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RESEARCH ARTICLE

Understanding the relationship between networks, startup risk-taking behaviour, and digitalization: the role of ecosystem coopetition

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Abstract

Technology that develops rapidly has profoundly affected the business field and reshaped some behaviours of corporations, and the discussion on startup risk-taking behaviour in the new era is still insufficient. Based on social network theory and social capital theory, this article studies how social networks and entrepreneurial ecosystems support startup risk-taking behaviour. This article cuts into this issue through the perspective of coopetition. Based on 737 responses, this article employs regression and fuzzy-set qualitative comparative analysis to explore the relationships between networks, ecosystem coopetition, and risk-taking behaviour. Results indicate that networks and coopetition may stimulate startup risk-taking behaviour, and coopetition may weaken the impacts of networks. There are replacement effects between different characteristics of networks, and there are several configurations, which may lead to high-level risk-taking. This article may help us understand startup risk-taking behaviour in the digital era and the positive impacts of ecosystems.

Key words: Coopetition; entrepreneurial ecosystem; risk-taking; social network

Introduction

Scholars have long sought to explore what promotes entrepreneurial vitality and quality, as entrepreneurship may further contribute to employment, innovation, and economic growth (Van Praag & Versloot, 2007). The relevant literature proposes that entrepreneurship means taking risks because entrepreneurs need to make large resource commitments to seizing or creating entrepreneurial opportunities, and these activities may involve a higher likelihood of costly failure and high payoff (Alvarez, 2007; Covin & Slevin, 1989; Guo & Jiang, 2020; Miller, 1983). Therefore, risk-taking is frequently one of the core elements of the entrepreneurship literature (e.g., Block, Sandner, & Spiegel, 2015; Bonte & Piegeler, 2013; Dimitratos, Amoros, Etchebarne, & Felzensztein, 2014; Sebora & Theerapatvong, 2010), and the goal of this article is to further understand the risk-taking behaviour of startups in the digital era.

Over the last couple of decades, we have quickly entered the digital era, and many new phenomena have appeared in the business field (Caputo, Pizzi, Pellegrini, & Dabić, 2021; Rialti, Marzi, Caputo, & Mayah, 2020; Ritter & Pedersen, 2020). In the field of entrepreneurship, digital technology, which has a significant influence on how startups are imagined and created, has reshaped the entrepreneurial process (Elia, Margherita, & Passiante, 2020; Garzella, Fiorentino, Caputo, & Lardo, 2021). In this digital era, the relationships, interactions, and social networks between individuals or organizations are also reshaped and have become the focus of many scholars (e.g., Smith & Smith, 2021; Zhu, Wang, Wang, & Nastos, 2020). Social networks and risk-taking are closely related, as risk-taking is a resource-consuming activity, and networks may

help startups obtain resources more conveniently and cheaply (Ferris, Javakhadze, & Rajkovic, 2019; Luu & Ngo, 2019). The existing literature has deeply explained how different types of social networks (e.g., networks with different objects and networks with different characteristics) affect corporate resources and entrepreneur risk propensity and ultimately increase the level of risk-taking (e.g., Bembom & Schwens, 2018; Boso, Story, & Cadogan, 2013; Carnabuci & Dioszegi, 2015; Dbouk, Fang, Liu, & Wang, 2020; Efendic, Mickiewicz, & Rebmann, 2015; Fogel & Nehmad, 2009). These relationships have undergone tremendous changes, as digital technology is empowering an unprecedented convergence of networks, computing, contents, and communications[1] (Elia, Margherita, & Passiante, 2020). As Kohtamaki, Parida, Patel, and Gebauer (2020: 2) proposed, digitalization is profoundly affecting ecosystems and value chains of enterprises, changing the way enterprises interact with other entities. There have been many studies discussing the influence of digitalization on individual companies (e.g., Eller, Alford, Kallmunzer, & Peters, 2020; Gebauer, Fleisch, Lamprecht, & Wortmann, 2020). However, existing literature fails to recognize the embeddedness of digitalization in inter-organizational contexts and ecosystems (Frick, Fremont, Age, & Osarenkhoe, 2020), and the network literature provides an appropriate perspective on this topic. On the other hand, some recent studies have also pointed out the role of digital networks in resource acquisition, which is different from the role of traditional face-to-face networks (e.g., Smith & Smith, 2021). Resource and risk-taking are closely related, and thus digitization may further affect risk-taking. This article continues to explore the relationships between networks, risk-taking, and digitalization.

Furthermore, the behaviours of startups are influenced not only by their attributes or entrepreneurs but also by external circumstances. Many scholars in the field of entrepreneurship have begun to consider the broader entrepreneurial context, especially the entrepreneurial ecosystem, and explore the way to success for startups from the perspective of ecosystems (Audretsch, Cunningham, Kuratko, Lehmann, & Menter, 2019; Autio, Nambisan, Thomas, & Wright, 2018; Cao & Shi, 2021; Roundy, Bradshaw, & Brockman, 2018; Spigel & Harrison, 2018; Stam & Van de Ven, 2021). Considering the impact of the ecosystem echoes the current trend in the field of entrepreneurship, that is, employing the concept of ecosystem to understand how digitalization affects entrepreneurial activities and the interactions among entities (Song, 2019: 570; Sussan & Acs, 2017). Entities in the ecosystem create value based on a shared vision, and thus, there will be complicated interactions between enterprises, including cooperation and competition (Elia, Margherita, & Passiante, 2020; Ma & Hou, 2020). Coopetition refers to a dynamic and paradoxical relationship, enabling companies to involve in cooperation and competition simultaneously (Bengtsson & Kock, 2000; Czakon, Srivastava, Le Roy, & Gnyawali, 2020; Raza-Ullah & Kostis, 2020). Coopetition activities between enterprises and organizations in the ecosystem constitute the overall characteristics of the ecosystem and may further influence the behaviour of individual adolescent companies. Coopetition reveals the conflicts and tensions within the ecosystem from a different perspective from Nambisan and Baron (2021), which may help us better understand how digitalization, networks, and ecosystems currently affect entrepreneurial activities. The ecosystem's basic attribute (i.e., coopetition) may influence startup risk-taking behaviour and moderate the relationships between networks and risk-taking behaviour, and the present article aims to explore this in depth.

