Institutional Forces and Knowledge Search Strategies as Predictors of Entrepreneurial Venture Performance

Jie **WU**
Faculty of Business Administration
University of Macau
Avenida Padre Tomás Pereira, Taipa
Macau, China
Phone: (853) 8397-4720
Fax: (853) 2883-8320
Email: jiewu@um.edu.mo

Patrick J. **Murphy**
Collat School of Business
The University of Alabama at Birmingham
Phone: 206-486-5163
Email: pjmurphy@uab.edu

Jean Jinghan **Chen**
Faculty of Business Administration
University of Macau
Avenida Padre Tomás Pereira, Taipa
Macau, China
Phone: (853) 8822-4632
Fax: (853) 2883-2377
Email: JeanChen@um.edu.mo

Mickey
Collat School of Business
The University of Alabama at Birmingham
Phone: 206-486-5742

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Keywords: Knowledge, Search strategy, Institutionalism

Introduction

Entrepreneurial ventures surmount challenges, navigate obstacles to performance, compete with other ventures, and discover opportunities by utilizing knowledge from their environments to inform their strategic and operational decisions. Because knowledge can function as a resource in this way, entrepreneurial ventures employ a number of search strategies - singly or in combination - in order to procure such knowledge. These different search strategies are more or less effective based on the relations between them and also in light of characteristics of the environment in which a given entrepreneurial venture exists.

These basic notions raise a number of important questions. What are the different kinds of search strategies? How do they interrelate? How do they interact with different kinds of entrepreneurial environments? These questions have driven many studies in the entrepreneurship literature that have yielded a range of contributions. One such contribution is the identification of two principal knowledge search strategies. The first strategy, arm's-length search, is when entrepreneurial ventures search the environment independently, via formal transactions when necessary, using what they learn in order to innovate, generate ideas, and perform strategically.

For example, during an economic downturn or a severe recession, an entrepreneurial venture may independently take advantage of formal state support that they can research and discover on their own. Such support can and could come in the form of a "paycheck protection program" that allows a nascent entrepreneur to launch innovative initiatives or compensate employees when their business is performing poorly, and when it would otherwise be impossible to take such action or afford those administrative costs. The second strategy, collaborative search, is when entrepreneurial ventures rely on close relationships with other firms or partners via mutually beneficial arrangements, to procure the same kinds of knowledge and solve the same problems in more informal ways. For example, during an economic downturn or severe recession, an entrepreneurial venture may seek, discover, and develop informal relationships with other ventures or organizations. These informal relationships can involve collaborative actions that produce opportunities to launch joint programs in innovative ways that are mutually beneficial. They can also make it possible to reduce administrative costs via the discovery of new informal arrangements for sharing space, employees, or other resources.

Some research holds that both of these distinct strategies should be maximized (Grimpe, and Kaiser 2010; Laursen, and Salter 2006). However, other research holds that maximizing them can be inefficient and harmful to entrepreneurial ventures because the strategies are complementary (Radicic, and Pugh 2017). In other words, there are qualitative differences between the two strategies based on the competing logics that underlie them. These divergences can produce negative and damaging operational inefficiencies when both strategies are employed simultaneously and to a significant degree by one entrepreneurial venture. As such, there is a "right level" for each search strategy at which they are each thought to be optimized instead of maximized (Nerkar, and Paruchuri 2005; Paruchuri, and Awate 2017).

The research on knowledge search strategies also distinguishes specifically between the two strategies, with a nuanced view of the unique value each one brings based on the external context (Cassiman, and Veugelers 2006; Sleutjes, and Schutjens 2012). These contributions clarify specifically more specifically how entrepreneurial ventures search for knowledge needed for performance. However, research questions persist about the relations between the two search strategies and how they interact with the external environment as predictors of venture performance (Piperopoulos, Wu, and Wang 2018).

Entrepreneurial ecosystems and environments feature different kinds of institutional support, which comes from community resource centers, external training programs, state-based incentives, subsidies, and resources, and other factors that support entrepreneurial venture performance (Cantner, Cunningham, and Lehmann 2020). Depending on the presence of or access to such institutional factors, an entrepreneurial venture may seek necessary knowledge with a strategy most appropriate to its specific context (Chittoor, Kale, and Puranem 2015). Whereas arm's-length and collaborative search are germane to venture performance in a such contexts, research has not yet clarified which strategy best enables entrepreneurial ventures under which specific contexts. Such research is important because it promises to shed light on how to support the development of economic settings and entrepreneurial ecosystems (Attour, and Lazaric 2020).

In this paper, we focus on the foregoing questions and make two contributions to the literature. The first contribution clarifies the relative effects of arm's-length and collaborative search on entrepreneurial venture performance. Prior studies hold that the strategies are complementary and that "multi-firm collaborative innovation complements a firm's internal innovation efforts" (Ketchen, Ireland, and Snow 2007, p. 382). We also examine this interrelation but we expand the consideration to include effects from the institutional context. Whereas it is

conceivable that entrepreneurial ventures can and do implement both search strategies simultaneously, that approach is liable to drive inefficient utilizations of resources in certain environments. We examine this compound notion and our paper sheds new light on these dynamics by considering institutional characteristics of the larger environment.

The second contribution is a fuller illustration of the institutional forces that support entrepreneurial ventures. Prior research in this area regards institutional forces as moderators of firm strategy and firm performance (Huston, and Sakkab 2006; Khanna, Palepu, and Bullock 2010). However, that research does not address clearly how institutional forces moderate the knowledge search strategies given that institutions themselves are also sources of knowledge (Iansiti and Levien 2004). All told, we intend for this paper to improve the field's understanding of how entrepreneurial venture performance varies based on interrelations between knowledge search strategies and their interactions with institutional forces.

Theoretic Background and Development

Knowledge Search Strategies

It is practically a truism in the entrepreneurship literature that innovation and adaptivity are vital to performance. Entrepreneurial firms seek new knowledge in order to generate new ideas for innovative activities (Chesbrough 2003; Minola, Hahn, and Cassia 2019). As such, entrepreneurship research has increased its emphasis on the role of external knowledge and related resources in performance in market settings (McMullen 2006; Murphy 2011). This emphasis has ontological roots in the Austrian School of Economics (Hayek 1945; Kirzner 1997). The Austrian school perspective holds that firms draw from external sources as a way to obtain more knowledge, which leads to better performance outcomes (Leiponen, and Helfat 2010; Veugelers, and Cassiman 1999). Entrepreneurship scholars have shown that firms tend to undertake either arm's-length or collaborative search, or a combination of both, when seeking

such knowledge to support performance (Katila, and Ahuja 2002; Laursen, and Salter 2006). Arm's-length search is a market-based strategy whereby firms independently search, create, and recombine technological and market information from various sources. By contrast, collaborative search entails reliance on partnerships with other entities to procure such knowledge.

The activities enabled by both types of knowledge search include hiring, technology licensing, purchasing services from a vendor, or procuring new technologies. The external parties in question can include customers, suppliers, service intermediaries, competitors, other firms, or former employees (Taura, and Radicic 2019). To be sure, all such parties can function as sources of knowledge that can be instrumental to the performance of an entrepreneurial venture. Although the two search strategies both aim to improve such performance outcomes, they each carry unique assumptions. Whereas arm's-length search entails more independence, collaborative search entails more partnership. Whereas an arm's-length search involves the impersonal retrieval of knowledge, collaborative search involves inter-organizational alliances (Chesbrough 2003; Leiponen, and Helfat 2010). Arm's-length search is associated with business transactions that reflect the principles of a market (e.g., economic costs, contractual relationships). By contrast, collaborative search is associated with alliances, partnerships, and network-based action as a means to survive and compete in an entrepreneurial setting (Zhang, and Li 2010).

Entrepreneurial ventures employ one or the other search strategy, or a combination of both, for reasons that range from leadership styles to costs (Robertson, and Gatignon 1998). Indeed, the two strategies are known to differ in terms of relative costs. Whereas arm's-length search involves higher economic costs than collaborative search, collaborative search entails more administrative and temporal costs in terms of shared resources, coordination activities, and monitoring the governance structures that regulate interactions with partners (Williamson 1985).

