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# Constrained by Localized Attention Focus: The Negative Effect of Firm-Specific Knowledge on Exploratory Firm Innovation

Bilian Ni Sullivan<sup>1</sup>, Kaixian Mao<sup>2</sup>, and Heli Wang<sup>3</sup>

<sup>1</sup>Department of Management, School of Business and Management, Hong Kong University of Science and Technology, Hong Kong SAR, China, <sup>2</sup>Department of Human Resource Management, School of Labor and Human Resources, Renmin University of China, Beijing, China and <sup>3</sup>Lee Kong Chian School of Business, Singapore Management University, Singapore, Singapore  
**Corresponding author:** Kaixian Mao (kxm@ruc.edu.cn)

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## Abstract

Integrating the resource-based view (RBV) and attention-based view (ABV), this study explores the impact of firm-specific knowledge (FSK) on a firm's exploratory innovation and the role of government support in this process. We argue that firms with a high degree of specificity in their knowledge assets tend to have a more localized attention focus, leading to those firms with less exposure to distant and diverse information and knowledge. Consequently, such firms are likely to have reduced exploratory innovative outputs. However, government resource support could expand a firm's attention focus beyond local searches, mitigating its negative effects. Based on a unique combined two-wave survey and archival data from over 500 firms in China, we find that the level of FSK is negatively related to a firm's exploratory innovation output. We provide evidence that localized attention focus partially mediates the negative effect of FSK on firms' exploratory innovation. We further reveal that state ownership and state financial support for firm innovation weaken the negative main effect. This study makes important contributions to the literatures on the RBV, FSK, and firm innovation.

## 摘要

本研究结合资源基础观 (RBV) 和注意力基础观 (ABV), 探讨了企业特定知识对企业探索性创新的影响以及政府支持在此过程中的作用。我们认为, 在知识资产中具有高度特异性的企业往往有更多本地化的注意力, 导致那些企业较少接触到远距离而多样化的信息和知识。因此, 这类企业可能会减少探索性的创新产出。然而, 政府的资源支持可以将企业的关注点扩大到本地搜索之外, 这样就可以减轻负面效应。基于来自中国 500 多家企业的两轮问卷调查及二手数据, 我们发现企业特定知识水平与企业的探索性创新产出呈负相关。我们提供的证据表明, 本地化的注意力对上述关系有部分中介效应。我们进一步揭示, 国企和政府对企业创新的财政支持削弱了前述负面影响。我们的研究发现能够对资源基础观、企业特定知识和企业创新的文献做出贡献。

**Keywords:** firm innovation; firm-specific knowledge; government financial support for firm innovation; localized attention; state ownership

**关键词:** 企业特定知识; 本地化注意力; 企业创新; 政府所有权; 政府对企业创新的财政支持

## Introduction

Many scholars of strategic management have highlighted the importance of firm-specific knowledge (FSK) to enhance firm competitiveness and promote long-term development (e.g., Hatch & Dyer, 2004; Mayer, Somaya, & Williamson, 2012; Wang & Chen, 2010; Wang, Zhao, & Chen, 2017). FSK refers to knowledge assets whose values are closely related to the focal firm's unique characteristics and are less useful and applicable in alternative business settings (Becker, 1975; Helfat, 1994). Thus,

scholars have argued that FSK could form the foundation for long-term competitiveness of firms (Helfat, 1994; Wang, He, & Mahoney, 2009).

However, it has frequently been observed that some well-known firms high in knowledge specificity experience tremendous failures (Goldstein, 2017), and some scholars (e.g., Barney, 2001; Wang & Chen, 2010) have recognized the possible negative impact of FSK. For instance, in their examination of the value appropriation of firm-specific innovation, Wang and Chen (2010) suggested that the value erosion of FSK could occur in a dynamic environment and thus reduce the value appropriation of firm-specific innovation. Their study did not provide direct empirical evidence for the negative effect of FSK on firms' performance outcomes, however. Furthermore, the extant literature has not paid sufficient attention to the impact of FSK on a firm's strategic choices that have less straightforward roles in firm performance outcomes, such as the strategic choice to pursue exploratory activities (Cohen & Levinthal, 1990; Greve, 2007; March, 1991). An examination of such relationships could potentially address an observed puzzle: although some firms have sufficient time and resources to move into a new business and develop new knowledge that adapts to the changes in market demands, top management teams decide to stay on the familiar path with their FSK (Goldstein, 2017). This puzzling fact seems to suggest that the way firms or top management teams channel their attention focus while acquiring new knowledge may play a role in the process through which a high level of FSK hampers a firm's search for new knowledge in distant areas.

As a step toward answering the call for more systematic studies of FSK with more empirical evidence, especially on the negative impact of FSK on firms' strategic choices and decisions (Wang & Chen, 2010), we argue, with the support of empirical testing, that FSK could be negatively associated with a firm's exploratory innovation. By exploratory innovation, we mean innovation that involves new knowledge and new practices rather than the refinement of existing knowledge or practices (Benner & Tushman, 2003; Cui, Ding, & Yanadori, 2019; Jansen, Van den Bosch, & Volberda, 2006; March, 1991). Integrating the resource-based view (RBV) (Barney, 1991, 2001) and attention-based view (ABV) (Cyert & March, 1963; Ocasio, 1997), we develop the argument that firms with a high level of FSK tend to have locally focused attention, which limits attention to new innovative opportunities in distance areas. Accordingly, a negative relationship likely exists between FSK and exploratory firm innovation. Specifically, a high level of FSK leads firms to increase internal or localized attention focus. Owing to such localized attention focus, firms with a high level of knowledge specificity are less likely to invest resources to search for new knowledge in distant or unfamiliar areas, leading to a negative impact of firm knowledge specificity on firms' exploratory innovation.

