

# Competition network as a source of competitive advantage: The dynamic capability perspective and evidence from China

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**Competition network as a source of competitive advantage: The dynamic capability  
perspective and evidence from China**

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## **ABSTRACT**

The search for competitive advantage is the defining inquiry of strategic management research. In this study, we draw on the dynamic capability lens to develop a counterintuitive view that positions competitors of a firm as an important source of competitive advantage. We argue that a firm's competitors form a competition network from which it can collect information about innovative ideas, product market, and related industries. Such information helps it calibrate market opportunities, update the resource base, and, eventually, strengthen its competitive advantage. This positive effect of competition network on competitive advantage will reasonably be contingent upon the proactive information search by the firm. The empirical results based on the survey data of 631 Chinese firms strongly support our theoretical model. This study identifies another distinctive source of competitive advantage than industry context or organizational resources as well as advancing our understanding of competition network.

**Keywords:** competition network, competitive advantage, information search

**Methodological area:** quantitative and qualitative

## INTRODUCTION

How firms obtain and sustain competitive advantage is the fundamental question in the domain of strategic management. Multiple research strands on this question have highlighted the role of a firm's competitors. The emergence of new competitors may erode valuable competencies of incumbents or disrupt their market positions especially in regimes of discontinuous environmental change (Anand, Oriani, & Vassolo, 2010; Barney, 1991; Christensen, Raynor, & McDonald, 2015; Leiblein, Chen, & Posen, 2017). A firm is in a harsh industry if it simultaneously competes with numerous peers, in that intense competition renders it difficult to earn above-normal rents (Porter, 1980). Some studies even portray the direct competition among firms as a battle in which a focal firm must remain alert to attacks from others and respond effectively to ensure its viability and future success (Chen, 1996; Ferrier, Smith, & Grimm, 1999). As diverse as they may seem, all these stands unanimously treat competitors of a firm as its enemies in market, which do nothing but harm performance. Departing from them, this study seeks to explain how a firm can derive strategic benefits from its competitors and, in turn, strengthen its competitiveness.

We advance our view on competitors by focusing on a firm's competition network instead of a single competitor or a dyadic relationship with it. Here, competition network refers to 'the relational structures of interdependence between rivals that emerge from direct competition' (Skilton & Bernardes, 2015, p. 1688). Drawing from the dynamic capability (DC) lens (Salvato & Vassolo, 2018; Teece, Pisano, & Shuen, 1997; Winter, 2003), we argue that competition network can serve as an important source of competitive advantage. Fundamentally, competitors in the competition network hold critical information about market dynamics, from which profitable opportunities (or dampening threats) can be sensed (Chakrabarty & Wang, 2012). As a firm expands its ties with more competitors, it opens more accesses to valuable information about

technologies, market participants, and related industries, enabling it to beat rivals in market calibration and resource reconfiguration (Teece, 2007). A firm with a relatively larger competition network will reasonably outperform others.

The strategic implications of competition network, however, may not apply equally to all firms. Per the DC research, firms will still perform differently even in the same context for their heterogeneous organizational routines and processes of sensing and seizing market opportunities and reconfiguring resources (Eisenhardt & Martin, 2000; Teece, 2007; Winter, 2003). Given that the strategic benefits of competition network, in our conceptualization, are inherently informational, the routines and processes to search and assimilate information from the external environment (i.e., information search) are particularly relevant to the link between competition network and competitive advantage. The more a firm commits in information search, the more strategic benefits it presumably derives from its competition network. Absent effective search, competition network will remain dormant. So far, literature has identified three types of environmental change that tend to destroy the value of a firm's extant resources and prompt it to develop or acquire new ones, namely technological breakthroughs (Chakrabarty & Wang, 2012; Fleming, 2001; Yan, Dong, & Faems, 2020), changes in market participants (Podolny, 2001; Sinkula, 1994; Zaheer & Zaheer, 1997), and evolution in other related industries (Porter, 1980; Teece, 2007; Terjesen & Patel, 2017). Subsequently, the corresponding search for technology, product market, and related industry information will strengthen the positive impact of competition network on competitive advantage.

To verify our theoretical model, we collect survey data from 631 Chinese firms across industry sectors. The empirical findings strongly support the proposed influence of competition network. Throughout our regression models, the scale of competition network is consistently and

positively associated with the competitive advantage of a firm. The effect of the three information searches, nonetheless, varies: related-industry search significantly strengthens the competitive-enhancing effect of competitive network, product market search does it marginally, and technology search has no moderating effect. The moderating effect, therefore, declines from related industry search, to market search, and to technology search. Taken together, evidence reveals that larger competition network breeds stronger competitive advantage, especially for firms that engage more search for information about related industries or product market.

Being perhaps the first attempt to examine competition network from the DC perspective, this paper makes meaningful contributions to strategic management research. Firstly, we confirm that competition network represents an important but not-yet-recognized source of competitive advantage. Within a competition network, competitors are not merely enemies. Rather, they contain valuable information that is otherwise unavailable from other external constituents and, if effectively gathered and processed, can foster a firm's competitiveness. Secondly, we incorporate a unique context (i.e., a firm's competition network) to the analysis of information search, a micro process of a firm's dynamic capabilities. As a firm knits its competition network, it gains sensors – i.e., its competitors – to environmental stimuli and additional pathways – i.e., the competitive ties with them – to glean external information. This insight sheds new light on how firms sense opportunities from the environment – a process that precedes opportunity seizing and resource reconfiguration but has remained insufficiently addressed. Thirdly, we reveal an important property of competition network, namely its information-specific carrying capacity. Competition network is powerful in carrying the competitiveness-enhancing information that is relevant to but not immediately about a firm's own industry. This capacity subsides as the information (e.g., technological information) becomes more proprietary. Practically, this research helps firms build

a balanced view toward competitors and identifies concrete approaches for extracting the strategic benefits from competition network that, by itself, is a relatively novel dimension of the external environment.

In the coming sections, we first briefly review studies on competitive advantage with an emphasis on the role of competitors. Next, we theorize on the mechanisms that link competition network of a firm to its competitive advantage and formulate hypotheses on the direct effect of competition network scale as well as the moderating effects of information search. The sample, method, and regression result then follow. We conclude the paper with the scholarly and practical implications of our findings.

### **COMPETITIVE ADVANTAGE AND COMPETITORS: A BRIEF REVIEW**

Competitive advantage of a firm serves as a pivotal determinant to its performance and survival (Barnett & McKendrick, 2004; Barney, 2001; Leiblein et al., 2017). A firm is perceived to possess competitive advantage over rivals when it earns above-average return (Porter, 1980). Such advantage only lasts as long as others are unable to emulate it, highlighting the necessity of strategic renewal for a firm to stay ahead of competition. Subsequently, where does a firm gain competitive advantage is one of the most central inquiries in strategy research.

Two dominant views emerge from studies on the source of competitive advantage. Rooted in industrial organization economics (I/O economics), the first view ascribes a firm's competitive advantage to its industry context, giving prominence to such structural attributes as entry/exit barriers, bargaining power of suppliers or customers, etc (Porter, 1980; Takata, 2016). A firm, as this view goes, can gain advantage over rivals by astutely positioning in a profitable industry or endeavoring to shape the industry structure to its favor. The second view, resource-based view (RBV), asserts that competitive advantage of a firm resides internally in its resource and capability



endowments (Barney, 1991). This shift to an inward-looking approach stimulates an immense body of studies to explore the value-generating resources and capabilities within the possessions of a firm and identify various isolation mechanisms (e.g., causal ambiguity) that preserve the competitive value of these resources (Barney, 2001; Helfat & Peteraf, 2015). Naturally, RBV heavily emphasizes the development or acquisition of firm-idiosyncratic resources as the core competitive strategy (Barney, 2001; Leiblein et al., 2017).