Institutions and Entrepreneurship

Institutions are created by people, societies, and evolutionary processes over time. They eventually come to define important purposes, norms, and regulations for actors in a given environment in a stable and almost timeless sense. They "are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction" (North 1990, p. 3). Institutions can provide resources that are useful to entrepreneurial ventures. For decades, the field of organizational studies has acknowledged and examined the effects that institutional forces have on organizations and their functioning (Scott 1995/2013). When it comes to institutional effects on entrepreneurship, in particular, institutions help regulate production activities, exchanges, the establishment of distribution channels, and other actions undertaken by entrepreneurial firms (Battilana, Leca, and Boxenbaum 2009). Thus, institutional forces have been shown to promote entrepreneurial success and performance (Lv, Rodríguez-García, and Sendra-García 2020). However, although institutions play important roles in understanding entrepreneurial venture performance, some gaps remain in the literature. The relation between institutional forces and entrepreneurial ecosystems has been described as a "missing link" in the understanding of economic growth that derives entrepreneurial activities (Acs et al. 2018). Because institutions help shape what entrepreneurs as well as entrepreneurial ventures in an environment are able to do (or not do), a substantial body of entrepreneurship research focuses on how institutional forces can function as resources or constraints to entrepreneurial performance.

In addition to institutional resources, institutional constraints make up the environments in which entrepreneurial ventures operate (North, 1990, p. 73). Even when institutions are designed to support entrepreneurial ventures, they also entail constraints that discourage certain entrepreneurial activities. Institutional constraints come in various forms and include rules, laws, and regulations. When these constraints and institutional forces of the environment are designed to promote economic growth, they have been shown to lead to higher levels of entrepreneurial

opportunity for new ventures (Urbano et al. 2020). Institutional forces can also include informal aspects of the environment such as norms, customs, and cultures (Scott, 1995/2013). Such aspects relate to institutional elements such as education and financial practices, which serve to influence the level of entrepreneurial effort in a given environmental context (Bowen, and De Clercq 2008). This research illustrates some of the general effects that institutional forces can have on entrepreneurial venture performance, but it does not illustrate the specific effects that institutional forces can have on knowledge search activities.

In general terms, whether institutional forces are formal or informal, they provide a kind of stability that can reduce specific kind of uncertainty, mitigate transaction costs, and facilitate economic exchanges among entrepreneurial ventures (Wu, Si, and Wu 2016). Given that the knowledge possessed by an entrepreneurial venture promotes its performance, the stability derived from institutional forces and constraints also plays a role. Namely, the policies, preferences, financial support, legal frameworks, local ordinances, customs, and other factors of an institutional environment influence how knowledge is shared among those entrepreneurial ventures (Wu, and Si 2018; Nelson 1993). Although the role of institutions can serve clearly as a supportive factor of entrepreneurial venture activities, the more specific and practical nature of this role is still unclear. It is known that institutions affect entrepreneurial ventures in different ways than they affect larger firms and companies, but the finer details of these differences are not defined formally in the research literature (Ali, Kelley, and Levie 2020). What is clear is that levels of institutional development surely do vary across different environments, entrepreneurial ecosystems, and other settings. Moreover, when it comes to specific contexts in which entrepreneurial intensity by small startup ventures is very high, institutional development and the presence of institutions tends to be lower (Tiberius, Rietz, and Bouncken 2020).

In such environments, the low level of institutional development is characterized by two aspects: voids and complexities (Khanna, Palepu, and Bullock 2010). Institutional voids are absences of market-supporting intermediaries and entities. Their absence increases costs for entrepreneurial ventures, which must utilize internal resources for their own procurement of information (Howells 2006). Institutional voids reduce access to information and can distort or destroy the quality of information (Khanna, and Palepu 2000). In such instances, external threats are not easily detectable, and firms incur costs related to inefficiencies of useless information. Low levels of institutional development can be hostile to entrepreneurial venture performance for these reasons (Fiet, and Patel 2008). As well, going beyond mere levels of performance, the qualitative types of entrepreneurial ventures that tend to emerge amidst institutional voids and complexities are usually not as growth-oriented or scalable as those that emerge elsewhere (Bowen, and De Clercq 2008). The negative effects of institutional complexities are the result of a glut of concomitant forces. For entrepreneurial firms, these concomitant forces arise as contradictory signals, conflicting messages, heterogeneous guidelines, unstable regulations, and ambiguous rules (Khanna, Palepu, and Bullock 2010). These forces can contradict each other and yield a discordant effect that is generally deleterious to venture performance. Whereas institutional voids increase search costs, institutional complexities exhaust managerial capacities in terms of venture innovation and adaptivity.

Yet, as we noted above, the literature has not yet examined specifically how the level of institutional development influences the interrelations between the search strategies. In developed institutional settings, neither arm's-length search nor collaborative search is thought to be more or less effective. Given the conceptual differences between the strategies, and given the practical entrepreneurial realities of finite resources, it is straightforward to assume that the two strategies are complementary in institutionally robust settings. To the degree an entrepreneurial venture

expends time and money on one search strategy, it reduces what can be expended on the other search strategy. However, in contexts defined by institutional complexities and voids, this notion becomes more complicated. For instance, when mutual trust between ventures becomes operationally essential to the procurement of knowledge, it can mitigate the need for an individual venture to incur the costs of arm's-length search. Institutional forces thus appear to moderate knowledge search strategy because, as the literature suggests, the two search strategies appear to be interrelated.

To illustrate the interrelation formally, we propose that high levels of institutional development (i.e., support structures and clarity) generate a complementary relation between arm's-length and collaborative search strategies. In turn, amidst low levels of institutional development (i.e., institutional voids and complexities), collaborative search can substitute for arm's-length search. Institutional development thus moderates the effect of search strategy on venture performance. Table 1 summarizes the interrelations. In the next section, we formulate hypotheses based on this framework.

Insert Table 1 about here

Summary and Hypotheses

Institutions can offer a range of organizations and programs that provide access to capital, expertise, and services for private and public entrepreneurial ventures. These offerings bring knowledge and other resources to entrepreneurial ventures. As described above, high levels of institutional development enable arm's-length search to reduce the need for in-house expertise because the necessary knowledge is procurable from the environment. Research and development (R&D) activities, for example, are less costly when a firm is able to recruit key personnel,

contract with consulting firms, or acquire external technologies (Audretsch, and Feldman 1996; Grimpe, and Kaiser 2010). These affordances enable entrepreneurial ventures to perform at higher levels more easily. This search strategy can help an entrepreneurial venture become the first one to enter a competitive market, which can also be important to success. Moreover, as arm's-length search entails faster acquisition of resources, it can defray the inefficiencies of temporal costs based on the necessary trials and errors of innovation (Katila 2002). The competitive aspects of entrepreneurial settings can also stimulate performance via the discovery of novel knowledge (Tapon, and Cadsby 1996).

Arm's-length search also has limitations. For instance, the greater speed of this search strategy can yield too many new ideas for a firm to manage easily (Laursen, and Salter 2006; Leiponen, and Helfat 2010). This kind of analysis paralysis can generate blind spots that hinder strategic performance (Koput 1997; Ocasio 1997). As such, the relation between arm's-length search and firm performance becomes non-linear as firms "over-search" their environment (Laursen, and Salter 2006). The diminishing marginal return of arms-length search is due to increasing challenge of managing relationships and transactions required to procure knowledge. Collaborative search complements such inefficiencies (Leiponen, and Helfat 2010). It mollifies the challenge of managing too many relationships and transactions simultaneously via access to a greater diversity of knowledge sources. As such, it can enhance a firm's capacity for procuring external knowledge despite the over-search problem noted above (Grimpe, and Kaiser 2010). Moreover, it can provide substitutes for the market-supporting mechanisms (Robertson, and Gatignon 1998; Shan, Walker, and Kogut 1994). But, this substitution comes with a temporal cost. Collaborative search relies critically upon mutual trust, which develops slowly. When this particular search strategy enhances access to technologies and markets, it almost always requires more governance and regulation than arm's-length search does (Ketchen et al. 2007).

Maintaining relationships with the agents of such regulation can require significant time and resources (Grimpe, and Kaiser 2010; McGee, Dowling, and Megginson 1995). Therefore, the interrelation between the search strategies should be complementary when the level of institutional development is high.