Following Lim (2018), the present article proposes an integrated model that includes the entrepreneur, the entrepreneurial ecosystem, and corporate behaviour. We advance knowledge of how social networks affect startup risk-taking behaviours that vary in the characteristics of the entrepreneurial ecosystem. This research makes two principal contributions to the existing literature. First, we contribute to deepening the understanding of the risk-taking behaviour of startups in the ecosystem. Considering the impact of social networks, we embed the risk-taking theoretical model of Lim (2018) into the entrepreneurial ecosystem to explore new phenomena in the digital

[1]This is also reflected in our measure methods.

era. The natural ecosystem has the ability to resist external risks and maintain dynamic stability. At the same time, research on the relationship between ecosystems and risk-taking in the field of entrepreneurship is slightly insufficient. This article thus responds to the call by Dbouk et al. (2020) to explore the relationship between social networks and risk-taking in different situations. Second, we consider coopetition to be the essential feature of the entrepreneurial ecosystem. Previous studies in the field of coopetition mostly explored the coopetition activities of mature companies or high-tech companies (e.g., Luo, Slotegraaf, & Pan, 2006; Raza-Ullah & Kostis, 2020). In the digital era, some scholars have begun to discuss coopetition activities in some special spaces, such as innovation ecosystems, business networks, alliances, and coworking spaces (Bacon, Williams, & Davies, 2020; Bengtsson & Kock, 2000; Bouncken, Fredrich, Ritala, & Kraus, 2017; Bouncken, Laudien, Fredrich, & Görmar, 2018). Following these scholars, we extend coopetition to new situations and propose that coopetition should be regarded as one of the essential attributes of the ecosystem. The attributes of the ecosystem will adversely affect the behaviour of the enterprise.

For several reasons, we study the proposed model in the Chinese context. In the past few decades, China's entrepreneurial activities have flourished and contributed to China's rapid development, showing their global impact and relevance (Huang, Liu, & Li, 2020: 353). The Chinese context provides a potential opportunity to explore the role of the taken-for-granted entrepreneurial conditions and the influence of the entrepreneurial ecosystem (Ahlstrom & Bruton, 2002; He, Lu, & Qian, 2019; Tan, 2001; Welter, 2011). The instability and uncertainty accompanying the transitional economy may affect startup risk-taking behaviour, and China's risk aversion culture may also have a subtle influence on entrepreneurs (Cai, Yu, Liu, & Nguyen, 2015). Considering the recent changes in the mentality of Chinese entrepreneurs (Huang, Liu, & Li, 2020: 356) and the connection between entrepreneurship and network (Child, 2009), it is interesting and meaningful to choose Chinese startups as research objects.

The following section includes the theoretical framework, explaining the concepts of social networks, entrepreneurial ecosystems, coopetition, and risk-taking. The research expectations and model of this article are then discussed in the Hypotheses section. Then, our sample, measures, and methods are discussed in the Methodology section. The Results section presents the findings and the analytical techniques we employed. Finally, in the Discussion and Conclusions sections, we discuss the theoretical and practical implications, future research opportunities, and our limitations.

Theoretical framework

Risk-taking

There are roughly two main lines in the previous research on risk-taking, including *managerial risk-taking* from a general economic/management perspective and *risk-taking* from a special entrepreneurship perspective (i.e., entrepreneurial orientation [EO]). The first type of research is mainly based on various theories (e.g., agency theory, prospect theory, upper echelons theory, and behavioural theory of the firm; see Hoskisson, Chirico, Zyung, & Gambeta, 2017), discussing top managers' strategic choices that may bring uncertain outcomes. The related literature proposes that these choices may be affected by external and internal factors, such as economic, institutional, industry, policy, and cultural factors (e.g., Laeven & Levine, 2009; Su & Lee, 2013), and the characteristics of executives, corporate attributes, ownership, and shareholders (e.g., Chatterjee & Hambrick, 2007; Chrisman & Patel, 2012; Walumbwa & Schaubroeck, 2009). On the other hand, risk-taking is one of the core elements of EO, which includes risk-taking, innovativeness, competitive aggressiveness, proactiveness, and autonomy (Covin & Slevin, 1989; Lumpkin & Dess, 1996; Miller, 1983). As a latent variable, scholars have not yet reached a consensus on the nature of EO. Covin and Lumpkin (2011) specifically discussed that EO should be

regarded as disposition or behaviour. Following their discussion, this article defines risk-taking as the behaviours of startups to depart from tried-and-true paths and undertake initiatives with uncertain outcomes. This way of definition may better distinguish risk-taking from other organization-level latent variables and facilitate the study of its antecedent conditions (Wiklund & Shepherd, 2003). Because managerial power is more concentrated in startups than mature firms, entrepreneurs may dominate the decision-making process, and their behaviour is highly related to organizational behaviour (Dai, Maksimov, Gilbert, & Fernhaber, 2014; Lumpkin & Dess, 1996). Therefore, in general, the discussion of risk-taking in this article combines the ideas of two types of literature and may help to promote the dialogue between them.

As mentioned above, risk-taking behaviours and entrepreneurial activities are closely related. Startup active risk-taking behaviour may promote innovation and further economic development (Faccio, Marchica, & Mura, 2016). Thus, many scholars have studied the factors affecting corporate risk-taking behaviours, and currently, external entrepreneurial contexts have received special attention (Welter, Baker, Audretsch, & Gartner, 2017). Specifically, technology that develops rapidly has profoundly affected the business field and reshaped some behaviours of corporations. Some scholars proposed that today's competition is competition between ecosystems rather than competition between individual companies (Ma & Hou, 2020; Hou & Shi, 2021), and some scholars have employed the entrepreneurial ecosystem to explain startup behaviour and performance (e.g., Link & Sarala, 2019; Yang & Zhang, 2021). This article regards startup risk-taking behaviour as an act of embedding in ecosystems and social networks (see Lim, 2018). Therefore, we may deepen the understanding of startup risk-taking behaviours in the era of Industry 4.0.

Social network theory and social capital theory

The present study is underpinned by social network theory (SNT) and social capital theory (SCT). Some concepts of SNT are derived from graph theory. Graph theory believes that many point sets and lines between points can be depicted on a piece of paper (Kilduff & Brass, 2010; Sharafizad & Coetzer, 2017). SNT regards the points as the actors or the network's nodes, and the lines are regarded as the corresponding links or paths (Neergaard, Shaw, & Carter, 2005). The basic concept is that actors' behaviour in social situations may be affected by the bonds between them (Lee & Yang, 2014; Nicholson, Alexander, & Kiel, 2004). SCT believes that actors may obtain tangible or intangible resources at the individual, group, and organizational levels through links or paths (Chang, 2020; Nonino, 2013). The sum of actual and potential resources available from the network is called social capital (Nicholson, Alexander, & Kiel, 2004). Further research on social capital shows that this capital may affect entrepreneur risk-taking propensity and cause startups to take risks more actively (e.g., Dbouk et al., 2020; Masiello & Izzo, 2019; Rodriguez-Gutierrez, Romero, & Yu, 2020). Thus, based on SNT and SCT, the present article proposes that social networks may promote startup risk-taking behaviour through various resources in the network.