As theories of ABV have pointed out that firms' attention focus can be contextually situated (Ocasio, 1997; Ocasio & Joseph, 2005; Posen, Keil, Kim, & Meissner, 2018), and the government can be an important institutional context affecting the attention allocation process within organizations (Sullivan, 2010), we further argue that resource support from the government could help broaden the localized attention focus due to developing FSK in the innovation process, reducing the effect of FSK on firms' exploratory innovation. State ownership and receiving government financial support for innovation could weaken the negative relation between FSK and firms' exploratory innovations.

This study first extends the understanding of resource-based theory (e.g., Barney, 1991, 2001) by investigating the negative side of FSK and corresponding mechanisms. Though the risk of developing FSK is recognized in the literature (e.g., Barney, 2001; Wang & Chen, 2010), the processes and specific mechanisms through which FSK exerts a negative impact on firms' decision-making process, especially in the innovation context, are not fully understood. By exploring the negative relationship between FSK and a firm's exploratory innovation, we make significant contributions to address this gap in the current literature. Second, this study enriches the ABV literature (Ocasio, 1997, 2011) by incorporating RBV arguments and the theories of attention allocation, and by indicating that attention mechanisms are closely linked to key contextual factors affecting a firm's competitive advantages. Our article shows an important contingent effect of government resource support in the process of allocating attention within firms: it can ease a firm's localized attention focus and alleviate the negative effect of knowledge specificity on innovation performance.

Furthermore, as the role of the attention mechanism in firm innovation has been under-explored in the innovation literature, this study contributes to firm innovation research by focusing on the attention mechanism through which a firm's knowledge assets may or may not help it generate positive innovation outcomes.

In addition, this study contributes to the FSK literature by adopting a survey-based measure of this construct. Research has frequently used patent-based proxies to measure FSK. Apart from overlooking a large portion of unpatented firm knowledge, such a measure creates difficulties in differentiating knowledge and firm innovation performance because it implicitly takes a firm's innovation performance as given (e.g., Wang et al., 2009, 2017). Recent studies have called for a better measurement of firm knowledge specificity to overcome this limitation (Wang et al., 2017). As a response to this call, this study utilizes a novel measure of survey items that is independent from firm innovations to directly assess the level of the knowledge specificity of a firm. This survey-based measure enables us to better capture a firm's knowledge specificity and explicitly focus on the influence of FSK on a firm's innovation performance.

## Theoretical Background and Hypotheses Development

### *Importance of Firm-Specific Knowledge*

According to the RBV of the firm, resources can bring sustainable competitive advantages for a firm if the value-creating strategies implemented by it cannot be simultaneously implemented by others (Amit & Schoemaker, 1993; Barney, 1991). Among the bundle of resources, knowledge assets are constantly deemed fundamental and essential to a firm's competitive advantage (e.g., Grant, 1996; Kogut & Zander, 1992). Knowledge assets can also be differentiated as general and firm-specific knowledge. The key difference between the two types of knowledge lies in the extent to which knowledge can be applied in other business settings (Wang et al., 2017). Unlike general knowledge, firm-specific knowledge is frequently developed internally within a firm, and its usage is limited to the focal firm setting and less relevant in other business settings (Wang et al., 2017). While firm-specific and general knowledge are important to a firm's competitive advantage, the rarity and imperfect imitability of firm-specific knowledge likely enable a firm to generate sustained competitive advantages (Barney, 1991; Helfat, 1994).

Given that FSK is critical to competitive advantage and long-term financial success, firms should be motivated to absorb and apply it in strategic development to maximize value creation from FSK. For instance, to extract value from a high level of knowledge specificity, firms emphasize the investment of firm-specific human capital in its managers and key employees (Chadwick & Dabu, 2009; Mayer et al., 2012). Accordingly, various governance or design mechanisms are considered important if a firm wants to most effectively accumulate and deploy FSK to achieve superior economic performance (Wang & Barney 2006; Wang et al., 2009), including decentralization of decision rights (Jensen & Meckling, 1992), stock ownership by key employees (Wang et al., 2009), or additional job securities for CEOs (e.g., by compensating them with restricted stocks) (Wang et al., 2017).

By contrast, a few scholars have underlined possible downsides or potential costs and risks associated with the development and deployment of FSK. The key argument is that its narrow applicability in a specific firm setting may cause a mismatch between FSK and market demands, especially when the market is uncertain and dynamic (Wang & Chen, 2010). This scenario leads firms with considerable FSK to failures (Sirmon, Hitt, & Ireland, 2007). However, as pointed out above, this argument fails to address the issues of how firms with FSK reach the point of experiencing a mismatch and why such firms cannot be adaptive when facing new situations and new knowledge that cause market mismatch. To address the gaps in the literature and answer the call for further empirical investigations of the negative impact of FSK (Raffiee & Coff, 2016), we build on theories of attention (Cyert & March, 1963; Ocasio, 1997) to develop arguments that firms high in knowledge specificity tend to achieve fewer exploratory innovations owing to highly localized attention focus.

### *Impact of Firm-Specific Knowledge on Firms' Exploratory Innovation*

Firm innovation is essential to gain a competitive advantage in the market (Schumpeter, 1963). Related to March's (1991) seminal work of exploration and exploitation, scholars have argued that firms engage in exploratory innovation and exploitative innovation (Benner & Tushman, 2003; Jansen et al., 2006). Whereas exploratory innovation refers to innovations involving new search, new knowledge, and new practices, exploitative innovation refers to innovations that refine existing knowledge and practices (Benner & Tushman, 2003; Jansen et al., 2006). Since it has been suggested that new knowledge related to new products and services plays a big role in the failure of FSK (Wang & Chen, 2010), we focus in particular on the impact of FSK on exploratory innovation, which involves challenging processes as a firm explores new products, business models, technologies, and markets (Jansen et al., 2006).