Hypothesis 1: *The relation between arm's-length and collaborative knowledge search strategies is complementary at higher levels of institutional development.*

When the level of institutional development is low, entrepreneurial firms must find ways to procure knowledge and verify its validity. It is a practical truism that in these circumstances, without the proper institutions, arm's-length search is less useful for identifying knowledge when it is dispersed and incomplete (Hayek 1945, pp. 519). Arm's-length search is costly when competition is germane to its procurement (Kirzner 1997). Moreover, as noted above, communication between the parties instrumental to procuring knowledge becomes challenging. Institutional complexities thus frustrate arm's-length search. In these settings, however, collaborative search can offer unique affordances to search and procure knowledge.

On the other hand, entrepreneurs can resort to networks and relationships as a means to counteract institutional voids and complexities (Boisot, and Child 1996; Nee 1992). The literature shows that the frequent or continuous interactions between entrepreneurial firms and partners facilitate transferring, acquiring and utilizing valuable knowledge (Hansen 1999). Collaborative search is therefore effective in highly uncertain environments (McGee, Dowling, and Megginson 1995). It does not assume immediately that the knowledge procured is valid. Instead, it assumes that the knowledge via one-time transactions can become invalid as an environment shifts and changes. Collaborative search is a more robust knowledge source in such settings. It supports

entrepreneurial performance when institutional development is low. Therefore, it serves as a substitute for arm's-length search in such settings.

> **Hypothesis 2:** *The relation between arm's-length and collaborative knowledge search strategies is substitutive at lower levels of institutional development.*

Data and Method

To examine our hypotheses, we drew extensive entrepreneurial data from the World Bank and International Finance Corporation's Enterprise Surveys program and the Chinese National Bureau of Statistics. These sources have been used previously in research on entrepreneurial venture performance (Wu, Wu, and Harrigan 2019). The entrepreneurial ventures that we targeted were participants in a larger sponsored research program and long-term panel study intended to identify obstacles faced by non-agricultural firms in formal private sectors across a range of international regions (World Bank 2012). Two members of our author team had access to the panel study as supporters and participants. The Enterprise Surveys research program offers data and findings from many countries. Its data from China derive from a firm-level survey of the economy's private sector and offer a curated and uncommonly rigorous data source.

China is still one of the world's largest and most complex market environments. Its market-oriented economic system features a range of regional institutional forces designed to support entrepreneurial ventures that have evolved over the past least two decades (Li, and Atuahene-Gima 2002). Although the economy is no longer regarded as developing in general, there is considerable variance in development levels across various regions (Gang, Ma, and Wang 2018). Our data sample benefited from the enormous size of this market at its current range of developmental states. This variance enabled us to examine large samples of entrepreneurial ventures from a range of regional environments featuring considerable variance in institutional

contexts (Peng, and Luo 2000; Piperopoulos, Wu, and Wang 2018). We concluded that the data and scores were amenable to computing the variables and researching constructs reviewed above.

The primary sample included 2,400 randomly selected entrepreneurial firms in 18 cities.[1] We retained cases in our sample for this study only if the number of employees and age of the venture were reported so that we could control statistically (reported below) for variance in performance that might be accounted for by those variables, instead of by the variables of theoretic interest. After removing cases with missing observations, the final sample contained 2,350 valid cases that we deemed provisionally suitable for our empirical study.

The ventures in our study completed a two-part email survey. The first part was completed by accountants or personnel managers. It collected basic profile information such as firm age, ownership, the total number of employees, R&D expenditures, and more demographic information. The second part of the survey was completed by unit managers. It covered product innovation practices, innovation strategies, and operational information. The two parts entailed different respondent categories and were intended to reduce participant burden and common method variance (Zhang, and Li 2010). Whereas the first part of the survey yielded scores that we could utilize for producing a usable sample, the second part of the survey yielded scores that were instrumental to examining our hypotheses.

Before turning to the analyses of the data and the examination of our two hypotheses, we examined the data for specific suitability based on published guidance for enhancing rigor in quantitative entrepreneurship research (Maula, and Stam 2019). In particular, we matched the

[1] The empirical data collection portion of this research was supported in part by the university of the first author. The targeted cities included Benxi, Changchun, Changsha, Chongqing, Dalian, Guiyang, Haerbin, Hangzhou, Jiangmen, Kunming, Lanzhou, Nanchang, Nanning, Shenzhen, Wenzhou, Wuhan, Xian, and Zhengzhou.

research design with our research question, considered the limitations of our data source, and were intentional about our measures and methods. By sharing our source, we also intended to support reproducibility. As will be shown, for example, we also suggest the use of evolving methods, particularly in the form of post-hoc analyses from a separate data source as a means to enhance rigor.

We also examined the demographics of the data for purposes of face validity. In our sample, 23% of the ventures had fewer than 20 employees, 38% had 20-99 employees, and 40% had more than 100 employees. As well, 47% of the ventures were 1-6 years old, 34% were 7-10 years old, and 19% were >10 years old. In order to ensure that each case offered complete data and was a viable entrepreneurial venture in terms of operational status, we deleted cases with missing scores from the study variables or control variables (detailed below). As Table 2 shows, these preliminary treatments of the study data and our survey-based data collection yielded a smaller sample of 1,470 valid cases (a 61% response rate overall) across ten industry sectors. We deemed these data to be suitable for the computation of our study variables and execution of our main analyses.

Insert Table 2 about here

Variables and Controls

Dependent Variable. We measured entrepreneurial firm performance via the number of new products or services a firm introduced to the market over the past three years. We deemed this operationalization to be suitable because, unlike other measures of innovation or performance based on R&D expenditures, patent applications, or citations, this score indicates more than an orientation and it captures objective evidence of entrepreneurial performance. There is precedent

in the literature for using this score as entrepreneurial venture performance (Katila 2002, pp. 996) and the operationalization has a long history of usage in research of entrepreneurial ventures (Damanpour 1991). On these theoretic and empirical grounds, we regarded it as an appropriate dependent variable to indicate performance of the entrepreneurial ventures in our sample.

Independent Variables. We operationalized arm's-length search based on reported activities by the entrepreneurial ventures in our sample that were designed to search for knowledge instrumental to their performance. To operationalize this variable, we computed a composite score based on (a) recruiting required personnel; (b) hiring consulting firms; (c) acquiring new licenses; and (d) purchasing new technologies. We coded each composite item as either 1 or 0, following past research on product innovation performance by firms (Laursen, and Salter 2006). In computing the composite scores, we assessed reliability with Cronbach's alpha. The result ($\alpha = 0.74$) indicated adequate reliability. Then, in order to assess the appropriateness of the composite factor structure, we undertook an exploratory principal components analysis. Results showed one dimension (with an eigenvalue of > 1) that explained 79.4% of the variance in individual scores. The factor loadings of the seven items were each greater than 0.67. As these results were deemed acceptable, we summed the four items to obtain a composite measure of the arm's-length search.

For the collaborative search variable scores, we computed a composite measure based on reported venture activities designed to search for knowledge instrumental to performance. However, these search activities included (a) collaborative relationships with competitors; (b) collaborative relationships with suppliers; (c) collaborative relationships with clients; and (d) collaborative relationships with universities or research institutions. These kinds of collaborative partners match what is reported in previous research in the search strategy literature (Leiponen, and Helfat 2010). As with arm's-length search, each item was coded as 1 or 0. We again assessed

the reliability of the composite scores with Cronbach's alpha and found an acceptable level of internal consistency reliability (α=0.78). Finally, the four items were utilized to compute a new variable (0-4) to indicate variance in collaborative search activities across cases.

Moderating Variable. We measured the level of institutional development using the Marketization Process Indices provided by National Economic Research Institute. Known as the NERI index, it reflects the development of the relative marketization processes across local regions, rather reporting an absolute distance from a grand mean based on the diversities of an entire economic system. The NERI index is widely known as a powerful way to examine regional-level marketization differences and comparisons (Gang 2011). The NERI index utilizes five principal scores: (a) relationship between government and market, (b) development of the nonstate sector, (c) development of the product market, (d) development of the factor market, and (e) development of market intermediaries and the legal environment. Each score derives from two or more sub-scores. The entire NERI index comprises 19 sub-scores, which were combined empirically into its five principal indices. The index scores range from 0 to 10 to indicate the level of regional institutional development.