The distinction between I/O economics and RBV on competitive advantage is fundamental and evident, but they share a hostile stand toward competitors. According to I/O economics, increased competitors intensifies intra-industry rivalry and the advantage of incumbents inevitably wanes. Observed by Porter (1980, p. 80), ‘new entrants to an industry bring new capacity and a desire to gain market share that puts pressure on prices, costs, and the rate of investment necessary to compete.’ Similarly, RBV posits that a firm would be robbed of competitiveness once other firms surmount the isolation mechanisms to imitate or substitute its valuable resources and capabilities (Barney, 2001; Helfat & Peteraf, 2015). Particularly when new competitors bring in disruptive technologies that render existing technologies or assets obsolete, leading incumbents allegedly face jeopardy of losing its dominant position or even going bankrupt (Christensen et al., 2015).

Whereas most strategy research casts a negative light on competitors, few innovation studies allude to their positive potential. Notably, Powell, Koput, & Smith-Doeer (1996) consider competitors as important nodes in a firm’s social network in which innovation-inspiring knowledge disperses. This is clear in their statement, ‘in industries in which know-how is critical, companies must be experts at both in-house research and cooperative research with such external partners as university scientists, research hospitals, and skilled *competitors*’ (Powell, et al., p. 119). Except

for occasional mentions, competitors have not received systematic scrutiny in innovation literature even though they are perhaps the most conspicuous constituents in the external environment. Instead, most innovation scholars have fixated on suppliers and customers whose relationship with a focal firm is explicitly collaborative and input to idea generation and innovation refinement apparent (Laursen & Salter, 2006; Lopez-Vega, Tell, & Vanhaverbeke, 2016; Phelps, 2010; Schilling & Phelps, 2007). To date, innovation literature yields little knowledge as to how competitors contribute to a firm's innovation process – let alone its overall competitive advantage.

A small thread in alliance literature seems to reveal a more concrete way that a firm's competitors can be strategically beneficial. Here, alliance scholars observe that rivals sometimes collaborate – a phenomenon termed as coopetition (Luo, 2007) – to enlist such relational gains as risk and capital sharing, economy of scale, acquisition of proprietary knowledge, and consolidation of market power (Chen, Pun, & Wang, 2017; Raza-Ullah, 2020; Vassolo, Anand, & Folta, 2004; Yan et al., 2020). Coopetition alliance, nonetheless, only rises in the presence of a strong cooperative bond (Phelps, 2010) and a meticulously designed formal governance structure (Barringer & Harrison, 2000; Chen et al., 2017; Dyer & Singh, 1998). In cases these fundamental conditions are not concurrently met, foes will unlikely become friends (Klein, Semrau, Albers, & Zajac, 2020; Raza-Ullah, 2020). Even if they do initially, the complex interplay between competition and cooperation usually imposes enduring but hard-to-manage tension (Hoffman, Lavie, Reuer, & Shipilov, 2018). At the point the alliance's potential for value creation depletes, partners are prone to compete for value capture, thereby sabotaging the alliance performance or viability (Dyer, Singh, & Hesterly, 2018). Kogut (1989), for example, found that the odds of unexpected termination of an international joint venture increases when the partners simultaneously compete on the product market.

In summary, previous management literature is overwhelmingly negative as far as competitors are concerned, except for few studies on innovation and coopetition alliances (See Table 1). But those innovation studies merely imply a positive role of competitors without giving much in-depth consideration while the alliance research imposes a strict condition – i.e., a formal alliance – on it. In this paper, we acknowledge that the negative view represents only a partial understanding of competitors. Rivals can certainly resort to various strategic initiatives that undermine the advantage of a focal firm, e.g., repositioning in an industry context, imitation, or head-on confrontation. As we will argue below, they also contain useful information that, if properly leveraged, could enable a firm to further its lead. This is feasible even in the void of an alliance. The exclusively negative view, thus, could mislead firms to overlook an additional source of competitive advantage, raising an urgent call to supplement the current comprehension of competitors with the knowledge about their positive side.

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Insert Table 1 about here  
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## **HYPOTHESIS DEVELOPMENT**

In this section, we build our research model within the DC framework. Here DCs refer to the organizational capabilities to ‘purposefully create, extend, or modify its resource base’ (Helfat et al., 2007, p. 4). Guiding reliable, patterned changes in operational capabilities, DCs usually embed in organizational routines and processes (Winter, 2003), intertwine with business models (Teece, 2018), and operate through the productive interactions and dialogues among individual employees within a firm (Salvato & Vassolo, 2018). Asserted in this framework, the ownership of certain hard-to-replicate resources alone is insufficient to produce enduring competitive advantage since

environmental changes, especially the discontinuous ones, often render the valuable capabilities and resources obsolete (Anand et al., 2010; Chakrabarty & Wang, 2012; Dyer et al., 2018). To sustain the advantage over rivals depends critically on a firm's capabilities of modifying resources to keep pace with or even lead environmental changes. A firm exercises its DCs primarily via the process of sensing opportunities or threats from market and then reconfiguring organizational processes or resources to seize the opportunities (or nullify the threats) (Teece, 2007). Following this line of argument, we propose that competition network of a firm, by feeding information on critical dimensions of the environment to the opportunity sensing process, would eventually bear on its competitive advantage.

### **The direct effect of competition network**

A firm's direct competitors form a competition network (Burt, 1992; Skilton & Bernardes, 2015). This network is egocentric, connecting a firm to the competitors within its perception but not beyond (Gimeno, 2004). The tie between a nod and the focal firm exhibits clear, competitive tension (Gnyawali & Madhavan, 2001; Madhavan, Gnyawali, & He, 2004). For these distinctive features, competitive network approach 'opens the door to network studies of industries and populations that have been overlooked because they are not characterized by cooperative relationships' (Skilton & Bernardes, 2015, p. 1696). Figure 1 visualizes the competition network of two hypothesized firms, A and B. A's competition network comprises A1, B, and C while that of B includes A, B1, B2, B3, and C. As a common competitor to A and B, C appears in both networks.

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Insert Figure 1 about here

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As the nodes linked to a focal firm, competitors in a competition network hold various critical information to market calibration and, in turn, to competitive advantage. First is technological information. Technological shifts, per the DC research, represent the most consequential environmental changes that tend to destroy the value of the current technologies and jeopardize the existing business (Christensen et al., 2015; Fleming, 2001; Teece, 2007). To remain viable and competitive, a firm must constantly monitor the technology evolution in its market and the opportunities or threats that may ensue. Although various sources may contain signals about the existing technologies and the future trend (e.g., research institutes), competitors have perhaps the most relevant knowledge in this aspect. They employ similar technologies and skills to serve the overlapping market and keep refining them through their research activities (Powell et al., 1996). The technological information from its competition network offers critical input for a firm to forecast technological changes in its industry and then accordingly update its own skillset.

Furthermore, competitors also provide information on other market participants, which may suggest opportunities in the external environment (Podolny, 2001; Skilton & Bernardes, 2015; Zaheer & Zaheer, 1997). In a market, customer preferences may evolve, suppliers switch operations, or regulative authorities enact new policies. Such changes from market participants can sometimes introduce fundamental turbulences in environment (Sinkula, 1994). To strive for a constant alignment with environment compels firms to continuously tailor their operation, organization, processes, and resources to the preferences of the market participants (Pfeffer & Salancik, 1978). As such, competitors can serve as reference points for the environmental dynamics caused by market participants, and this market-related information reasonably enhances a firm's capabilities to translate technologies into well-received products or services (through product development and commercialization) (Kapoor & Klueter, 2015) or even to spot new

market segments (Chakrabarty & Wang, 2012; Sinkula, 1994; Skilton & Bernardes, 2015). For example, convenient store chains often infer the potential patronage traffic of one location from the nearby competing stores. Meanwhile, many firms become aware of foreign markets by observing the internationalization footprint of industry rivals (Knickerbocker, 1973).

Triggers to environmental shifts, nonetheless, are not confined to internal factors like technological breakthroughs or dynamics in market participants but can originate externally from the development of other related (or co-specialized) industries, i.e., those with complements or substitutes to an industry's products (Khanagha, Ansari, Paroutis, & Oviedo, 2020; Porter, 1980). Complements spawn market opportunities by elevating the value of the existing products, and substitutes pose threats by fulfilling the same market needs with alternative approaches. The appearances of complements or substitutes are usually dissimilar and their signals weak to perceive, making the resultant opportunities easy to miss but threats particularly disruptive. Surveying related industries, hence, is no less critical to opportunity sensing and seizing than attending to endogenous dynamics (Teece, 2007). The products or strategies of competing firms are often considered as one of the few observable indicators of the emergence of complements or substitutes from outside (Zaheer & Zaheer, 1997). After all, among various external parties, competing firms are the ones with the highest alerts to the evolution of related industries and often the first to respond.