Firms with a high degree of knowledge specificity tend to generate rents through these knowledge assets (Wang & Chen, 2010) and desire to maintain their advantages by developing such knowledge specificity (Wang et al., 2009). During this process, a firm's attention is naturally highly focused on the knowledge trajectory it has developed in the past (Levitt & March, 1988), considering that attention tends to be localized in general and naturally tends to be exploitative of existing knowledge and routines (March, 1991). With increased FSK, this focus on knowledge trajectory specific to the focal firm likely further localizes a firm's attention focus.

It has been long established in the literature that organizational attention is a valuable but scarce resource (Cyert & March, 1963) and that problems or strategic issues compete for the limited attention of decision-makers (Ocasio, 1997; Sullivan, 2010). Consequently, extra attention allocated to localized activities related to FSK means less attention can be allocated to other inconspicuous but important trends or technical information in the market. Such a situation would limit a firm's exposure to a considerable variety of information, ideas, and knowledge and thus limit its exploratory innovation activities (Ahuja & Lampert, 2001; Jansen et al., 2006).

The characteristics of the rarity and imperfect imitability of FSK also suggest that firms would engage in local and internal searches for knowledge (Wang & Chen, 2010). Since attention to distant and broad searches bring up additional novel, salient, and vivid information, which is helpful for innovativeness (Ocasio, 2011), firms high in knowledge specificity could potentially suffer from a lack of distant searching. For instance, Li, Maggitti, Smith, Tesluk, and Katila (2013) corroborated that new business locations in unfamiliar and distant areas can provide additional novel, vivid, and salient information and subsequently lead firms to introduce new products. By contrast, when organizational attention is highly localized owing to its focus on FSK, the focal firm tends to have internally focused searches, which will be less helpful for discovering new information and new insights and thus lead to a low level of exploratory innovation.

This localized attention focus might also be associated with a strong tendency for escalated commitment when such focus generates a mismatch between the company's new products and market demands. Escalated commitment is when decision-makers commit additional resources to a failing project and is typically related to time invested and costs sunk (Arkes & Blumer, 1985; Soman, 2001). One meta-analysis has revealed that familiarity with decision contexts, such as experience, expertise, and self-efficacy, is positively related to the escalation of commitment (Sleesman, Conlon, McNamara, & Miles, 2012). Therefore, when there is a mismatch between FSK and current technological trends, given the firm's internally focused attention with limited options, managers would then spend extra time looking for information and knowledge related to FSK, thereby impeding the firm's ability to capture opportunities elsewhere. The firm's innovation progress and outcomes could be negatively affected. Given the above, we present the following two hypotheses:

*Hypothesis 1a (H1a): A higher level of firm-specific knowledge is likely associated with a lower level of exploratory innovation outputs.*

*Hypothesis 1b (H1b): A firm's localized attention focus partially mediates the negative relationship between firm-specific knowledge and a firm's exploratory innovation outputs.*

### *Moderating Role of Government Resource Support for Innovation*

Theories of ABV have revealed that firms' attention can be contextually situated (Piezunka & Dahlander, 2015; Sullivan, 2010). For instance, Sullivan (2010) found that the way decision-makers allocate their attention may depend on external institutional pressure. More importantly, political forces connected to the government may be influential in shifting decision-makers' attention (Sullivan, 2010). In general, given that firms are embedded in institutional structures (DiMaggio & Powell, 1983), institutional factors may set boundaries for firms' decision-making through shaping their attention focus.

Therefore, we next theorize how government resource support for innovation could impact the negative effect of FSK on firms' exploratory innovation. We particularly focus on whether state ownership and receiving government financial support for firm innovation moderate the main effect.

#### *Moderating role of state ownership*

The extent of state ownership indicates the extent to which a firm's decision-making and resource allocation processes are influenced by the government. In general, government is more likely to have influence over a firm with more state ownership (Edelman, 1990; Fiss & Zajac, 2004; Greve & Zhang, 2017). Fiss and Zajac (2004) revealed that German firms with more state ownership are more likely to adopt the shareholder value orientation encouraged by the German government. Firms with more state ownership tend to have a close relationship with the government and are more likely to receive financial and non-financial support from the government in the innovation process. A significant amount of important resources in emerging markets such as China are controlled by the government, which can provide essential resource support to state-owned firms (Xia, Ma, Lu, & Yiu, 2014; Zhou, Gao, & Zhao, 2017). For instance, state-owned firms have much easier access to bank loan services, especially in countries where the banking system is heavily controlled by the government, such as China. These firms are also more likely to receive government-controlled R&D resources for innovation (Zhou et al., 2017). Furthermore, in countries like China, state-owned firms tend also to accrue substantial non-financial resources since the government establishes a close relationship with them by appointing their top management. Consequently, these firms acquire advantages in terms of information access, procurement channels, and political legitimacy (Kou & Zang, 2014; Lou, Qian, & Zhang, 2021).

State ownership is likely to weaken the negative impact of FSK on exploratory innovation for the following reasons. First, a key theme in the ABV of the firm is that attention focus of individual decision-makers across different organizational levels is bounded by the organizational context and situations where decision-makers are embedded (Ocasio, 1997; Simon, 1957). One important factor affecting the distribution of decision-makers' attention is the availability of resources (Ocasio, 1997; Sullivan, 2010), which could affect the attention allocation of top managers and other employees. Top managers in firms with a high level of FSK are likely to be more internally focused on innovation activities, as they need to follow the firm-based technological trajectory (Wang et al., 2017). Those in state-owned firms, however, with more available resources, could be forced to pay attention to the external environment and the expectations of the government and to examine new innovation activities undertaken by competitors, leading to more exposure to distant and novel information and knowledge. Furthermore, attention competition is more likely to arise if decision-makers working in different areas share the same resource pool or if the same decision-makers need to carry out the same tasks (Sullivan, 2010). Managers and employees involved in the innovation process are likely to face competition between localized attention focus as a result of developing FSK and other activities demanding attention, such as a distant search for new and different knowledge, since these activities are likely to share the same resource pool (e.g., the same R&D team, or some employees, are expected to work simultaneously on different tasks). With more resources readily available to state-owned firms, such competition for attention within firms could be eased since additional resources may allow the firm to allocate more resources (e.g., more staff) to areas where attention is needed, such as distant searches for new information and knowledge in new directions (Ocasio, 1997; Ocasio & Joseph,



2005; Sullivan, 2010). As a result, state-owned firms are more likely to alleviate the impact of localized attention focus due to the FSK development trajectory. As the localized attention focus associated with FSK is likely to be broadened in state-owned firms and subsequently new distant searches for new and diverse knowledge and information are more likely, the negative effect of FSK on exploratory innovation could be weakened.