Social network

After decades of development, social networks have become a topic that cannot be ignored in the field of social science (Hoang & Yi, 2015; Slotte-Kock & Coviello, 2010; Stuart & Sorenson, 2007). Networks can be regarded as 'a specific set of linkages among a defined set of persons, with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behavior of the persons involved' (Mitchell, 1969: p. 2). Social networks are an important source of information and resources, and therefore, they play a catalytic role in the creation, survival, and development of startups (Bembom & Schwens, 2018; Birley, 1985; Hoang & Antoncic, 2003; Nordstrom & Steier, 2015). Some scholars even view entrepreneurship as an

activity embedded in social networks (e.g., Aldrich & Zimmer, 1986; Rocha, Galvão, Marques, Mascarenhas, & Braga, 2020). Based on several theories (e.g., strong-weak tie theory, structural hole theory, and SCT), scholars have conducted in-depth research on different types of social networks and their attributes (Capaldo, 2007; Li et al., 2021; Shane & Cable, 2002). The structure of the social network is one of the most concerning topics (Tichy, Tushman, & Fombrun, 1979). Granovetter (1992) employed the term 'embeddedness' to refer to the decision-making and behavioural process in social relationships, which includes relational embeddedness and structural embeddedness (Czernek-Marszalek, 2021; Lashitew, Bals, & Van Tulder, 2020). The former embeddedness refers to the qualitative and strength attributes of the relation, and the latter refers to the overall pattern of the relation (Tichy, Tushman, & Fombrun, 1979).

We focus on the entrepreneurial ecosystem, which pays particular attention to structure (see Adner, 2017; Hou & Shi, 2021) and may be formed based on networks (see Scott, Hughes, & Ribeiro-Soriano, 2021). This article provides an in-depth exploration of structural embeddedness. Combining the views of Tichy, Tushman, and Fombrun (1979) and the current literature, the research on structural embeddedness mainly focuses on individual network size, density, heterogeneity, and centrality (Wong & Boh, 2010). Network size reflects the number of relationships and external resources that entities can effectively use. This means that the larger the size is, the richer the resources available to the entity (Roberts, Dunbar, Pollet, & Kuppens, 2009). Network density refers to the sufficiency of direct contact between entities and their external network members, which indicates the proportion of the number of contacts that exist to the number of possible contacts. According to the strong–weak tie theory, it may be related to people's psychology and behaviour, facilitating the dissemination of information (Donati, Zappalà, & González-Romá, 2016; Wang, Tjosvold, Chen, & Luo, 2014). Network heterogeneity reflects the degree of difference in the types of network members and resources. This means the possibility of collisions between different resources, knowledge, and information, contributing to the generation of new ideas and innovation (Estrada, 2010; Lee, Choi, Kim, & Kim, 2014). Finally, network centrality refers to the position of an entity in the network, reflecting the entity's ability to acquire and control resources. The better the network location is, the shorter the path for the entity to acquire knowledge and resources, and thus, the entity is more likely to obtain competitive advantages (Gilsing, Nooteboom, Vanhaverbeke, Duysters, & Van de Oord, 2008; Li, Liao, & Yen, 2013; Reinholt, Pedersen, & Foss, 2011).

The existing literature has well explored the relationships between social networks and corporate risk-taking behaviours. Social networks may provide various resources for entrepreneurs and startups, such as funds, materials, human capital, information, and knowledge (Ferris, Javakhadze, & Rajkovic, 2017). Networks may play an irreplaceable role in the growth of startups and enhance the propensity and capability of risk-taking. However, the exploration of relationships between networks and risk-taking behaviours in the context of ecosystems is insufficient. In nature, ecosystems can help entities combat risks, but existing empirical research seems to ignore this mechanism. Thus, this article verifies this mechanism by integrating different network features.

Entrepreneurial ecosystem

The ecosystem refers to 'the alignment structure of the multilateral set of partners' (Adner, 2017, p. 40). Entrepreneurial ecosystems and networks are closely related. The ecosystem can be regarded as a concept that fundamentally relies on networks, and interorganizational networks may lead ecosystems to form or evolve (Scott, Hughes, & Ribeiro-Soriano, 2021). The ecosystem can be understood as a complex social construct composed of a network of entrepreneurs, investors, and supporting institutions (Neumeyer, Santos, & Morris, 2019). Both the network and the entrepreneurial ecosystem assume that firms or organizations operate as open systems, and they can improve performance by interacting with other complementary organizations (Shipilov &

Gawer, 2020). Following these studies, the present article assumes that entrepreneurs or startups are embedded in the network and the ecosystem simultaneously. We also assume that the ecosystem is an exogenous concept and that the network is an endogenous concept, as the network of a single startup may have little impact on the whole ecosystem (Clarysse, Wright, Bruneel, & Mahajan, 2014).

Furthermore, entities within the same ecosystem need to conduct value creation activities based on a shared vision (Pitelis, 2012). There will be complex interactions and relationships between entities (Scott, Hughes, & Ribeiro-Soriano, 2021). Through such processes, startups that were originally scarce in resources can obtain the resources they need, as the ecosystem may provide access to resources and finance, facilitate the easing of institutional barriers, and stimulate the knowledge spill-over among entities (Feldman & Francis, 2004; Owen-Smith & Powell, 2004; Powell, 2002; Spigel, 2017; Yin, Hughes, & Hu, 2021). This article emphasizes that this kind of interaction is actually a kind of coopetition, and coopetition should be considered as a sine qua non condition of ecosystems (Bacon, Williams, & Davies, 2020; Selander, Henfridsson, & Svahn, 2010). As Bengtsson and Kock (2000) proposed, entities participating in coopetition activities do not necessarily have to be in the same industry but can also be other related companies, such as banks and car manufacturers. In the ecosystem, coopetition strategy is important for all entities, such as universities and incubators (e.g., Clarysse et al., 2014; Miri-Lavassani, 2017; Theodoraki, Messeghem, & Audretsch, 2020). If it is assumed that there is an ecosystem in a certain geographic area or virtual range, we can infer that there are corresponding coopetition activities between the research objects. Ecosystems also require firms to balance cooperation and competition (Basole, Park, & Barnett, 2015; Ben Letaifa, 2014). If the startup cooperates too much, it may lose its unique resources and not capture enough value for survival. If startups compete too much, the ecosystem may fail to form (see Hannah & Eisenhardt, 2018). The coopetition behaviour and propensity of all actors in the ecosystem constitute the overall coopetition attribute of the ecosystem. This characteristic may shed light on why one ecosystem performs better than others (Scott, Hughes, & Ribeiro-Soriano, 2021).

In fact, there have been many articles discussing coopetition activities in different situations, such as innovation ecosystems, networks, alliances, and coworking spaces (Bacon, Williams, & Davies, 2020; Bengtsson & Kock, 2000; Bouncken et al., 2017, 2018; Bouncken & Fredrich, 2016). However, research on coopetition from the perspective of the entrepreneurial ecosystem is relatively insufficient. Thus, the present article studies the ecosystem-level coopetition attribute, as Spigel (2017) notes that ecosystem theory should more thoroughly consider the internal attributes of ecosystems and explore how these characteristics facilitate entrepreneurial activities.

