The role of equity crowdfunding campaigns in shaping firm innovativeness: evidence from Italy

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Abstract

Purpose – This paper aims to contribute to the scientific debate concerning the impact of equity crowdfunding on the performance of crowdfunded firms after campaigning. To this aim, the purpose of this paper is to investigate the relationship between the characteristics of the campaign and the subsequent firm innovativeness.

Design/methodology/approach – This study adopts a quantitative research approach to evaluate if the entrepreneurial choices affecting the characteristics of the equity crowdfunding campaigns have an impact on the post-campaign firm innovativeness.

Findings – The results of the models show that the campaign characteristics have a direct impact on the firm innovativeness, both in terms of offering and communication and the campaign performance.

Originality/value – This paper presents one of the first studies to investigate the relationship between the choice of campaign characteristics and the post-campaign firm innovativeness. As such, the study contributes to both the literature concerning start-up innovation and the literature about the impact of equity crowdfunding.

Keywords Equity crowdfunding, Firm innovativeness, Innovation, Performance, Italy, Post-campaign

Paper type Research paper

1. Introduction

In today's age, entrepreneurs can leverage several sources of financing to heighten the effectiveness of their innovation attempts. Among them, crowdfunding – originally a form of microfinance that allows capital to be raised from the financial contribution of many individuals (Bruton *et al.*, 2015) – has become a widespread practice and focus of increased academic interest (Lagazio and Querci, 2018).

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Several crowdfunding models have emerged, and among them, equity crowdfunding is one of the fastest-growing (Walthoff-Borm *et al.*, 2018). It allows entrepreneurs to make open campaigns for selling equity shares of their start-ups to the crowd (Ahlers *et al.*, 2015) through specific platforms that connect them with investors (Kleinert *et al.*, 2021). This often attracts a large audience of small amateur investors (Polzin *et al.*, 2017; Vismara, 2018). As a result, backers gain a share of the venture they supported proportionate to the amount of funding they have provided, which may present them with rights of involvement in the governance.

Equity crowdfunding is considered to provide strategic advantages to entrepreneurs and their firms, particularly in easing the search for investors (Schwienbacher and Larralde, 2012), protecting ownership and increasing control (Ahlers *et al.*, 2015; Vismara, 2016), and allowing to access larger pool resources, knowledge and networks (Belleflamme *et al.*, 2014). Thus, it provides collaborative opportunities to collect early feedback to improve products, processes and business models, representing a significant source of knowledge-based inputs when pursuing innovations (Troise *et al.*, 2021). However, the scientific debate on equity crowdfunding is still in its infancy (Mochkabadi and Volkmann, 2020), and its impact on innovation outcomes is theorised; however, it is still underexplored in terms of empirical verification (Wachs and Vedres, 2021). In particular, various studies have explored the relationship between equity crowdfunding campaigns and the financial performance of firms (e.g. Feola *et al.*, 2021), as well as that between innovation and its financial performance (e.g. Löfsten, 2014). Nevertheless, scholars' investigation of the relationship between equity crowdfunding and firm innovativeness is still underdeveloped. Therefore, to fill this gap, the present study empirically investigates the impactful relationship between the characteristics of the equity crowdfunding campaign and the post-campaign performances related to innovation and innovativeness of the crowdfunded venture. The study focuses on the Italian context, which was among the first in which the equity crowdfunding system was developed and regulated, with the specific purpose of encouraging the birth and development of innovative start-ups and, therefore, allowing these firms to collect funds through non-conventional financing sources.

The paper is structured as follows: following the introduction, we develop a literature review section that sets the boundaries of the investigation by presenting previous studies on the theorised relationship between crowdfunding and innovation and the correlation between innovativeness and performance. Then, we develop novel hypotheses on the importance of equity crowdfunding campaigns, their communication and offering characteristics, and firm innovativeness. After that, the methods and results are presented in the third and fourth sections, respectively. The main findings, highlighting the impact of equity crowdfunding campaigns on the innovativeness of the venture are then discussed, followed by conclusions derived with a set of possible research avenues to be investigated by future studies.

2. Literature review and hypotheses

2.1 Crowdfunding and innovation

Crowdfunding is a form of microfinance through which entrepreneurs raise funds for their firms (Bruton *et al.*, 2015). It typically consists of relatively small financial contributions by numerous individuals through online channels without standard financial intermediaries (Mollick, 2014). Often, crowdfunding campaigns are promoted on dual-sided online platforms that facilitate connections between fundraisers (i.e. entrepreneurs) and providers of funds (i.e. backers) (Lagazio and Querci, 2018). Today, crowdfunding is a popular alternative to traditional financing systems for raising funds in early-stage business operations (Vulkan *et al.*, 2016). In crowdfunding campaigns, backers play multiple roles; they can be seen as co-investors, co-founders, co-creators and co-producers of new market propositions (Agrawal and Rahman, 2015; Ordanini *et al.*, 2011). Thus far, extant literature has identified four main types of crowdfunding: donations-based, rewards-based, lending and equity crowdfunding (Kuti and Madarász, 2014). Donations and rewards-based are forms of non-financial crowdfunding campaigns in which funders either expect no return or receive a non-monetary reward, while lending and equity crowdfunding represent investment opportunities leading to financial returns for the backers.

There is a high convergence among scholars that initiating crowdfunding campaigns pertains to an entrepreneur's strategy, as crowdfunding considerably differs from more traditional financing solutions. The choice of equity crowdfunding provides a series of strategic advantages to entrepreneurs. First, it is based on online call processes, which considerably limit the needed resources in the search for investors (Schwienbacher and Larralde, 2012). Second, it allows setting the upbound limit of equity issuance to protect ownership and control (Ahlers *et al.*, 2015; Vismara, 2016). Third, it opens the path to sell equity to large crowds of investors, rather than concentrating such shares in the hands of a few big players (Belleflamme *et al.*, 2014). From an entrepreneurial viewpoint, equity crowdfunding is an opportunity to collect feedback on entrepreneurial ideas, improve products, refine processes and adapt business models' collaborative approaches. From a backer's point of view, equity crowdfunding is the riskiest crowdfunding practice as it embeds a non-zero chance of losing the whole invested value while representing an investment that can lead to appealing financial returns in the future (Coakley and Lazos, 2021).