Second, certain benefits acquired through close relationships with the government, such as information advantages, possible arrangements for new product procurement, and political legitimacy, could potentially ease the concerns of state-owned firms high in FSK about the risks associated with the shifting of their attentional foci. Thus, state-owned firms are more likely than non-state-owned firms to shift their managerial attention from localized to more distant areas for new knowledge and information. As a result, the negative effect of FSK on exploratory innovation may be reduced.<sup>1</sup> Therefore, we offer the following hypothesis:

*Hypothesis 2 (H2): The negative relationship between firm-specific knowledge and firm exploratory innovation outputs becomes weaker when a firm is state-owned.*

### *Moderating role of government financial support for firm innovation*

It is a common practice for governments around the world to use a variety of policies to encourage firm innovation, based on the reasoning of the classic economic theory that firms are unwilling to carry out innovation activities due to the concern of knowledge leakage (Arrow, 1965). Direct government financial support for innovation obviously brings in extra resources to firms and potentially generate significant impact on the innovation outputs (Arrow, 1965; Crossan & Apaydin, 2010; Moulart & Sekia, 2003). Given the importance of financial support from the government in the process of innovation, in the following, we theorize how it can moderate the impact of firm-specific-knowledge on firms' exploratory innovation through exerting influence on localized attention focus. An important note here is that government financial support for firm innovation is not limited by a firm's ownership status (i.e., if the firm is a state-owned or not). Although state-owned firms may receive more financial support from the government (Zhou et al., 2017), as documented in the literature, the government has paid considerable attention to the support of private firms in terms of the innovation process and innovation outputs (David, Hall, & Toole, 2000).

We argued above that firms with high knowledge specificity tend to have localized attention focus and engage less in distant searches, and consequently have reduced exploratory innovation outputs. We further argue that government financial support for innovation should broaden firms' localized attention focus related to FSK and weaken the negative impact of FSK on firms' exploratory innovation for two reasons. First, the localized attention focus resulting from developing FSK could be expanded into distant areas since additional financial resources from the government ease the competition for attention within firms. As we argued earlier, organizational attention is limited and scarce and firms tend to pay less attention to distant searches once they develop more localized attention due to the FSK development trajectory (Cyert & March, 1963; March & Simon, 1958). The availability of organizational attention, however, can be enhanced with an increased resource provision to organizations (Ocasio, 1997; Ocasio & Joseph, 2005; Sullivan, 2010). For instance, with financial support for firm innovation, firms can hire more talent who could share the burden to look for new information and important new trends in the industry and general environment. Consequently, firms are able to broaden their localized attention focus and pay more attention to distant areas. As a result, the negative effect of FSK on exploratory innovation outputs could be eased.

Second, firms' localized attention focus due to accumulating FSK could shift due to the expectations of the government attached to its financial support for firm innovation. The literature reveals that decision-makers shift their attention to certain types of solutions under the influences of institutional pressures (Sullivan, 2010). Financial support for firm innovation from the government often comes with certain expectations (e.g., innovation outputs) – this is particularly true in places where the government has a strong influence in economic activities (Jia, Huang, & Zhang, 2019). Specifically,

recipients of financial support for firm innovation need to demonstrate to the government that they can generate innovation outputs with such support. For instance, in the Chinese context, the government uses the number of patents as a performance metric for firms receiving government support for innovations (Jia et al., 2019). This kind of expectation associated with financial support for firm innovation may not only increase the attention of top management to areas of innovation, it can also enhance firms' desire to look for new information and knowledge in more distant areas, and force firms to shift their localized attention focus related to the FSK development trajectory to more distant searches. As a result, the negative effect of FSK on firms' exploratory innovation outputs could be reduced. We thus hypothesize the following:

*Hypothesis 3 (H3): The negative relationship between firm-specific knowledge and firm exploratory innovation outputs becomes weaker when a firm receives financial support for firm innovation from the government.*

## Methods

### Sample

We tested our theoretical hypotheses with data from a two-wave survey and archival data of about 500 firms in China in our final sample. The survey was conducted in 2011 and 2012, with approximately one year between the two waves. Various methods were employed to collect the data, including mail questionnaires, follow-up phone calls, and interviews, to ensure a high response rate. The first-wave survey included 750 firms located in five first- or second-tier cities in China, representing different levels of economic development: Beijing, Shanghai, Chongqing, Wuhan, and Wuxi. Due to the use of different tools to ensure responses, the valid response rate of the first-wave survey reached 78 percent. A stratified sampling procedure was utilized, compiling a firm list based on information from the Bureau of Statistics for each city. This sampling strategy ensured a balanced mix of sampled firms in terms of size and the 'high-tech' category, which is certified by the government when a firm meets certain criteria in terms of industry, size, and potential technological capability. Since our research focuses on firm innovation activities, we oversampled firms in the 'high-tech' category to ensure a sufficient number of firms with innovation activities for statistical analyses.