We operationalized institutional development based on a dichotomous categorization of NERI index regional scores. For each regional area in our sample, if its NERI index score was above the mean of all the other regions, then it received a high score. In our sample, those areas included Hangzhou, Jiangmen, Shenzhen, Wenzhou, Wuhan, Nanchang, and Nanning. The regional areas in our sample located in a region with a below average NERI index were Benxi, Changchun, Changsha, Chongqing, Dalian, Guiyang, Haerbin, Kunming, Lanzhou, Xian, and Zhengzhou. Based on their NERI index, those regional areas received a low score and were categorized accordingly.

Control Variables. In order to safeguard the integrity of our main analyses, and in light of our theoretic approach, we controlled for nine variables that could influence entrepreneurial performance outside of the hypothesized effects. Parsing out the variance attributable to these variables enabled a stronger analysis of the relations between the variables of theoretic interest and fuller appreciation of the effects of institutional forces on the entrepreneurial ventures in our sample.

First, we controlled statistically for the effects of firm longevity, as the newer ventures (less than five years old) in our sample were likely to be more adaptable in terms of their evolving operations. This control variable enabled us to isolate variance associated with the effects of institutional forces on the newest entrepreneurial ventures in comparison with more established ones. Second, we controlled for firm size based on a two-thousand employee cutoff to give us the capacity to focus on smaller entrepreneurial ventures (e.g., 500 employees) in comparison to entrepreneurial ventures that are larger (e.g., 1,500 employees). This variable allowed us to capture fuller evidence of institutional effects. Third, because investments in R&D yield higher levels of innovation-based performance by entrepreneurial ventures (Agarwal et al. 2004), we controlled for those expenditures on a *per capita* basis. This statistical adjustment standardized R&D expenditures as a proportion of total annual sales by computing difference scores based on both industry and city averages. Fourth, we controlled for venture performance based on annual sales and revenue data. This control parsed out the cases of ventures with more resources to invest in knowledge search activities and ensured that this demographic category did not unduly explain variance in dependent variable scores.

We also controlled for aspects of performance attributable to the context of each case. This fifth control variable reflected whether or not the firm was publicly listed. This control is important because, in China, private firms have severely limited access to capital markets (Li,

and Atuahene-Gima 2001). Our sixth control variable was based on whether or not the firm was situated in an industry cluster. This control variable related to knowledge search because industry clusters facilitate knowledge transfer and firm innovation activity (Li, and Bathelt 2018). Seventh, we controlled for government ownership, as the regulation associated with state authority would serve to inflate scores indicating collaborative knowledge search. We also computed an eighth control, an industry-level control variable based on any market share based on import activities. This control variable reflects the competitive intensity generated from import activities, which has shown to be an artificial driver of innovation performance in a range of national and international datasets (Bowen, and Wiersema 2005; Sirilli, and Evangelista 1998). Finally, to control for undue environmental influences, we computed four dummy variables based on industry sector.

These rigorous statistical controls were necessary for conducting analyses in our large and complex dataset. The uncommon level of statistical treatment enabled us to isolate a great deal of variance in scores not related to our hypotheses, which included statistical tests for moderation. We took special care to ameliorate such threats to our analysis approach. As described next, we also took steps to eliminate common method variance among these variables and observe the assumptions of the statistical tests.

Common Method Variance

Given that we computed variables on both sides of the equation (i.e., independent variable and dependent variable) in our empirical analyses, we implemented several safeguards against common method variance. Some of these safeguards were afforded by virtue of our research design, whereas others were implemented statistically. First, as noted, our dependent and independent variable scores derived from multiple respondents within each entrepreneurial firm. Second, as also noted, our measurement of institutional forces derived from the NERI index,

which is a separate and authoritative data source. Third, we undertook Harmon's one-factor test to assess common method variance directly. The initial factor explained less than 37% of the variance in an exploratory factor analysis. This result indicates that common method variance is unlikely to have influenced variance in the dependent variable to a significant degree from a noncongeneric perspective of equal effects across all independent variables (Richard, Simmering, and Sturman 2009). Finally, our assessment of a standard interaction hypotheses, reported in the next section, also showed that common method variance is not likely to have influenced the results of our empirical study based on shared or unshared data sources (Podsakoff et al. 2003; Spector et al. 2019).

Statistical Tests and Analysis Assumptions

We used a Poisson-based multiple regression analysis to test our hypotheses. As the dependent variable is based on a frequency scores, we used an appropriate specification for the number of new products and services introduced:

$$E(NP_{it} / X_{it-1}) = e^{X_{it-1}\beta}$$

where NP_{it} is the number of new products introduced by firm i in year t, and X_{it-1} is a vector of regressors affecting the mean of NP_{it}, e is exponential, and β is the coefficient vector (Long, and Freese 2006). Next, we undertook a distributed lag analysis (Judge et al. 1982) to assess the impact of changes in the independent variables distributed over the values of the dependent variables. As firm-level search activity is a relatively enduring operational characteristic over time, the one-period lagged value of the independent variable was included as a covariate in the

model.[2] This analysis gauges the impact of firm-level search on performance outcomes. In addition, because the over-dispersion of residual scores can hinder any Poison-based regression analysis (Cameron, and Trivedi 1986), we examined the dispersion indices to ensure robustness to analysis assumptions. Moreover, to safeguard against multicollinearity and auto-correlation, we mean-centered the independent variables and the moderating variables before creating interaction terms for use in the main analyses (Aiken, West, and Reno 1991). The results of these tests indicated that the data did not violate any analysis assumptions.

Main Analyses and Results

Table 3 presents the means, standard deviations, and correlations among all study variables. These descriptive statistics were aligned with our expectations for these variables and did not reveal any findings that would preclude the execution of our main analyses.

Insert Table 3 about here

Table 4 presents the results of the hierarchical regression analyses of the models necessary for examining our hypotheses. Model 1 and Model 2 report the results for high institutional development, among which Model 1 includes only the control variables and the main effects of each type of knowledge search. Model 2 adds the interaction term of two search types. In turn, Model 3 and Model 4 report the results for low institutional development. Model 3 includes only the control variables and the main effects of the two search types. Model 4 adds the interaction term for the two knowledge search types. The log-likelihood ratios and chi-squares for

[2] We also executed two-period lagged value scores. Results were consistent with the use of the one-period lagged scores but necessarily reduced the number of sample observations to 721.

all of these models indicated appropriate levels of statistical power to interpret the specific effects. Moreover, the values for Akaike's and Bayesian information criteria (i.e., AIC and BIC: Model 2 and 4) show that the goodness of fit was positive for the full model. We regarded these results as positive signs that our research design parsed out extraneous variance and enabled us to explain variance primarily attributable to the variables of interest.

Insert Table 4 about here

These results show that the coefficient of arm's-length search is positive and significant (b = 0.243, p =.001; b = 0.254, p =.001 in Model 2 and 4, separately) and the coefficient of collaborative search had a significant and positive relation with innovation performance (b = 0.214, p = .001 b = 0.282, p = .001 in Model 2 and 4, separately). These results are consistent with prior studies (e.g., Laursen, and Salter 2006). The coefficient of arm's-length search is *stronger* than that of collaborative search at high levels of institutional development, but *weaker* than that of collaborative search at low levels of institutional development. These results suggest that arm's-length and collaborative search increase firm innovation performance. The directional difference suggests arm's-length search is stronger when institutional development is high, and that collaborative search is stronger when institutional development is low. The specific results for the two hypotheses offer clear evidence for examining our original research question.

Hypothesis 1 held that the relation between arm's-length and collaborative search is complementary at high levels of institutional development. As shown in Model 2, the coefficient of the interaction term, AC × CS, is positive and statistically significant (b = 0.223, p =.001). The result indicates that at higher levels of institutional development, arm's-length search and collaborative search reinforce each other and impose a jointly positive influence on firm

innovation performance despite being distinctly different from one another as search strategies. Therefore, we found support for Hypothesis 1.

Hypothesis 2 held that the relation between arm's-length and collaborative search is substitutive at low levels of institutional development. As shown in Model 4, the coefficient of the interaction term, AC × CS, is negative and statistically significant (b = -0.026, p =.001). This result suggests that when institutional developments are low, arm's-length search and collaborative search weaken each other and impose a jointly negative influence on performance. Therefore, we also found support for Hypothesis 2. Based on these results, we undertook several post-hoc examinations to supplement the strength of our findings.