Furthermore, equity crowdfunding acts as a lever to reduce the distance between entrepreneurs and large crowds of potential investors. Also, equity crowdfunding allows consumers to shape entrepreneurial ideas according to their preferences and needs (Belleflamme *et al.*, 2014; Estrin *et al.*, 2018). Consequently, the enhanced public exposure of entrepreneurial projects helps growing businesses to develop an adequate market through iterative steps of idea refinement and builds consumer loyalty, grounding their roots on the concert of stakeholders and their variety of viewpoints in developing and commercialising ideas (Di Pietro *et al.*, 2017). In fact, during the early stages of a business, the openness of the business paradigm to external knowledge compensates for the relative scarcity of resources and capability of the nascent venture. Moreover, the open innovation paradigm favours improvements in product, strategy and market knowledge, and network ties (Chesbrough, 2003). Consistently, when entrepreneurial ideas are presented to many potential investors, such exposition propels innovation in a way that increases entrepreneurs' awareness concerning the potential of their ideas and leverages collaborative approaches to enhance the chances of survival and growth of their business (Di Pietro *et al.*, 2017). In this perspective, crowdfunding campaigns induce direct and indirect benefits for entrepreneurs through the activation of virtuous circles. In particular, crowdfunding campaigns captivate stakeholders by increasing their engagement in the development processes and generate salience around an entrepreneurial idea for it to reach a greater audience of potential investors and consumers, facilitating access to additional sources of funds and revenues (Belleflamme *et al.*, 2014; Giones and Oo, 2017). To date, Wald *et al.* (2019) noted that entrepreneurs launching equity crowdfunding campaigns enjoy several inward benefits, such as the acquisition of knowledge and expertise through continuous interactions with the investors, the implementation of more effective strategies and the access to new potential investors, and outward benefits such as network building opportunities and media exposure. Overall, equity crowdfunding practices are not merely finalised to access funds but also to develop the brand image, gain external insights from an expert audience, build loyal consumer bases, and enhance firm survival and success.

In an emergent stream of research, scholars noted that the benefits linked to equity crowdfunding campaigns are connected to innovation outcomes, as the constant interactions between entrepreneurs and backers often generate reciprocal self-esteem and favour the creation of innovative climates which rely on learning and collaboration among various stakeholders (Efrat and Gilboa, 2020). In Alalwan *et al.*'s (2022) analysis of

500 entrepreneurs, it was found that entrepreneurial engagement in equity crowdfunding activities enhances knowledge acquisition and firm innovativeness. Stanko and Henard (2017) argued that backers are vital sources of open inbound innovation as they are the main actors in knowledge creation via continuous interactions with entrepreneurs on entrepreneurial ideas they invest in. Through this lens, equity crowdfunding practices can be conceptualised as organisational innovations which foster the creativity of entrepreneurs (Testa *et al.*, 2019). They combine aspects of traditional financial intermediation with collaborative approaches so that the amount of funds raised becomes a public testament of quality and profitable entrepreneurial opportunities to stimulate innovation. Different from professional investors, the backers of equity crowdfunding campaigns are involved in several operational activities which demand their active role in the development of an entrepreneurial idea and provision of their market knowledge (Di Pietro *et al.*, 2017). In fact, equity crowdfunding campaigns enable creators to enter loops of iterative refinement of high-risk ideas and expert feedback and spread the chances of supporting original ideas among the crowd (Wachs and Vedres, 2021). Accordingly, Wachs and Vedres (2021), in their study of the board game industry theorised and found empirical support for their hypothesis that the innovative potential of crowdfunding goes beyond an initial entrepreneurial idea, as such bottom-up logic, which characterises crowdfunding campaigns propel idea development processes, which can spread along multiple industry trajectories. As a result of bottom-up paths in the financing and implementation of entrepreneurial ideas, the commercialisation of innovations (Mollick and Robb, 2016) is democratised, and they offer the possibility to actively take part in the innovation processes by creating a direct connection with entrepreneurs to many individuals (Hervé and Schwienbacher, 2018). Additionally, as new shareholders, the backers can exert influence on the venture's innovation trajectory (Walthoff-Borm *et al.*, 2018).

Concerning the relationship between crowdfunding practices and innovations, several scholars provide literature with valuable insights. For example, Gamble *et al.* (2017) observed that crowdfunding practices influence business model innovations, while Callaghan (2014) and Di Pietro *et al.* (2017) noted that crowdfunding practices have a direct and positive impact on crowdsourced R&D, product and process innovations. Furthermore, scholars highlighted that crowdfunding practices also influence organisational innovations (Palacios *et al.*, 2016; Vasileiadou *et al.*, 2016). Stanko and Henard (2017) showed that crowdfunding practices prepare the ground for radical innovations inside the venture in their empirical analysis of funded Kickstarter campaigns, by involving consumers in idea development processes. In a similar vein, scholars observed that equity crowdfunding practices foster firm innovation and new product success in the market as they allow investors to incorporate their own preferences in the development of the new entrepreneurial idea and serve as catalysts for triggering innovative activities inside the venture (Klewitz and Hansen, 2014; Walthoff-Borm *et al.*, 2018). Not only does such incorporation of large public preferences trigger innovation, but it is positively related to the financial performance of the venture. Rather, the activation of participative processes increases the likelihood that investors also become consumers in the light of their proactive role (Yao and Zhang, 2014; Zhang and Chen, 2019) and stimulate co-creation pathways. Despite the various theoretical studies highlighting the relationship between equity crowdfunding practices and innovation, we found a limited number of empirical studies which analysed how the strategic choice to leverage equity crowdfunding influences the innovativeness of nascent firms. Also, scholars recognised that the careful choice of characteristics of equity crowdfunding campaigns has profound implications for the outcomes of the campaign itself.

2.2 The link between firm innovativeness and performance

Innovation can occur in processes, products, technologies, business models, platforms and methods (Johannessen *et al.*, 2001; Robertson *et al.*, 2021), entailing inventions and their exploitations (Roberts, 1998). More specifically, "an innovation consists of certain technical knowledge about how to do things better than the existing state of the art" (Teece, 1986, p. 288). Thus, to achieve innovative outcomes, firms have to develop advanced technological capabilities. In turn, technological capabilities originate from R&D expenditures, intangible assets, laboratories, education, networks and imitating capabilities (Christensen, 1996). In sum, innovation is a complex phenomenon in organisations, and its multidimensional nature makes it challenging to capture innovation. Generally accepted measures of innovation are based on R&D expenditures, a number of patents or patentable processes, and products (Gunday *et al.*, 2011; Walthoff-Borm *et al.*, 2018). Innovation constitutes a determinant element of corporate strategies as it stimulates more productive manufacturing processes and greater financial performances, and contributes to the creation of positive reputations among consumers (Gunday *et al.*, 2011). This idea is corroborated by Löfsten (2014) in his study of Swedish medium-sized technology-based industrial firms with R&D. Löfsten (2014) theorised and found empirical support for the positive causal relationship between innovation and financial performance. Similarly, in Le Pendeven and Schwienbacher's (2021) study of four large equity crowdfunding platforms, it was observed that more innovative business projects have a greater capacity to attract investors and achieve success. Thus, devoting significant attention to achieving great innovation can constitute a triggering mechanism for reaching firms' financial objectives.