Firms were asked about their background, firm knowledge development, and patenting activities, as well as other questions pertinent to our theoretical interests. The participants were general and top managers in charge of R&D activities as they best understand their firm's conditions, knowledge development, and patenting activities. We asked the participants to answer relevant questions for the period 2006–2010 in the first-wave survey. In the second-wave survey, we contacted firms that provided valid responses to the first wave and invited the top managers to answer our survey. The valid response rate for our second-wave survey was nearly 90 percent. The final sample for analysis consisted of 505 firms after cleaning out observations with extensive missing values. We had a relatively high response rate as we conducted multiple close follow-ups, via phone calls and personal visits, to ensure the completion of the questionnaires. We conducted *t*-tests to assess the mean differences of the following attributes between responding and non-responding firms: number of employees, firm age, firm sales, and invention patents between 2006 and 2010. None of the *t*-test results showed a significant mean difference, suggesting that the impact of respondent attrition is likely to be limited.

The data collection process employed a multisource and multi-wave design, thus reducing concerns of common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The independent variable was surveyed in the first wave, the mediator was drawn from the second-wave survey, and the dependent variable was collected from an archival data source. Our moderating variables came from the second-wave survey, and our control variables came from the first-wave survey. Our robust check analyses utilized variables from both the first- and second-wave surveys. Furthermore, the independent variable (FSK) and mediator (localized attention) were addressed by firms' general managers (e.g., CEOs). We also used an objective measure of FSK based on patent classes to verify the survey results

and reduce concerns about common method bias. Any questions on variables relating to R&D and patenting activities were answered by the firms' top managers in charge of R&D activities, thus further easing the common method issue.

### *Dependent Variable*

#### *Firm exploratory innovation*

Following prior research, we utilized patent data to capture innovation (e.g., Tang, Li, & Yang, 2015; Yang, Phelps, & Steensma, 2010). We measured firm innovation using the number of invention patents granted to each firm by the State Intellectual Property Office (SIPO) of China from 2007 to 2011, information that we collected directly from the SIPO. Under the Patent Law of the People's Republic of China, there are three types of patents: invention patents, utility models, and design patents. The legal text defines these: 'Inventions mean new technical solutions proposed for a product, a process or the improvement thereof. Utility models mean new technical solutions proposed for the shape and the structure of a product, or the combination thereof, which are fit for practical use. Designs mean, with respect to a product, new designs of the shape, pattern, or the combination thereof, or the combination of the color with shape and pattern, which are rich in an aesthetic appeal and are fit for industrial application' (Article 2, Chapter I, Patent Law of the People's Republic of China). According to the patent law, a utility patent possesses 'a substantive feature and indicates an advancement', while an inventive patent has 'a prominent substantive feature and indicates remarkable advancements' (Article 2, Chapter I, Patent Law of the People's Republic of China). Given the patent requirements on newness, both inventive and non-inventive patents may fit the definition of exploratory innovation since it is defined as new knowledge and new practices. However, while newness is emphasized for all types of patents, inventive patents represent the highest degree of novelty, requiring substantially more time for expert examination. And, since non-inventive patents do not require substantive examination, there might be some uncertainty about the level of novelty. On the other hand, since inventive patents involve substantial time, effort, and resources, it is less likely for firms to use inventive patents to simply refine existing knowledge and practices. Therefore, for the purposes of our study, we utilized the number of inventive patents to better capture firms' exploratory innovation and conducted robust analyses with other types of patents that may indicate lower levels of exploratory innovation.

To check for robustness, in first- and second-wave surveys, we asked respondents to report the number of inventive patents they were granted during the survey time period and whether they had conducted product and process innovations. With these two additional measures in either the first- or second-wave survey, the results were largely similar to those reported here, addressing the concerns about using patents as a measure of firm innovation that have been voiced by a few scholars (Archibugi & Pianta, 1996).

### *Independent Variable*

#### *Firm-specific knowledge*

We used the average of two items to measure FSK: 'To what extent do you think your firm's innovations during the period from 2006 to 2010 can be applied to other firms?' and 'To what extent do you think your firm's innovations during the period from 2006 to 2010 enable other firms to generate economic value?' The respondents answered these questions on a five-point Likert scale, ranging from 1 ('only applicable to our firm' or 'no economic value for other firms') to 5 ('highly applicable to other firms' or 'high economic value to others'). We reverse coded the values of the answers to these questions, with 1 indicating a low level of FSK and 5 indicating a high level of FSK. The Cronbach's  $\alpha$  of this two-item measure was 0.91, indicating strong internal consistency. Prior research has used patent data to construct a proxy for the level of FSK (Wang et al., 2009, 2017; Wang, Choi, Wan, & Dong, 2016). However, there are concerns about the validity of the measure. We used these two items to measure FSK as a response to Wang and colleagues' (2017) call for future research to use survey or field data to better measure FSK. Given that the general manager of the



firm has the best understanding of firm knowledge assets, especially specificity, their evaluation of the degree of knowledge specificity can be highly valuable. The independent variable had a one-year lag from the dependent variable because a certain time is required for firms to acquire patents.

To further verify the validity of this item-based measure, we calculated the heterogeneity score (Haunschild & Sullivan, 2002) of the industry categories of the patents that the firms applied for. This entropy-based index allowed us to infer the diversity of the knowledge base of the firm. After calculating the heterogeneity score of each firm in different years from 2006 to 2012, we calculated the correlation between this and the item-based measure of FSK used in the main analysis. The correlation was significantly negative ( $p < 0.05$ ) for the patents in the matched sample of 281 firms. Since this diversity or heterogeneity score means a broad knowledge base for a firm, this negative relation indicates that firms with a high score on an item-based measure of FSK are linked to a narrow and more FSK base. This result to some extent confirms the validity of our measurement and enhanced our confidence about using the two items to measure FSK.<sup>2</sup>

## Moderators

### State ownership

This was measured by a question in the second-wave survey, asking if the company was state-owned or not. The variable was coded '1' if the answer was 'yes' and '0' if the answer was 'no'.