Hypotheses

Social network and risk-taking

As one of the core elements of EO, dozens of studies have explored the relationship between social networks and risk-taking (Boso, Story, & Cadogan, 2013; Cao, Simsek, & Jansen, 2015; Doblinger, Dowling, & Helm, 2016; Kreiser, 2011; Presutti & Odorici, 2019; Stam & Elfring, 2008; Tang, Tang, Marino, Zhang, & Li, 2008; Wang & Altinay, 2012). The risk-taking level reflects the enterprise's risk preference in decision-making, which may be conducive to improving future financial performance and enhancing long-term competitive advantage (Acharya, Amihud, & Litov, 2011; Boubakri, Cosset, & Saffar, 2013; Cucculelli & Ermini, 2012). However, risk-taking is a resource-consuming activity with strong resource dependence (Almeida & Campello, 2007). If startups cannot obtain sufficient resource support, they will face greater constraints when making decisions, leading to inefficiency or even failure. Social networks are one of the main sources of resources, and they may work as collective risk insurance

and diversification, mitigating the negative impacts of risk-taking (Danso, Adomako, Damoah, & Uddin, 2016; Dimitratos et al., 2014; Schneider, Fehrenbacher, & Weber, 2017; Smith & Smith, 2021). Based on SNT and SCT, social networks may promote startup risk-taking behaviour by providing actual and potential resources (social capital).

Specifically, first, entrepreneurs with extensive networks may be inclined to make more risky decisions, as the vast social network may serve as a safety net and offer help in case of loss (Hsee & Weber, 1999; Mandel, 2003). The risk-taking tendency of entrepreneurs will undoubtedly stimulate startups to take risks (Dai et al., 2014). Second, entrepreneurs with high density can work with others more easily, and they may have higher self-efficacy and are more willing to participate in risky activities (Donati, Zappalà, & González-Romá, 2016; Roberson & Williamson, 2012; Rosenkranz & Weitzel, 2012). Third, heterogeneous relationships mean a diverse range of opinions, which may facilitate the generation of new ideas (Aral & Van Alstyne, 2011; Carnabuci & Dioszegi, 2015; Hemphala & Magnusson, 2012). Entrepreneurs will have more novel ideas and may put them into practice because of their unique risk inclination and execution ability (Stewart & Roth, 2001). Innovation is also accompanied by uncertainty and risk (Iyengar & Sundararajan, 2020). In addition, network heterogeneity may also increase the possibility for startups to obtain complementary resources. Fourth, entrepreneurs at the centre of networks have more timely and critical information and resources (Li, Liao, & Yen, 2013; Su & Liu, 2019). These entrepreneurs are more likely to discover potential opportunities, which are under high uncertainty and may yield long-term high benefits (Markose, Giansante, & Shaghaghi, 2012; Wu, Liu, & Zhang, 2017). Startups in the central position may choose to embrace opportunities to pursue high benefits, which means a higher level of risk-taking. Thus, based on SNT and SCT, structural embeddedness may influence the risk-taking behaviour of entrepreneurs and startups through tangible and intangible resources. The present article proposes the following hypotheses:

Hypothesis 1a: Network size is positively associated with startup risk-taking behaviour.

Hypothesis 1b: Network density is positively associated with startup risk-taking behaviour.

Hypothesis 1c: Network heterogeneity is positively associated with startup risk-taking behaviour.

Hypothesis 1d: Network centrality is positively associated with startup risk-taking behaviour.

The moderating effect of ecosystem coopetition

Many scholars have studied the impacts of contingency factors on the relationship between networks and risk-taking. Research has confirmed the influences of external factors such as environmental dynamism, regional marketization, investment opportunity, information asymmetry, legality, culture, and economic development (Ferris, Javakhadze, & Rajkovic, 2017, 2019; Lim, 2018; Su & Liu, 2019) and internal factors such as size, funds, corporate capability, manager characteristics, and shareholders (Eggers, Hatak, Kraus, & Niemand, 2017; Ferris, Javakhadze, & Rajkovic, 2017; Li, Li, & Wang, 2019; Tsai & Luan, 2016).

Following Lim (2018), this article integrates the entrepreneur network and external environment. Entrepreneurship is not separate from the external environment. As Szerb, Lafuente, Horváth, and Páger (2019) proposed, the entrepreneurial ecosystem significantly impacts the quality and quantity of entrepreneurial activities. Some studies have also shown that knowledge, finance, institutions, and culture in the ecosystem can promote entrepreneurial performance by alleviating resource constraints (e.g., Nicotra, Romano, Del Giudice, & Schillaci, 2018; Yang & Zhang, 2021). Due to the close relationship between ecosystems, networks, resource allocation, and entrepreneurial activity, we employ the entrepreneurial ecosystem as the moderating variable.

As mentioned above, scholars are focusing on the coopetition activities of enterprises and organizations, as coopetition enables entities to benefit from competition and cooperation simultaneously, helping them access resources that were previously unavailable (e.g., Cortese, Giacosa, & Cantino, 2021; Cozzolino, Corbo, & Aversa, 2021; Crick, Karami, & Crick, 2021). We undertake Spigel's (2017) task to further explore the internal attributes of ecosystems. More specifically, we explore the impact of coopetition at the ecosystem level, as ecosystem approaches pay special attention to coopetition activities among partners (Adner & Kapoor, 2010: 309). Coopetition may create a sophisticated balance to facilitate the sustainable development of ecosystem and may help companies form their competitive advantages (Banc & Messeghem, 2020; Basole, Park, & Barnett, 2015; Miri-Lavassani, 2017; Watanabe, Kondo, Ouchi, & Wei, 2004). There have been studies exploring the impact of the team coopetition climate on individuals (e.g., David, Kim, Rodgers, & Chen, 2021), but little is known about the influences of coopetition at the entrepreneurial ecosystem level. The present article fills this research gap by exploring the moderating effects of ecosystem coopetition.

Based on SNT and SCT, the impact of coopetition on the relationship between the network and risk-taking is mainly reflected in three aspects: resource, propensity, and behaviour. First, in an entrepreneurial ecosystem with active coopetition activities, startups may have more opportunities to obtain scarce resources, supporting business adventures (Chai, Li, Tangpong, & Clauss, 2020; Roig-Tierno, Kraus, & Cruz, 2018). This may reduce actor dependence on networks and thereby weaken the influence of networks. Second, with the accumulation of other resources, the marginal impact of social capital on risk-taking may decrease. For example, by engaging in coopetition activities, startups can enter markets that they could not enter before (Devece, Ribeiro-Soriano, & Palacios-Marqués, 2019; Estrada, Faems, & De Faria, 2016). We assume that the market's pioneers have already absorbed some of the risks, so startups that are imitators or followers can take lesser risks (Lieberman & Montgomery, 1988; Su & Liu, 2019). When disadvantaged companies have relevant information and channels (i.e., network and coopetition) to engage in low-risk activities and obtain satisfactory returns, they may be inclined to engage in such activities (Han, Bose, Hu, Qi, & Tian, 2015; Lieberman & Asaba, 2006). Coopetition provides opportunities to startups and may reduce some unnecessary risks of startups. Third, social networks' influence on entrepreneurs may be affected by the coopetition atmosphere and organization-level interactions in the ecosystem (David et al., 2021). Individual behaviour depends not only on their characteristics but also on the social context (Priesemuth, Schminke, Ambrose, & Folger, 2014; Spurk, Keller, & Hirschi, 2019). For example, individuals working in highly competitive situations may prefer competition and refuse to cooperate (Fletcher, Major, & Davis, 2008). This kind of interaction (i.e., coopetition) may be more effective than personal networks, and entrepreneur behaviour may be affected by coopetition, which to some extent replaces the impacts of networks (Allen, James, & Gamlen, 2007; Merlino, 2014). Thus, this article proposes the following hypotheses:

Hypothesis 2: Ecosystem coopetition is positively associated with startup risk-taking behaviour.