The choice for equity crowdfunding relates to innovation *per se*. In fact, equity crowdfunding as an alternative source of financing is considered a radical financial innovation, which considerably differs from more traditional financing systems (Kuti and Madarász, 2014; Shiller, 2013). Since equity crowdfunding campaigns expand idea generation and external feedback phases, they play an important role in determining firm innovativeness (Hervé and Schwienbacher, 2018). From this perspective, equity crowdfunding can be considered a solution to fund innovative projects that would not have been funded otherwise. Also, extant literature unfolds the mechanisms under which equity crowdfunding campaigns can be closely connected with innovative outcomes. Equity crowdfunding can exert a direct influence on the innovation process making the crowd join entrepreneurs in innovative efforts. For example, crowds can suggest new ideas in the product development phases to meet the demand of a wider public. For this reason, crowdfunding is often associated with crowdsourcing, including the crowd in the innovation process (Schwienbacher and Larralde, 2012). In fact, the synthesis of crowdfunding and crowdsourcing presents an opportunity for new paradigms of innovation (Callaghan, 2014). This synthesis bridges the knowledge of the entrepreneur with the experience and competencies of a broad audience. Weaknesses of entrepreneurial projects are exposed to the crowd and improved through its variety of viewpoints. Further developments contribute to innovation outcomes for the entrepreneur and to further valuable investment opportunities for the crowd. This paradigm permits the crowd to position itself in a place where it can improve the means by which entrepreneurs develop new market propositions. Given its open approach, equity crowdfunding represents a significant source of innovation for entrepreneurs, as it consistently deals with the development of ideas and the testing of products, processes and the business model itself (Paschen, 2017; Stanko and Henard, 2016). Thus, equity crowdfunding campaigns provide several non-financial benefits that can potentially contribute to both innovation and financial performance. Extant literature corroborates the value of the feedback that is obtainable by leveraging equity crowdfunding campaigns (Belleflamme *et al.*, 2014). Particularly, the importance of such literature has been long-windedly recognised both in the fields of marketing and innovation management (e.g. Lovelock and Young, 1979; Mahr *et al.*, 2014; Prahalad and Ramaswamy, 2004). Although the crowd is, in principle, constituted of investors and not consumers, scholars have noted that investors have a great likelihood of becoming consumers of the entrepreneurial firm in which they invest through equity crowdfunding campaigns (Stanko and Henard, 2017). In fact, equity crowdfunding enables similar interactions to co-creation mechanisms (Belleflamme *et al.*, 2014; Brem *et al.*, 2019). Also, in light of their advanced knowledge and experience in the field and project, some investors are granted advisory board positions. This contributes to the creation of an innovative climate in which entrepreneurs are exposed to and benefit from a knowledge of crowds (Walthoff-Borm *et al.*, 2018). It allows firms that adopt equity crowdfunding to exercise more intense innovative activity. Walthoff-Borm *et al.* (2018) proxied innovation with the intangible assets' ratio and the number of patent applications and found that equity crowdfunded firms experience a more robust patenting application activity than the ones recurring to alternative funding practices.

Several authors provide arguments on the positive and strong relationship between equity crowdfunding and innovation outcomes; however, this connection is underexplored in empirical research (Wachs and Vedres, 2021). Only a handful of studies explore how equity crowdfunding influences the innovation activity and performance of entrepreneurial firms. The pursuit of firm innovativeness is of paramount importance for facilitating the achievement of financial goals (Löfsten, 2014).

2.3 Equity crowdfunding post-campaign performance

Equity crowdfunding plays a determinant role in financing entrepreneurial firms allowing founders to benefit from financial resources not recurring in traditional financing systems (Bruton *et al.*, 2015). Entrepreneurial firms embed considerable risks of failure (Schwienbacher, 2018; Signori and Vismara, 2016, 2018). Additionally, equity crowdfunding platforms are highly selective (Hervé and Schwienbacher, 2018). For example, several authors indicated that equity crowdfunding platforms in Europe have acceptance rates below 5% (Hervé *et al.*, 2017; Hornuf and Schwienbacher, 2018). Still, even after the selection process, success is not guaranteed. Mollick (2014) showed that 5% of Kickstarter projects failed to deliver the expected products, while only 25% of financed projects delivered products on time. This suggests that when a campaign reaches its funding target, it is the result of the successful development of a project which is able to capture a large number of participants. In this regard, Troise *et al.* (2022), in their study of seven Italian equity crowdfunding platforms, found that relational capital also positively affects the success of equity crowdfunding campaigns. Successful equity crowdfunding campaigns build the preconditions for enduring businesses. However, the completion of an equity crowdfunding campaign is a starting point in the entrepreneurial journey of development and commercialisation of a business idea. For this reason, scholars are increasingly interested in the investigation of post-campaign performances of funded projects (Colombo and Shafi, 2019). Di Pietro *et al.* (2017) found that equity crowdfunding investors contribute to the funded venture's post-campaign likelihood of survival by providing product and market knowledge, and network ties with relevant stakeholders. Cumming *et al.* (2019) observed that post-campaign performance depends on the adopted crowdfunding model since each model leads to different investment stakes. Precisely, the authors contended that equity crowdfunding models provide backers with greater investment stakes and, thus, are likely to increase their engagement in the business development process. In Signori and Vismara's (2016) studies of successfully funded equity crowdfunding campaigns on Crowdcube, they observed that various post-campaign scenarios can emerge. For example, the authors found that entrepreneurs who succeeded in equity crowdfunding campaigns in the past exhibited a greater likelihood of entering into a new equity crowdfunding campaign to raise additional capital.