Post-hoc Analyses and Replication

We conducted several post-hoc analyses using an additional dataset from the World Bank (2012) based on five cities not included in the original sample.[3] This stage of our empirical study allowed post-hoc examinations of the main analysis results and a full replication using a second dataset.

These data derived from 847 manufacturing firms. The firms represented a range of sectors (22% apparel and leather goods; 17% consumer products; 19% electronic components; 19% electronics hardware; 23% vehicle parts industry). Unlike the primary sample, these entrepreneurial ventures were distributed roughly evenly among five cities. In order to replicate the primary study, we adopted the same study variables defined above. Through direct contact with a smaller sample and via greater access, we were able to ensure that study participants were

[3] Beijing, Chengdu, Guangzhou, Shanghai, and Tianjin.

involved with the innovation and performance activities at their firms. Next, with an identical analysis structure, we replicated our original empirical techniques on these additional data.

We also undertook a post-hoc examination of the effects of institutional forces. This post-hoc empirical analysis gave us a fuller appreciation of the interaction effects based on data not accessible in our primary analysis. For instance, for this sample, we assessed region-normalized costs via two items: (1) does the cost of information about technical standards seem too high for your company and (2) does the cost of information about the new product/service and technological development seem too high for your company? Based on the responses to those two items, we constructed an alternative measure of institutional development and, similarly to the primary study, we classified the 847 firms based on high and low categories. Finally, we ran the replication of the original analyses (Table 5).

As detailed in Table 5, the coefficient for arm's-length is significant ($b = 0.686$, $p = .001$; $b = 0.447$, $p = .001$ in Model 2 and 4, separately) and the coefficient for collaborative search is significant ($b = 0.360$, $p = .001$ $b = 0.552$, $p = .001$ in Model 2 and 4, separately). The pattern of results suggests that both search strategies increase performance. However, the positive effect of arm's-length search is more reliable when institutional development is high. Similarly, the positive effect of collaborative search is more reliable when institutional development is low.

Insert Table 5 about here

Model 2 shows that the coefficient of the interaction term, AC × CS, is positive and significant ($b = 0.214$, $p = .001$). The result indicates that when institutional development is high, the joint effect of arm's-length search and collaborative search has an effect on entrepreneurial firm performance. This result mirrors what we found in our primary study for Hypothesis 1. As

shown in Model 4, the coefficient of the interaction term, AC × CS, is negative and significant (b = -0.162, p =.001). Similarly, this result indicates that when institutional development is low, the joint effect of arm's-length and collaborative search has an effect on entrepreneurial firm performance. These post-hoc results reported in Table 5 are thus consistent with the results reported in Table 4.

The overall set of findings provide a fuller appreciation of how arm's-length and collaborative search strategies relate differently to entrepreneurial performance based on institutional development levels. They also shed light on how the two search strategies relate to one another. When it comes to influencing performance, collaborative search appears to function as a complement for arm's-length search at higher levels of institutional development, but as a substitute for arm's-length search at lower levels of institutional development.

Discussion

This paper makes two principal contributions to what is known about the effects of knowledge search strategy on entrepreneurial performance. First, we showed that collaborative search is a more effective strategy when institutional development is low and that arm's-length search is a more effective strategy when institutional development is high. Second, we showed that the collaborative search strategy can serve as a substitute for arm's-length search when institutional development is low. These findings are novel because they formally integrate the role of institutional forces into the research on knowledge search. Our findings are based on a carefully designed empirical study with a large dataset, and a rigorous post-hoc replication analysis provided a fuller appreciation of the primary results.

Prior research has explored the joint effects of arm's-length and collaborative search. Whereas some of these studies merely suggest that the relation is complementary (Katila, and Ahuja 2002; Laursen, and Salter 2006; Leiponen, and Helfat 2010), others argue for a more

nuanced view of their interrelations based on the specific context. Most of this prior work has been based on mature market settings, and none of this prior work utilizes institutional theory to examine the interaction between the two search strategies. We addressed that gap by putting the joint impact of arm's-length and collaborative search into the context of the institutional forces that shape the activities of entrepreneurial firms. We found evidence that the complementary interrelation between the two search strategies applies when institutions are developed, but that this interrelation becomes substitutive when institutions are not developed.

The research on knowledge search strategies by entrepreneurial ventures must provide a more complete accounting of how different search strategies perform in different ways based on the larger institutional environment. The first implication of our study contributes to this purpose. Simply put, we found that the relation between the two strategies is contingent upon on the level of institutional support for entrepreneurial firms. Thus, a second implication of our study derives from our novel results, which serve to extend prior research. It appears that institutional forces can constrain arm's-length search and enable collaborative search. Although we acknowledged above that entrepreneurial firms in uncertain environments are sure to face challenging institutional contexts and therefore rely on each other, our study goes far beyond what has become a practical truism (Rosenkopf, and Almeida 2003; Stuart, and Podolny 1996). Namely, we shed light on which knowledge search strategy is most effective and in which kinds of institutional circumstances.

Our results are based on careful empirical work and a statistical test of moderation based on a large sample of firms and regions. In a practical sense, we showed that firms need to focus on collaboration when institutional forces are weak. It is the most reliable way to procure knowledge. In fact, this kind of strategy can substitute for a more independent approach under such circumstances. This finding is clearly important to entrepreneurship practice. However, it is

also important to entrepreneurship theory in that it reveals that there may be a u-shaped functional form whereby the need to maximize the two search strategies exists when institutional development is moderate. Due to the way we operationalized our moderating variable, we were not able to explain variance in the middle-range of this score distribution. As such, our first primary contribution opens the way to promising future research avenues, and our second primary research contribution sheds light on when each search strategy is more effective. We hold overall that institutional contexts have a strong influence on the relative effects of the two primary knowledge search strategies.

A third and somewhat less important implication of our study relates to the promise of network theory as a way to understand entrepreneurial firm performance and knowledge search strategy. Network theory holds that external ties are critical to performance by enabling access to knowledge. That literature has been heretofore agnostic regarding institutional effects. Our study shows that when search costs are high, then it becomes important to consider institutional theory. As a matter of theoretic tradition, network theory takes a different approach to knowledge procurement by entrepreneurial firms than we did in this paper. However, with the advent of online collaborative search strategies and knowledge sharing, artificial intelligences, and social media-based communication, new kinds of search costs may emerge that is as prohibitive as the traditional ones. Perhaps the pattern of interactive effects is different when the qualitative nature of the costs changes. Our assumptive definition of "search costs" in this paper had more to do with traditional resources such as time and money. In other domains, there may be other kinds of resources and costs that network theory is better able to explain.

Practical Implications

Our results have several important implications for policy makers, entrepreneurs, and other practitioners of entrepreneurship. We wish to emphasize these implications explicitly in the

spirit of business academia bringing value to the business world (Fisher 2020). From a practitioner's perspective, in an economic or social system, entrepreneurial ventures that are able to effectively seek and procure strategic knowledge are likely to outperform those ventures that are unable to do so. Our study sheds light on the complementary and substitutive interrelations between the two principal strategies for procuring such knowledge. Thus, our study offers practical contributions regarding which strategy works best in different environments. The success of any strategic approach to procuring knowledge is contingent upon that strategy's interaction with the context in which it is embedded. The context we examined is defined by institutional forces and their levels of development. Any entrepreneurial ecosystem, to be sure, features some level of development in terms of these institutional forces.

As such, for practitioners who seek to promote entrepreneurial performance in environments with weak institutional forces, collaborative search is a better strategy. The kinds of programs and initiatives that are more appropriate for enhancing entrepreneurial performance in these settings include ecosystem support programming, open networking events in real-life or on virtual platforms, and any information channels that promote organic communication. These kinds of institutional characteristics promote collaboration and connections between practitioners, which are germane to the collaborative search strategy that our study found to be associated with better entrepreneurial performance amidst voids and complexities. Communicating the presence of these institutional forces to the ventures in an ecosystem will be more effective if executed via informal channels that engage the ecosystem generally, instead of formal, targeted marketing campaigns. Formal support infrastructures may not be immediately appropriate because entrepreneurial ventures have more basic support needs that are being met via collaborative search strategies.

