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A Strategy Tripod Perspective on Knowledge Creation Capability

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Drawing on the strategy tripod perspective, in this study we examine how the performance effect of knowledge creation capability is contingent on key industrial and institutional variables. We find that technological turbulence, competitive intensity and government support all positively moderate the relationship between knowledge creation capability and firm performance, while dysfunctional competition has a negative moderating impact. This study provides a more fine-grained analysis on the performance implications of knowledge creation capability. Moreover, it represents one of the first attempts to empirically test the interactive effects of the three legs of the strategy tripod (the industry-based, resource-based and institution-based views) in one study and supports the importance of integrating the three legs to better understand the complex phenomenon.

Introduction

Does knowledge creation capability contribute to firm performance? The resource-based view states an ambiguous yes. This is because knowledge creation capability, which reflects a firm's ability to create new knowledge, has been admitted as an important resource with the characters of valuable, rare, inimitable and non-substitutable (Smith, Collins and Clark, 2005). Yet this statement is not well supported by existing empirical studies in that they report that neither knowledge creation capability nor new created knowledge positively impacts firm performance all the time (e.g. Collins, Smith and Stevens, 2001; Dröge, Claycomb and Germain, 2003; Schulze and Hoegl, 2006). As a result, the question of what the boundaries are within which knowledge creation capability contributes to firm performance necessitates further investigation drawn from a more insightful theoretical lens.

The strategy tripod perspective suggests that, although the resource-based view is powerful, it alone is not sufficient to explain the complex phenomenon; instead, it is the combination of three legs of the strategy tripod (the industry-based, resource-based and institution-based views) that provides a better understanding of the phenomenon (Gao *et al.*, 2010; Peng *et al.*, 2009; Yamakawa, Peng and Deeds, 2008). Accordingly, the strategy tripod perspective may be insightful to probe more deeply into the performance effect of knowledge creation capability. In particular, the perspective advocates examining the interactions of the three legs in terms of how the value of a certain resource varies with industrial and institutional settings (Lu, Liu and Wang, 2010; Meyer *et al.*, 2009). Extending this argument, we suggest that the relationship between knowledge creation capability and firm performance may be contingent on industrial and institutional contexts.

Therefore, in order to provide a more fine-grained analysis of the performance implications

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of knowledge creation capability, this study examines the moderating effects of key industrial and institutional variables on the relationship between knowledge creation capability and firm performance. Specifically, we outline technological turbulence and competitive intensity as key industrial variables and dysfunctional competition and government support as key institutional variables. Then, we hypothesize their moderating effects and empirically test the hypotheses based on a survey of 212 firms.

This study makes two contributions. First, through investigating how the relationship between knowledge creation capability and firm performance is moderated by key industrial and institutional variables, the study enriches the discipline's knowledge on the performance effect of knowledge creation capability. Second, although the strategy tripod perspective highlights integrating the three legs of the strategy tripod, extant studies often list them individually whereas little research has empirically tested their interactive effects within one study (Lu, Liu and Wang, 2010; Peng *et al.*, 2009; Yamakawa, Peng and Deeds, 2008). By viewing knowledge creation capability from the resource-based view, industrial variables from the industry-based view and institutional variables from the institution-based view, this study represents one of the first attempts to empirically examine the interactions between the three legs of the strategy tripod.

Literature review and hypotheses development

The strategy tripod perspective

The industry-based, resource-based and institution-based views are all leading perspectives in the strategy literature. The industry-based view states that the industrial conditions in which a firm competes to a large extent determines firm performance, and the firm can build and sustain its competitive advantage through altering its position in the industry (Boter and Holmquist, 1996; Porter, 1980). Based on the assumption that resources are heterogeneous and idiosyncratic, the resource-based view suggests a firm's sustainable competitive advantage is largely attributed to its valuable, rare, inimitable and non-substitutable resources (Barney, 1991). And the institution-based view highlights that firm performance at least in part is a reflection of the constraints of the particular institutional framework that the firm confronts (Peng, 2006).

Although these three views are insightful, they focus on different levels. Specifically, the industry-based view is good at identifying external forces at the industry level, the resource-based view excels in identifying internal strengths and weaknesses at the firm level, and the institution- based view emphasizes the societal-level influences (Peng, Wang and Jiang, 2008). None of them alone is enough to provide a comprehensive picture; rather, 'it is the combination of their insights that lead to a better and more insightful understanding of the complex phenomenon' (Yamakawa, Peng and Deeds, 2008, p. 64). For example, the resource-based view has been criticized for its 'little effort to establish appropriate contexts' (Priem and Butler, 2001, p. 32). Barney (2001, p. 52) himself acknowledged this criticism, noting that 'the value of a firm's resources must be understood in the specific market context within which a firm is operating … . [T]oo many authors have simply assumed away this question, and, thus, have failed to help develop a more complete theory of firm advantages.' Therefore, the strategy tripod perspective, which takes the industry-based, resource-based and institution-based views as three legs and combines them together, emerges to overcome some of the limitations of previous work that is typically based on a single perspective (Peng *et al.*, 2009; Yamakawa, Peng and Deeds, 2008).

Several scholars have utilized the strategy tripod perspective to investigate various complex phenomena. For example, building on the strategy tripod perspective Yamakawa, Peng and Deeds (2008) developed a comprehensive framework on what drives new ventures from emerging economies to enter developed economies. Gao *et al.* (2010) took the strategy tripod perspective to illustrate export behaviour and found that institutional environment has a stronger impact on export behaviour than firm competences and industry factors. Cui, Jiang and Stening (2011) employed the strategy tripod perspective to address the question of how Chinese firms make entry-mode decisions for outward investments. Xie *et al.* (2011) adopted the strategy tripod perspective to investigate foreign firms' strategic positioning in the US host market. And Ju, Zhao and Wang (2014) utilized the strategy tripod perspective to examine the boundaries of the positive relationship

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between relational governance and export performance.

These studies reveal the explanatory and predictive power of the strategy tripod perspective, yet they simply list the three legs of the strategy tripod in terms of the individual role played by key industry-, resource- and institution-related variables. Besides the independent impact, the industry-based, resource-based and institution-based views have interactive effects (Oliver, 1991; Peng, 2006). For instance, Oliver (1997, p. 698) combined the resource-based and institution-based views 'to provide a model of firm heterogeneity and sustainable advantage that incorporates the social context of resource selection'. Martin (2014, p. 59) indicated that a firm will have a competitive advantage 'when it is implementing a strategy, featuring distinctive resources and activities enabled by its interactions with the institutional environment'. Hence, the strategy tripod perspective advocates integrating its three legs together rather than simply listing them individually to generate more synergic insights, and it accordingly calls for elaborating the interactions between the legs (Lu, Liu and Wang, 2010; Peng *et al.*, 2009).

Knowledge creation capability

Knowledge has been viewed by the resource-based view as a critical strategic resource that significantly contributes to superior performance (Grant, 1996). Yet it is quickly obsolete, making it necessary for even leading firms to continually create new knowledge (Burns *et al.*, 2014; Zollo and Winter, 2002). Hence, knowledge creation is critical for a firm to ensure its competitive advantage, and it has attracted the interest of many scholars (e.g. Krogh, Nonaka and Rechsteiner, 2012; Nonaka, 1994). Because a firm's knowledge is embodied in its members and their social interactions (Tsoukas, 1996), knowledge creation relies on exchanging and combining information, knowledge and ideas among these members (Kogut and Zander, 1992). A firm's knowledge creation capability accordingly depends on the extent to which its members are capable of exchanging and combining information and knowledge into new knowledge and perceiving value from the exchange and combination process (Smith, Collins and Clark, 2005).