The authors also found that, in other cases, entrepreneurs lose money by investing in firms that fail soon after. Interestingly, the authors also noted that the extent to which investors participate in the initial offering significantly influences the prospects of the venture. Specifically, firms backed by a relatively small number of investors are more likely to issue further equity than those backed by a relatively large number of investors. The authors also highlighted that the speed at which capital is raised positively influences the likelihood of launching a follow-on equity crowdfunding campaign. Additionally, a strong indicator of post-campaign survival likelihood in the long term is the presence of qualified investors (e.g. venture capitalists or business angels) in the initial offering. In Coakley *et al.*'s (2018) study of equity crowdfunding campaigns launched on Crowdcube, Seedrs and SyndicateRoom, the authors analysed the probability of conducting a follow-on equity crowdfunding campaign. Interestingly, the authors found that such probability is positively influenced by novel platforms, overfunding on the initial campaign, the presence of lead investors and those with a nominee shareholder account structure that protects the rights of all equity crowdfunding shareholders. Hornuf and Schmittt (2018) found in their study of Germany and the United Kingdom that the number of senior managers and initial venture capital investors positively influences post-campaign financing performance. Interestingly, the average age of the senior management team played a negative role in such relationships. Since crowdfunding practices reduce requirements for long-term debt (negatively related to growth rates) they enhance growth opportunities and value creation, opening the path towards financing expansion (Cumming *et al.*, 2019). Corroborating these ideas, Eldridge *et al.* (2021) found empirical support for their hypothesis that the choice of equity crowdfunding will likely increase growth opportunities. In fact, as the authors argued, this is possible for two main reasons. First, active participants on equity crowdfunding platforms interact with each other creating wisdom-of-crowd effects (Surowiecki, 2004). Wisdom-of-crowd effects lead equity crowd investors to choose firms that are more likely to create value and provide constant valuable feedback to entrepreneurs (Cumming *et al.*, 2019; Polzin *et al.*, 2017). Second, information cascades serve as speedy channels which favour knowledge transfer from consumers to entrepreneurs (Vismara, 2018). Accordingly, Troise *et al.* (2020) provided novel insights on this issue, showing that the amount of equity offered, product innovation and the prior industry experience of the founders positively affect the growth of equity crowdfunded firms. In a similar vein, Eldridge *et al.* (2021) focused on the financial post-campaign performance of firms recurring to equity crowdfunding practices. There are several reasons why equity crowdfunding campaigns might positively affect a firm's financial performance post-campaign. Among others, equity crowdfunding practices allow unique selection mechanisms and a series of non-financial benefits. The former class of mechanisms assumes that firms that succeeded in equity crowdfunding campaigns were scrutinised and survived the wisdom-of-crowd effects. The latter comprises extra benefits (i.e. non-financial) that positively and indirectly contribute to a firm's post-campaign financial performance. For example, entrepreneurs adopting this funding option often recur to the use of online equity crowdfunding platforms providing an ad hoc forum in which entrepreneurs collect feedback on their business ideas (Belleflamme *et al.*, 2014, 2015). In turn, feedback from the crowd can guide entrepreneurs in the incorporation of prospective consumers' preferences into their initial propositions (Walthoff-Borm *et al.*, 2018). Taken together, the unique selection mechanisms that distinguish equity crowdfunding campaigns and the non-financial benefits result in a higher financial performance among equity crowdfunded firms than firms relying on other sources of capital. Likewise, Eldridge *et al.* (2021) theorised and found empirical support for their hypothesis, which postulated that leveraging on equity crowdfunding practices has beneficial post-campaign effects on the firm financial performance because of the role of crowdfunding platforms. Crowdfunding platforms activate feedback mechanisms and wisdom-of-crowd effects, which improve the operations of firms, as well as their financial post-campaign performance (Eldridge *et al.*, 2021; Walthoff-Borm *et al.*, 2018). Nonetheless, Walthoff-Borm *et al.* (2018) in their empirical analysis of UK firms successfully financed through equity crowdfunding campaigns on Crowdcube and Seedrs, did not find empirical support for their hypothesis that equity crowdfunded firms exhibit higher financial performance than those recurring to other sources of capital.

Extant literature widened research on the effects of equity crowdfunding campaigns on post-campaign performance, highlighting that firms funded through equity crowdfunded campaigns gain legitimacy and achieve significant levels of innovativeness. However, several factors can come into play in determining the firm innovativeness as a result of equity crowdfunding campaigns. For example, more funds can give access to new business opportunities, which might favour innovativeness. Similarly, while the presence of a relatively large number of investors propels information cascades and wisdom-of-the-crowd effects positively influence growth outcomes, a relatively small number of (larger) investors might increase their commitment to proactively engage in the business activity and offer innovative variations to the existing business model of the venture. Therefore, we propose:

H1. When firms recur to equity crowdfunding, firm innovativeness is influenced by the campaign performance (e.g. percentage of funding collected at the end of the campaigns, funds collected, the number of investors who have participated in the campaign).

2.4 Characteristics of equity crowdfunding campaigns

Equity crowdfunding campaigns are based on investment decision criteria that make this practice distinct from venture capitalists and business angels (Lukkarinen *et al.*, 2016). The outcomes of equity crowdfunding campaigns depend on a broad arrow of factors involving both entrepreneurs and their projects (Ahlers *et al.*, 2015; Block *et al.*, 2018; Hopp *et al.*, 2019; Polzin *et al.*, 2017). Among others, scholars found that the characteristics of crowdfunding campaigns exert significant influence on equity crowdfunding campaigns' success. Such results are consistent with the signalling theory (Spence, 1973), which suggests that entrepreneurs have to be careful about their choices, as they inevitably produce signals for the outside. Choosing the right campaign characteristics can mitigate information asymmetries by improving investors' knowledge about a given entrepreneurial idea and illuminating its potential (Ahlers *et al.*, 2015). In principle, entrepreneurs who address efforts towards the production of signals of venture quality will experience greater success (Coakley *et al.*, 2018; Wang *et al.*, 2019). Precisely, the likelihood of success of equity crowdfunding practices is influenced by campaign offering and communication characteristics (Lukkarinen *et al.*, 2016; Troise and Tani, 2020).

As regards campaign offering, scholars observed that funding targets, minimum required investments, duration, provision of financials and the proportion of equity offered are often pre-determined by entrepreneurs and crowdfunding platforms before campaigns begin (Lukkarinen *et al.*, 2016; Vulkan *et al.*, 2016). Funding targets relate to "all-or-nothing" and "keep-it-all" alternative options. The former offers entrepreneurs the opportunity to set a minimum target funding goal and to finance a given project only if such a goal is achieved, while failure to achieve this funding threshold leads to campaign failure. This approach to funding embeds the security to entrepreneurs that the realisation of entrepreneurial ideas is subordinate to achieving a pre-defined goal. Conversely, entrepreneurs adopting the latter approach keep any funds that they were able to collect during the campaign (Hakenes and Schlegel, 2014). Another offering characteristic of equity crowdfunding campaigns is the set of a minimum investment cut-off. In detail, equity crowdfunding campaigns typically require investments above a pre-defined minimum amount of money (Ahlers *et al.*, 2015; Ordanini *et al.*, 2011). However, setting a minimum investment cut-off point does not significantly impact the financial outcomes of equity crowdfunding campaigns (Ahlers *et al.*, 2015). In the analysis of the overall duration of equity crowdfunding campaigns, authors arrived at divergent results (e.g. Burtch *et al.*, 2013; Zheng *et al.*, 2014). The rationale behind these differences could lie in the twofold message that may arise as a result of setting great campaigns' duration. In fact, while campaigns which remain open for a greater time are more visible and allow to reach a wider number of potential investors, they can also be perceived as an indication of a lack of confidence in the capability of a project to generate positive cash flows (Vismara, 2016), and thus making the campaign less attractive (Mollick, 2014). Also, scholars examined how the provision of financial influences the success of equity crowdfunding campaigns. Specifically, the attachment of financial information (i.e. historical or forecast financial figures) to an equity crowdfunding campaign positively influences the amount of money collected. To avoid negative effects on the financial outcomes of the campaign, entrepreneurs should provide a disclaimer explaining why such information is missing (Ahlers *et al.*, 2015). Finally, prior studies pointed out that a high proportion of equity offered is negatively related to the campaign's financial performance, as it can be interpreted as a low commitment of the entrepreneur. Consistently, high ownership retention is often perceived as an indicator of great quality projects by potential investors (Vismara, 2016).

