, where it is quite difficult to access sources of equity finance and signal the quality of projects, CFPs and their partner networks should be considered as socio-economic devices that help to overcome market imperfections hampering the development of new enterprises by integrating diverse skills and professional competencies. CFPs are important players in creating a crowdfunding ecosystem for maintaining health and resilience. Platform networks influence interactions within a well-connected community of entrepreneurs and investors, facilitating access to various forms of relevant resources (knowledge, services, capital) with an enabling role for background legislation.

We acknowledge that our study has some limitations. First, it is important to mention that equity crowdfunding is a constantly evolving phenomenon, so future developments of the study would benefit from updating the sample with new observations. Second, we do not directly evaluate platforms' selection procedures or due-diligence activities, so we are not aware of the specific level of involvement of platforms and their partners in these stages. Moreover, we are not able to directly address the criteria that drive investors' project selection processes. A future study can explore the entire set of crowdfunding processes and their relationship with network diversity and performance. Furthermore, we do not evaluate network diversity with respect to the dimension of disparity of member types (Stirling, 1998), since this would entail subjective judgments that we are not yet ready to present. We believe that analyzing differences of this kind would enable a better understanding of the interactions between the actors involved in the crowdfunding ecosystem.

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Appendix

Variables	Size	Variety	Balance	Track record	Geographical distance	Shareholders	Board member	Business angels	Industrial shareholders	Prize for subscription	Equity retention	Fork width	Maximum target	Minimum investment	Share premium
Variety	0.361														
Balance	−0.295	0.738													
Track record	0.336	0.240	0.049												
Geographical distance	0.081	−0.128	−0.207	0.055											
Shareholders	−0.013	0.008	0.035	0.085	−0.012										
Board member	0.076	0.004	−0.027	−0.023	−0.048	0.053									
Business angels	0.184	0.046	−0.055	0.146	0.018	0.268	0.040								
Industrial shareholders	−0.014	−0.090	−0.057	0.230	0.040	0.192	0.102	0.158							
Prize for subscription	0.128	−0.187	−0.311	0.083	0.159	0.127	0.136	0.072	0.245						
Equity retention	−0.127	0.009	0.112	−0.072	−0.021	0.061	0.135	−0.097	0.213	−0.023					
Fork width	0.088	−0.237	−0.285	0.332	0.085	0.182	0.028	0.085	0.070	0.124	−0.113				
Maximum target	0.231	0.015	−0.124	0.312	0.198	0.264	0.055	0.093	0.179	0.171	−0.012	0.399			
Minimum investment	0.269	−0.081	−0.290	−0.018	0.124	0.036	0.077	0.075	0.032	0.065	−0.079	0.188	0.245		
Share premium	0.173	0.038	−0.107	0.223	0.116	0.090	−0.140	0.228	−0.111	0.081	−0.535	0.276	0.136	0.155	
All-or-nothing	0.212	0.031	−0.096	0.369	0.160	0.053	0.079	0.011	−0.003	0.009	−0.022	0.713	0.353	0.153	0.177

Table A1. Correlation matrix of linear regression explanatory variables

Table A2.
Variance inflation factors and correlations of linear regression explanatory variables

Variable	VIF	Multiple correlation (*R*-squared)
Size	6.20	0.839
Variety	11.87	0.916
Balance	11.82	0.915
Track record	1.60	0.373
Geographical distance	1.15	0.129
Shareholders	1.25	0.199
Board members	1.13	0.111
Business angels	1.20	0.170
Industrial shareholders	1.29	0.222
Prize for subscription	1.26	0.208
Equity retention	2.56	0.609
Fork width	2.88	0.652
Maximum target	1.50	0.333
Minimum investment	1.25	0.201
Share premium	2.61	0.616
All-or-nothing	2.50	0.599

Table A3. Linear regression capital raised on platform, issuer and campaign features

Variables (measure)	1.A Platforms features only Estimate	Standard error	*p*-value	1.B Issuer features only Estimate	Standard error	*p*-value	1.C Campaign features only Estimate	Standard error	*p*-value	1.D All features Estimate	Standard error	*p*-value
Platform features												
Size (log of count)	*1.743*	*0.773*	*0.025***							0.900	0.754	0.183
Variety (index, 0 to 100)	0.135	0.124	0.279							*0.313*	*0.150*	*0.009****
Variety^2	*−0.002*	*0.001*	*0.014***							*−0.003*	*0.001*	*> 0.000****
Balance (index, 0 to 100)	*0.096*	*0.039*	*0.041***							*0.079*	*0.034*	*0.013****
Track record (log of count)	0.295	0.232	0.204							−0.012	0.251	0.952
Issuer features												
Geographical distance (km)				0.031	0.066	0.638				0.071	0.082	0.273
Shareholders (count)				*0.012*	*0.004*	*0.006****				0.008	0.005	0.272
Board members (count)				*0.189*	*0.098*	*0.055***				0.093	0.093	0.401
Industrial shareholders (binary)				*1.192*	*0.257*	*> 0.000****				*0.913*	*0.285*	*0.011****
Campaign features												
Business angels (binary)							*0.931*	*0.351*	*0.009****	0.288	0.350	0.480
Prize for subscription (binary)							0.747	0.478	0.120	0.669	0.488	0.151
Equity retention (log of percent)							0.262	0.168	0.121	0.139	0.189	0.486
Fork width (percent)							−0.001	0.012	0.950	0.004	0.010	0.687
Maximum target (log of €)							0.385	0.267	0.151	0.083	0.332	0.750
Minimum investment (log of €)							0.172	0.154	0.263	*0.389*	*0.192*	*0.082**
Share premium (log of €)							0.003	0.129	0.979	−0.070	0.150	0.620
Take-it-all (binary)							1.263	1.107	0.255	0.613	1.070	0.442