Drawing on the resource-based view, scholars often take for granted that knowledge creation capability universally leads to superior performance. In particular, the resource-based view states that a firm's competitive advantage stems from its valuable, rare, inimitable and non-substitutable resources (Barney, 1991). Through creating new knowledge, knowledge creation capability aids in coping with environmental changes (Wang, Su and Yang, 2011). Thus, it is valuable. And knowledge creation capability is rare in that only a small number of firms are good at creating new knowledge such as developing innovative products (Krogh, Nonaka and Rechsteiner, 2012). In addition, because knowledge creation capability relies on exchanging and combining information and knowledge among organizational members (Smith, Collins and Clark, 2005), it is difficult to imitate and non-substitutable. Hence, based on the resource-based view scholars highlight knowledge creation capability as an important strategic resource that contributes to superior performance. And several studies have empirically evidenced the significant performance implications of knowledge creation capability or new created knowledge (e.g. Menguc, Auh and Uslu, 2013; Smith, Collins and Clark, 2005).

However, there are also studies reporting that knowledge creation capability or new created knowledge does not improve firm performance all the time. For example, Collins, Smith and Stevens (2001) reported that only one of three dimensions of knowledge creation capability is positively related to firm performance. Dröge, Claycomb and Germain (2003, p. 557) found an insignificant linkage between new knowledge creation and firm performance, and they stated that 'new knowledge creation did not predict financial performance'. Schulze and Hoegl (2006) tested the impact of knowledge creation modes on new product success, and they indicated that the modes play both positive and negative roles during the concept and development phases of new product development projects. The inconsistent findings suggest that the resource-based view alone is not sufficient to explain the performance implications of knowledge creation capability, thus calling for insights from additional theoretical perspectives.

Building on the strategy tripod perspective, we argue that the integration of the industry-based, resource-based and institution-based views is likely to provide a better and more insightful

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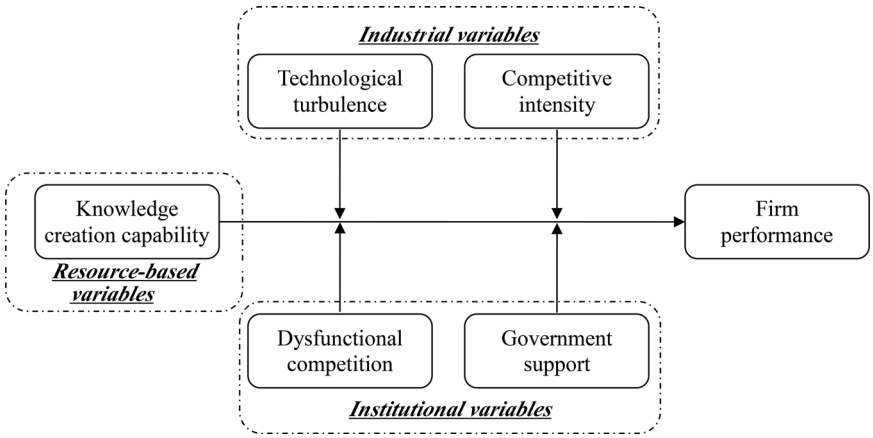

Figure 1. The conceptual model

understanding of the relationship between knowledge creation capability and firm performance. The strategy tripod perspective advocates examining the interactive effects among the three legs in terms of how the value of a certain resource varies in different industrial and institutional settings (Lu, Liu and Wang, 2010; Meyer *et al.*, 2009). Extending this idea to provide a more fine-grained picture of the performance effect of knowledge creation capability, we will clarify the boundaries within which knowledge creation capability contributes to firm performance through testing how the relationship of knowledge creation capability to firm performance is contingent on key industrial and institutional variables. Overall, Figure 1 shows our conceptual model.

The moderating effects of industrial variables

The industry-based view states that, through altering its position within an industry, a firm can develop and sustain competitive advantage (Boter and Holmquist, 1996; Porter, 1980). Yet the position the firm occupies and holds primarily relies on its resource base (Kraaijenbrink, Spender and Groen, 2010). Thus, there is an interface between the industry-based and resource- based views. The strategy tripod perspective indicates that the interface exhibits two modes. First, firms facing the same or similar industrial conditions capture different positions if they hold different resources or deploy resources in different ways (Conner, 1991; Parnell *et al.*, 2012). Hence, a firm's resources influence the impact of industrial conditions on firm performance. Second, if a firm leverages its resources under different industrial conditions, the profit generated by the same resource varies (Kraaijenbrink, Spender and Groen, 2010). In other words, the value and performance effects of resources are contingent on the industrial context (Su *et al.*, 2013a). Because we focus on the performance implications of knowledge creation capability, we employ the second mode to investigate how the relationship between knowledge creation capability and firm performance is moderated by key industrial variables.

In this study, we take technological turbulence and competitive intensity as key industrial variables and test their moderating effects. Technological turbulence and competitive intensity are highlighted for three reasons. First, both of them significantly affect a firm's position in an industry, and they are often used to reflect the condition of the industry (Jaworski and Kohli, 1993). Second, they strongly impact the value of a firm's resources such as new knowledge (Zhou, 2006). Thus, they may play a critical role in the performance implications of knowledge creation capability. Third, although many industrial variables have been studied previously, it is impossible to enumerate all of them within one study. Our quest for parsimony necessitates our attention on the most important ones. Both technological turbulence and competitive intensity have been deemed critical industrial variables (e.g. Kohli and Jaworski, 1990; Zhou, 2006); thus they are emphasized here.

Technological turbulence reflects the rate of technological changes in an industry (Jaworski and Kohli, 1993). Because technological changes generate challenges and opportunities for firms

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within the industry (Su *et al.*, 2013a), we argue that technological turbulence has a positive moderating effect on the relationship between knowledge creation capability and firm performance for two reasons. First, because rapid technological changes make firms' existing knowledge especially technological and relevant knowledge obsolescent (Song *et al.*, 2005), firms competing in high technological turbulence settings rely more heavily on new knowledge creation to ensure competitive advantage and superior performance than firms operating in low technological turbulence settings. Knowledge creation capability enables firms to create knowledge (Smith, Collins and Clark, 2005). Accordingly it has a much stronger performance effect for firms facing high technological turbulence than for firms facing low technological turbulence. In particular, firms competing in high technological turbulence contexts seriously rely on leveraging knowledge creation capability to cope with challenges generated by technological changes and then ensure competitive advantage, making knowledge creation capability have a stronger contribution to firm performance. In contrast, the performance implications of knowledge creation capability are not so serious for firms operating in a low technological turbulence context in that they face fewer challenges, resulting in the capability having a weaker impact on firm performance.

Second, knowledge creation capability helps firms cope with technological changes more quickly, better and more effectively; it thereby contributes to capturing opportunities and then improves firm performance (Su *et al.*, 2013a). Because technological turbulence often brings opportunities (Jaworski and Kohli, 1993), knowledge creation capability plays a much more important role in firm performance in a high technological turbulence context than in a low technological turbulence context. Specifically, when technological turbulence is at a high level, there are many opportunities a firm can take advantage of by leveraging knowledge creation capability. Thus, knowledge creation capability significantly contributes to the firm's success and outperformance in a rapidly changing technological context. In contrast, due to often fewer opportunities when technological turbulence is low, the role played by knowledge creation capability in capturing opportunities becomes less significant, making the impact of knowledge creation capability on firm performance weaker in a low technological turbulence context. Therefore:

H1: Technological turbulence positively moderates the relationship between knowledge creation capability and firm performance.