Hypothesis 3a: Ecosystem coopetition will weaken the positive relationship between network size and startup risk-taking behaviour.

Hypothesis 3b: Ecosystem coopetition will weaken the positive relationship between network density and startup risk-taking behaviour.

Hypothesis 3c: Ecosystem coopetition will weaken the positive relationship between network heterogeneity and startup risk-taking behaviour.

Hypothesis 3d: Ecosystem coopetition will weaken the positive relationship between network centrality and startup risk-taking behaviour.

Configuration

This research further employs fuzzy-set qualitative comparative analysis (fsQCA) to analyse the complex relationships between networks, coopetition, and risk-taking behaviour. The entrepreneurial ecosystem is a relatively new concept requiring new methodologies (Ketchen, Boyd, & Bergh, 2008). FsQCA can be employed to explore phenomena that should be understood as clusters of interconnected structures (Di Paola, 2020). Many scholars have recently employed fsQCA to study ecosystems (e.g., Bacon & Williams, 2021; Del Sarto, Isabelle, & Di Minin, 2020; Vedula & Fitza, 2019). Among them, some scholars use both regression (or structural equation modelling) and fsQCA for analysis (e.g., Hernández-Perlines, Covin, & Ribeiro-Soriano, 2021). The mixed use of the two methods can provide a more in-depth explanation of the original simple model (e.g., Lewellyn & Muller-Kahle, 2020) from two perspectives and discover results that may be overlooked by traditional empirical methods.

Specifically, we believe that the characteristics of networks affect risk-taking and are also interrelated. According to SNT, network attributes may affect actor behaviour and thoughts, and these attributes can exist simultaneously. These structural attributes may form different combinations (configuration), and these different combinations may have different effects (see Gilsing et al., 2008: 1722). As Granovetter (1993b) proposed, there may be some substitution effects between different social network attributes, and sometimes different combinations may produce the same result (high level of risk-taking). Furthermore, as mentioned above, coopetition may have a moderating impact on the relationship between the network and risk-taking (Camarero, Garrido, & Hernandez, 2020; Suseno & Ratten, 2007). Based on SNT and SCT, the characteristics of the ecosystem (i.e., coopetition) in which the entrepreneur is located may affect the flow of resources (social capital) in individual networks and affect entrepreneur behaviour, propensity, etc. (Nicholson, Alexander, & Kiel, 2004; Nonino, 2013; Ullah, Hameed, Kayani, & Fazal, 2019). Thus, there may be differences in the effects of each network attribute and their combinations in different ecosystems. This article proposes the following hypothesis:

Hypothesis 4: Different combinations (configurations) of network size, density, heterogeneity, centrality, and coopetition will have different effects on risk-taking.

Figure 1 presents the research model, depicting the hypotheses of this study.

Methodology

Sample and data collection

Following Zahra (1993), we conducted research on companies established in Jiangsu, Zhejiang, and Shanghai within 8 years. The study was conducted from the beginning of July to the end of August 2020. According to the Amway Global Entrepreneurship Report, the Chinese government has provided effective support for startups, and enthusiasm for entrepreneurship has improved rapidly. Management research in the Chinese context has also attracted the attention of many scholars (e.g., Ren & Chen, 2021; Wang, Yang, & Zhang, 2021; Zhang, Ji, Anwar, Li, & Fu, 2020). Jiangsu, Zhejiang, and Shanghai have the strongest entrepreneurial atmosphere, and their economic development is very close to that of Western countries (Yeh & Xu, 2010). After the COVID-19 pandemic, these areas are the first to resume normalization, and entrepreneurial activities in these areas may be relatively less affected by COVID-19. First, we conducted a preliminary quantitative study (guided by Hulland, Baumgartner, & Smith, 2018) to determine the questionnaire items. In this study, we set up items, invited inner startups to fill out the

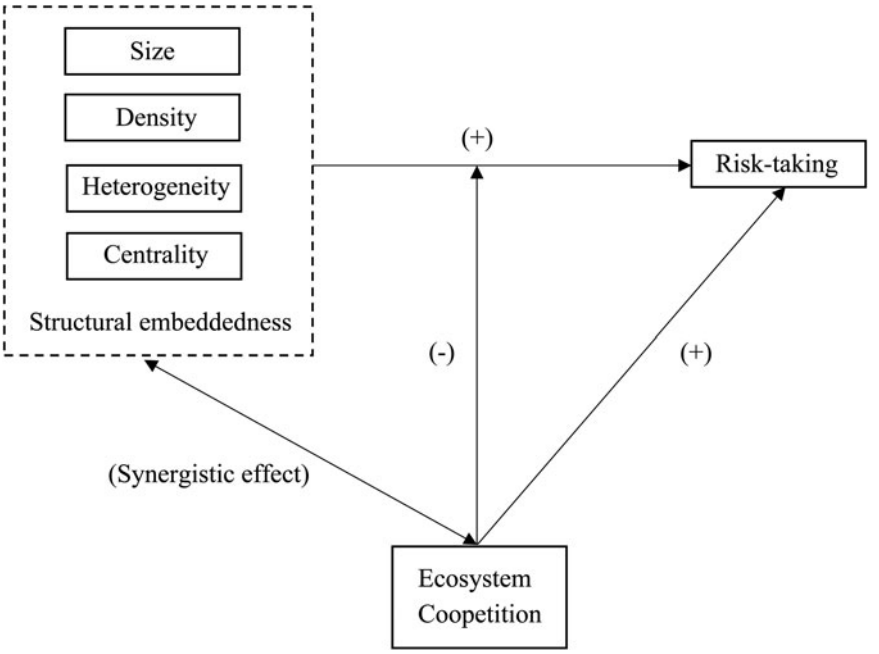

Figure 1. Proposed research model.

questionnaire and provide their insights, and repeatedly modified the items through this dynamic process. Second, we compiled the startups' information through several methods (i.e., research reports, search engines, and government information disclosure platforms) and randomly selected several streets (e.g., Hangzhou Dream Village and Shanghai Zhang Jiang high tech Park) where startups gather to visit. We first explained the intention of the study and promised to keep the company's information confidential. We then introduced the concept of the entrepreneurial ecosystem, and only entrepreneurs who believed that the ecosystem existed were further investigated.[2] A total of 100 samples were obtained in the first round of the study. We conducted a pretest, and the results indicated that the items could be used for large-scale surveys. Third, we commissioned four intermediary platforms (e.g., credamo) to issue questionnaires. These platforms cooperate with many Chinese scholars and universities, and many authoritative journals have accepted their survey data. We compared the data obtained from three rounds of surveys, and they did not show significant differences. Through five channels, we obtained 737 samples, corresponding to a response rate of 21%. We also compared the basic information of nonrespondent firms and respondent firms to test for nonresponse bias. The results showed no significant differences; thus, our data were less impacted by selection bias. Table 1 presents details of the samples.