Note(s): OLS estimation results. The response variable is the logarithm of Raised Capital. Effects of explanatory variables with marginal probability values of 10% or less are typed as italic face and significance is encoded as: "***" 0.01 "**" 0.05 "*" 0.10. Standard errors are heteroscedasticity-robust (Long and Ervin, 2000). The sample size is 233 campaigns lunched from year 2014 and 2018

Table A4.
Linear regression of relative success on platform, issuer and campaign features

Variables (measure)	2.A Platforms features only Estimate	Standard error	*p*-value	2.B Issuer features only Estimate	Standard error	*p*-value	2.C Campaign features only Estimate	Standard error	*p*-value	2.D All features Estimate	Standard error	*p*-value
Platform features												
Size (log of count)	−0.779	1.103	0.481							−0.463	4.080	0.556
Variety (index, 0 to 100)	*0.242*	*0.111*	*0.030***							*0.232*	*0.782*	*0.033***
Variety^2	*−0.002*	*0.001*	*0.018***							*−0.002*	*0.108*	*0.016***
Balance (index, 0 to 100)	−0.031	0.065	0.633							−0.015	0.001	0.735
Track record (log of count)	−0.157	0.201	0.433							−0.023	0.216	0.279
Issuer features												
Geographical distance (km)				0.051	0.048	0.288				0.065	0.054	0.228
Shareholders (count)				*0.018*	*0.003*	*> 0.000****				*0.018*	*0.007*	*0.008****
Board members (count)				0.056	0.081	0.492				0.058	0.079	0.462
Industrial shareholders (binary)				*0.748*	*0.235*	*0.002****				*0.863*	*0.306*	*0.005****
Campaign features												
Business angels (binary)							*0.869*	*0.267*	*0.001****	0.263	0.239	0.273

(*continued*)

Table A4.

Variables (measure)	2.A Platforms features only Estimate	Standard error	*p*-value	2.B Issuer features only Estimate	Standard error	*p*-value	2.C Campaign features only Estimate	Standard error	*p*-value	2.D All features Estimate	Standard error	*p*-value
Prize for subscription (binary)							*0.693*	*0.339*	*0.049***	0.137	0.419	0.744
Equity retention (log of percent)							*0.206*	*0.110*	*0.063**	0.030	0.096	0.751
Minimum investment (log of €)							−0.026	0.213	0.904	0.030	0.232	0.899
Share premium (log of €)							*0.046*	*0.028*	*0.096**	0.013	0.027	0.619

Note(s): OLS estimation results. The response variable is the logarithm of the ratio of raised capital to the minimum target. Effects of explanatory variables with marginal probability values of 10% or less are typed as italic face and significance is encoded as: "***" 0.01 "**" 0.05 "*" 0.10. Standard errors are heteroscedasticity-robust (Long and Ervin, 2000). The sample size is 211 campaigns lunched from year 2014 and 2018

Table A5.
Logistic regression of success on platform, issuer and campaign features

Variables (measure)	3.A Platforms features only Coefficient	APE	Standard error	*p*-value	3.B Issuer features only Coefficient	APE	Standard error	*p*-value	3.C Campaign features only Coefficient	APE	Standard error	*P*-value	3.D. All features Coefficient	APE	Standard error	*p*-value
Platform features																
Size (log of count)	0.096	0.002	0.01	0.878									0.312	0.004	0.011	0.77
Variety (index, 0 to 100)	0.257	0.045	0.183	0.015**									*0.312*	*0.047*	*0.019*	*0.016***
Variety^2	*−0.002*	*0*	*0*	*0.002****									*−0.003*	*0*	*0*	*0.003****
Balance (index, 0 to 100)	−0.021	−0.004	0.006	0.537									−0.001	0	0.007	0.986
Track record (log of count)	0.084	0.002	0.005	0.66									−0.132	−0.003	0.005	0.568
Issuer features																
Geographical distance (km)					0.024	0.001	0.003	0.704					0.078	0.003	0.003	0.318
Shareholders (count)					0.034	0.021	0.022	0.336					0.03	0.009	0.021	0.667
Board members (count)					*0.113*	*0.006*	*0.004*	*0.097**					0.06	0.005	0.003	0.163
Industrial shareholders (binary)					*0.772*	*0.135*	*0.06*	*0.026***					*0.706*	*0.102*	*0.061*	*0.093**
Campaign features																
Business angels (binary)									*0.133*	*0.057*	*0.019*	*0.026***	0.271	0.04	0.056	0.47
Prize for subscription (binary)									*0.229*	*0.058*	*0*	*0****	*1.52*	*0.181*	*0.072*	*0.011***
Equity retention (Log of percent)									0.293	0.01	0.007	0.158	0.164	0.005	0.006	0.456
Fork width (percent)									0.005	0.002	0.003	0.002	*0.027*	*0.004*	*0.002*	*0.018***
Maximum target (log of €)									*−0.001*	*0*	*0.087*	*0.093**	*−0.686*	*−0.001*	*0*	*0.022***
Minimum investment (log of €)									0	0	0.435	0.523	0.34	0	0	0.31
Share premium (log of €)									0.008	0.025	0.748	0.315	−0.06	−0.009	0.023	0.695
Take-it-all (binary)									−0.113	0.094	0.226	0.191	−0.966	−0.124	0.092	0.175

Note(s): ML estimation results. The binary response variable equal one if raised capital achieved the minimum target for campaign success and zero if it did not. Effects of explanatory variables with marginal probability values of 10% or less are typed as italic face and significance is encoded as: "***" 0.01 "**" 0.05 "*" 0.10. Both model coefficients and average partial effects (APEs) are shown, standard errors and marginal probabilities refer to the latter. The sample size is 233 campaigns lunched from year 2014 and 2018