Competitive intensity refers to the degree of competition that a firm faces within an industry (Kohli and Jaworski, 1990; Zhou, 2006). We argue that competitive intensity positively moderates the relationship between knowledge creation capability and firm performance since the value and performance implications of knowledge creation capability increase with competitive intensity. On the one hand, because head-on competition leads to existing knowledge obsolescence at an accelerating rate (Zollo and Winter, 2002), it is much more valuable for firms competing in high competitive intensity settings to continually create new knowledge than for firms operating in low competitive intensity contexts (Krogh, Nonaka and Rechsteiner, 2012). Knowledge creation capability enables new knowledge to be created; it therefore plays a more significant role in ensuring survival and success and then achieving higher performance among firms suffering from a higher level of competitive intensity. In particular, firms suffering from intense competition seriously rely on creating new knowledge to ensure competitive advantage and superior performance, making the knowledge creation capability contribute significantly to firm performance. Yet, the value of creating new knowledge is less serious for firms operating in low competitive intensity settings, resulting in the performance implications of knowledge creation capability becoming weaker.

On the other hand, the knowledge creation capability aids in different firms by generating new knowledge (Smith, Collins and Clark, 2005). In a high competitive intensity context, a firm should distinguish itself from its competitors to avoid head-on competition and ensure better performance (Porter, 1980). Accordingly, in such a context knowledge creation capability plays a significant role in the firm outperforming its competitors and thereby has a strong contribution to firm performance (Nahapiet and Ghoshal, 1998). In contrast, in a low competitive intensity context a firm does not need to differentiate itself from competitors so seriously. As a result, the value of

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knowledge creation capability is reduced and its contribution to firm performance becomes less significant, weakening the relationship between knowledge creation capability and firm performance. Therefore:

> *H2*: Competitive intensity positively moderates the relationship between knowledge creation capability and firm performance.

The moderating effects of institutional variables

Institutions are commonly known as the 'rules of the game' (North, 1990). Influenced by North (1990) and Scott (1995), the institution-based view argues that firm performance is at least in part a reflection of the constraints of the institutional framework that the firm confronts (Peng, 2006). Institutions play their role in two ways. First, institutions impact the functioning of market mechanisms (Peng, 2003). For example, due to institutional voids and weak enforcement of legislation and regulations, firms in emerging economies often suffer from opportunistic, unfair or even unlawful competitive behaviour (Khanna and Palepu, 1997). Second, institutions shape the structure of the market by facilitating or constraining the development of certain industries, products and technologies (Wright *et al.*, 2005). For instance, the prosperity of the information technology (IT) industry and the success of many IT firms in the 1990s were facilitated by widespread support from the US government.

Given the strong impact of institutions, firms often actively leverage their resources to take advantage of institutions rather than passively comply with them (Oliver and Holzinger, 2008). Hence, a firm's resources and the institutions it faces jointly affect its strategy and performance (Oliver, 1997). This joint impact breeds the interface between the resource-based and institution- based views. The strategy tripod perspective exhibits two modes at the interface. First, the effects of institutions are contingent on resources (Meyer *et al.*, 2009; Oliver, 1997). For example, due to the diversity in resource base, some firms approach institutional changes as opportunities whereas others do so as challenges (Oliver and Holzinger, 2008). Second, institutions influence the value of firms' resources (Peng *et al.*, 2009). For instance, when institutions on intellectual property rights protection function well, a resource centred on intellectual property rights is valuable and can significantly improve firm performance. Yet its value is seriously damaged by imitations when institutions governing intellectual property rights protection fail or are weak, making the firm hardly profit from the resource. Since this study focuses on the performance effect of knowledge creation capability, we build on the second mode to test how the relationship between knowledge creation capability and firm performance is moderated by key institutional variables.

Here, we investigate the moderating effects of dysfunctional competition and government support. Dysfunctional competition reflects the role of institutions in the functioning of market mechanisms, and government support refers to the role of institutions in shaping the structure of the market (Li and Atuahene-Gima, 2001). They have been widely adopted as key institutional variables (e.g. Qian, Cao and Taceuchi, 2013; Sheng, Zhou and Li, 2011). And dysfunctional competition and government support both strongly affect the value of firms' resources (Li and Zhang, 2007). They accordingly may play a critical role in the performance implications of knowledge creation capability. Hence, they are employed here to describe institutional context.

Dysfunctional competition refers to 'the extent to which the competitive behaviour of firms in a market is opportunistic, unfair or even unlawful' (Li and Atuahene-Gima, 2001, p. 1125). In a highly dysfunctional competition context, the enforcement of legislation and regulations is problematic, leading to firms suffering from unlawful or unethical competitive behaviour (Li and Zhang, 2007). And firms cannot follow normal legal processes to gain protection against this behaviour (Sheng, Zhou and Li, 2011). In contrast, institutions are effective in fighting against unlawful or unethical competitive behaviour in a lowly dysfunctional competition setting (Li and Zhang, 2007). Firms can gain protection against the behaviour through following normal legal processes (Sheng, Zhou and Li, 2011). Thus, dysfunctional competition reflects the extent to which institutions support market mechanisms such as market-based transactions (Li and Atuahene-Gima, 2001).

In terms of the moderating effect of dysfunctional competition on the relationship between knowledge creation capability and firm performance, we argue that it is negative for three reasons. First, the highly dysfunctional competition context is full of unlawful or unethical

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competitive behaviour that damages the value of knowledge creation capability. For instance, knowledge creation capability enables the firm to create new knowledge to build and improve customers' loyalty (Krogh, Nonaka and Rechsteiner, 2012). Yet counterfeits of products and trademarks destroy the firm's good reputation among customers and hurt customers' loyalty, and therefore have an adverse impact on the value of knowledge creation capability (Li and Zhang, 2007). In contrast, when dysfunctional competition is at a low level, the firm escapes from the harms of various unlawful or unethical competitive behaviours on the value of knowledge creation capability. As a result, knowledge creation capability is more valuable in a lowly dysfunctional competition context.

Second, 'high levels of dysfunctional competition, which are characterized by patent and copyright violation and difficulties in monitoring and enforcing contracts, represent a weak appropriability regime' (Li and Zhang, 2007, p. 796). The weak appropriability regime impedes profiting from knowledge creation capability. For example, imitations caused by patent and copyright violation inhibit the firm monopolizing economic returns generated by its knowledge creation capability. And ineffective market competition laws lead to difficulties in monitoring and enforcing contracts, which prevents the firm from outsourcing, licensing and other ways to maximize the profit of new created knowledge. Thus, the contribution of knowledge creation capability to firm performance is damaged by dysfunctional competition. In contrast, the appropriability regime is tighter in a lowly dysfunctional competition context, which makes the firm more likely to capture returns generated by knowledge creation capability and further achieve higher performance (Sheng, Zhou and Li, 2011).