Situating a focal firm in the center, competition network affords numerous means for it to learn and/or access the critical information from its competitors. It is not uncommon that a firm obtains technological and market information from its competitors by closely monitoring media outlets (e.g., company webpage), attending public events like technology or product debut, studying patents, or even reverse-engineering products (Burt, 1992). Other formal channels

encompass inter-firm visits, industry association, or industry reports from independent research institutes, exhibition events, and so on (Podolny, 2001). Besides, the informal ties that rise from friendship, common customers, or the exchange of employees are sometimes more effective in penetrating the protection of competitors and accessing critical information (Carpenter, Li, & Jiang, 2012; Podolny, 2001; Skilton & Bernardes, 2015)<sup>1</sup>.

Competition network, therefore, would enhance the competitive advantage of a firm by enabling it to sense the opportunities triggered by the dynamics in technology, market participants, or related industries and updating its resource base responsively. This effect varies with the size of the competition network. In a large competition network, a firm ties up with numerous competitors and technically gains direct access to many sources of information about the external environment. Intuitively, it will sense the market opportunities or threats faster, positioning it among the early movers to make necessary reconfiguration in resources or processes. More important, the firm has a privilege to verify the credibility of the information through triangulating it among different competitors (Jolink & Niesten, 2020)<sup>2</sup>. It is less likely to fall victim to the misleading signals intentionally disseminated by its competitors. In contrast, a firm with a small competition network lacks direct ties with many other firms and may be blind to environmental shifts. Market calibration by this firm will be retarded or flawed compared to its well-connected rivals. Consequently, it will either overly rely on the existing resources to the extent of path dependency or bear the risk of changing resources in an erroneous direction. In either way, its organizational resources and capabilities will easily drift out of alignment with the external environment and competitive advantage will hardly develop nor sustain (Helfat et al., 2007; Teece, 2018). The above arguments suggest,

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<sup>1</sup> We are grateful to one anonymous reviewer for pointing out the role of informal ties.

<sup>2</sup> We are grateful to one anonymous reviewer for suggesting this important function of a large competition network.

*H1. The scale of a firm's competition network will increase its competitive advantage, all else being constant.*

### **The moderating effects of information search**

Depending on its scale, competition network will constrain or facilitate the inflow of important information to the market calibration process and correspondingly shape a firm's competitiveness vis-à-vis other firms. Yet, as the DC research maintains (Eisenhardt & Martin, 2000; Helfat et al., 2007; Salvato & Vassolo, 2018), firms may still perform differently even in the same context for their heterogeneous capabilities as well as the underpinning micro processes to calibrate and respond to market dynamics. These internal variances dictate that even though competition network constitutes a potential source of valuable information, how effective a firm taps into it and derives tangible outcomes will plausibly hinge upon the information search it commits. Here information search refers to the organizational processes a firm employs to sense, collect, and interpret external signals for identifying upside opportunities or downside risks (Martin & Mitchell, 1998; Sinkula, 1994; Smith, Grimm, Gannon, & Chen, 1991). Previous research (Teece, 2007) has recognized information search as a critical micro process a firm exercises its DCs. To delineate more fine-grained insights, we decompose information search into three specific types – technology search, product-market search, and related-industry search – and respectively analyze how each of them influences the effect of competition network on competitive advantage.

Technology search denotes the process of searching for new methods, processes, or skills in developing products or services (Fleming, 2001; Lopez-Vega et al., 2016). This search is increasingly deterministic to a firm's success as 'research breakthroughs demand a range of intellectual and scientific skills that far exceed the capabilities of any single organization' (Powell et al., 1996, p. 118). It is also indispensable because truly useful technological assets or skills tend



to be under safeguards that isolate them from the public (Martynov, 2019; Yan et al., 2020). When an innovation emerges in a competition network, the firm with resources and processes designated to search for technological information will likely notice it ahead of others. This lead-time allows it to apply the innovative ideas and knowledge from its competitors to its own R&D process or to devise strategies to acquire the new technology (Anand et al., 2010; Laursen & Salter, 2006; Lopez-Vega et al., 2016; Martynov, 2019; Snihur & Wiklund, 2019). Consequently, it can update its technological capabilities to catch up with the new competitive realm, avoiding the danger of being rendered obsolete (Yan et al., 2020). By contrast, a firm that passively waits for the information on new technologies to come in would only learn about a critical innovation rather late and suffer from time diseconomy in altering its resources or processes (Dierickx & Cool, 1989). This firm would hardly gain or sustain a technology leadership position that is otherwise possible for its large competition network.

*H2. Technology search enhances the positive relationship between the scale of a firm's competition network and its competitive advantage.*

Product market search involves the search for information regarding customer demographics and preferences, price, supplier operations, supply-demand fluctuations, and relevant regulations (Katila, 2002; Martin & Mitchell, 1998). Through a well-versed market search, a firm can gather and exploit more market-related information from its competition network, which intuitively strengthens its capabilities to size up market status quo and predict future evolution (Martin & Mitchell, 1998; Podolny, 2001; Sinkula, 1994). Product market information offers critical input to the processes of product development and commercialization (Kapoor & Klueter, 2015; Skilton & Bernardes, 2015). Clear and thorough insights about market facilitate upgrading existing products or launching new ones that cater to market needs and expand market shares

(Martin & Mitchell, 1998). However, when market search is weak or absent, a firm will still be ill-informed about market conditions even in a far-reaching competition network. The chance that it misjudges market dynamics and puts forth misoriented products is high, effectively putting a cap on the strategic benefits it could derive from its competition network. We therefore propose,

*H3. Product market search enhances the positive relationship between the scale of a firm's competition network and its competitive advantage.*

Related industry search, by definition, is the organizational process to monitor and comprehend the development of related industries, particularly those with complements or substitutes to an industry's products. Unlike technology or market search that are local for focusing on a firm's own industry, related industry search is global or distant with a scope spanning across multiple industries (Iyer, Bau, Chirico, Patel, & Brush, 2019; Rosenkopf & Nerkar, 2001). Equipped with a strong related industry search, a firm is capable of sensing cues from its competition network regarding the development of potential complements or substitutes. This information then allows it to formulate effective and timely strategies in response such as altering its resources and processes to capture or even pre-empt the market space that initially sparked by other industries (Helfat et al., 2007; Teece, 2018). A firm that confines attention only within its immediate industry may lose sight of the events from other industries in which profitable opportunities embed. Furthermore, this firm is more prone to develop learning myopia (Terjesen & Patel, 2017), organizational inertia (Miller & Chen, 1994), and strategic rigidity (Kapoor & Klueter, 2015), which prevents it from acquiring or developing necessary resources or capabilities to face the arrival of unexpected threats. The firm's existing competitive advantage will falter and its demise may even loom. A case in point is the bankruptcy of Kodak caused by the rise of digital technology in other industries. Hence, absent the effective search for related industry information,

the firm with a large competition network will still be vulnerable to the threats of substitutes or miss the opportunities to use complements to enhance the value of its products. We therefore propose,

*H4. Related industry search enhances the positive relationship between the scale of a firm's competition network and its competitive advantage.*

Figure 2 depicts our research model.

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Insert Figure 2 about here  
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## **METHOD**

### **Sample**

We collect data for this study via a survey to managers at the middle or even higher level of a company in China. The survey draws well-established items from previous literature, all of which use the seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7). Since the survey must be in Chinese, we employ the back-translation technique to ensure accuracy. We first translate the items from English to Chinese and then ask research assistants with strong English and Chinese capabilities to translate the Chinese version back into English. The two English versions see high convergence. To assess content validity and item readability, we send the survey to ten business scholars and ten managers for a preview. Any unclear item is revised and improved per their feedback. We distribute the survey and collect responses using a popular online platform (<https://www.wjx.cn/>) which has over 2.6 million middle or above level managers registered as users. To encourage responses, the survey offers some monetary rewards to respondents who complete it. The survey runs for two weeks and 890 respondents fill the questionnaires. We delete

those responses that are incomplete, finished too fast (i.e., in less than five minutes), or with wrong answers to reversed questions. This process leaves us 631 useable responses. Table 2 shows the sample statistics.