As well as offering characteristics, communication characteristics communicate to potential investors relevant signals on the quality of a business idea, and the credibility of an entrepreneurial project (Vismara, 2016). Therefore, communication characteristics provide the audience of potential investors with insights into how entrepreneurs present their projects, as well as their own confidence and values. In other words, the choice of communication characteristics of an equity crowdfunding campaign shapes the perception of potential investors, allowing them to better position an entrepreneurial idea in terms of potential and interest. Communication characteristics of equity crowdfunding campaigns concern how much entrepreneurs disclose details on their business ideas, adopt different communication styles and social networks, and link their equity crowdfunding campaign with various media (e.g. videos, images, textual messages) making campaigns attractive while sending appealing signals to potential investors (Ahlers *et al.*, 2015; Piva and Rossi-Lamastra, 2018; Vismara, 2016). To begin with, prior studies highlighted that information disclosure is perceived as an indicator of quality and thus has a positive effect on equity crowdfunding performance (Colombo *et al.*, 2015). For this reason, effectively presenting an entrepreneurial idea through detailed descriptions and fine-grained analysis of feasibility increases the likelihood of success. Similarly, communication with investors through the adoption of a narrative style and visual clues are perceived as signals of venture quality (Block *et al.*, 2018; Mahmood *et al.*, 2019; Parhankangas and Renko, 2017). Di Pietro *et al.* (2021) corroborated extant evidence on the importance of choosing appropriate communication styles, noticing that potential investors care about the extent to which entrepreneurs provide updated and precise information to their audience. Moreover, Mollick (2014) theorised and found empirical support for his hypothesis that the provision of constant and timely updates about founders' projects during an equity crowdfunding campaign has a positive effect on the financial performance of the campaign. Therefore, entrepreneurs can extract considerable value from the adoption of ready and available communication with their potential investors when crowdfunding platforms allow the provision of information, while maintaining a narrative on the development of ideas. An additional option to accomplish the search for timely and updated information lies within the regular usage of social networks by entrepreneurs, which can be treated as levers to spread information and platforms to meet potential investors while facilitating interaction (Colombo *et al.*, 2015).

Entrepreneurs can overcome information asymmetries between the parties and boost the financial performance of their equity crowdfunding campaigns by using social networks to publicly present updated information of a given entrepreneurial idea (Vismara, 2016). Interestingly, extant literature highlighted that the number of connections of entrepreneurs on social networks simultaneously enhances the number of funds collected through equity crowdfunding campaigns and the number of investors attracted (Mollick, 2014; Colombo *et al.*, 2015; Vismara, 2016, 2018) while also facilitating inter-investor signalling by increasing the visibility of entrepreneurial ideas (Wang *et al.*, 2019). Another focal choice on communication characteristics of equity crowdfunding campaigns consists of the selection of media. Regarding this aspect, scholars noted that images and colours can be powerful means for attracting investors as they influence venture investment screening decisions (Chan and Park, 2015). The authors found empirical support for their hypothesis that presenting product images considerably increases the favourability in screening decisions.

As noted by Lukkarinen *et al.* (2016), the success or failure of an equity crowdfunding campaign is associated with several campaign characteristics attaining both offering and communication spheres. In the present study, we argue that these campaign characteristics not solely influence the financial performance of an equity crowdfunding campaign, but also the overall firm innovativeness for three main reasons. First, producing signals of great quality leads investors to commit more resources to the venture, favouring the emergence of new (often serendipitous) innovative business opportunities. Second, the embeddedness of entrepreneurs within social networks and the proactive behaviours of entrepreneurs online can enhance the integration of innovative ideas coming from the outside in the existing business model of the venture. Third, an appropriate communication strategy can directly affect the engagement of investors in entrepreneurial activities, thus affecting their innovative contributions.

Therefore, we formulate the following two hypotheses:

H2. When firms recur to equity crowdfunding, firm innovativeness is influenced by the campaign communication characteristics (e.g. the number of photos in the campaign presentation, the number of updates during the campaign, the presence of an active link to the entrepreneur's social media).

H3. When firms recur to equity crowdfunding, firm innovativeness is influenced by the campaign offering characteristics (the valuation that the firm had before starting the campaign, the equity offered, the minimum investment that every single investor had to underwrite to participate in the campaign).

In Figure 1 we report the proposed research model.

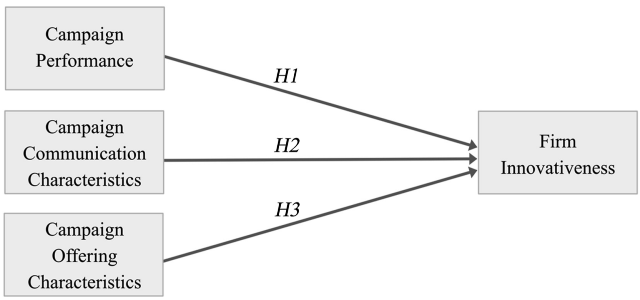

Figure 1.
Research model

3. Methods

3.1 Sample and setting

This study focuses on equity crowdfunding in Italy, among the first countries to introduce regulation for equity crowdfunding (in 2012) and create a national registry for equity crowdfunding operators (Vismara, 2016; Rossi and Vismara, 2018). Since then, the Italian equity crowdfunding market has rapidly grown in terms of collected funding to more than 430 million euros, campaigns launched and their success rate (about 79.3%) (Politecnico di Milano, 2022). The Italian context is a vibrant case for equity crowdfunding, and its policymakers are vigilant in improving the equity crowdfunding regulation, i.e. new regulation requires entrepreneurs to sell a minimum of 5% of equity to professional investors, banks or innovative start-up incubators as a way (Rossi and Vismara, 2018).

Several studies have been focused on equity crowdfunding in Italy, such as Piva and Rossi-Lamastra (2018), which examine the effects of human capital signals on entrepreneurs' success, or Feola *et al.* (2021) that segments the Italian equity crowdfunding investors' market to explore the investors' drivers when selecting investment proposals and investigate differences between segments. These reasons lead us to focus on Italy, a growing ecosystem rich with newness related to equity crowdfunding.

Data were collected from 12 authorised crowdfunding platforms officially included in the national public registry for equity crowdfunding operators. Campaign data referred to August 2019, resulting in a total of 115 campaigns. Performance data were collected in February 2022 from the AIDA (Italian company information and business intelligence – Bureau van Dijk) database, which includes financial and corporate data of Italian firms. Data were also triangulated with the Italian Chamber of Commerce registry of Innovative SMEs and Start-ups. The related data are shown in Table 1.

3.2 Measures

To reduce the method biases (Podsakoff *et al.*, 2012), we retrieved the data on the campaign characteristics and their performance, directly on the equity crowdfunding platforms.