Third, a firm needs to combine new created knowledge with other resources to profit from it (Teece, 1986; Su *et al.*, 2013a). Yet firms often do not have all resources needed and they have to acquire external resources (Pisano, 2006). Thus, acquiring external resources plays a critical role in accomplishing the performance implications of knowledge creation capability. Dysfunctional competition 'implies that it is difficult for firms to benefit from their market transactions' (Li and Zhang, 2007, p. 796). Thus, a firm suffering from high dysfunctional competition cannot acquire external resources through market transactions, which inhibits the firm from satisfying the resource requirements of knowledge creation capability and profiting from it (Teece, 1986; Su *et al.*, 2013a). In contrast, a firm facing a low level of dysfunctional competition can acquire external resources by market transactions. It is thereby more likely to meet the resource requirements of knowledge creation capability and accomplish its performance effects.

Overall, for the three reasons above we argue that dysfunctional competition inhibits the relationship between knowledge creation capability and firm performance. And extant research also reports that dysfunctional competition impedes profiting from new created knowledge; for example, Li and Atuahene-Gima (2001) found that dysfunctional competition has a negative impact on the relationship between product innovation and firm performance. Therefore:

> *H3*: Dysfunctional competition negatively moderates the relationship between knowledge creation capability and firm performance.

Government support reflects the extent to which government and its agencies provide general and broad support for firms in terms of beneficial policies and programmes, technical support, financial support as well as the access to foreign technology, manufacturing and other equipment (Li and Atuahene-Gima, 2001; Sheng, Zhou and Li, 2011). Due to the increasingly pervasive influence of government on firm activities and outcomes, government support is prevalent in both developed and emerging economies (Rasmussen and Rice, 2012).

Since the government support a firm obtains is often the accumulation of support launched by government and its agencies at various levels, government support varies significantly across firms (Qian, Cao and Taceuchi, 2013; Sheng, Zhou and Li, 2011). For example, a Chinese electronics firm gets support provided by the Electronics and Information Industry Restructuring and Revitalization Plan, which was launched by central government in 2009. If the firm is located in an industrial park, it also enjoys support from the park's government and its agencies. And if the firm is recognized as a high-tech enterprise, it gets government support earmarked for high-tech enterprises (Kshetri, Palvia and Dai, 2011). Thus, although government support is an institution-based variable, it takes on the character of a firm-specific variable (Li and

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Atuahene-Gima, 2001; Qian, Cao and Taceuchi, 2013).

In this study, we have three reasons to argue that government support positively moderates the relationship between knowledge creation capability and firm performance. First, as we have mentioned above, to profit from new created knowledge firms need to acquire external resources (Pisano, 2006). Thus, the access to external resources plays a critical role in accomplishing the performance implications of knowledge creation capability. Firms enjoying government support not only acquire resources directly provided by government and its agencies but also get access to external resources held by other organizations (Li and Atuahene-Gima, 2001; Sheng, Zhou and Li, 2011). Accordingly, firms getting strong government support are better at translating knowledge creation capability into superior performance.

Second, government can 'alter the size of markets through government purchases and regulations affecting substitute and complementary products', 'affect the structure of markets through entry and exit barriers and antitrust legislation', 'alter the cost structure of firms through various types of legislation pertaining to multiple factors', 'affect the demand for products and services by charging excise taxes and imposing regulations that affect consumption patterns' and so on (Hillman and Hitt, 1999, p. 826). Through implementing beneficial policies and programmes which play the role above, government and its agencies will improve the performance effect of knowledge creation capability. For example, government purchases and regulations affecting substitute and complementary products can make a firm capture more economic returns from new products developed by its knowledge creation capability; and through implementing policies and programmes that increase entry and exit barriers and antitrust legislation, government support enables the firm to monopolize in a niche generated from its knowledge creation capability and enjoy the monopoly rents. Thus, firms enjoying government support can better take advantage of knowledge creation capability and achieve higher performance.

Third, government support aids in reducing the adverse effects of inadequate institutional infrastructure on accomplishing the performance implications of knowledge creation capability (Li and Atuahene-Gima, 2001). For example, in emerging economies inadequate institutional infrastructure leaves a mass of institutional voids that often damage the value of firms' resources (Peng, 2003). Government support is likely to fill in institutional voids and lessens the adverse effects of inadequate institutional infrastructure and institutional voids (Qian, Cao and Taceuchi, 2013; Sheng, Zhou and Li, 2011). It accordingly improves the linkage of a firm's resources such as knowledge creation capability to firm performance. Existing research has found that government support helps firms capture returns from new created knowledge. For example, Li and Atuahene-Gima (2001) reported that government support strengthens the relationship between product innovation and firm performance. Therefore:

> *H4*: Government support positively moderates the relationship between knowledge creation capability and firm performance.

Method

Sample and data collection

For three compelling reasons, we focus on firms in China to test our hypotheses. First, there is a high variation in knowledge creation capability among Chinese firms (Wang, Su and Yang, 2011), offering an ideal context to test its performance implications. Second, dysfunctional competition and government support vary significantly across regions, industries and firms in China (Qian, Cao and Taceuchi, 2013; Sheng, Zhou and Li, 2011). Third, as the global research horizon is increasingly expanding to China, it is critical to know more about what is going on there (Su *et al.*, 2013a). Improved knowledge about China not only is helpful for Chinese firms competing in the market place but also aids western firms in competing and/or collaborating with Chinese firms.

We gathered data for this study through an interview survey instrument. First, we developed a questionnaire based on previous studies and modified it according to the actual conditions that firms face in China. Then, we did a pilot test with 15 firms, whose responses were excluded from the final database. We further revised the questionnaire using feedback from the pilot study. The questionnaire was prepared in English and was translated into Chinese. The Chinese version was subsequently back-translated by a third party to ensure

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accuracy. The two translations indicated no substantial difference in the meanings of the scales.

Second, we focused on manufacturing firms to eliminate differences between manufacturing and service industries. And to avoid bias in certain regions we chose firms from six provinces in different regions of China including Beijing, Guangdong, Hebei, Henan, Jiangsu and Shaanxi. We randomly selected 1000 firms from a list provided by local governments and business research firms. For the purpose of increasing response rate, we undertook the pre-commitment technique in terms of performing a telephone inquiry on these 1000 firms before the formal survey. We got 263 firms that agreed to participate in the survey.

Finally, the face-to-face interview method was adopted to obtain subjects' responses to the survey instrument. Although it was a resource-intensive method, it was chosen over mail survey and online survey for the purposes of clarifying respondents' queries on the spot, avoiding a busy executive delegating the task of filling out the survey to his/her secretary and ensuring responses were complete and usable. All interviewers were PhD students and teachers in Chinese universities, and most of them had taken part in an interview survey before. They were trained before embarking on the interview process. The training covered background knowledge of the survey, interview skills and the exact meaning of every question in the questionnaire.

To ensure reliability of firm-level measures, the questionnaires for each firm were completed by two executives individually. At the beginning, interviewers showed a letter that explained the intent of the survey and stated the promise to keep responses confidential. Then, they conducted two separate face-to-face interviews with two executives of each firm. The final score of each item was the average of those from the two executives (Su *et al.*, 2013a).

The survey was started in October 2009. By March 2010 the answers from 241 firms were obtained. After deleting firms with missing data in responses, with response from only one executive and with inconsistent answers from the two executives, 212 firms were identified as usable, resulting in a response rate of 21.2% (212/1000). The information on these 212 firms regarding firm size, age, ownership type and industry is shown in Table 1. The distributions of the firms in firm size and age are not significantly different from those of the *China Statistical Yearbook 2009*.