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Insert Table 2 about here  
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### **Variables and measures**

While the measure for some of our variables has one item, others are multi-item latent variables. To ensure the confidence of regression results, it is paramount to verify the measurement validity and reliability of those latent variables. For this purpose, we undertake confirmatory factor analysis. The results suggest strong convergence and discriminant validity of our measures with the significant loadings of all items on their latent construct and no major cross loading. Cronbach's alpha of all our measures is above the 0.60 threshold, indicating sufficient reliability. Following the standard procedure, we take the average of the multiple items as the value of a firm for each latent variable.

*Competitive advantage.* In the present study, we use the managers' assessment of performance consequences to indicate the competitive advantage of his or her firm. This measure is in line with the fundamental contention in literature that a firm with competitive advantage must outperform the rivals (Barney, 1991). Also, previous studies have long established competitive advantage as a multi-dimensional construct (Leiblein et al., 2017). Hence, we conceptually consider market share, growth prospect, and market leadership position as three sub-dimensions of competitive advantage (Cronbach's  $\alpha = 0.876$ ).

*Competitive network scale.* The scale of a social network is perhaps the most frequently examined structural feature in previous research (Burt, 1992; Carpenter et al., 2012; Granovetter, 1985). Consistently, Skilton and Bernardes (2015) also maintain that the scale of competition network exerts strong implications on firm strategies. Our survey asks responding managers to assess whether his or her firm has many competitors with similar products, target customers, or suppliers (Cronbach's  $\alpha = 0.879$ ).

*Technology search.* We adopt the three items for this variable from Sidhu, et al (2007), which asks about the efforts a firm invests to look for the technology-related knowledge and ideas within its own industry and from other industries that also apply the same technology (Cronbach's  $\alpha = 0.78$ ).

*Product market search.* The study by Laursen & Salter (2006) provides the items for this variable. Specifically, survey items ask whether the respondent's company has (1) a specialized department to search for customer, supplier, or partner information, (2) a database to store market-related information, (3) activities to routinely analyze, learn, and discuss market information (Cronbach's  $\alpha = 0.81$ ).

*Related industry search.* Consistent with previous research (Porter, 1980), we define related industries as those with complementary or substitutive products to a firm's own products. Items for this variable come from the study by Terjesen and Patel (2017), which ask how much attention a respondent's firm pays to the activities from industries with substitutes or complements (Cronbach's  $\alpha = 0.866$ ).

### **Control variables**

To count for the alternative explanations of competitive advantage, we add several control variables to the regression models. Suggested by RBV (Barney, 1991), resources and capabilities

within a firm constitute a fundamental basis of competitive advantage. Directly, we capture *firm resources* by asking whether a firm controls more market information, business resources, and technology capabilities relative to its competitors. In addition, we employ multiple firm-level variables to proxy the resource endowments of a firm, namely *firm scale*, *ownership type*, and *whether the firm is listed*. Firm scale is assessed by the number of employees and two indicator variables are used to measure firm ownership structure (State owned =1; others =0) and its public status (Listed =1; other =0). In the Chinese context, the ownership structure of a firm relates significantly to its resources, in that state-owned enterprises normally possess more resources and can muster more resources than privately-owned counterparts. Similarly, listed companies also tend to have more access to financial capitals and other forms of resources than non-listed ones.

We used *market share* and *market entry* to control respectively for the market power a firm wields and the potential influences of entry timing (i.e., early mover or latecomer). We distinguish between four ranked divisions of market share. A company with a market share of less than 10% has a score of 1, between 10% and 30% a score of 2, between 30% and 50% a score of 3, and more than 50% a score of 4. Market entry is also split into four categories (1= between 1 and 3 years, 2= between 3 to 5 years, 3= between 6 and 10 years, and 4 = between 11 and 25 years). We control for potential age-dependence of competitive advantage by including firm age in the regressions. *Firm age* is measured with an indicator variable (1= between 1 year and 5 years since founding, 2=between 6 and 10 years, 3=between 11 and 15 years, and 4=more than 15 years). The greater the value, the older the firm.

Besides firm-level factors, we also include three fixed effects to account for influences of the external environment. I/O economics suggests that the industry context significantly shape the competitive conducts and advantage of a firm (Terjesen & Patel, 2017). As such, we include a

fixed effect of *industry stage* to control for the heterogeneous context a firm faces in the industry life cycle. We account for other unobserved industry variations through an *industry-fixed effect* based on the industry designation of each firm. To control for the macro environment, we use an *area-fixed effect* based on the six areas in China. These areas feature vast differences in economic development, market maturity, infrastructure, and institutional arrangements, which may shape the competitive advantage of firms.

## Results

To check the common method bias, we apply Harman's one-factor test. The test extracts more than one factor that explain 69.803% of the total variances. The first factor only accounts for 25.046% of the total variance. Thus, no single factor explains most of the variance, ruling out the common method bias. As Table 3 shows, the binary correlation coefficients among all variables are less than 0.45.

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To test the hypotheses, we use the ordinary least squares (OLS) linear regression approach. We estimate nine models in total to verify the direct effect of competition network scale and the moderating effects of information search (Table 4). Model 1 includes all control variables, Model 2 adds competitive network scale, Model 3 to 5 then include three information search respectively, Model 6 entails all controls, competitive network scale, and all three search approaches, Model 7 to 9 add the interaction between competitive network scale and three information search actions respectively. The variance inflation factors of all our models are smaller than 3, suggesting no presence of multicollinearity.

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Insert Table 4 about here  
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In Model 2, the coefficient of competition network scale is significant and positive ( $\beta=0.072$ ;  $p<0.05$ ). Consistent with Hypothesis 1, the larger the competition network is, the more competitive advantage a firm has. This positive effect stays mostly unchanged throughout all the regression models, providing strong evidence for its robustness. From Model 3 to 5, each of the three search actions alone has a significantly positive coefficient ( $\beta=0.242$ ,  $p<0.01$  for technology search,  $\beta=0.182$ ,  $p<0.01$  for product market search,  $\beta=0.102$ ,  $p<0.01$  for related industry search). After entering all three search actions simultaneously into Model 6, the coefficient of technology search ( $\beta=0.172$ ,  $p<0.01$ ) and market search ( $\beta=0.133$ ,  $p<0.01$ ) remain significant but that of related industry search does not ( $\beta=0.029$ ,  $p>0.05$ ). The findings suggest that technology search and market search exert more robust influences on competitive advantage than does related industry search.

In Model 7, the coefficient of the interaction between competition network scale and technology search is positive but not significant ( $\beta=0.014$ ;  $p>0.10$ ). Inconsistent with Hypothesis 2, technology search action does not moderate the relationship between competition network scale and competitive advantage. Interestingly, the simple main effect of both competition network scale ( $\beta=0.052$ ,  $p<0.10$ ) and technology search ( $\beta=0.172$ ,  $p<0.05$ ) remain positive and significant in the presence of the interaction term. Even without a competition network (i.e., a monopoly), technology search still contributes to a firm's competitive advantage and a firm still benefits from its competition network despite the absence of technology search. As such, it seems that the effect of either variable on competitive advantage is not contingent upon the other.



In Model 8, the interaction between product market search and competition network scale is positive but marginally significant ( $\beta=0.038$ ,  $p<0.10$ ). This finding supports Hypothesis 3 that the more product market search the stronger the effect of competition network on competitive advantage of a firm. In Model 9, the interaction term of competition network scale and related industry search is significantly positive ( $\beta=0.078$ ,  $p<0.05$ ). Consistent with Hypothesis 4, the greater related industry search a firm commits in, the stronger the effect of competition network scale on competitive advantage. Taken together, the three moderating effects extend a clear pattern, the moderating effect weakens from related industry search, to product market search, and then to technology search.