[2]We introduced the concept of entrepreneurial ecosystem through a descriptive paragraph at the beginning of the questionnaire. We described it colloquially as '*The entrepreneurial ecosystem is composed of entrepreneurial actors and the entrepreneurial environment startups rely on for survival and development. In the entrepreneurial ecosystem, the interaction of multiple elements (e.g., entrepreneurs, mature companies, governments, universities, institutions, culture, and natural environment) can promote entrepreneurial activities*'. Then we asked them if they could understand the concept of the ecosystem and if they thought they were in the ecosystem. If the entrepreneurs answered 'no' to our above questions, then they didn't need to continue filling in the questionnaire. Entrepreneurs who answered 'no' are only a minority.

Table 1. General sample information

		N	%			*N*	%
Firm age	<1	33	4.4	Ownership	State-owned	71	9.6
	1–2	141	19.1		State and private	54	7.3
	3–4	219	29.7		Private-owned	612	83
	5–8	344	46.7	Gender	Male	386	52.3
Firm employees	1–20	108	14.6		Female	351	47.7
	21–50	154	20.8	Age	Under 25	53	7.1
	51–200	213	28.9		26–30	251	34
	201–500	121	16.4		31–40	350	47.4
	501–1,000	72	9.7		41–50	70	9.4
	>1,000	69	9.3		Above 51	13	1.7
Industry	Manufacturing	205	27.8	Education	Elementary school and below	1	.1
	Biomedicine	43	5.8		Junior high school	2	.2
	Construction and real estate	61	8.2		High school or technical secondary school	36	4.8
	Transportation and post	36	4.8		Junior college	91	12.3
	Finance	31	4.2		Undergraduate	505	68.5
	Wholesale and retail	69	9.3		Master and PhD	102	13.8
	Accommodation and catering	30	4				
	Rental and business services	34	4.6				
	IT	170	23				
	Others	58	7.8				

Measures

Risk-taking was measured using the method of Lim (2018) and Sanders and Hambrick (2007) method, which considers R&D spending, capital expenditures, and acquisition investments. They were all measured in RMB, and the unit was 10,000 yuan. We transformed them into natural logarithms and obtained a composite risk-taking index by summing them. Factor analysis indicated that these three risk proxies loaded well onto one factor (i.e., eigenvalue was 1.86, variance captured in a single factor was 61.98%, and factor loadings ranged from .767 to .818).

Network size and density were measured using the method of Lin, Tov, and Qiu (2014) and Hammarfjord and Roxenhall (2017). We used an item (i.e., number of your WeChat friends) to capture the number of direct relationships (size), as WeChat has become the main channel for Chinese people to communicate. Then, we employed an item (i.e., the number of WeChat friends you are still in contact with) to calculate the proportion of existing relative to potential connections (density).

Network heterogeneity was measured using a mature 5-point scale, which has been widely employed (see Hsueh & Gomez-Solorzano, 2019). Entrepreneurs were asked to report to what extent they communicate with different groups, including different genders, opinions, religions, majors, races/ethnicities, nationalities, places, and backgrounds. Following Lee et al. (2014), for each group, we used an item: On WeChat, how often do you communicate with people listed below? Factor analysis indicated that the eigenvalue was 2.2, variance captured in a single factor was 67.21%, and factor loadings ranged from .78 to .857. Those items were then averaged to create the index of heterogeneity (Cronbach's $\alpha = .85$, AVE = .665, CR = .884).

Network centrality was measured using four items from the 5-point scale of Nyuur, Brecic, and Debrah (2018). We adapted these items for this article: (1) Networking with others is important to me; (2) I am very active among my network; (3) I am central within my network; and (4) I have extensive links with others. Factor analysis indicated that the eigenvalue was 1.89, variance captured in a single factor was 61.08%, and factor loadings ranged from .741 to .805. Those items were then averaged to create the index of centrality (Cronbach's $\alpha = .78$, AVE = .611, CR = .825).

Coopetition was measured using four items from the 5-point scale of Bouncken et al. (2017) and Devece, Ribeiro-Soriano, and Palacios-Marqués (2019). It has been widely used in the field of coopetition. We adapted these items for this article: (1) In our ecosystem, entities cooperate with their competitors extensively; (2) In our ecosystem, entities cooperate with their competitors to achieve a common goal; (3) In our ecosystem, active collaboration with rival firms is important; and (4) In our ecosystem, competition will not hinder entity willingness to cooperate with rivals. The method of measuring ecosystem attributes through questionnaires is supported by Bischoff (2021). Factor analysis indicated that the eigenvalue was 1.72, variance captured in a single factor was 67.55%, and factor loadings ranged from .739 to .788. Those items were then averaged to create the index of coopetition (Cronbach's $\alpha = .72$, AVE = .576, CR = .803).

Control variables included firm age (number of years since founded), size (number of employees), ownership (1 = state, 2 = state and private, 3 = private), industry (dummy variables of the industries mentioned in Table 1), entrepreneur gender (1 = male, 2 = female), and education (dummy variables of the academic qualifications mentioned in Table 1). These control variables have been employed by many scholars (e.g., Lim, 2018).