For practitioners who seek to promote entrepreneurial performance in environments with strong institutional forces and high levels of development, arm's-length search is the more effective strategy. Therefore, the kinds of programs and initiatives that are more appropriate for enhancing entrepreneurial performance in these settings include investor roundtables and angel groups, lending programs and tax incentives, legal infrastructure and support, and centers with established formal programs such as accelerators and incubators. These kinds of institutional characteristics support entrepreneurial ventures by allowing them to seek, find, and undertake transactions with these institutional elements independently, without the need to collaborate with any other ventures or partners. Similarly, such institutional characteristics promote entrepreneurial performance in these environments. Communicating the presence of these institutional forces is likely to be more effective if executed via formal channels and advertising campaigns, which can be targeted to specific sectors. In such environments, the utilization of more informal channels is likely to be less effective because the entrepreneurial ventures that populate the developed ecosystems may not find value in communicating intensely with one another.

Our findings offer new kinds of guidance and perspective for organizational leaders, ecosystem builders, and state or government officials who have an interest in stimulating entrepreneurial activities (Attour, and Lazaric 2020). Leaders ought to carefully undertake collaborative activities in weak institutional settings. Ecosystem builders must determine the establishment of the best types of institutional resources for entrepreneurs to perform. State and government officials can expect the need to support entrepreneurs more fully in emerging community settings, with better institutions that will deliver valuable knowledge to those entrepreneurs.

Our findings suggest that nascent or startup entrepreneurial firms should challenge themselves to utilize collaborative search for early performance. Like developing entrepreneurial communities, developing entrepreneurial ventures are bolstered by institutional forces (e.g., incubators, coalitions, angel groups, support networks). Such institutional elements play critical roles in connecting entrepreneurs with one another as a means to procure the knowledge they need for performance. In this way, collaborative search reduces costs as emerging ventures weather the trials and errors of early-stage innovative actions.

Limitations and Conclusion

Despite its contributions to theory and practice, our study contains some limitations that warrant care when interpreting our findings. First, in an empirical sense, it is worth noting that our primary dependent variable was the number of new products or services a firm introduced over the past three years. We were not able to consider the specific novelty or value of those new offerings. We consider this limitation through the lens of past research. For instance, Laursen and Salter (2006) found evidence that search intensity drives incremental innovations more so than it drives radical innovations. Although our study does not distinguish between radical and incremental innovations, this distinction accords with our operationalization, which did not ascertain the impact one tends to associate with frame-breaking radical innovations. The paucity of prior research on this topic suggests that the search strategies germane to radical innovation tend to be exploitive rather than collaborative (Maes, and Sels 2014). Indeed, future research can build on this implication by examining how arm's-length or collaborative search enables firms to develop radical versus incremental new product and service offerings.

We drew from a considerable diversity of firms as we executed the empirical portion of this research. About half of the entrepreneurial ventures had over 100 employees, which led us to utilize control variables and take special care to ensure that innovation activity in these ventures

generalizes to smaller ventures. In the case of the larger ventures, our research team had specific conversations with several of the survey participants, which provided confidence that they were exposed to innovative entrepreneurial activities. Nonetheless, we took empirical steps to control for error.

As we utilized data from a particular national context with complex market and social characteristics, one might question the generalizability of our findings. As an international research team, we reject such concerns regarding this study. We took care to safeguard against those threats. When institutional forces are weak in a given region – whether in China, a European country, or elsewhere - it is liable to compel entrepreneurial ventures in that setting to undertake the same kinds of informal knowledge search activities, which can include communicating with other ventures, seeking mutually advantageous alliances, and making informal deals with customers and constituents. Collaborative search, which we found to be a critical performance strategy derives from the practical necessities of survival when one is leading an entrepreneurial venture in an environment marked by institutional voids or complexities. Collaborative search can be adapted to the setting in which it occurs and still be defined as collaborative. It can be structured as appropriate in any culturally-laden environment where there is virtually no institutional support for entrepreneurial activities.

Our research design was cross-sectional. This limitation of our empirical sample led us to compute nine control variables, observe for common method variance effects, and utilize post-hoc analyses to support the validity of our conclusions. Nonetheless, we remain cautious about claiming cause-effect relations between the study variables. Our operationalization of the independent variables enabled us to generate evidence of a complementary interrelation between the two search strategies. However, evidence is not the same as direct observations. The latter could be illustrated more clearly through qualitative research that utilizes interviews and focus

groups with the same individuals who completed our survey forms. However, based on our theoretic development and statistical controls, the results of our analyses support a complementary interrelation between search strategies. Future entrepreneurship research ought to investigate qualitatively how these dynamics change over time. Such research would also provide useful boundary conditions for the implications of studies like ours, particularly regarding the pattern of joint search strategy effects in the middle ranges of institutional development. It would be valuable to the field of entrepreneurship in a practical sense to explore how firms shift their search strategies in these kinds of more nuanced environments.

This paper deepens the entrepreneurship field's understanding of knowledge search strategies and their effects on performance in different institutional settings. It is certain that the variables we examined are more complex than our operationalization of them suggests. Thus, future research should not oversimplify entrepreneurial venture performance as a mere set of linearly-derived variables. The richness of the context is important. We call for the introduction of new contextual factors, such as coalitions and venture group affiliations, new forms of angel investor networks, new kinds of community engagement, and new forces that derive from novel technological applications. These factors will serve to improve the support offered to entrepreneurs by institutional forces that are designed to stimulate economic and ecosystem development. Such vistas promise to yield new findings of the strategies that entrepreneurial ventures employ – singly or in combination – to seek knowledge about industries and the world. Such research will discover new methods for engaging long-running and deeper questions regarding how entrepreneurs use knowledge in society (Hayek 1945) and contribute positively to our understanding of how to stimulate the development of social and economic realms.

References

Acs, Z. J., Estrin, S., Mickiewicz, T., and L. Szerb (2018). "Entrepreneurship, institutional economics, and economic growth: An ecosystem perspective," *Small Business Economics* 51(2), 501-514.

Agarwal, R., Echambadi, R., Franco, A.M., and M. Sarkar (2004). "Knowledge transfer through inheritance: Spin-out generation, development, and survival," *Academy of Management Journal* 47(4), 501-522.

Aiken, L. S., West, S. G., R. R. Reno (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, Calif: Sage Publications.

Ali, A., Kelley, D., and J. Levie (2020). "Market-driven entrepreneurship and institutions," *Journal of Business Research* 113, 117-128.

Attour, A. and N. Lazaric (2020). "From knowledge to business ecosystems: emergence of an entrepreneurial activity during knowledge replication," *Small Business Economics* 54(2), 575-587.

Audretsch, D. B. and M. Feldman (1996). "R&D spillovers and the geography of innovation and production," *The American Economic Review* 86(3), 630-640.

Battilana, J., Leca, B., and E. Boxenbaum (2009). "How actors change institutions: Institutional entrepreneurship," *Academy of Management Annals* 3(1), 65-107.

Boisot, M., and J. Child (1996). "From fiefs to clans and network capitalism: Explaining China's emerging economic order," *Administrative Science Quarterly* 41(4), 600-628.

Bowen, H. P. and D. De Clercq (2008). "Institutional context and the allocation of entrepreneurial effort," *Journal of International Business Studies* 39(4), 747-768.

Bowen, H.P. and M. F. Wiersema (2005). "Foreign based competition and corporate diversification strategy," *Strategic Management Journal* 26(12), 1153-1171.

Cameron, G., and P. Trivedi (1986). "Econometric models based on count data: Comparisons and applications of some estimators and tests," *Journal of Applied Econometrics* 1(1), 29-54.

Cantner, U., Cunningham, J. A., and Lehmann, E. E. (2020). Entrepreneurial ecosystems: a dynamic lifecycle model. *Small Business Economics.* https://doi.org/10.1007/s11187-020-00316-0.

Cassiman, B., and R. Veugelers (2006). "In search of complementarity in innovation strategy: Internal R&D and external knowledge acquisition," *Management Science* 52(1), 68-82.

Chesbrough, H.W. (2003). "The era of open innovation," *Sloan Management Review* 35(Spring), 35-41.

Chitoor, R., Kale, P. and P. Puranam (2015). "Business groups in developing capital markets: Towards a complementarity perspective," *Strategic Management Journal* 36(9), 1277-1296.

Damanpour, F. (1991). "Organizational innovation: A meta-analysis of effects of determinants and moderators," *Academy of Management Journal* 34(3), 555-590.

Fiet, J. O. and P. C. Patel (2008). "Entrepreneurial discovery as constrained, systematic search," *Small Business Economics* 30(3), 215-229.