We have measured equity crowdfunding performance using three proxies already used in literature (e.g. Vulkan *et al.*, 2016; Lukkarinen *et al.*, 2016; Vismara, 2016, 2018), i.e. the final percentage of funding collected, the final number of investors and the total funds collected (Ahlers *et al.*, 2015). The percentage of funding (percentage fund) collected at the end of the campaigns is a more fine-tuned measure of equity crowdfunding success; if the fundraising exceeds the target goal, it gives a measure of the success of the campaign, and it may measure its failure, when the funds raised do not reach the target goal (Vismara, 2016, 2018; Vulkan *et al.*, 2016). The final

Crowdfunding platform	Number of included campaigns
200Crowd	15
Assiteca Crowd	1
Back to Work 24	23
CrowdFundMe	31
Fundera	1
In-vestire	1
Lita	1
Mamacrowd	16
MuumLab	2
Opstart	11
Starsup	9
WeAreStarting	4
Total campaigns	*115*

Table 1. The distribution of campaign on the equity crowdfunding platforms

number of investors (NumInv) is a count variable, and it measures the crowd participation in terms of investors involved at the end of campaigns that invested in the project (Ahlers *et al.*, 2015; Vismara, 2016). This is an important measure of success as entrepreneurs aim to accumulate a large number of investors, and the logic of crowdfunding tools is to involve a large crowd. The last variable, funds collected (TotFund), indicates the total funding amount that was generated by the project (in € thousands) (Ahlers *et al.*, 2015; Vismara, 2018). It is a common proxy of equity crowdfunding success and measures the amount of capital raised at the end of the campaign.

Following previous studies (Troise and Tani, 2020), we have divided the campaign characteristics into two dimensions: the Campaign Communication Characteristics (CCC) and the Campaign Offering Characteristics (COC).

To understand how the equity crowdfunding campaign was designed by the crowd funders, we looked at three main variables that have already been used in the equity crowdfunding literature to account for the CCC: the number of updates (NumUd) (Mollick, 2014; Block *et al.*, 2018; Dorfleitner *et al.*, 2018), the number of images (NumImg) (Chan and Park, 2015; Kunz *et al.*, 2017), and if the entrepreneurs' had linked their own social networks accounts to the equity crowdfunding campaign (Sml) (Mollick, 2014; Vismara, 2016).

On the other side, we measured COC using three variables previously used in the literature (Vulkan *et al.*, 2016; Vismara, 2018; Troise and Tani, 2020): the equity offered (in the percentage of the total shares: EqOff) (Ahlers *et al.*, 2015; Vismara, 2016, 2018; Vulkan *et al.*, 2016); the valuation that the firm had before starting the campaign as presented in the campaign offer (ValPreM) (Vulkan *et al.*, 2016; Coakley and Lazos, 2021) (in € thousands), and the minimum investment that every single investor had to underwrite to participate in the campaign (MinInv) (Lukkarinen *et al.*, 2016) (in thousands of €).

Firm innovativeness (Innov) is a complex construct. As a consequence, we built a composite variable to take into consideration the three requirements that are considered by the Italian regulator to classify innovative firms. Consistently with previous research and the Italian legislation, we have operationalised the variable to account to what extent the firm would meet the following requirements: if the firm spent more than 3% of Revenues or Production Costs on R&D (Tseng *et al.*, 2011; Usai *et al.*, 2021), if at least one-third of their employees had a PhD (or if they had worked for at least three years in a certified research activity) (Kaiser *et al.*, 2018; Barge-Gil *et al.*, 2021), and if they registered at least one patent or software (Löfsten, 2014; Walthoff-Borm *et al.*, 2018). Four control variables were included: the total percentage of firm assets invested in intangibles (Intp); the percentage of the intangibles invested into patents (Patp); the firm revenues (Rev); and the number of employees (Emp). The full list of variables is reported in Table 2.

4. Results

To understand the effect of campaign characteristics on post-campaign innovativeness, we developed four robust regression analyses, as shown in the following Table 3. The robust regression (Draper and Smith, 1998; Fox, 2015) has been carried out using the MM-type regression estimator as described in Yohai (1987) and Koller and Stahel (2011) in R-Cran, package *robust base*.

In particular, in the first model, we tested the effect of the controls (Intp, Patp, Rev, Emp) on the firm innovativeness (Innov) to have a baseline.

In the second model, we have added performance variables, i.e. the percentage of overfunding (%Fund), the total fund collected using equity crowdfunding (TotFund) and the number of investors that have participated in the equity crowdfunding campaign (NumInv).

In the third model, we have added the CCC, i.e. the number of photos in the campaign presentation (NumImg), the number of updates during the campaign (NumUd), and the presence of an active link to the entrepreneur's social media (Sml).

Variable	Description	Source
Innov	Level of satisfaction of innovative SMEs or Start-ups requirements	Barge-gil *et al.* (2021), Kaiser *et al.* (2018), Löfsten (2014), Tseng *et al.* (2011), Usai *et al.* (2021), Walthoff-Borm *et al.* (2018)
TotFund	Total funding collected	Troise and Tani (2020), Vismara (2018)
%Fund	Total funding collected/funds asked	Vismara (2016, 2018), Vulkan *et al.* (2016)
NumInv	Number of Investors	Ahlers *et al.* (2015), Troise and Tani (2020), Vismara (2016)
EqOff	% of shares offered	Ahlers *et al.* (2015), Vismara (2016), 2018, Vulkan *et al.* (2016)
ValPreM	Valuation pre-money	Coakley and Lazos (2021), Vulkan *et al.* (2016)
MinInv	Minimum investment	Lukkarinen *et al.* (2016)
NumUd	Number of updates	Block *et al.* (2018), Dorfleitner *et al.* (2018), Mollick (2014)
NumImg	Number of photos	Chan and Park (2015), Kunz *et al.* (2017)
Sml	Presence of entrepreneurs social media link	Mollick (2014), Vismara (2016)
Intp	% assets in intangibles	
Patp	% intangibles in patents	
Rev	Revenues (thousands)	
Emp	Employees	

Table 2.
Description of variables

	Model 1		Model 2		Model 3		Model 4	
	Beta	*p*-value	Beta	*p*-value	Beta	*p*-value	Beta	*p*-value
Controls								
Intp	1.248	0.007(**)	1.272	0.008(**)	1.071	0.024(*)	0.763	0.032(*)
Patp	0.568	0.092(.)	0.760	0.078(.)	0.737	0.087(.)	0.853	0.023(*)
Rev	0.000	0.073(.)	0.000	0.233	0.000	0.531	0.000	0.201
Emp	0.046	0.006(**)	0.051	0.008**	0.052	0.011(*)	0.036	0.089(.)
Equity Crowdfunding Performance								
%Fund	–	–	0.001	0.385	0.000	0.583	0.001	0.509
TotFund	–	–	0.000	0.139	0.000	0.192	0.000	0.514
NumInv	–	–	−0.002	0.069	−0.002	0.070(.)	−0.003	0.049(*)
Campaign Communication Characteristics								
NumImg	–	–	–	–	−0.007	0.780	−0.020	0.419
NumUd	–	–	–	–	0.007	0.702	−0.006	0.674
Sml	–	–	–	–	0.405	0.107	0.452	0.037(*)
Campaign Offering Characteristics								
ValPreM	–	–	–	–	–	–	0.014	0.000(***)
EqOff	–	–	–	–	–	–	−0.027	0.165
MinInv	–	–	–	–	–	–	0.000	0.160
R^2	0.2743		0.2981		0.3305		0.4528	
Adj.R^2	0.2447		0.2464		0.2578		0.3658	

Note(s): (.): p-value ≤0.1; (*): p-value ≤0.05; (**): p-value ≤0.01; (***): p-value ≤0.001; Dependent Variable: Firm Innovativeness

Table 3.
Results of the model testing procedure

In the fourth model, we have added the COC, i.e. the valuation that the firm had before starting the campaign (ValPreM), the equity offered (EqOff), and the minimum investment that every single investor had to underwrite to participate in the campaign (MinInv).