Analytical techniques

Two main methods were employed in this study. Following Lewellyn and Muller-Kahle (2020), we used a regression model to examine Hypothesis 1a, Hypothesis 1b, Hypothesis 1c, Hypothesis 1d, Hypothesis 2, Hypothesis 3a, Hypothesis 3b, Hypothesis 3c, and Hypothesis 3d. We employed fsQCA to examine Hypothesis 4. Because the use of regression models is already common, we focus on describing fsQCA and why we employ both methods. Configuration analysis originates from scholars' interest in configuration problems and the

limitations of traditional analysis methods in analysing these problems. This analysis assumes that organizational or individual behaviour and attributes are caused by multiple interdependent conditions (Palmer, Phadke, Nair, & Flanagan, 2019; Yang & Zhang, 2021). FsQCA adopts a holistic perspective to conduct comparative analysis at the case level. In other words, each case can be regarded as a configuration of different conditions. In other words, fsQCA regards each sample as a case and then analyses the causal relationship between the combination of conditions (i.e., network attributes) and the result (i.e., risk-taking) through the comparison between cases. Thus, the logic of fsQCA is different from that of regression. The former focuses on the influences of different configurations, and the latter can indicate the specific relationship between variables by numerical values. Currently, in the field of management, the mixed use of these two methods is receiving increasing attention (e.g., Bouncken & Fredrich, 2016; Hernández-Perlines, Covin, & Ribeiro-Soriano, 2021; Lewellyn & Muller-Kahle, 2020). This type of research suggests that these two methods can complement each other and make the study more in-depth. In our study, we believe that it is not enough to analyse only the impacts of various network attributes on risk-taking, as these attributes may exist at the same time and may influence each other.

Results

Assessing common method bias

We employed several methods to evaluate the magnitude of common method bias. First, we used Harman's one-factor test on all items, extracting three factors that accounted for 59.897% of the total variance (the first one explained 25.233%). Second, using MPLUS (i.e., conducting confirmatory factor analysis), we included common method deviation as a latent variable. The model fit did not improve, showing that common method bias was not significant.

Discriminant validity

We also employed several methods to analyse discriminant validity. First, Table 2 summarizes the correlations between constructs. Our key variables show relatively high intercorrelations, with no correlation above .65 (Tabachnick & Fidell, 1996). Second, following Kollmann and Stöckmann (2014), we extracted the average variance by the variable's measure, which is larger than shared variances with others. Third, using MPLUS, we constructed a sequence of nested structural models to examine the discrimination and model fit (Table 3). The results indicate that the fit of the three-factor model is best (i.e., $\chi^2 = 35.477$, $p < .001$, CFI = .989 > .9, TLI = .983 > .9, RMSEA = .025 < .08, SRMR = .022 < .1). Thus, there are significant differences between the three variables, especially between coopetition and networks.

Regression results

Table 4 shows the regression models, which were estimated using STATA. As expected, the results indicate that network size, density, heterogeneity, and centrality are positively related to startup risk-taking behaviour ($b = .119$, $p < .05$; $b = .168$, $p < .001$; $b = .147$, $p < .05$; $b = .144$, $p < .05$), supporting Hypothesis 1a, Hypothesis 1b, Hypothesis 1c, and Hypothesis 1d. The interactions between the networks and coopetition are shown in Models 3–6. From the results, we found that the moderating effects of coopetition were verified ($b = -.096$, $p < .05$; $b = -.131$, $p < .01$; $b = -.155$, $p < .1$; $b = -.095$, $p < .1$).

FsQCA results

We employed STATA to examine Hypothesis 4 (Longest & Vaisey, 2008). As there were no missing values, we calibrated the data using the upper quartile, lower quartile, and their mean.

Table 2. Correlation matrix

	1	2	3	4	5	2	5	6	7	6	3	8
1. Firm age												
2. Ownership	−.169***											
3. Firm size	.360***	−.330***										
4. Gender	−.050	.137***	−.073*									
5. Age	.147***	−.145***	.198***	−.127***								
6. Education	.020	−.093*	.120**	−.011	−.033							
7. Industry	.404***	−.300***	.433***	−.091*	.202***	.070						
8. Coopetition	.041	−.051	.081*	.024	.035	.142***	.066					
9. Risk-taking	.087*	−.061	.035	.034	.011	.175***	.030	.452***				
10. Size	.063	.002	.084*	.010	.037	−.013	.075*	.135***	.139***			
11. Heterogeneity	.095*	−.027	.075*	−.036	.046	.046	.058	.126***	.121***	.530***		
12. Centrality	.088*	−.033	.112**	.056	.012	.041	.103***	.158***	.143***	.502***	.575***	
13. Density	.068	.008	.112**	.049	−.007	.007	.087*	.129***	.023	.582***	.583***	.616***

***$p < .001$, **$p < .01$, *$p < .05$.

Table 3. Confirmatory factor analysis results

Model	χ^2	*df*	χ^2/df	CFI	TLI	RMSEA	SRMR
Three factors (HE; CE; CO)	35.477	24	1.478	.989	.983	.025	.022
Two factors (HE + CE; CO)	46.522	26	1.789	.980	.972	.033	.025
Two factors (HE + CO; CE)	271.971	26	10.460	.762	.670	.113	.082
Two factors (CO + CE; HE)	266.805	26	10.262	.767	.677	.112	.082
One factor (CO + CE + HE)	273.638	27	10.135	.761	.681	.111	.083

HE, heterogeneity; CO, coopetition; CE, centrality.

Following Longest and Vaisey (2008), the first step in the analysis indicated that 13.84% of startups were likely to experience all conditions at above-median levels, while the most common configuration (low coopetition and low network characteristics), with 14.79% of the sample best fitting it. The sufficiency and necessity matrix indicated that no variable was the necessary condition for risk-taking. Following Di Paola (2020), we employed .85 as the consistency threshold (the result no longer changed within the range of .7–.9). The results indicated that three configurations may stimulate startup risk-taking behaviour. These configurations can explain 75% of the cases whose risk-taking level was above average (total coverage = .75). All three configurations emphasized a high level of coopetition. At the same time, these three configurations showed the important roles of high-level density, high-level centrality, and high-level size and heterogeneity. Table 5 summarizes these configurations.

Discussion

In this study, we explore the impacts of networks and ecosystems on startup risk-taking behaviour. As we hypothesized that coopetition and the dynamic balance of ecosystems are fit, this article combines the coopetitive attributes of ecosystems with networks. We solved the following questions: Do social networks influence startup risk-taking behaviour? How does ecosystem coopetition stimulate risk-taking and moderate the influence of networks? Is there substitution between different network characteristics?

We hypothesize four positive relationships between networks (i.e., size, density, heterogeneity, and centrality) and risk-taking to solve the first question. Through the flexible use of indicators such as finance and social media, this study adds to the literature that proposes that networks are positively associated with EO and startup risk-taking behaviour (Smith & Smith, 2021; Su & Liu, 2019; Wu, Liu, & Zhang, 2017). The second question is whether coopetition influences risk-taking, and our results indicate that the characteristics of the ecosystem do affect startup behaviour. This result is consistent with Bischoff (2021); that is, the characteristics of ecosystems affect the behaviour of entrepreneurs and startups. Both methods verify the third question; that is, coopetition weakens the influences of networks, and all configurations emphasize the existence of high-level coopetition. The results of this article are consistent with previous studies (e.g., Ferris, Javakhadze, & Rajkovic, 2017), which propose that networks offer a way to share risks and intensify entrepreneurs' sense of power. Moreover, this article employs new methods to study the relationship between networks and risk-taking behaviour. Configuration results indicate that in some ecosystems (i.e., high coopetition), different structural attributes of the network may stimulate startup risk-taking behaviour. This result verifies our fourth question.