Table 1. Profile of responding firms

Firm age		Ownership type	
≤ 3	28.3%	State-owned enterprises	13.7%
3–6	26.4%	Joint stock companies	33.0%
7–12	25.5%	Privately owned enterprises	40.1%
>12	19.8%	Others	13.2%
Industry		**Firm size (number of employees)**	
Textiles	17.5%	≤50	67.5%
Chemicals	22.6%	51–200	17.5%
Mechanical	17.9%	201–500	6.6%
Metal processing	13.7%	501–1000	4.7%
Electronics	23.1%	>1000	3.8%
Others	5.2%		

Note: Due to the rounding, the distribution of firm size does not add up to 100%.

One issue commonly raised concerning survey methodology is non-response bias. To check for it, responding and non-responding firms were compared along major attributes such as firm age and ownership status. The t statistics were insignificant. In addition, there was no significant difference between the 212 usable firms and 29 deleted firms. Moreover, we divided the 212 usable firms into two groups based on the time when they agreed to be interviewed (Armstrong and Overton, 1977). A comparison of the two groups revealed no significant differences, supporting the assumption that respondents were not different from non-respondents.

Measures

Where possible, standard and validated instruments from the literature were used or adapted. Questionnaire items, unless stated otherwise, were measured using a five-point scale in which 1 represented 'strongly disagree' and 5 represented 'strongly agree'. For multi-item constructs, we used the widely employed mean value of all items method to operationalize it (Kumar *et al.*, 2011).

Knowledge creation capability was measured with 12 items developed by Smith, Collins and Clark (2005). The respondent was asked to rate the degree to which each of following statements

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described his/her firm over the past three years: (1) employees met frequently to discuss work-related ideas and new developments; (2) employees did not have difficulty getting together to exchange new ideas and developments; (3) employees were available to discuss new ideas or developments; (4) employees felt free to contact anyone to discuss new ideas or developments; (5) employees were proficient at combining and exchanging ideas to solve problems or create opportunities; (6) employees did a good job of sharing their individual ideas to come up with new ideas, products or services; (7) employees learned to effectively pool their ideas and knowledge; (8) employees often exchanged and combined ideas to find solutions to problems; (9) employees saw benefits from exchanging and combining ideas with one another; (10) the most valuable ideas seemed to come when employees pooled their efforts; (11) employees believed that, by exchanging and combining ideas, they could create value for the company; and (12) employees believed that, by pooling their efforts, they could create value for the company.

Technological turbulence and competitive intensity were measured by items adopted from Jaworski and Kohli (1993) and Zhou (2006). Specifically, to measure technological turbulence, the respondent was asked to rate the degree to which each of following statements described his/her firm over the past three years: (1) our industry was characterized by rapidly changing technology; (2) the rate of technology obsolescence was high in our industry; (3) it was difficult to forecast technological changes in the next three years; and (4) technological changes provided big opportunities in our industry. Competitive intensity was measured by (1) price competition was a hallmark of our industry; (2) any action that a company took, others made a response swiftly; (3) one heard of a new competitive move almost every day; and (4) competition in our industry was cut-throat.

The measures of dysfunctional competition and government support were adopted from Li and Atuahene-Gima (2001) and Sheng, Zhou and Li (2011). In order to measure dysfunctional competition, the respondent was asked to indicate the extent to which his/her firm's principal industry had experienced the following in the last three years: (1) unlawful competitive practices; (2) counterfeiting of your firm's own products and trademarks by other firms; (3) ineffective market competition law to protect your firm; and (4) increased unfair competitive practices by other firms in the industry. To measure government support, the respondent was asked to indicate the extent to which in the last three years the government and its agencies had (1) implemented policies and programmes that have been beneficial to your firm's operations; (2) provided needed technology information and technical support to your firm; (3) played a significant role in providing financial support for your firm; and (4) helped your firm to obtain licences for imports of technology, manufacturing and other equipment.

Firm performance was measured by subjective measures here for two reasons. First, 'using perceived performance scales relative to objectives permits comparisons across firms and contexts' (Song *et al.*, 2005, p. 264). Second, subjective measures can yield needed information (Dess and Robinson, 1984), and they have been widely used and exhibited high correlation with objective performance measures (Su *et al.*, 2013a). Further, since extant subjective performance measures highlight comparing firm performance relative to its principal competitors (e.g. Li and Zhang, 2007; Su *et al.*, 2013a), we employed this way as well. Specifically, the respondent was asked to rate his/her firm's performance relative to its principal competitors over the last three years in (1) return on assets; (2) return on investment; and (3) return on sales (ROS). The response scale ranged from 1 = 'much worse' to 5 = 'much better'.

Control variables. Firm size was adopted as the first control variable referring to the number of full-time employees measured by a five-point scale from 1 = '50 or less' to 5 = 'more than 1000'. Firm age was the second one. Industry was controlled by dummies including textiles, metal processing, chemicals, electronics, mechanical and others. Given that ownership type may impact firm performance, it was also controlled by dummies in terms of joint ventures, limited companies, privately owned enterprises and others. Finally, our firms were located in six provinces of China. These provinces differ in building institutional architecture to support market-based transactions, which strongly affects firm performance. Thus, the NERI marketization index, which is a province-level index of marketization developed by the National Economic Research Institution of China Reform Foundation and has been well employed in extant

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studies (Fan, Wang and Zhu, 2011; Shi, Sun and Peng, 2012), was taken as the last control variable.

Reliability and validity

As shown in Table 2, Cronbach's alpha value of all multi-item factors is above the cut-off point 0.70, suggesting that their theoretical constructs have good composite reliability (Cronbach, 1971). All loadings are above 0.70 with only one exception (0.686); thus all items show good construct validity (Fornell and Larcker, 1981). In addition, we ran confirmatory factor analyses (CFA) for each set of focal constructs to further test composite reliability and convergent validity. At 0.766 or higher, the composite reliability (CR) for each construct exceeds the 0.70 benchmark (Fornell and Larcker, 1981). The average variance extracted (AVE) for each construct is 0.503 or higher, exceeding the 0.50 benchmark (Fornell and Larcker, 1981). Thus, composite reliability and convergent validity are also demonstrated by the CFA results.

Discriminant validity is assessed by running chi-squared difference tests for all multi-item constructs in pairs to see if they are distinct from one another (Anderson and Gerbing, 1988). The process involves collapsing each pair of constructs into a single model and comparing its fit with that of a two-construct model. The chi-squared value is significant in each case, supporting discriminant validity. And the results of a varimax rotated component matrix in Table 3 indicate that all variables differ from each other. Thus, our measures show good discriminant validity.

Since the score for each item is the average of those from two interviewers, the inter-rater reliability is tested by correlation coefficients (Shrout and Fleiss, 1979). All variables show high correlation coefficients. Thus, our data have good inter-rater reliability.

Common method bias results in one general factor accounting for the majority of covariance in the variables, and collecting data from different sources can avoid it (Podsakoff and Organ, 1986). Since the data of the NERI marketization index are obtained from other sources rather than our survey, they contribute to avoiding common method bias. And the results of the rotated component matrix in Table 3 indicate that no general factor is apparent. Thus, common method bias is unlikely to be a threat to the validity of our findings.