As the results in Table 3 show, adding the various measures related to the equity crowdfunding campaign characteristics can help to understand the firm innovativeness; in particular, the data shows that adding the campaign performance and the campaign communication characteristics (as shown in Model 2 and Model 3) does not have a strong impact on the results, while even adding the campaign offer characteristics can be useful.

The last model highlights that the firm innovativeness is related to both the intangibles and, in particular, the value of the firm's patents. The campaign performance is not really relevant; the only significant variable is the number of investors, which may reduce the firm innovativeness, but the value of this effect is quite low; therefore, it may become relevant only for the biggest campaigns. Simultaneously, the results highlight that the firm innovativeness is tightly linked to the valuation the firm entered the campaign with, as more valuable firms are those proving to be more innovative in the long run. Even the presence of social media links is a significant factor in understanding the firm innovativeness.

We have found partial support for the H1 as no measure of the equity crowdfunding performance had a positive effect on the innovativeness performance of the company. The only significant effect is related to the number of investors; however, its effect is negative. Even given the dimension of the effect, it will be significant only in the biggest campaign. One potential explanation may be associated with the lower engagement that is related when there are many backers: it is more difficult for the entrepreneur to sort them out and to identify the relevant feedback from the less relevant ones.

In line with previous studies that theoretically argue a relationship between equity crowdfunding and innovation (Wachs and Vedres, 2021), we empirically found that the campaign's characteristics influence firm innovativeness. We have found limited support for the H2 on the capability of CCC to predict innovation performance. In particular, our results highlight a positive effect of correlating the entrepreneur's social media profile to the ECF campaign; this may be linked to the reduced information asymmetries (Vismara, 2016) taking place when entrepreneurs and potential investors have the opportunity to leverage social media to exchange ideas and provide suggestions, which, if adopted, improve innovation in the post-campaign period.

We have also found only partial support for H3. We found a significant effect only for the value pre-money showing that when the company/start-up is able to enter the campaign with an offer that has a better valuation will be able to get a better innovation performance. The other two proxies we have used (equity offered and minimum investment) do not significantly affect the innovation performance.

5. Discussion

While equity crowdfunding has received increasing attention from practitioners, the academic debate is still developing and gauging interest (Mochkabadi and Volkmann, 2020; Wachs and Vedres, 2021). Our study investigated the effects of equity crowdfunding characteristics on the innovativeness of firms in the post-campaign phase. Focusing on the Italian context, we enhanced the academic debate on the relationship between equity crowdfunding and innovation. In light of the results, equity crowdfunding appears as a valuable alternative to traditional financing systems. On the one hand, its unique selection method allows entrepreneurs to collect precious insights into their business ideas. On the other hand, the intimate link between the open innovation paradigm and equity crowdfunding can serve the market with original and validated market propositions.

5.1 Theoretical implications

This research extends extant literature in five ways. First, it provides insights into how the offering characteristics of an equity crowdfunding campaign can influence the firm innovativeness.

The literature agrees that disseminating information on the quality of the venture can positively influence its success (Coakley *et al.*, 2018; Wang *et al.*, 2019). Our article empirically demonstrates that the offering characteristics primarily influence the firm innovativeness. The results are in line with previous studies (Lukkarinen *et al.*, 2016; Troise and Tani, 2020), according to which the campaign's offering characteristics influence the success of equity crowdfunding operations. However, among the tested variables, only the company's evaluation before initiating the campaign was significant, as it was found to positively influence post-campaign innovativeness. This conclusion corroborates previous studies that setting a minimum investment does not significantly affect campaign outcomes (Ahlers *et al.*, 2015).

Second, it provides new insights into how campaign communication characteristics impact firm innovativeness. It shows that entrepreneurs recurring to equity crowdfunding can obtain several benefits not solely ascribable to financial performance. In particular, scholars have highlighted the effects of media use in making equity crowdfunding campaigns more attractive (Ahlers *et al.*, 2015; Piva and Rossi-Lamastra, 2018; Vismara, 2016). In general, the communication characteristics of an equity crowdfunding campaign can influence the company's innovativeness through the number of photos published, the number of information updates and the use of social media, which can favour attractiveness and interaction. Specifically, using social networks is a lever that can enhance the interaction between backers and entrepreneurs (Colombo *et al.*, 2015). This study intended to empirically demonstrate which variables associated with communication significantly influenced innovativeness in the post-campaign phase. Among the variables tested, only the presence of an active link to the entrepreneur's social media is significant, which positively influences innovativeness. Therefore, consistent with prior studies (Callaghan, 2014; Di Pietro *et al.*, 2017; Schwienbacher and Larralde, 2012), equity crowdfunding campaigns open the path towards new innovation paradigms. Equity crowdfunding is a financing system in which the open innovation paradigm fosters an innovative climate (Di Pietro *et al.*, 2017). In examining the effect of campaign communication characteristics on firm innovativeness, we respond to a call for more empirical research on how equity crowdfunding shapes entrepreneurial firms by being a vital source of innovation (Wachs and Vedres, 2021). For example, future researchers could empirically explore which factors lead to the involvement of crowd investors in co-creation and process innovation when adopting an open innovation perspective. Furthermore, qualitative empirical research could study how investors influence the strategy of start-ups, whereas quantitative research could analyse the factors that significantly influence the choices of entrepreneurs in identifying the stakeholders and networks involved in the co-creation processes (Di Pietro *et al.*, 2017). Moreover, this study corroborates the argument under which networking activities lay at the base of firm innovativeness of entrepreneurial firms, with social networking directly influencing the firm innovativeness. Open innovation serves as an enabler of innovative outcomes, which in turn may have a considerable effect also on a variety of performance outcomes. Thus, through this study, we highlight how proactive and populated environments favour the emergence of innovation and support entrepreneurial firms in achieving superior firm innovativeness.

Third, this study shows insights into the relationship between campaign performance and innovativeness, which can be considered somewhat controversial. Our study sheds light on this relationship by analysing the influence of the variables of equity crowdfunding performance on firm innovativeness. The results show that the percentage of funds raised and the value of the funds raised positively influence firm innovativeness, while the number of investors who participated in the campaign negatively affects it. The latter result is in line with Cumming *et al.* (2019), according to which larger shares of investments increase investor engagement in the business development process, positively influencing innovativeness in the post-campaign. However, this result contradicts the wisdom-of-crowd theory

(Surowiecki, 2004; Polzin *et al.*, 2017), according to which a large crowd of investors produces feedback capable of determining positive effects on innovativeness. In light of this inconsistency, we propose that empirical research seeks to clarify this controversial relationship, focusing on the wisdom-of-crowds effect on the firm's ability to innovate. Future research may benefit from fuzzy sets and non-parametric investigations of such relationships that could reveal the complexity and interactions among and between crowdfunding characteristics and firm performance (e.g. Caputo *et al.*, 2022).