Although there have been many studies on the structural characteristics of networks, this article innovatively explores whether different features can achieve the same effect in a specific situation (i.e., entrepreneurial ecosystem). This result also indicates that there may be a certain correlation between previous studies focusing on different network characteristics. Unlike

Table 4. Regression models (DV: risk-taking behaviour)

Variables	Theory	Support	Model 1	Model 2	Model 3 (interact)	Model 4 (interact)	Model 5 (interact)	Model 6 (interact)
Size	Hypothesis 1a	Yes	.119*	.102*	.098*	.101*	.101*	.095*
Density	Hypothesis 1b	Yes	.168***	.183***	.177***	.184***	.182***	.181***
Heterogeneity	Hypothesis 1c	Yes	.147*	.139*	.136*	.136*	.134*	.140*
Centrality	Hypothesis 1d	Yes	.144*	.194*	.187†	.188†	.193*	.185†
Firm age			.070*	.067*	.066*	.068*	.069*	.068*
Ownership			−.054	−.038	−.039	−.036	−.039	−.038
Firm size			−.013	−.023	−.022	−.022	−.022	−.022
Industry			−.009	−.010	−.010	−.010	−.010	−.009
Gender			.067	.044	.043	.054	.045	.048
Age			.002	−.012	−.011	−.012	−.015	−.013
Education			.187***	.109**	.110**	.111**	.108**	.109**
Coopetition	Hypothesis 2	Yes		.352***	.343***	.340***	.347***	.341***
Size × coopetition	Hypothesis 3a	Yes			−.096*			
Density × coopetition	Hypothesis 3b	Yes				−.131**		
Heterogeneity × coopetition	Hypothesis 3c	Yes					−.155†	
Centrality × coopetition	Hypothesis 3d	Yes						−.095†
R^2			.178	.344	.347	.351	.345	.347
Adjust-R^2			.164	.333	.336	.339	.333	.335
F-value			5.587	31.590	29.599	30.062	29.319	29.490
p			$p < .001$	$p < .001$	$p < .001$	$p < .001$	$p < .001$	$p < .001$

***$p < .001$, **$p < .01$, *$p < .05$, †$p < .1$.

Table 5. Configurations

	CO	SI	DE	HE	CE	Raw coverage	Unique coverage	Solution consistency
1	■	■		■		0.530	0.022	0.867
2	■		■			0.533	0.117	0.872
3	■				■	0.594	0.043	0.863
Outcome: Risk taking			Threshold: 0.850			Total coverage: 0.750		Solution consistency: 0.831

CO, coopetition; SI, size; DE, density; HE, heterogeneity; CE, centrality.
Blue means above average, and white means the element has no influence on risk-taking.

Sanou, Le Roy, and Gnyawali (2016) and Zhu et al. (2020), we did not explore coopetition from the perspective of a firm's network but explored the role of coopetition as the overall attribute of the ecosystem. We propose that coopetition activities within the ecosystem may significantly affect startups and entrepreneurs, even if the startups have not been able to participate. The moderating effects of coopetition and the results of fsQCA support the proposal of Spigel (2017) and Bischoff (2021) that external ecosystem conditions do affect the behaviours of entrepreneurs and startups. Our results are consistent with some international studies. First, our configuration results support Granovetter's (1993b) proposal in the context of ecosystems; that is, different network attributes may achieve the same effect, showing homogeneity between different network attributes. Second, our regression results are similar to some previous studies, suggesting the important impact of networks and ecosystems on risk-taking (e.g., Allen, James, & Gamlen, 2007; Boso, Story, & Cadogan, 2013; Cao, Simsek, & Jansen, 2015).

Conclusion

The first theoretical contribution of this article relates to the attributes of ecosystems (coopetition). Unlike the traditional network perspective (Scott, Hughes, & Ribeiro-Soriano, 2021), although coopetition also emphasizes the interaction between entities, it may be more contradictory, dynamic, and closer to the natural ecosystem. The present article reveals the conflicts and tensions within the ecosystem from a different perspective from Nambisan and Baron (2021). Under the consensus that the ecosystem may significantly impact entrepreneurial activities (Szerb et al., 2019), this study may help us better understand how digitalization, networks, and ecosystems currently affect value creation. Furthermore, as Spigel (2017) proposed, future studies need to conduct in-depth research on the attributes of entrepreneurial ecosystems. Following Spigel (2017) and Bischoff (2021), we discussed the relationship between coopetition and ecosystems and regarded coopetition as the basis of the formation and development of ecosystems. Thus, we introduce the concept of coopetition, which is defined as interactions between enterprises, into the field of ecosystems.

Our second theoretical contribution relates to the relationship between structural embeddedness and startup risk-taking behaviour. The existing literature has deeply explored the relationship between networks, resources, and risk-taking. Still, there is limited discussion on the relationship between networks and risk-taking in the context of digitalization (Elia, Margherita, & Passiante, 2020). This relationship has undergone tremendous changes, and some scholars have begun to explore these changes (e.g., Smith & Smith, 2021). Based on these studies, we expanded the model of Wong and Boh (2010) to integrate social networks and ecosystems in the digital era. Unlike Neumeyer, Santos, and Morris (2019) and Scott, Hughes, and Ribeiro-Soriano (2021), who deconstruct the ecosystem and explore the impacts of networks on ecosystems, this study explores how the ecosystem affects networks and risk-

taking in the context of digitalization. Therefore, this article further explores SNT and SCT in the digital era, considering the roles of ecosystems and networks in providing sources. Furthermore, because of the unique attribute of ecosystems (i.e., resist risks), this article may deepen the understanding of startup risk-taking behaviour, which was always seen as a dimension of EO. Our research also shows replacement effects between different network characteristics proposed by Granovetter (1993b).

The managerial implications of the present article relate to the positive impacts of social networks and the moderating role of the ecosystem. As Ferris, Javakhadze, and Rajkovic (2019) proposed, managers' characteristics and external situations influence risk-taking. Thus, entrepreneurs should actively cultivate their networks, which may enhance their risk-taking capability, and on the other hand, choose the appropriate ecosystem. Excellent ecosystems may compensate for the shortcomings of entrepreneurs and startups. Startups should actively participate in coopetition activities to shape the overall characteristics of the ecosystem. At the same time, it is crucial to stay or strive to stay in the key location of the network. Administrators or leaders of the ecosystem need to establish a reasonable evaluation index of the ecosystem, which some scholars have studied (e.g., Stam & Van de Ven, 2021), and work hard to maintain a healthy ecosystem.

There are also some limitations to this research, which may provide opportunities for future studies. First, we employed the questionnaire to measure the ecosystem attributes. Despite the support of the literature, we believe that using objective data or surveying regional managers may be more effective. Second, we encourage more longitudinal studies, as they may be better at explaining dynamic changes in ecosystems and startup behaviour.

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