Fisher, G. (2020). "Why every business professor should write practitioner-focused articles, *Business Horizons,* 63(4), 417-419.

Gang, F. (2011). *NERI index of marketization of China's provinces*. Economic Science Press.

Gang, F., Ma, G., and X. Wang (2018). "Marketisation in China from 1997 to 2014: Achievements and contribution to growth," in *China's 40 years of reform and development: 1978-2018.* Ed. R. Garnaut, L. Song, and C. Fang, Canberra, Australia: ANU Press.

Grimpe, C., and U. Kaiser (2010). "Balancing internal and external knowledge acquisition: The gains and pains from R&D outsourcing," *Journal of Management Studies* 47(8), 1483-1509.

Hansen, M. T. (1999). "The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits," *Administrative Science Quarterly* 44(1), 82-111.

Hayek, F.A. (1945). "The use of knowledge in society," *The American Economic Review* 35(4), 519-530.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations.* (2nd ed.). Thousand Oaks, CA: Sage.

Howells, J. (2006). "Intermediation and the role of intermediaries in innovation," *Research Policy* 35(5), 715-728.

Huston, L., and N. Sakkab (2006). "Connect and develop," *Harvard Business Review* 84(3), 58-66.

Iansiti, M., and R. Levien (2004). "Strategy as ecology," *Harvard Business Review* 82(3), 68-78.

Judge, G.R., Hill, C., Griffiths, W.E., Lutkepohl, H., and T-C. Lee (1982). *Introduction to the theory and practice of econometrics*. New York: John Wiley & Sons., Inc.

Katila, R. 2002. "New product search over time: Past ideas in their prime?" *Academy of Management Journal* 45(5), 995-1010.

Katila, R., and G. Ahuja (2002). "Something old, something new: A longitudinal study of search behavior and new product introduction," *Academy of Management Journal* 45(6), 1183-1194.

Ketchen, Jr., D.J., Ireland, R.D., and C. C. Snow (2007). "Strategic entrepreneurship, collaborative innovation, and wealth creation," *Strategic Entrepreneurship Journal* 1(3-4), 371-385.

Khanna, T. and K. Palepu (2000). "Is group affiliation profitable in emerging markets? An analysis of diversified Indian business groups," *Journal of Finance* 55(2), 867-891.

Khanna, T., Palepu, K.G., and R. Bullock (2010). *Winning in Emerging Markets: A Road Map for Strategy and Execution*. Boston: Harvard Business Press.

Kirzner, I. (1997). "Entrepreneurial discovery and the competitive market process: An Austrian approach," *Journal of Economic Literature* 35(1), 60-85.

Koput, K.W. 1997. "A chaotic model of innovation search: Some answers, many questions," *Organization Science* 8(5), 528-542.

Laursen, K., and A. Salter (2006). "Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms," *Strategic Management Journal* 27(2), 131-150.

Leiponen, A., and C. E. Helfat (2010). "Innovation objectives, knowledge sources, and the benefits of breadth," *Strategic Management Journal* 31(2), 224-236.

Li, H., and K. Atuahene-Gima (2001). "Product innovation strategy and the performance of new technology ventures in China," *Academy of Management Journal* 44(6), 1123-1134.

Li, H., and K. Atuahene-Gima (2002). "The adoption of agency business activity, product innovation, and performance in Chinese technology ventures," *Strategic Management Journal* 23(6), 469-490.

Li, P. and H. Bathelt (2018). "Location strategy in cluster networks," *Journal of International Business Studies* 49(8), 967-989.

Long, J. S., and J. Freese (2006). *Regression models for categorical dependent variables using Stata*. College Station, Texas: Stata Corp.

Lv, Z., Rodríguez-García, M., and J. Sendra-García (2020). "Does institutional quality affect the level of entrepreneurial success differently across the entrepreneurship distribution?" *Review of Managerial Science* 1-19.

Maes, J. and L. Sels (2014). "SMEs' radical product innovation: The role of internally and externally oriented knowledge capabilities," *Journal of Small Business Management* 52(1), 141-163.

Maula, M. and W. Stam (2019). "Enhancing rigor in quantitative entrepreneurship research," *Entrepreneurship Theory and Practice* 44(6), 1059-1090.

McGee, J. E., Dowling, M. J., and W. L. Megginson (1995). "Cooperative strategy and new venture performance: The role of business strategy and management experience," *Strategic Management Journal* 16(7), 565-580.

McMullen, J. (2006). "Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur," *Academy of Management Review* 31(1), 132-152.

Minola, T., Hahn, D., and L. Cassia (2019). "The relationship between origin and performance of innovative startups: The role of technological knowledge at founding," *Small Business Economics* 53, 1-17.

Murphy, P. J. (2011). "A 2x2 conceptual foundation for entrepreneurial discovery theory," *Entrepreneurship Theory and Practice* 35(2), 359-374.

Nee, V. (1992). "Organizational dynamics of market transition: Hybrid forms, property rights, and mixed economy in China," *Administrative Science Quarterly* 37, 1-27.

Nelson, R. (1993). *National innovation systems: A comparative analysis*. Oxford University Press, New York.

Nerkar, A., and S. Paruchuri (2005). "Evolution of R&D capabilities: The role of knowledge networks within a firm," *Management Science* 51(5), 771-785.

North, D. C. (1990). *Institutions, institutional change, and economic performance*. New York, NY: Cambridge University Press.

Ocasio, W. (1997). "Towards an attention-based view of the firm," *Strategic Management Journal* 18(S1), 187-206.

Paruchuri, S., and S. Awate (2017). "Organizational knowledge networks and local search: The role of intra-organizational inventor networks," *Strategic Management Journal* 38(3), 657-675.

Peng, M.W., and Y. Luo (2000). "Managerial ties and firm performance in a transition economy: The nature of a micro-macro link," *Academy of Management Journal* 43(3), 486-501.

Piperopoulos, P., Wu, J., and C. Wang (2018). "Outward FDI, home-country political ties and innovation performance of emerging market enterprises," *Research Policy* 47(1), 232-240.

Podsakoff, P.M., MacKenzie, S.B., Lee, J-Y, and N. P. Podsakoff (2003). "Common method biases in behavioral research: A critical review of the literature and recommended remedies," *Journal of Applied Psychology* 88(5), 879-903.

Radicic, D. and G. Pugh (2017). "Performance effects of external search strategies in European small and medium-sized enterprises," *Journal of Small Business Management* 55(sup1), 76-114.

Richardson, H. A., Simmering, M. J., and M. C. Sturman (2009). "A tale of three perspectives: Examining post hoc statistical techniques for detection and correction of common method variance," *Organizational Research Methods* 12(4), 762-800.

Robertson, T.S., and H. Gatignon (1998). "Technology development mode: A transaction cost conceptualization," *Strategic Management Journal* 19(6), 515-531.

Rosenkopf, L. and P. Almeida (2003). "Overcoming local search through alliances and mobility," *Management Science* 49(6), 751-766.

Scott, R. W. (1995/2013). *Institutions and organizations.* Thousand Oaks, CA: Sage.

Shan, W., Walker, G., and B. Kogut (1994). "Interfirm cooperation and startup innovation in the biotechnology industry," *Strategic Management Journal* 15(5), 387-394.

Sirilli, G., and R. Evangelista (1998). "Technological innovation in services and manufacturing: Results from Italian surveys," *Research Policy* 27(9), 881-899.

Sleutjes, B. and V. Schutjens (2012). "The added value of neighborhood-based support networks to local firm growth," *Entrepreneurship Research Journal* 2(2), 1-31.

Spector, P. E., Rosen, C. C., Richardson, H. A., Williams, L. J., and R. E. Johnson (2019). "A new perspective on method variance: A measure-centric approach," *Journal of Management* 45(3), 855-880.

Stuart, T.E. and J. M. Podolny (1996). "Local search and the evolution of technological capabilities," *Strategic Management Journal* 17(S1), 21-38.

Tapon, F., and C. Cadsby (1996). "The optimal organization of research: Evidence from eight case studies of pharmaceutical firms," *Journal of Economic Behavior and Organization* 31(3), 381-399.

Taura, N. and D. Radicic (2019). "Intra-cluster knowledge exchange and frequency of product innovation in a digital cluster," *Journal of Small Business Management* 57(sup2), 350-373.