Our subjective measures of firm performance may suffer from a self-reporting bias; thus we endeavoured to collect objective performance data from various sources, such as annual reports, internet and media, for our sample. We finally gathered data on ROS for 96 firms in our sample. These 96 firms do not differ from the total sample along major attributes such as firm age and size. The correlation between subjective performance and objective ROS is 0.351 and that between subjective ROS and objective ROS is 0.413, both of which are significant at the 0.001 level (two-tailed). The high and statistically significant correlation coefficients provide additional support to the reliability of our subjective performance measures and further indicate that common method bias is not a major problem.

Findings

Table 4 shows basic information on each factor and correlations between them. It shows that the correlation between knowledge creation capability and firm performance is not significant ($r = 0.042$, $p > 0.05$). In addition, none of the correlations of firm performance with key industrial and institutional variables and the NERI marketization index is significant. And the correlations of the NERI marketization index with key industrial and institutional variables are also insignificant.

We used the regression method in steps to test our hypotheses. Specifically, we mean-centred all variables to minimize the threat of multicollinearity especially in the equation where we include interaction terms (Aiken and West, 1991). All values of the variance inflation factor are well below the cut-off point 10 (Neter, Wasserman and Kutner, 1985). And we used the F-test to test whether there is an increment in R^2 between different steps (Finkle, 1998).

Table 5 reports the regression results. Model 1 focuses on the effects of control variables on firm performance. It is found that the NERI marketization index does not have a significant linkage with firm performance ($\beta = 0.089$, $p > 0.05$). Model 2 shows an insignificant relationship of knowledge creation capability and firm performance ($\beta = 0.030$, $p > 0.05$), which is the same as the findings of several extant studies that knowledge creation capability or new created knowledge does not improve firm performance all the time (e.g. Collins,

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Table 2. Standard estimates and coefficient alpha

Variables and items	Loading
Knowledge creation capability (alpha = 0.959, CR = 0.960, AVE = 0.667)	
1. Employees met frequently to discuss work-related ideas and new developments	0.858
2. Employees did not have difficulty getting together to exchange new ideas and developments	0.879
3. Employees were available to discuss new ideas or developments	0.824
4. Employees felt free to contact anyone to discuss new ideas or developments	0.824
5. Employees were proficient at combining and exchange ideas to solve problems or create opportunities	0.810
6. Employees did a good job of sharing their individual ideas to come up with new ideas, products, or services	0.820
7. Employees learned to effectively pool their ideas and knowledge	0.771
8. Employees often exchanged and combined ideas to find solutions to problems	0.807
9. Employees saw benefits from exchanging and combining ideas with one another	0.838
10. The most valuable ideas seemed to come when employees pooled their effort	0.863
11. Employees believed that, by exchanging and combining ideas, they can create value for the company	0.860
12. Employees believed that, by pooling their efforts, they can create value for the company	0.833
Technological turbulence (alpha = 0.762, CR = 0.766, AVE = 0.503)	
1. Our industry was characterized by rapidly changing technology	0.854
2. The rate of technology obsolescence was high in our industry	0.852
3. It was difficult to forecast the technological changes in the next three years	0.686
4. Technological changes provided big opportunities in our industry	0.761
Competitive intensity (alpha = 0.833, CR = 0.836, AVE = 0.561)	
1. Price competition was a hallmark of our industry	0.794
2. Any action that a company took, others made a response swiftly	0.794
3. One heard of a new competitive move almost every day	0.852
4. Competition in our industry was cut-throat	0.830
Dysfunctional competition (alpha = 0.870, CR = 0.871, AVE = 0.629)	
1. Unlawful competitive practices	0.845
2. Counterfeiting of your firm's own products and trademarks by other firms	0.819
3. Ineffective market competitive law to protect your firm	0.870
4. Increased unfair competitive practices by other firms in the industry	0.861
Government support (alpha = 0.903, CR = 0.904, AVE = 0.703)	
1. Implemented policies and programs that have been beneficial to your firm's operations	0.840
2. Provided needed technology information and technical supports to your firm	0.897
3. Played a significant role in providing financial supports for your firm	0.885
4. Helped your firm to obtain licensed for imports of technology, manufacturing, and other equipment	0.901
Firm performance (alpha = 0.916, CR = 0.919, AVE = 0.793)	
1. Return on assets	0.951
2. Return on investment	0.928
3. Return on sales	0.897

Smith and Stevens, 2001; Dröge, Claycomb and Germain, 2003; Schulze and Hoegl, 2006). The result supports our argument that simply testing the direct linkage between knowledge creation capability and firm performance is not sufficient to illustrate the performance implications of knowledge creation capability; rather, it is imperative to identify the boundaries within which knowledge creation capability improves firm performance. In addition, we test the potential of a non-linear relationship through adding the square of knowledge creation capability into model 3. We fail to find a significant non-linear linkage ($\beta = -0.051$, $p > 0.05$).

Model 4 tests the moderating effect of technological turbulence on the relationship between knowledge creation capability and firm performance. It reports a positive moderating effect ($\beta = 0.131$, $p < 0.05$), supporting Hypothesis 1. Hypothesis 2, which argues that the moderating effect of competitive intensity is positive, is supported by the results of model 5 ($\beta = 0.125$, $p < 0.05$). Model 6 indicates that the moderating effect of dysfunctional competition is negative ($\beta = -0.218$, $p < 0.01$), and model 7 shows that the moderating effect of government support is positive ($\beta = 0.193$, $p < 0.01$). Thus, both Hypothesis 3 and Hypothesis 4 are supported. To further ensure the stability

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Table 3. Rotated component matrix

	Component					
	1	2	3	4	5	6
Knowledge creation capability 1	0.864	0.014	0.111	−0.005	0.027	0.073
Knowledge creation capability 2	0.866	−0.027	0.042	0.134	0.032	0.102
Knowledge creation capability 3	0.827	−0.126	0.024	0.015	0.060	0.176
Knowledge creation capability 4	0.806	0.047	0.115	0.056	−0.001	0.149
Knowledge creation capability 5	0.800	0.151	0.087	0.016	−0.049	0.106
Knowledge creation capability 6	0.782	0.135	0.121	0.166	−0.001	0.099
Knowledge creation capability 7	0.754	0.089	0.103	0.172	−0.012	−0.030
Knowledge creation capability 8	0.794	0.206	−0.028	0.216	0.036	−0.112
Knowledge creation capability 9	0.820	0.011	0.011	0.149	−0.029	0.118
Knowledge creation capability 10	0.832	0.058	0.050	0.169	0.039	0.125
Knowledge creation capability 11	0.848	−0.044	0.015	0.135	0.051	0.091
Knowledge creation capability 12	0.781	0.044	0.065	0.279	−0.022	0.144
Technological turbulence 1	0.269	0.044	0.128	0.186	0.156	0.791
Technological turbulence 2	0.163	0.219	0.114	0.167	−0.063	0.786
Technological turbulence 3	0.037	0.217	0.104	0.145	−0.192	0.663
Technological turbulence 4	0.192	0.073	0.055	0.246	0.197	0.687
Competitive intensity 1	0.201	0.083	0.051	0.755	0.004	0.137
Competitive intensity 2	0.144	0.250	0.218	0.697	0.094	0.166
Competitive intensity 3	0.250	0.146	0.141	0.764	−0.006	0.132
Competitive intensity 4	0.297	0.053	−0.042	0.773	−0.024	0.208
Dysfunctional competition 1	0.018	0.834	−0.043	0.108	−0.006	0.022
Dysfunctional competition 2	0.037	0.819	0.146	0.022	0.014	−0.019
Dysfunctional competition 3	0.081	0.847	0.030	0.109	0.043	0.083
Dysfunctional competition 4	0.117	0.808	−0.068	0.147	0.038	0.190
Government support 1	0.155	−0.146	0.812	0.092	0.041	0.162
Government support 2	0.096	0.019	0.880	0.072	−0.007	0.057
Government support 3	0.059	0.091	0.886	0.007	0.088	0.005
Government support 4	0.095	0.144	0.880	0.139	−0.001	0.083
Firm performance 1	0.011	0.023	0.056	−0.036	0.946	0.042
Firm performance 2	0.027	0.035	0.054	0.062	0.918	0.017
Firm performance 3	0.008	−0.045	0.003	0.021	0.892	0.107
Eigenvalue	8.392	3.325	3.211	2.737	2.674	2.269
% of variance	27.071	10.724	10.359	8.828	8.625	7.320
Cumulative % of variance	27.071	37.795	48.155	56.982	65.608	72.928