Fourth, our study indirectly contributes to the literature on the relationship between equity crowdfunding and financial performance. Devoting great attention to innovation performance can constitute a triggering mechanism for reaching firms' financial objectives (Löfsten, 2014). For example, according to Eldridge *et al.* (2021), crowdfunding platforms can activate feedback mechanisms capable of improving the plans and operations of firms, contributing to an improvement in their financial performance. However, this relationship is not supported in some empirical studies (i.e. Walthoff-Borm *et al.*, 2018). We extend equity crowdfunding literature by introducing campaign communication characteristics in determining innovation performance. We thus believe that our study contributes to taking the analysis of the relationship between equity crowdfunding and performance outcomes a step forward.

Finally, our study could be used to extend knowledge of the relationship between campaign characteristics and innovativeness to other types of crowdfunding. In particular, our statistical model could be the starting point for establishing which variables significantly influence innovation in crowdsourcing.

5.2 Practical implications

In addition to the theoretical contributions, this study offers implications for entrepreneurs and managers of entrepreneurial firms enhancing their firm innovativeness while recurring to equity crowdfunding as an alternative financing source. This study also proposes implications for policymakers, who can intervene to establish contextual conditions that favour firm innovativeness. Based on these implications, governments and operators who manage crowdfunding platforms could promote actions capable of positively influencing innovativeness.

Since our findings indicate that a factor that favourably affects innovativeness is the company's valuation prior to the campaign, this has significant managerial implications. This finding raises the possibility that the backers could evaluate a venture project's merits based on its pre-money valuation, which would notably impact their decision to invest in it and, consequently, its innovativeness. Consequently, managers should leverage a high degree of effective communication to potential backers about the company's valuation in the funding phase. Furthermore, if there is no adequate valuation, managers should consider postponing access to the campaign while waiting to reach an adequate valuation through the adoption of targeted interventions. Regarding the implications for policymakers, they should try to make the companies participating in the campaigns understand the importance of the offer and communication characteristics. In particular, policymakers should inform managers of the usefulness of communicating the company's evaluation before the campaign launch to influence innovation positively. Policymakers should also establish guidelines for all crowdfunding platforms, ensuring they highlight information that positively impacts innovativeness, especially pre-money valuation. Given such importance of the valuation, the road towards more transparent valuation models and rules should be followed to ensure that investors make decisions based on true and real information.

Among the communication characteristics of the campaign, the significant variable is the presence of an active link to the entrepreneur's social media. From the view of managerial implications, this result leads to the conclusion that managers should leverage and pay careful attention to social media (Facebook, Instagram) to increase innovativeness by using social media more and intensifying their use to communicate with potential backers. In fact, by reducing information asymmetries (Vismara, 2016), social media allows potential investors the opportunity to exchange ideas and provide suggestions, which, if adopted, improve innovation in the post-campaign period.

Concerning the implications for policymakers, they should try to make the companies participating in the campaigns understand the importance of using social media to create greater engagement on the part of investors. Policymakers could promote meetings with start-uppers to instruct them about the policies to follow before starting the campaign, explaining the various types of social networks and how they should be used. Again, policymakers should propose guidelines that equity crowdfunding platforms should comply with. The platforms should contain links to the social media of the companies participating in the campaign to intensify the interaction between entrepreneurs and potential investors.

Among the characteristics of the campaign's performance, the significant variable is the number of investors participating, negatively influencing the innovativeness in the post-campaign phase. Our findings suggest that the firms running the campaigns should avoid inviting many investors since this can result in a general lack of interest, fewer commitments and a consequent decrease in innovativeness. This result allows us to formulate some managerial implications. During the equity crowdfunding campaign, managers should try to involve fewer investors but with larger shares of investments. One way could be to set a minimum investment quota that involves a higher quality of backers. Investor involvement should be as selective as possible, especially involving those with an entrepreneurial background. Also, upon identifying the "core investors", managers should establish a relationship of continuous feedback with them to undertake plans and operations agreed upon. There are also implications for policymakers who organise campaigns and manage crowdfunding platforms. As already stated, they should define guidelines to encourage managers to prepare the performance characteristics of the campaign before launching the campaign. In particular, they should highlight how to reach the optimal number of investors that can positively influence innovation. Furthermore, policymakers could set up crowdfunding platforms to allow access to a limited number of investors, thus facilitating achieving their optimal number.

In sum, this study provides evidence on outcomes related to equity crowdfunding but not strictly concerning financial performance. Hence, it is hoped these findings could stimulate entrepreneurs and managers of entrepreneurial firms to recognise and pursue firm innovativeness as an important firm objective. Innovation can improve processes, products, technologies, business models, platforms and methods (Johannessen *et al.*, 2001) while offering additional benefits than the existing state of the art (Teece, 1986). The embeddedness of entrepreneurial firms in established networks and the creation of new opportunities to collect additional feedback are core mechanisms through which entrepreneurs can achieve business growth while offering valuable solutions to the market. The nature of equity crowdfunding, attaining open innovation while recurring to new funds, may serve entrepreneurs in such vital processes.

6. Conclusions and further research

Equity crowdfunding campaigns are considered effective methods for innovative start-ups to obtain financial resources. Through the use of authorised platforms, investors (crowd) can finance these firms by obtaining firm shares (equity). What is unclear, from an empirical point of view, is whether the equity crowdfunding campaigns influence the innovativeness of the financed firms (Colombo and Shafi, 2019). In particular, focusing on the post-campaign results of the funded projects, some studies (Hervé and Schwienbacher, 2018) have attempted to understand if equity crowdfunding campaigns contribute to better firm innovativeness.

This study, focusing on the equity crowdfunding campaigns promoted in Italy, aims to empirically analyse whether the new enterprises financed through equity crowdfunding have had benefits in terms of improvement of the firm innovativeness in the post-campaign period. In particular, firm innovativeness is measured through the parameters of R&D expenditures, and the number and value of patents (Gunday *et al.*, 2011; Walthoff-Borm *et al.*, 2018).

This study aims to provide a double contribution. The first is to offer empirical findings to the existing literature on the antecedents of firm innovativeness in the context of equity crowdfunding campaigns. In light of the current debate on this topic, only a few papers have explored the impacts of equity crowdfunding on the innovativeness of start-ups. The second is a contribution aimed at entrepreneurs and start-ups (Pugliese *et al.*, 2022), providing them with a clear picture of the potential benefits that equity crowdfunding initiatives can have in terms of improving innovative and financial performance in the post-campaign period.

This study is not free of limitations. The first limitation concerns the collected data. Since the examined equity crowdfunding campaigns concern different years, therefore the data are not homogeneous from a temporal point of view. The second limitation concerns the fact that there is no single parameter to measure firm innovativeness; therefore, proxies have been used to measure it. Finally, the regression models did not consider the industrial sector of the firms included in the sample, which would have been a valid control variable. Future research could propose a study similar to this one and try to find a solution to the mentioned limitations.

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