Tiberius, V., Rietz, M., and R. B. Bouncken (2020). "Performance analysis and science mapping of institutional entrepreneurship research," *Administrative Sciences* 10(3), 69.

Urbano, D., Audretsch, D., Aparicio, S., and M. Noguera (2019). "Does entrepreneurial activity matter for economic growth in developing countries? The role of the institutional environment," *International Entrepreneurship and Management Journal* 1-35.

Veugelers, R., and B. Cassiman (1999). "Make and buy in innovation strategies: Evidence from Belgian manufacturing firms," *Research Policy* 28(1), 63-80.

Williamson, O. (1985). *The economic institutions of capitalism: Firms, markets, relational contracting*. The Free Press. New York.

World Bank (2012). *Summary of Enterprise Surveys data for China*. https://www.enterprisesurveys.org/en/data/exploreeconomies/2012/china

Wu, J., and S. Si (2018). "Poverty reduction through entrepreneurship: Incentives, social networks and sustainability," *Asian Business and Management* 17(4), 243–259.

Wu, J., Si, S., and X-B. Wu (2016). "Entrepreneurial finance and innovation: Informal debt as an empirical case," *Strategic Entrepreneurship Journal* 10(3), 257-273.

Wu, J., Wu, Z., and K. Harrigan (2019). "Process quality management and technological innovation revisited: A Contingency perspective from an emerging market," *Journal of Technology Transfer* 1(4), 11-27.

Zhang, Y., and H. Li (2010). "Innovation search of new ventures in a technology cluster: The role of ties with service intermediaries," *Strategic Management Journal* 31(1), 88-109.

TABLE 1
Knowledge Search Strategy Interrelation by Institutional Development Level

Knowledge Search Strategy Interrelation / Institutional Development	Substitutive	Complementary
Low: a. Voids b. Complexities	moderate search costs adequate managerial capacity	high search costs inadequate managerial capacity
High: a. Support Structures b. Clarity	high search costs inadequate managerial capacity	moderate search costs adequate managerial capacity

TABLE 2
Valid Cases and Industry Sectors

	Frequency	Percent
Automobile and Parts	296	20.14
Biotech Products and Medicine	36	2.45
Chemical Products	63	4.29
Electronic Equipment	182	12.38
Electronic Parts Making	271	18.44
Food Processing	69	4.69
Garment and Leather Products	287	19.52
Household Electronics	63	4.29
Metallurgical Products	154	10.47
Transportation and Telecommunications	49	3.33
Total	1,470	100

TABLE 3
Descriptive Statistics and Intercorrelations

	Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1	Innovation performance	1.536	8.680	1.000											
2	Firm age	2.309	0.877	0.040	1.000										
3	Firm size [a]	0.049	0.216	0.136*	0.115*	1.000									
4	R&D advantage	0.236	0.425	0.126*	-0.004	0.074*	1.000								
5	Return on sales	-0.446	13.632	0.004	-0.048*	0.007	0.012	1.000							
6	Public listed	0.024	0.154	0.077*	-0.048*	0.208*	0.088*	0.006	1.000						
7	Market share by import	4.265	12.806	0.038	-0.060*	-0.046*	0.1083*	0.011	-0.006	1.000					
8	Located inside industrial cluster	1.714	0.491	-0.037	0.169*	-0.033	-0.147*	-0.015	-0.072*	-0.083*	1.000				
9	Government ownership percent	21.938	40.231	0.008	0.410*	0.159*	-0.029	-0.040	-0.010	-0.095*	0.082*	1.000			
10	Arm's-length search (AS)	1.986	1.728	0.111*	-0.033	0.081*	0.194*	-0.007	0.099*	0.065*	-0.093*	-0.009	1.000		
11	Collaborative search (CS)	0.323	0.670	0.119*	-0.030	0.100*	0.249*	0.017	0.155*	0.085*	-0.161*	-0.051*	0.228*	1.000	
12	Levels of institutions)	4.063	1.242	0.008	0.041*	-0.002	0.093*	0.007	0.062*	-0.002	0.000	0.025	0.137*	0.057*	1.000

* indicates significance at the $p \leq 0.05$ level of confidence.
[a] logarithmically-transformed scores.

TABLE 4
Results for Search Strategy and Venture Performance (*n*=1,470)

Variables	Model 1	Model 2	Model 3	Model 4
	High levels of institutional development		Low levels of institutional development	
Constant	-2.296***	-2.395***	-2.477***	-2.505***
	(0.211)	(0.212)	(0.214)	(0.214)
Firm age	0.263***	0.244***	0.247***	0.229***
	(0.021)	(0.021)	(0.021)	(0.022)
Firm size	1.081***	1.043***	1.055***	1.045***
	(0.049)	(0.049)	(0.049)	(0.049)
R&D advantage	0.929***	0.848***	0.855***	0.815***
	(0.035)	(0.036)	(0.036)	(0.036)
Return on sales	0.004	0.003	0.003	0.003
	(0.006)	(0.005)	(0.005)	(0.005)
Public listed	0.424***	0.340***	0.341***	0.484***
	(0.066)	(0.068)	(0.068)	(0.067)
Market share by import	0.006***	0.005***	0.006***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Government ownership	-0.002***	-0.001*	-0.001**	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)
Located inside industrial cluster	-0.103**	-0.061	-0.061	-0.034
	(0.034)	(0.034)	(0.034)	(0.034)
Industry dummy	Yes	Yes	Yes	Yes
Location dummy	Yes	Yes	Yes	Yes
Arm's-length search (AS)	0.261***	0.243***	0.242***	0.254***
	(0.016)	(0.016)	(0.016)	(0.016)
Collaborative search (CS)	0.224***	0.214***	0.267***	0.282***
	(0.017)	(0.019)	(0.025)	(0.026)
AS × CS		0.223***		-0.026*
		(0.011)		(0.011)
Log-likelihood	-7227.750	-7163.046	-7157.631	-7062.648
AIC	14513.501	14388.092	14379.262	14195.295
Degree of freedom (*df*)	28	30	31	34
Prob. > $\chi 2$	0.000	0.000	0.000	0.000

Standard errors in parentheses; * $p< .05$, ** $p< .01$, ***$p<.001$ (two-tailed tests).

TABLE 5
Post-hoc Replication of Findings (*n*=847)

Variables	Model 1	Model 2	Model 3	Model 4
Constant	0.567***	0.495***	0.517***	-2.505***
	(0.099)	(0.099)	(0.100)	(0.214)
Firm age	-0.117***	-0.143***	-0.159***	0.229***
	(0.029)	(0.029)	(0.029)	(0.022)
Firm size	0.437***	0.164*	0.207**	1.045***
	(0.074)	(0.078)	(0.077)	(0.049)
R&D advantage	0.317***	0.255***	0.206***	0.815***
	(0.054)	(0.055)	(0.054)	(0.036)
Return on sales	-0.007	-0.007	-0.008	0.003
	(0.009)	(0.009)	(0.010)	(0.005)
Public listed	0.321**	0.153	0.279**	0.484***
	(0.104)	(0.108)	(0.108)	(0.067)
Market share by import	-0.004*	-0.004*	-0.006***	0.005***
	(0.002)	(0.002)	(0.002)	(0.001)
Government ownership	-0.002**	-0.002**	-0.002*	-0.001*
	(0.001)	(0.001)	(0.001)	(0.000)
Located inside industrial cluster	0.073	0.016	0.042	-0.034
	(0.054)	(0.054)	(0.054)	(0.034)
Industry dummy	Yes	Yes	Yes	Yes
Location dummy	Yes	Yes	Yes	Yes
Arm's-length search (AS)	0.834***	0.686***	0.420***	0.447***
	(0.040)	(0.041)	(0.040)	(0.041)
Collaborative search (CS)	0.347***	0.360***	0.550***	0.552***
	(0.021)	(0.024)	(0.027)	(0.026)
AS × CS		0.214***		-0.162***
		(0.055)		(0.014)
Log-likelihood	-7226.710	-7164.051	-7156.931	-7052.709
AIC	14512.401	14365.092	14346.062	14175.861
Degree of freedom (*df*)	28	30	31	34
Prob. > $\chi 2$	0.000	0.000	0.000	0.000

Standard errors in parentheses; * $p< .05$, ** $p< .01$, ***$p<.001$ (two-tailed tests).