of our findings, we tested all moderating effects in a full model (model 8). The full model shows the same results as the separate models (models 4, 5, 6 and 7), which means that our results have strong stability.

In order to test for the robustness of our findings, we undertake a supplemental analysis whereby the data for the independent variables and moderating variables are drawn from one respondent and the data for dependent measures are used from the different respondent of the same firm. We randomly split two respondents per firm into two groups instead of aggregating the responses from each firm. All four hypotheses are supported as well. Thus, the robustness checks provide further validity for our findings.

Discussion

Contributions

Two contributions distinguish this study. First, this study enriches the discipline's knowledge on the performance implications of knowledge creation capability. Although knowledge creation capability is often deemed as positively impacting firm performance, we fail to find either a linear or non-linear relationship between knowledge creation capability and firm performance. The findings indicate that knowledge creation capability *per se* does not universally ensure superior performance, which is consistent with the results of several studies that knowledge creation capability or new created knowledge does not contribute

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Table 4. Descriptive statistics and correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Firm age	1																
2. Firm size	0.360***	1															
3. Textiles	−0.065	0.092	1														
4. Metal processing	−0.085	−0.035	−0.180**	1													
5. Chemicals	0.137*	0.002	−0.245***	−0.215**	1												
6. Electronics	−0.088	−0.089	−0.248***	−0.218**	−0.297***	1											
7. Mechanical	0.045	0.023	−0.211**	−0.186**	−0.253***	−0.256***	1										
8. Joint ventures	0.016	0.158*	0.018	−0.024	0.039	0.036	−0.104	1									
9. Limited companies	−0.101	−0.165*	−0.001	−0.086	−0.091	0.048	0.143*	−0.148*	1								
10. Privately owned enterprises	−0.280***	−0.155*	0.037	0.087	0.021	−0.034	−0.034	−0.173*	−0.518***	1							
11. NERI marketization index	0.016	−0.021	−0.063	0.004	0.007	0.045	−0.007	−0.107	−0.071	0.036	1						
12. Knowledge creation capability	0.011	−0.056	0.083	0.074	−0.106	−0.098	0.021	−0.090	0.100	0.103	0.017	1					
13. Technological turbulence	0.037	0.018	0.042	−0.093	−0.082	0.049	0.078	0.010	0.066	0.103	−0.087	0.367***	1				
14. Competitive intensity	0.057	−0.008	0.057	−0.018	−0.119	0.080	−0.032	−0.047	0.078	0.022	−0.057	0.440***	0.509***	1			
15. Dysfunctional competition	−0.053	−0.158*	−0.076	−0.013	−0.072	0.070	0.080	−0.068	0.092	−0.032	−0.016	0.149*	0.370***	0.299***	1		
16. Government support	0.032	−0.033	0.092	−0.034	0.127	−0.198**	−0.049	0.001	−0.278***	0.254***	−0.032	0.206**	0.258***	0.238***	0.087	1	
17. Firm performance	0.158*	0.133	0.042	−0.102	−0.014	−0.100	0.168*	−0.093	−0.036	−0.054	0.087	0.042	0.106	0.059	0.028	0.082	1
Means	10.151	1.495	0.170	0.137	0.226	0.231	0.179	0.047	0.307	0.377	8.635	3.610	3.304	3.700	3.004	3.057	2.188
Standard deviation	12.043	0.915	0.376	0.344	0.420	0.423	0.384	0.213	0.462	0.484	2.166	0.664	0.735	0.709	0.914	0.917	0.801

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

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Table 5. Results of regression analysis

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Firm age	0.211**	0.208**	0.206**	0.219**	0.229**	0.231***	0.250***	0.254***
	(0.075)	(0.075)	(0.075)	(0.075)	(0.076)	(0.075)	(0.074)	(0.073)
Firm size	0.220***	0.225***	0.226***	0.205**	0.210**	0.205**	0.200**	0.186**
	(0.071)	(0.071)	(0.071)	(0.071)	(0.072)	(0.070)	(0.070)	(0.068)
Textiles	0.049	0.050	0.046	0.069	0.087	0.090	0.046	0.069
	(0.118)	(0.118)	(0.119)	(0.119)	(0.121)	(0.119)	(0.119)	(0.116)
Metal processing	0.024	0.023	0.023	0.047	0.077	0.059	0.013	0.031
	(0.112)	(0.112)	(0.112)	(0.112)	(0.116)	(0.112)	(0.111)	(0.111)
Chemicals	0.006	0.011	0.006	0.002	0.035	0.027	−0.032	−0.010
	(0.126)	(0.127)	(0.128)	(0.127)	(0.129)	(0.126)	(0.127)	(0.126)
Electronics	0.103	0.107	0.101	0.128	0.145	0.130	0.092	0.116
	(0.129)	(0.130)	(0.131)	(0.130)	(0.132)	(0.130)	(0.129)	(0.128)
Mechanical	0.192	0.193	0.185	0.217*	0.222*	0.209*	0.177	0.184
	(0.121)	(0.121)	(0.122)	(0.122)	(0.122)	(0.121)	(0.122)	(0.120)
Joint ventures	−0.173**	−0.171**	−0.175**	−0.183**	−0.183**	−0.180**	−0.168**	−0.174**
	(0.069)	(0.069)	(0.070)	(0.069)	(0.070)	(0.069)	(0.069)	(0.068)
Limited companies	−0.132	−0.137	−0.146	−0.145*	−0.132	−0.167*	−0.116	−0.148*
	(0.089)	(0.089)	(0.091)	(0.088)	(0.090)	(0.089)	(0.087)	(0.087)
Privately owned enterprises	−0.126	−0.129	−0.128	−0.136	−0.121	−0.125	−0.099	−0.121
	(0.091)	(0.091)	(0.092)	(0.090)	(0.092)	(0.091)	(0.090)	(0.089)
NERI marketization index	0.089	0.089	0.087	0.094	0.084	0.073	0.078	0.104
	(0.065)	(0.066)	(0.065)	(0.065)	(0.066)	(0.065)	(0.064)	(0.064)
Technological turbulence (TT)	0.151*	0.146*	0.138*	0.164*	0.158*	0.137*	0.177**	0.134*
	(0.074)	(0.076)	(0.078)	(0.072)	(0.078)	(0.078)	(0.072)	(0.073)
Competitive intensity (CI)	0.040	0.030	0.029	0.035	0.054	0.099	0.103	0.114
	(0.072)	(0.075)	(0.076)	(0.070)	(0.069)	(0.072)	(0.070)	(0.078)
Dysfunctional competition (DC)	−0.028	−0.028	−0.027	−0.032	−0.037	−0.020	−0.085	−0.042
	(0.071)	(0.071)	(0.071)	(0.070)	(0.071)	(0.070)	(0.074)	(0.073)
Government support (GS)	0.021	0.016	0.017	0.078	0.063	0.085	0.032	0.063
	(0.071)	(0.072)	(0.072)	(0.069)	(0.069)	(0.070)	(0.071)	(0.070)
Knowledge creation capability (KCC)		0.030	0.008	−0.057	0.063	−0.105	−0.064	−0.032
		(0.075)	(0.081)	(0.067)	(0.076)	(0.090)	(0.067)	(0.078)
KCC × KCC			−0.051					
			(0.079)					
KCC × TT				0.131*				0.165**
				(0.066)				(0.070)
KCC × CI					0.125*			0.145*
					(0.073)			(0.074)
KCC × DC						−0.218**		−0.267***
						(0.083)		(0.080)
KCC × GS							0.193**	0.212**
							(0.071)	(0.072)
R^2	0.232	0.233	0.234	0.253	0.249	0.263	0.267	0.314
F-value	2.888***	2.898***	2.631***	2.773***	2.255**	2.656***	2.970***	2.757***
R^2 change	–	0.001	0.002	0.020	0.016	0.030	0.034	0.081
F-test for R^2 change	–	0.254	0.253	5.194*	4.133*	7.897**	8.999**	5.638***