### **Robustness checks**

We perform a series of robustness checks on our results. Firstly, the effect of competition network scale on competitive advantage is quite solid across all our regression models. We, thus, apply additional validations over the moderating effect of the three information search approaches by adopting another widely-used method for testing moderation. Following the standard procedure (Kapoor & Klueter, 2015), we split the entire sample into an upper and a lower regime according to the mean value of each search approach, run the full model with all independent variables on both regimes, and then compare the coefficient of the competition network scale. The inter-regime difference in this coefficient attests to whether the effect of competition network scale varies between firms with a low or high level of each information search. Table 5 shows the results. Model 10a and 10b are the regressions on the regimes divided by the mean of technology search, Model 11a and 11b on the regimes divided by the mean of market search, and Model 12a and 12b on the regimes divided by the mean of related-industry search.

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Insert Table 5 about here

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In both Model 10a and 10b, the coefficient of competition network size is positive but not significant ( $\beta=0.049$ ,  $p>0.1$  and  $\beta=0.030$ ,  $p>0.1$  respectively). This evidence further substantiates the finding of Model 7 that the effect of competition network size is indifferent to the level of technology search across firms. In Model 11a, the coefficient of competition network size is insignificantly negative ( $\beta= -0.009$ ,  $p>0.1$ ) but becomes positive and significant in Model 11b ( $\beta= 0.090$ ,  $p<0.05$ ). This pattern also clearly appears in Model 12a and 12b ( $\beta= -0.019$ ,  $p>0.1$  and  $\beta= 0.103$ ,  $p<0.05$ ). Per these findings and consistent with our suppositions, both market search and related-industry search are a key contingency to the effect of competition network scale. Competition network offers a source of competitive advantage for a firm with a strong market search or related-industry search but may become a strategic liability (indicated by the negative coefficient in the low regime) if a firm falls short of either search approach. Overall, Model 11a to Model 12b present additional evidence to the early findings in Model 7 to 9 that both market search and related industry search foster the positive effect of competition network scale but not technology search.

Two other concerns remain regarding the validity of our findings. One stems from the variance-based approach of our analysis. This approach is suitable to validate hypotheses but may be limited in providing direct evidence as to the underlying processes or mechanisms (Khanagha et al., 2020). The other concern is the subjective nature of our data, especially those on the three performance dimensions of competitive advantage measure<sup>3</sup>. It would be ideal to link competition network scale in our survey with the objective performance measure of the firms (e.g., market

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<sup>3</sup> We are thankful to the editor for identifying this concern.

share, return on assets, Tobin's Q, etc.). This enhances the objectivity of the results and conforms to the definition of competition network – it is a perceptive construct by managers. This ideal approach, nonetheless, is infeasible in our context as the survey, for the anonymity reason, omits the identification of the respondents including his or her affiliations and denies the possibility of retrieving the objective performance of their firms. In this situation, previous research has suggested to source qualitative evidence as an alternative validation approach (Kapoor & Klueter, 2015; Powell et al., 1996). The two remaining concerns, thus, call for the qualitative analysis. Correspondingly, we focus on two key inquiries – whether competition network indeed promotes competitive advantage and how this effect unfolds.

We employ a semi-structured interview to collect qualitative data. To qualify for our research, the informant must be a top echelon in his or her organization, who directly involves and has influential power in the making of strategic decisions. These qualified individuals, nevertheless, rarely have time for an extensive interview or repeated interviews, rendering an in-depth single case approach infeasible. These considerations lead us to adopt a multi-case study method with a relatively brief interview. To foster the generalizability of our findings, we carefully select informants so that their managerial positions and firm characters like ownership structure, major business lines, and industry segments can be as diverse as possible. We ask open-ended questions and cautiously avoid showing or implying our research objectives and interests during every interview. This ensures the perspectives from the informants are genuine and voluntary, which is critical for observing the underlying patterns or themes. Eventually, we complete interviews with 13 informants who come from different companies; each interview lasts for about an hour. Table 6 reports details of the informants and company background. Most of these firms are purely

domestic in China, two are joint ventures between Chinese and foreign partners, and two are the local subsidiary of two global companies headquartered in North America.

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Insert Table 6 about here

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Despite their extensive heterogeneities, all informants confirm the importance of competitors to their firms while acknowledging the competitive tension in between. Table 7 presents the representative quotes from the interviews. One intriguing finding is that informants commonly apply metaphors to describe competitors as friends, escalators, catalysts, or boosters to the performance and development of their firms. A general manager even goes so far as to assert that his company would not have existed if not for competitors. Even when some managers see no chance to cooperate with competitors in their unique settings, they still admit that their companies benefit from competitors in many accounts. Hence, qualitative evidence forcefully substantiates that competitors are more than enemies to a firm but contribute to its competitive advantage. Given the top position of these informants, their unanimous observations add confidence to the prediction that competition network would significantly enhance firm performance if we were able to measure it objectively.

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Insert Table 7 about here

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We follow up by asking the informants to identify and elaborate on the specific benefits their companies gain from competitors. Here the responses start to diversify by showing a high degree of firm- and individual-specificity. However, one clear fact is that nearly all the benefits

mentioned by the informants are in the form of knowledge or information and acquired through a learning procedure – albeit in varied approaches. This finding is highly consistent with our contention that the strategic benefits in the competition network are mostly informational in nature and deliberately searching, processing, and assimilating the information by a focal firm represents an important accessing instrument. Besides, most of the responses bear on three dominant themes namely technology, market, and other industries<sup>4</sup>. Table 8 contains the representative quotes. These three main themes correspond tightly with the theoretical mechanisms we propose from the DC perspective, thereby offering strong validations to the linkage between competition network and competitive advantage.

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Insert Table 8 about here  
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## **DISCUSSION AND CONCLUSION**

Previous research has generally viewed competitors of a firm through a negative lens, but we maintain that competitors are also an important source of a firm's competitive advantage. We develop this counterintuitive view by positioning a firm in its competition network (Skilton & Bernardes, 2015) and by drawing the theoretical foundation from the DC perspective (Helfat et al., 2007; Salvato & Vassolo, 2018). Specifically, a firm through its competition network can gather valuable information about innovative ideas, market participants, and related industries from its competitors. This information enables it to calibrate market opportunities, modify resource base, and strengthen its competitive advantage. This DC-based proposition receives strong support from

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<sup>4</sup> Besides the three themes, some informants also mention that competitors together help nurture the whole market by improving the supply conditions and, in turn, benefit them. We do not consider this perspective in this research as the environmental improvement applies to all firms in an industry and, in principle, does not generate competitive advantage for any single one.

the empirical finding that a firm's competitive advantage increases with its competition network after controlling for firm resources, industry context, and macro environment. Also, we find that the linkage between competition network and competitive advantage does not apply equally to all firms but is contingent upon their information search actions. The theoretical arguments and empirical findings of this study make meaningful contributions to research on competitive advantage, competition network, and information search.

### **Scholarly implications**

The finding on the positive effect of competition network scale first contributes to the strategy literature by identifying an additional source of competitive advantage. Two dominant frameworks have underpinned most studies on competitive advantage, namely I/O economics (Porter, 1980) and RBV (Barney, 1991). The former highlights industry positioning and the latter emphasizes idiosyncratic resources as the basis for a firm to gain its advantage over rivals. While external industry and internal resources are undoubtedly important antecedents to firm competitiveness, our finding suggests that competition network a firm operates in can also play a unique role. Indeed, after controlling for the firm-level resources and industry effects in our empirical models, competition network scale explains additional variances of a firm's competitive advantage.

In shaping a firm's competitive advantage, competition network extends some uniqueness and similarity with industry context and internal resources. Like the industry environment, competition network constitutes an external contextual force that affects firm competitiveness through an outside-in path (Chen, 1996). Rather than treating industry as the unit of analysis, competition network focuses on the relational structure consisting of a firm and its intra-industry peers (Skilton & Bernardes, 2015). This intra-industry focus makes competition network a suitable, analytical approach to explain the within-industry variations in firm strategy and performance, an

important issue I/O economics has been unable to tackle. In addition, even though lying beyond the organizational boundary of a firm, competition network like resources and capabilities is firm-specific and, to a great extent, amenable to organizational decisions and actions. A firm can deliberately reconfigure its network by initiating or retreating from contests with other firms. Thus, competition network captures a contextual influence that has been missing in I/O economics and RBV analysis but is highly relevant to strategy.