### Financial support for firm innovation from the government

This variable was measured by a question in the second-wave survey. Respondents were asked whether their firms had received direct financial support from the government for their innovation activities between 2006 and 2010. The variable was coded '1' if the firm had received financial support from the government and '0' if not.

As indicated by the results in Table 1, the correlation between the two variables is only 0.101, suggesting that the two variables are likely to manifest different aspects of the firms. Statistically, including both in the model, we could show the independent effects from the two variables, which could be a more accurate way to show the effect of each variable.

## Mediator

### Localized attention focus

We used the average of 13 items indicating top managers' attention allocation from the second-wave survey to proxy a firm's attention focus based on the idea that top managers' attention focus is likely to influence that of the firm. These items were adapted from the literature (Li & Sullivan, 2022; Wu, 2014). The general manager answered questions related to these items on a five-point Likert scale, such as 'Top managers spent a large amount of time envisioning the future', 'Top managers allocated energy to analyze what will happen', and 'Top managers spent time thinking about innovation activities in the future' (see Appendix I for details of the 13 items). Certain items (such as items 1, 2, and 3 above) were reversed coded to indicate the level of local attention focus. The Cronbach's  $\alpha$  of this measure was about 0.70, which is acceptable, according to prior research (Hair, Anderson, Tatham, & Black, 1998).

## Control Variables

To account for other explanations of firm innovation capability or innovation outcomes, we included various control variables in our analyses. First, we controlled for those factors that might affect a firm's innovation capability. *Firm age* was measured by the difference between the firm's founding year and 2010 and *firm size* was measured by the logarithm of the firm's total assets. The information of firm age and firm size were obtained in the first-wave survey. We also controlled for intangible resources of the firm that might have an important influence on innovation performance, including *the percentage of R&D employees* and *the percentage of R&D outsourcing*. We also controlled for *R&D intensity* by calculating the ratio of R&D expenditure to the total sales of the firm from 2006 to 2010. These

**Table 1.** Descriptive statistics and correlations of variables

Variables	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) Firm age	13.51	11.68	1.000															
(2) Firm size	6.22	3.22	0.116	1.000														
(3) % of R&D employees	0.16	0.14	0.054	-0.104	1.000													
(4) % of R&D outsourcing	0.01	0.05	-0.021	-0.001	-0.011	1.000												
(5) Firm status	3.86	0.78	0.129	0.271	-0.122	0.083	1.000											
(6) Rent generation	12.58	1.29	-0.016	-0.059	-0.093	-0.133	-0.140	1.000										
(7) Patent blocking	12.14	1.52	0.028	0.340	-0.134	0.015	0.340	0.057	1.000									
(8) Concern for knowledge spillover	0.56	0.55	-0.094	0.163	-0.115	0.028	0.028	0.002	0.076	1.000								
(9) R&D intensity	0.16	0.14	0.118	-0.146	0.195	0.090	0.152	-0.077	-0.046	-0.064	1.000							
(10) Relative performance	-0.00	0.15	-0.085	0.162	0.096	0.028	-0.065	-0.131	-0.064	0.081	-0.240	1.000						
(11) State-owned	0.25	0.43	0.257	0.021	0.076	-0.042	0.135	-0.046	0.039	-0.067	0.120	-0.071	1.000					
(12) Financial support for firm innovation from the government	0.07	0.26	0.022	-0.092	0.102	0.047	-0.012	-0.033	-0.060	0.057	0.071	-0.002	0.102	1.000				
(13) Non-invention patents	7.17	26.07	0.081	0.052	0.038	-0.006	0.040	-0.009	0.010	-0.037	0.065	0.057	0.123	0.122	1.000			
(14) Firm-specific knowledge	4.60	1.73	-0.288	-0.385	-0.109	-0.044	-0.368	0.090	-0.312	0.044	-0.318	0.201	-0.162	0.024	-0.084	1.000		
(15) Localized attention focus	2.93	0.21	-0.011	-0.094	0.062	-0.004	-0.133	-0.052	-0.112	-0.084	0.003	-0.026	-0.093	-0.292	-0.097	0.091	1.000	
(16) Firm innovation (invention patents)	3.71	10.99	0.113	0.044	0.037	0.017	0.105	0.043	0.018	-0.078	0.092	0.019	0.159	0.053	0.572	-0.101	-0.137	1.000

Note: Correlation coefficients with absolute values greater than 0.09 are statistically significant ( $p \leq 0.05$ ).

three questions were asked in the first-wave survey. We controlled for a firm's relative performance as good performance can gain firms access to more resources for innovation. We first generated the variable of financial performance measured by the average percentage of profit over sales (POS) between 2006 and 2010. We acquired this number from our first-wave survey. Thereafter, *relative financial performance* was generated for each firm by adjusting each its financial performance by subtracting the mean financial performance (excluding the focal firm) of the industry (level-3 industry classification code; e.g., C13, G62) to which the focal firm belongs. Moreover, to control for its effect in a particular industry, *firm status* was included in our analysis. Status was measured by one item in the first-wave survey, 'How do you evaluate your firm's status in the industry', on a five-point Likert scale, from 1 (very low status) to 5 (very high status).

Second, we controlled for a firm's motivation to file or not file patents, which might affect its actual number of granted patents. We first controlled for two specific factors that could affect firms' tendency to file more patents: rent generation and patent blocking (Chu, 2009; Cohen, Nelson, & Walsh, 2000). The questions for these two factors were asked in the first-wave survey. The sum of the scores for the following three items was used to measure a firm's need for rent generation: 'How important was the business applications of the patents to your firm?', 'How important was the franchising of the patents to your firm?', and 'How important was the trade of the patents to your firm?' All questions were answered on a five-point Likert scale, with 1 indicating 'not important' and 5 indicating 'highly important'. We measured *patent blocking* using the sum of the scores for the following three items: 'How important was to use patents to strategically defend your firm?', 'How important was to use patents to prevent other firms from patenting similar products?', and 'How important was to use patents to prevent other firms from patenting products that are not related to the patents in filing?' These questions were also answered on a five-point Likert scale, with 1 indicating 'not important' and 5 indicating 'highly important'.