Note: Models 2 and 3 compare R^2 with model 1, models 4, 5, 6, 7 and 8 with model 2. The standard error is reported in parentheses. *p < 0.05; **p < 0.01; ***p < 0.001.

to firm performance all the time (e.g. Collins, Smith and Stevens, 2001; Dröge, Claycomb and Germain, 2003; Schulze and Hoegl, 2006). Thus, scholars cannot take for granted that knowledge creation capability substantially leads to higher performance; instead, they should pay attention to the issue which has been ignored by extant research: what are the boundaries within which knowledge creation capability contributes to firm performance?

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Further, based on the strategy tripod perspective we endeavour to identify such boundaries by examining how the relationship between knowledge creation capability and firm performance is moderated by industrial and institutional variables. We find technological turbulence, competitive intensity and government support have positive moderating effects on the relationship, whereas dysfunctional competition plays a negative moderating role. These moderators all reflect the boundaries to accomplish the performance implications of knowledge creation capability. And the findings indicate that the performance effect of knowledge creation capability varies with industrial and institutional contexts. Thus scholars must take industrial and institutional settings into account when analysing the relationship between knowledge creation capability and firm performance. Overall, this study offers a fine-grained analysis on the performance implications of knowledge creation capability, which improves our understanding on this issue.

Second, this study represents one of the first attempts to empirically test the interactions of the three legs of the strategy tripod in one paper. In order to provide a better and more insightful understanding of a complex phenomenon, the strategy tripod perspective advocates integrating the three legs of the strategy tripod (Peng *et al.*, 2009; Yamakawa, Peng and Deeds, 2008). However, extant studies drawn on the strategy tripod perspective often list the three legs individually whereas little research empirically tests their interactions within one study (Cui, Jiang and Stening, 2011; Ju, Zhao and Wang, 2014; Lu, Liu and Wang, 2010). In this study, we view knowledge creation capability from the resource-based view, industrial factors from the industry-based view and institutional factors from the institution-based view. And then we examine the interactive effects of knowledge creation capability with these industrial and institutional factors on firm performance. Thus, we have successfully combined the three legs of the strategy tripod into one model. Our findings support the proposition that it is imperative to integrate the resource-based, industry-based and institution-based views to understand the complex phenomenon (Gao *et al.*, 2010; Peng, Wang and Jiang, 2008). As a result, the study provides some much-needed empirical support to the strategy tripod perspective.

Managerial implications

Our findings have strong practical implications. Firms often take for granted that knowledge creation capability automatically leads to superior performance. They accordingly spend much effort on enhancing knowledge creation capability whereas they ignore leveraging the capability. Our results indicate that the performance impact of knowledge creation capability is contingent on industrial and institutional contexts. Thus, firms need to proactively leverage knowledge creation capability in different industrial and institutional settings to achieve higher performance.

Specifically, the positive moderating effects of technological turbulence and competitive intensity suggest that knowledge creation capability helps cope with technological turbulence and intense competition. Thus, firms can leverage the capability to respond to rapid technological changes and head-on competition and then achieve higher performance. The positive moderating effect of government support means it aids in accomplishing the performance implications of knowledge creation capability. Therefore, firms enjoying government support take advantage of knowledge creation capability to achieve higher performance, and firms lacking government support had better seek for support from government and its agencies. The negative moderating effect of dysfunctional competition suggests that opportunistic behaviour caused by dysfunctional competition damages the value of knowledge creation capability. Hence, firms must endeavour to decline and even avoid the adverse impact of opportunistic behaviour when leveraging knowledge creation capability; otherwise, they may fail to profit from the capability.

Limitations and future directions

Despite its contributions, this study has some limitations. First, our sample is limited to Chinese firms. Although dysfunctional competition and government support vary significantly across regions, industries and even firms in China (Qian, Cao and Taceuchi, 2013; Sheng, Zhou and Li, 2011), it is better to use data from multiple countries to test our model as there are higher variances in dysfunctional competition and government support among different countries. Second,

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since cross-sectional data can hardly define evidence of a causal relationship, our data discounts any causal statements being supported by empirical findings. Thus, longitudinal data are needed to further investigate the performance implications of knowledge creation capability. Third, we highlight technological turbulence and competitive intensity as key industrial variables and dysfunctional competition and government support as key institutional variables. Certainly, more industry- and institution-related variables should be used in future research.

We have two suggestions for future research. First, as we have found, knowledge creation capability does not necessarily ensure superior performance. Thus, future studies need to further clarify the boundaries within which knowledge creation capability improves firm performance. For example, they should examine the effects of key environmental, organizational and strategic factors. Second, besides the interactive modes used in this study, the strategy tripod perspective suggests several other modes that integrate the three legs of the strategy tripod together. For example, firms can utilize certain resources to overcome the adverse impact of industrial and institutional factors (the moderating effects of resources on the relationships of industrial and institutional variables to firm performance); firms can change industrial and institutional contexts through leveraging certain resources (the impact of resources on industrial and institutional contexts); institutions may influence industrial context and the value of resources (the impact of institutions on industrial context and the value of resources); industrial and institutional factors may facilitate or inhibit the advancing of certain resources (the impact of industrial and institutional contexts on resources) etc. As a result, to better and more insightfully understand the combination of the three legs of the strategy tripod, more frameworks should be developed and investigated.

Conclusion

Drawing on the strategy tripod perspective, this study examines how the relationship between knowledge creation capability and firm performance varies in different industrial and institutional contexts. We find that technological turbulence, competitive intensity and government support all positively moderate the relationship between knowledge creation capability and firm performance, while dysfunctional competition plays a negative moderating role. The findings not only provide a more fine-grained analysis on the performance implications of knowledge creation capability, but also represent one of the first attempts to empirically integrate the three legs of the strategy tripod in one study, which necessitates more integrative efforts in future research.

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