By highlighting a novel context, i.e., a firm's competition network, in the moderating effect of the three search actions, we also advance the information search literature. Previous research, particularly studies from the DC perspective, has confirmed that information search within and outside of a given industry is of strategic importance to firm performance or even survival (Carpenter et al., 2012; Fleming, 2001; Helfat et al., 2007; Katila, 2002; Lopez-Vega et al., 2016). Consistently, our models confirm that the technology and product market search, indicated by their positive coefficients, significantly promote competitive advantage. More important, additional insights stem from the three interactions between those actions by a firm and its competition network. The insignificant moderating effect of technology search shows that its influence on competitive advantage is independent of a firm's competition network. Product market search marginally promotes the positive influence of competition network. Related industry search, however, has a significantly positive interaction with competition network. Evidence hence reveals that the effect of product market search and related industry search is contingent upon the size of competition network. The larger the competition network, the greater the two effects.

The moderating effect, thus, escalates from technology search, to product market search and then to related industry search. One speculation about this escalating pattern is the declining carrying capacity of competition network across the three types of information. To begin with, as

our findings suggest, a firm does not derive extra benefits from its competition network even if it increases commitments in technology search. Competition network, therefore, is barren in terms of technological information. This is intuitive as technologies of a firm tend to be highly proprietary and, for its centrality to competitive advantage, securely safeguarded. Mere search for the information from its competition network proves inadequate to surmount the obstacles to acquire technological assets or knowledge from its competitors. A formal linkage, as in a supplier-customer relationship (Khanagha et al., 2020) and a coopetition alliance (Raza-Ullah, 2020), seems necessary. In contrast, competition network contains rich information about related industries as the corresponding search enhances the influence of competition network on advantage. Explaining this finding may be the common tendency of firms to undervalue the related industry information and to put lax protection over it against the probing of competitors. Subsequently, the related industry information can be relatively easy to discover and acquire from competition network if a firm deliberately searches for it. Comparatively, competition network may contain a moderate level of product market information that appear less proprietary than technology information but draws more protection than related industry information.

### **Practical implications**

Managers can gain valuable insights from the theoretical arguments and empirical findings of this research. It is timely to modify the simple, negative, and incomplete view on competitors. True that competitors are enemies on many occasions such as price wars. They, nonetheless, contain beneficial information that, if acquired and exploited effectively, contributes significantly to a focal firm's advantage. Indeed, from its competition network, a firm can acquire useful information about the product market and related industries which put it ahead of rivals. It would be a considerable loss if a firm single-mindedly focuses on the competitive tension but forfeits the



opportunities to learn strategic information from its competitors. Furthermore, managers should heed the information-specific carrying capacity of competition network and differentiate the search strategies accordingly. From a firm's competition network, the search for market and related industry information will likely yield fruitful rewards but technology search may be ineffective. For technological knowledge, the firm may have to look somewhere else (rather than its competition network) and adopt another approach beyond information search (e.g., allying).

### **Limitations and future extension**

Besides meaningful contributions, this study is not exempt from limitations. Firstly, for its research objective, this paper examines the link between competition network and competitive advantage. Linking competition network to other organizational outcomes like innovation, revenues, and profitability can potentially extend our research from strategic management to other important domains like revenue management. Secondly, we employ the survey method to capture the assessment of managers on competition network of his or her firm. Consistent with the egocentric nature of competition network, subjective assessment may be susceptible to individual biases. To address this limitation, further research is needed to map out the actual competition landscape of a firm and then study its strategic implications on objective performance measures. Evidence from this approach will be a valuable supplement to the findings of this study. Thirdly, it is necessary to extend the empirical context beyond one country. The present study features a single country design that holds the country-level environment constant. Yet, more firms are riding the wave of globalization to seek opportunities abroad, which exposes them to heterogeneous national contexts and a more diverse set of competitors. To extend the boundary of the research on competition network calls for more replications of our framework across national settings<sup>5</sup>. Countries in South

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<sup>5</sup> We are grateful to an anonymous reviewer who points out the need for this future extension.

America are interesting examples, which are largely emerging economies like China but demonstrate much distinctiveness in their cultural, political, and institutional environment (Vassolo, De Castro, & Gomez-Mejia, 2011). Fourthly, other structural attributes of competition network are worthy of more explorations. In this study, we focus on network scale as an important antecedent to competitive advantage; other structural characteristics like heterogeneity of the network may also impact a firm's competitive advantage.

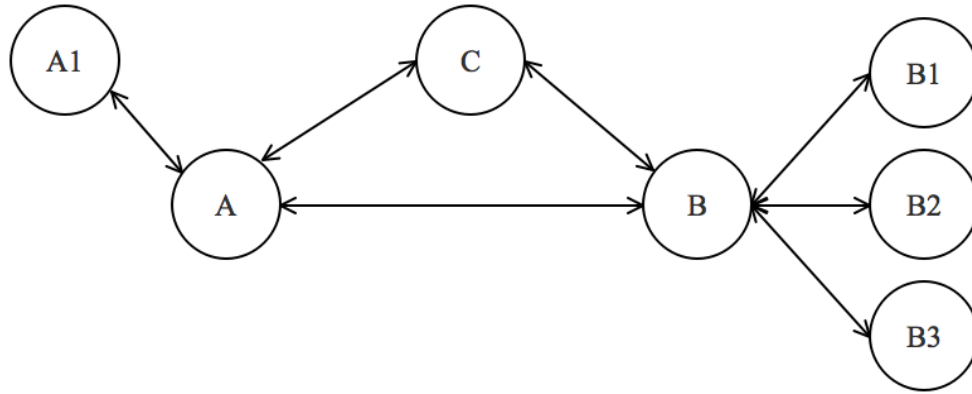


Figure 1. The competition network of A and B

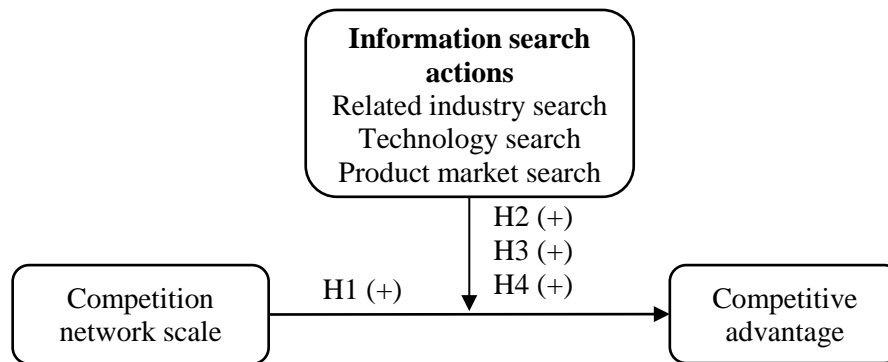


Figure 2. The research model

Table 1. Previous research streams on competition and competitors

<b>Research strands</b>	<b>Representative studies</b>	<b>Sources of competitive advantage</b>	<b>Role of competitors</b>	<b>View on competitors</b>
I/O economics	(Porter, 1980; Takata, 2016)	Structural conditions of the industry	Intensify intra-industry competition and undercut industry profitability	Negative
RBV	(Barnett & McKendrick, 2004; Barney, 1991; Leiblein et al., 2017)	Internal resources and capabilities	Imitate or substitute valuable resources and erode other firm's advantage	Negative
Innovation	(Laursen & Salter, 2006; Lopez-Vega et al., 2016; Phelps, 2010; Powell et al., 1996; Terjesen & Patel, 2017; Trantopoulos, Von Krogh, Wallin, & Woerter, 2017)	Unique innovations in technologies, products, services, or processes	A potential source of innovation-inspiring ideas and knowledge	Possibly positive but barely explored
Strategic alliance	(Aggarwal, 2020; Agostini & Nosella, 2017; Anand et al., 2010; Chen et al., 2017; Dyer & Singh, 1998; Gimeno, 2004; Jolink & Niesten, 2020; Kogut, 1989; Luo, 2007; Martynov, 2019; Raza-Ullah, 2020; Vassolo et al., 2004)	Relational benefits (e.g., saving on transaction costs, exchange of proprietary knowledge, pooling complementary assets, etc).	An ally that provides value-generating and often non-tradable assets and knowledge.	Possibly Positive but only in a formal alliance