We then controlled for a firm's own motivation not to file patents. This was indicated by the sum of the scores for two items asking why the firm decided not to apply for patents for its most important inventions between 2006 and 2010: 'Need to disclose information when applying for patents' and 'It would be easy for others to produce inventions based on our patents'. These two items were used in the first-wave survey.

Finally, we controlled for the number of non-inventive patents (i.e., utility models and designs). Given that our sample consists of firms from various industries, *industry dummies* were considered to control industry-level variation. We originally had about 60 level-3 industry categories and for the purpose of analyses we grouped them into five larger categories: food and textile manufacturing, raw material manufacturing, special machinery manufacturing, information technology, and others. The last category was used as the reference.

### Estimation Method

Considering that our dependent variable, the number of inventive patents, is a count variable, and we need to use a control-function estimator approach to estimate the coefficients to address the possible endogeneity issue, we employed Poisson regression models to test our hypotheses (ivpoisson command in Stata). Specifically, we used two exogenous variables to serve as instruments to predict a firm's FSK: regional product market development level and factor market development level (Fan, Wang, & Ma, 2012; Fan, Wang, & Zhang, 2001). With more developed product and factor markets, firms might rely less on the ability of individual managers for knowledge development (and thus rely less on FSK) in competition since they can obtain needed resources from the market. However, such regional-level factors are less likely to affect a firm's innovation outcomes. The data of regional-level product market development and factor market development came from Fan et al.'s (2012) marketization data set. We particularly chose their provincial data for 2006 to match our data set. We merged two parts of data by specifying the province or municipality in which each firm is located. Our additional analyses show that the two instrument variables were significant predictors of FSK. While provincial product market development had a negative and significant effect on FSK ( $\beta = -0.568$ ,  $p =$

0.043), factor market development had a negative and significant effect on FSK ( $\beta = -0.375, p = 0.000$ ). The two instrument variables had no significant effects on exploratory firm innovation, however, indicating the validity of using them as instruments in our control-function approach of Poisson regression models (results are available upon request). As the estimates of Poisson models are extremely sensitive to outliers, we winsorized the dependent variable at the 1st and 99th percentiles. Models with non-winsorized variables provided similar results for our hypothesized effects.

## Results

**Table 1** presents the descriptive statistics and correlations among the key variables. It shows that the coefficients of the correlations were not particularly high. A further test of the variance inflation factor (VIF) indicated that the VIF score had a mean of 1.25 and a maximum of 1.75, well below the threshold of 10 for multicollinearity concerns. This finding shows that there was no serious multicollinearity problem.

**Table 2** summarizes the findings from the Poisson regression models, where the dependent variable is the number of inventive patents. Model 1 of **Table 2** includes all control variables and moderating variables. Model 2 of **Table 2** includes the independent variable.

Regression results in Model 2 of **Table 2** confirm that FSK was negatively and significantly related to firm innovation ( $\beta = -1.591, p = 0.013$ ). Since our model is nonlinear, we used the Margins function in STATA to better understand the main effect. Marginal effects show that a 1-unit increase in the FSK is linked to an average decrease of 1.96 inventive patents for the firm, given the other predictor variables in the model are held constant. Our Hypothesis 1, which states that FSK is negatively associated with firm exploratory innovation, is thus supported.

We entered the interaction of FSK and SOE into Model 3 of **Table 2**. Model 3 of **Table 2** shows that the interaction term of FSK and SOE has a positive and marginally significant effect on firm innovation ( $\beta = 0.930, p = 0.070$ ). We further used the Margins function in Stata to understand the moderating effect. The results show that the negative effect of FSK on firm innovation is stronger ( $p = 0.018$ ) when the firm is not state-owned than when it is state-owned ( $p = 0.451$ ). We plot the interaction effect in **Figure 1**. Our Hypothesis 2, stating that the negative relationship between FSK and firms' exploratory innovation is mitigated by a firm's state ownership, is thus supported.

Model 4 of **Table 2** exhibits the results when the interaction term of FSK and government financial support for innovation was included in the regression. Model 4 shows that this interaction term had a positive and significant effect on firm innovation ( $\beta = 2.088, p = 0.012$ ). Again, we used the Margins function in Stata to better understand the moderating effect. Results show that the negative effect of FSK on exploratory firm innovation is stronger when the firm has no financial support for innovation from the government ( $p = 0.038$ ) than when it has financial support ( $p = 0.225$ ). We further plot the interaction effect in **Figure 2**. Therefore, Hypothesis 3 is supported. In Model 5 of **Table 2**, we included both interaction terms of FSK and the two moderators in the regression analysis. The results are generally consistent.

An interesting finding revealed in **Figures 1** and **2** is that for state-owned firms and firms receiving financial support from the government, the relationship between FSK and exploratory innovation seems to be positive. While the positive relationships were not significant, as shown in additional analysis with split samples, this finding does suggest the influential impact of government resource support in shifting a focal firm's attention focus.