Table 2. Sample descriptive statistics

Measure	Details	Count	%
Industry	Manufacturing	304	48.2
	Accommodation and catering industry	31	4.9
	Transportation industry	29	4.6
	Building industry	42	6.7
	Information and communication	125	19.8
	Finance and insurance	46	7.3
	Retail industry	31	4.9
	Others	23	3.6
Area	North China	138	21.9
	East China	244	38.7
	Central South Region	172	27.3
	North-east Region	39	6.1
	Southwest Region	34	5.4
	North-west region	4	0.6
Market entry time	Less than 3years	492	78.0
	4-8years	139	22.0
Number of employees	Less than 10	2	0.3
	10-99 persons	115	18.2
	100-199 persons	109	17.3
	200-299 persons	85	13.5
	300-499 persons	89	14.1
	500-999 persons	105	16.6
	More than 1000 persons	126	20.0
Market share	Less than 10%	128	20.3
	10%-20%	234	37.1
	20%-30%	159	25.2
	30%-50%	85	13.4
	More than 50%	25	4.0
Year of the firm	1-5 years	82	13.0
	6-10 years	203	32.2
	11-15 years	177	28.1
	More than 15 years	169	26.7
Period of industry	Introduction	16	2.5
	Growth	339	53.7
	Maturity	272	43.2
	Decline	4	0.6
Type of ownership	State-owned company	141	22.3
	Private company	405	64.2
	Foreign-owned	68	10.8
	Collective-owned	17	2.7
Listed or not	Listed company	202	32.0
	Unlisted company	429	68.0

Table 3. Pearson correlation

Variables	Mean	1	2	3	4	5	6	7	8	9	10	11	12
1. Firm age status	0.21	1.00											
2. Market entry	0.78	0.04	1.00										
3. Firm scale	0.20	-0.13**	0.05	1.00									
4. Market share	2.44	-0.08*	0.01	0.20**	1.00								
5. Ownership	0.22	-0.14**	0.05	0.07†	0.19**	1.00							
6. Listed or not	0.32	-0.26**	0.14**	0.33**	0.25**	0.35**	1.00						
7. Firm resource	4.81	0.02	0.01	0.12**	0.28**	0.13**	0.14**	1.00					
8. Competitive advantage	4.86	0.07†	0.03	0.15**	0.45**	0.19**	0.27**	0.52**	1.00				
9. Network scale	4.88	0.00	0.09*	0.05	0.03	0.01	0.08*	0.07	0.10*	1.00			
10. Technology search	5.94	0.01	0.00	0.10*	0.17**	0.00	0.06	0.31**	0.36**	0.10*	1.00		
11. Product market search	5.32	0.00	0.05	0.09*	0.14**	0.05	0.10*	0.35**	0.37**	0.07	0.39**	1.00	
12. Related industry search	4.87	0.03	0.04	-0.08*	0.01	0.095*	0.01	0.25**	0.214**	0.12**	0.30**	0.37**	1.00

N=631, †p < 0.10; \*p < 0.05; \*\* p < 0.01, Two-tailed test.

Table 4. Competition advantage of a firm: network scale and interaction with information search

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	1.814** (0.242)	1.470** (0.28)	0.496 (0.326)	0.838** (0.294)	1.086** (0.301)	0.205 (0.331)	0.199 (0.332)	0.220 (0.331)	0.175 (0.330)
Firm age status	-0.007 (0.093)	-0.010 (0.092)	-0.028 (0.090)	-0.011 (0.090)	-0.011 (0.092)	-0.025 (0.089)	-0.025 (0.089)	-0.023 (0.089)	-0.016 (0.089)
Market entry	-0.141 (0.087)	-0.158† (0.087)	-0.152† (0.085)	-0.127 (0.085)	-0.145† (0.086)	-0.053 (0.094)	-0.128 (0.084)	-0.132 (0.084)	-0.129 (0.084)
Firm scale	-0.056 (0.097)	-0.038 (0.097)	-0.053 (0.095)	-0.055 (0.094)	-0.012 (0.096)	0.053 (0.094)	-0.055 (0.094)	-0.053 (0.094)	-0.061 (0.094)
Market share	0.305** (0.036)	0.31** (0.035)	0.292** (0.035)	0.302** (0.035)	0.316** (0.035)	0.294** (0.034)	0.294** (0.034)	0.291** (0.034)	0.290** (0.034)
Ownership	0.079 (0.092)	0.089 (0.092)	0.116 (0.090)	0.096 (0.089)	0.063 (0.091)	0.106 (0.089)	0.107 (0.089)	0.108 (0.089)	0.099 (0.089)
Listed or not	0.349** (0.090)	0.326** (0.090)	0.326** (0.088)	0.307** (0.088)	0.328** (0.089)	0.314** (0.087)	0.315** (0.087)	0.311** (0.087)	0.317** (0.087)
Firm resource	0.410** (0.033)	0.404** (0.033)	0.356** (0.033)	0.344** (0.034)	0.377** (0.033)	0.318** (0.034)	0.319** (0.034)	0.317** (0.034)	0.312** (0.034)
Network scale(a)		<b>0.072*</b> <b>(0.030)</b>	0.057* (0.029)	0.063* (0.029)	0.063* (0.030)	0.052† (0.029)	0.052† (0.029)	0.053† (0.029)	0.059* (0.029)
Technology search (b)			0.242** (0.044)			0.172** (0.047)	0.174** (0.047)	0.173** (0.047)	0.180** (0.047)
Market search (c)				0.182** (0.031)		0.133** (0.034)	0.132** (0.034)	0.135** (0.034)	0.128** (0.034)
Related industry search (d)					0.102** (0.031)	0.029 (0.032)	0.030 (0.032)	0.026 (0.032)	0.031 (0.032)
a*b							0.014 (0.033)		
a*c								<b>0.038†</b> <b>(0.032)</b>	
a*d									<b>0.078*</b> <b>(0.033)</b>
Industry stage	√	√	√	√	√	√	√	√	√
Industry sector	√	√	√	√	√	√	√	√	√
Area	√	√	√	√	√	√	√	√	√
Adj R <sup>2</sup>	0.389	0.394	0.421	0.424	0.415	0.437	0.437	0.438	0.441
F-value	41.177**	38.262**	39.23**	39.71**	36.54**	35.97**	33.54**	33.69**	34.19**

Sample size = 631 observations. The dependent variable is competitive advantage of a firm assessed by responding managers on three dimensions, namely current market share, market leadership, and growth prospect. Results from Harman's one-factor test rules out the common method bias in our measurement. Maximum variance inflation factor (VIF) of all models is less than 3, indicating the absence of multicollinearity problem. Interacting variables are mean-centered. Values in parentheses are standard errors. All models contain three fixed effects, Industry stage, Industry, and Area, to control for the potential impacts of unobserved industry conditions and geographic locations.

Model 1 includes all control variables. Model 2 adds the independent variable, network scale (a), and its regression coefficient tests H1. Model 3 to 5 separately estimates the direct effect of technology search (b), market search (c), and related industry search (d) while Model 6 includes all independent variables. Model 7 to 9 estimates the interaction between network scale and each of the three information searches, which respectively verifies H2, 3, and 4.

†p < 0.10; \*p < 0.05; \*\* p < 0.01

Table 5. Regressions on split sample

	Technology search		Market search		Industry search	
	Model 10a Lower regime	Model 10b Upper regime	Model 11a Lower regime	Model 11b Upper regime	Model 12a Lower regime	Model 12b Upper regime
Constant	0.379 (0.484)	-0.398 (0.802)	1.266* (0.541)	0.405** (0.824)	0.749 (0.530)	-0.324 (0.728)
Firm age status	0.001** (0.131)	-0.165 (0.144)	-0.153 (0.148)	0.023 (0.122)	-0.185 (0.145)	0.058 (0.127)
Market entry	0.087 (0.124)	-0.282* (0.131)	0.091 (0.136)	-0.248* (0.120)	0.026 (0.135)	-0.155 (0.119)
Scale	0.114 (0.142)	-0.276† (0.142)	0.093 (0.154)	-0.230† (0.130)	0.006 (0.141)	-0.178 (0.142)
Market share	0.318** (0.052)	0.251** (0.052)	0.249** (0.057)	0.339** (0.048)	0.313** (0.054)	0.229** (0.051)
Ownership	-0.079 (0.136)	0.235† (0.134)	0.049 (0.146)	0.091 (0.122)	-0.101 (0.151)	0.228† (0.124)
Listed or not	0.373** (0.128)	0.274* (0.134)	0.431** (0.143)	0.273* (0.121)	0.495** (0.136)	0.164 (0.128)
Resource	0.336** (0.046)	0.344** (0.058)	0.347** (0.054)	0.325** (0.048)	0.309** (0.050)	0.375** (0.053)
Network size	0.049 (0.041)	0.030 (0.043)	-0.009 (0.045)	<b>0.090*</b> <b>(0.039)</b>	-0.019 (0.043)	<b>0.103*</b> <b>(0.041)</b>
Tech search	0.150* (0.070)	0.249* (0.112)	0.065 (0.060)	0.205** (0.076)	0.132* (0.061)	0.080 (0.074)
Market search	0.102* (0.045)	0.191** (0.054)	0.048 (0.060)	0.072 (0.108)	0.114* (0.048)	0.197** (0.063)
Related industry search	0.039 (0.046)	-0.003 (0.050)	0.066 (0.050)	-0.039 (0.045)	0.070 (0.061)	0.053 (0.083)
Industry stage	√	√	√	√	√	√
Industry sector	√	√	√	√	√	√
Area	√	√	√	√	√	√
Adj R <sup>2</sup>	0.426	0.342	0.314	0.357	0.390	0.385
F-value	17.628**	12.681**	11.259**	13.472**	15.342	13.448**
N	315	316	315	316	315	316

The three pairs of regressions run on three pairs of subsamples. The first pair of subsamples is from the split of the total sample according to the mean value of technology search, with the sample below the mean as the lower regime (N=315) but that above as the upper regime (N=316). Similarly, the second and the third subsamples are from the split based on the mean value of market search and related-industry search. On these subsamples, the same regression model is estimated, which includes all control and independent variables and the three fixed effects – industry age, industry sector, and geographic areas.

Contrasting the coefficient of network size in each pair of the regressions verifies the moderating effect of each information search. In Model 10a and 10b, the coefficient of network size is insignificant, suggesting that the effect of competition network is invariant whether the firm is strong or weak in technology search. In Model 11a and 11b, the coefficient of network size is first negative and insignificant but then turns positive and significant. This change strongly supports that competition network produces competitive advantage when the firm has high market search. The same result also appears in Model 12a and 12b, which positions related-industry search as an important contingency to the link between competition network and competitive advantage.

†p < 0.10; \*p < 0.05; \*\* p < 0.01



Table 6 Informant and company background

	<b>Informant Position</b>	<b>Company</b>	<b>Industry</b>	<b>Products or services</b>
1.	General Manager	State-owned	Manufacturing, oligopoly industry	Car seats (manufacturing and design)
2.	Vice President	Foreign-Sino joint venture	Metallurgical industry	Aluminum ingot (manufacturing and sales)
3.	Vice General Manager	Foreign-Sino Joint Venture	Manufacturing	Design and manufacturing steering system of cars
4.	General Manager	State-owned	Manufacturing	R&D, manufacturing, and sales of electronics
5.	Vice General Manager	State-private joint venture	Manufacturing	Manufacturing heat exchangers
6.	Founder and General Manager	Private	Service	Consultation on strategic planning and management
7.	Marketing Director	Private	Manufacturing	Feed additives
8.	Chief Financial Officer	Private	Manufacturing	Kitchen appliances (e.g., range hoods, ovens, dishwashers)
9.	National Chief Marketing Officer	Multinational enterprise	Restaurant	Coffee shop chain
10.	Chief Financial Officer	State-owned	Manufacturing	R&D, manufacturing semi-conductors
11.	Chief Operation Officer	State-owned	Service	Building and running incubators of start-ups
12.	Chief Operation Officer	Private	Manufacturing	Manufacturing chemicals
13.	Chief Executive Officer	Multinational enterprise	Restaurant	Fast-food chain

Table 7. Performance impacts of competition network

	Representative quotes from the informants
1.	It is the competitors that give us inexhaustible incentives to grow. No competition no improvement. Competitors are inherently good, and the right view is to see them as friends.
2.	Market competition is fierce and ruthless, but our competitors are the escalators to the development of our company.
3.	Competitors have profoundly helped our strategy and operation, including strategic positioning in China and across the world, technology leadership, strategic renewal, and the improvement of our management capabilities.
4.	Competitors are the catalysts and boosters of our company, especially in R&D. They force us to relentlessly seek further development and competitive advantage.
5.	Currently, competition is intense and there is no way for competitors to become cooperators. Yet, we still constantly learn from them; their existence pushes us to improve product quality and build differentiation advantage.
6.	We both compete and cooperate with our rivals. It is important to maintain a good relationship with them. With countless private companies, our market features full competition. Only with a good relationship with each other can we lift up the technological level of this market.
7.	They (i.e., competitors) are not only rivals to us; we cooperate in many fields. Sometimes we can form a supplier-customer relationship per the requirement of our clients or collaborate in some human resource training programs.
8.	Competitors can be considered as pure rivals given the intense competition in our market. But we all develop together by imitating and learning the strengths of each other. Competitors usually focus on the same issues or problems and through communications and competition we may create new innovative opportunities together.

Table 8. The strategic benefits from competition network

Strategic benefits from competition network	Representative quotes from the informants
Technology information	<p>We monitor closely the technologies of competitors, which may settle the developmental trend of our industry for the next 2 or 3 decades.</p> <p>The technological innovation of our companies benefits a lot from domestic and foreign competitors. They also inspire us to locate R&amp;D centers in the best countries and source talents across the world.</p> <p>We focus on the R&amp;D activities of our competitors, especially the cutting-edge technologies. Our industry is in the transition from a traditional manufacturing industry to a high-tech one. Many intelligent technologies are fast developing. Hence, we follow closely our competitors' steps that make products light and intelligent.</p> <p>We attach great importance to competitors, especially the development of new products and advanced technologies.</p> <p>The technologies of competitors are critical learning subjects. We don't learn their skills and methods in just one specific area but normally at every stage of the supply chain from design, to R&amp;D, to manufacturing, and then to the development of applications.</p> <p>Competitors can help spot the deficiency in our technologies and production processes and even suggest solutions. The technological solutions provided by competitors to their clients usually serve as the reference for sensing the future direction of new technologies and new products.</p>
Market information	<p>It is a routine to collect market information from competitors. We have common customers and serve the same market segments.</p> <p>Through observing our competitors, we gather important data as to our common market segment and customer demands. Such data offer a basis for predicting the future development of our industry. From them, we scout the industry dynamics, government policies, and supplier selection, distribution channel design, and logistics.</p> <p>Low price is the key competitive weapon of our competitors to win market shares. Hence, we pay special attention to their pricing strategy as well as how they execute it through slashing costs. They are our learning subjects.</p> <p>Benchmarking against competitors, we have managed to improve our customer services, increase customer satisfaction, and reduce management costs. Competitors and we are interdependent now.</p> <p>Among the Foreign-Sino joint ventures, the ones between Chinese and European partners and between Chinese and American partners take high market shares in our industry. They are truly skillful at market development and how they achieve that is a key lesson to us.</p> <p>We have weekly meetings to examine our major competitors. What customers do they target? Any major campaign? How are they performing? Answers to these questions enable us to draw the market landscape of our industry.</p>
Other industry information	<p>The knowledge we acquire from competitors is not limited to technical skills in a specific field or even to just our own industry. In fact, the scope of our surveillance and analysis spans across industries wherever we see them relevant.</p> <p>Competitors provide us with valuable information on how to diversify and operate in other unfamiliar industries. We also source critical input to creating and modifying our technological service to fit in other industry scenarios.</p> <p>Semi-conductors have a wide range of applications, so our industry is linked to many industries like information security, vehicles, internet, e-commerce, etc. Subsequently, we watch carefully how competitors design and develop semiconductors as well as the related applications in other industries.</p>

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