## Mediation Test

Following the latest developments in the mediation test (Ullman & Bentler, 2012), we used structural equation modeling (SEM) to provide evidence that localized attention focus mediates the relationship between FSK and firm exploratory innovation. The results are shown in **Table 3**. The results show that FSK is positive and marginally significant ( $\beta = 0.010; p = 0.052$ ) in predicting localized attention focus. When using both FSK and localized attention focus to predict firm explorative innovation, localized

**Table 2.** Poisson regression estimates of firm explorative innovation (invention patents)

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Firm age	0.0160*** (0.00155)	-0.0164 (0.0164)	-0.0191 (0.0164)	-0.0202 (0.0174)	-0.00264 (0.0127)
Firm size	0.0211* (0.00876)	-0.0691 (0.0809)	-0.0987 (0.0858)	-0.0553 (0.0807)	0.0843 (0.0591)
% of R&D employees	0.505* (0.212)	4.177** (1.388)	4.208** (1.463)	6.611** (2.033)	4.761*** (1.427)
% of R&D outsourcing	-2.650** (0.925)	0.177 (3.005)	0.113 (2.984)	2.946 (3.346)	0.709 (2.800)
Firm status	0.284*** (0.0355)	-1.304** (0.476)	-1.312** (0.464)	-1.519** (0.506)	-0.762* (0.310)
Non-inventive patents	0.0161*** (0.000407)	0.0815*** (0.0220)	0.0769** (0.0246)	0.0854*** (0.0221)	0.0694*** (0.0193)
Rent generation	0.114*** (0.0224)	0.220 (0.123)	0.316* (0.128)	0.318* (0.144)	0.200 (0.103)
Patent blocking	-0.0512** (0.0187)	-0.414** (0.156)	-0.455** (0.166)	-0.425** (0.160)	-0.234* (0.102)
Concern for knowledge spillover	-0.309*** (0.0451)	0.169 (0.303)	0.162 (0.319)	0.306 (0.345)	0.0244 (0.282)
R&D intensity	2.108*** (0.174)	5.264*** (1.535)	4.289** (1.570)	5.739*** (1.578)	7.279*** (1.823)
Relative performance	0.162 (0.188)	4.083* (1.663)	4.380* (1.742)	3.851* (1.718)	1.656 (1.103)
Localized attention focus	-1.899*** (0.125)	-2.100** (0.809)	-2.262** (0.806)	-1.710* (0.839)	-1.740* (0.772)
State-owned	0.129* (0.0554)	-0.0635 (0.366)	0.239 (0.407)	-0.191 (0.411)	0.0399 (0.425)
Financial support for innovation from the government	-0.660*** (0.0912)	-1.180 (0.673)	-1.312 (0.710)	-2.451*** (0.742)	-2.129*** (0.597)
<b>Firm-specific knowledge</b>		-1.591* (0.637)	-2.002** (0.665)	-1.955** (0.704)	-0.693** (0.227)
<b>FSK * State-owned</b>			0.930 <sup>+</sup> (0.513)		0.0665 (0.584)
<b>FSK * Financial support for innovation from the government</b>				2.088* (0.833)	1.247* (0.751)
Industry dummies	Yes	Yes	Yes	Yes	Yes
Constant	3.900*** (0.550)	13.31** (4.368)	13.26** (4.234)	11.43** (4.169)	7.226* (3.029)
<i>N</i>	501	501	501	501	501

Notes: Robust standard errors in parentheses; <sup>+</sup> $p < 0.10$ , \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

attention focus is negative and significant ( $\beta = -6.016$ ;  $p = 0.019$ ) in predicting firm explorative innovation. And, FSK is also significant in predicting firm explorative innovation ( $\beta = -0.530$ ;  $p = 0.013$ ). Bootstrapping analysis (5,000 samples) further showed that the indirect effect of FSK on firm innovation had a 95% CI from  $-0.22$  to  $-0.01$ , which does not include zero. The proportion of the total effect that was mediated was 0.12. These findings indicate that firms with a high level of knowledge specificity likely have fewer exploratory firm innovations, at least partially owing to the mediating role of localized



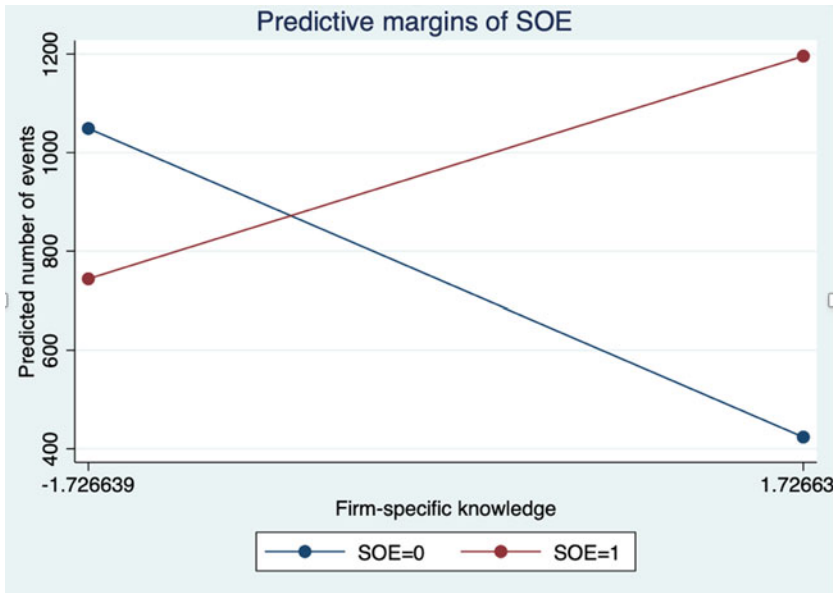


Figure 1. The moderating role of SOE

attention focus. Therefore, the hypothesis that a firm’s localized attention focus partially mediates the negative relationship between FSK and a firm’s exploratory innovation outputs, is supported.

**Supplementary Analyses**

We performed a few supplementary analyses to check the robustness of our findings and to test the attention mechanism we proposed in the theoretical development. First, while it is clear that non-inventive patents have a lower level of novelty than inventive patents, scholars often give the same weight to both types (Hsu, Hsu, Zhou, & Ziedonis, 2021). To address the possibility that FSK might have similar effects on non-inventive patents, in a few additional analyses we used the number of utility and design

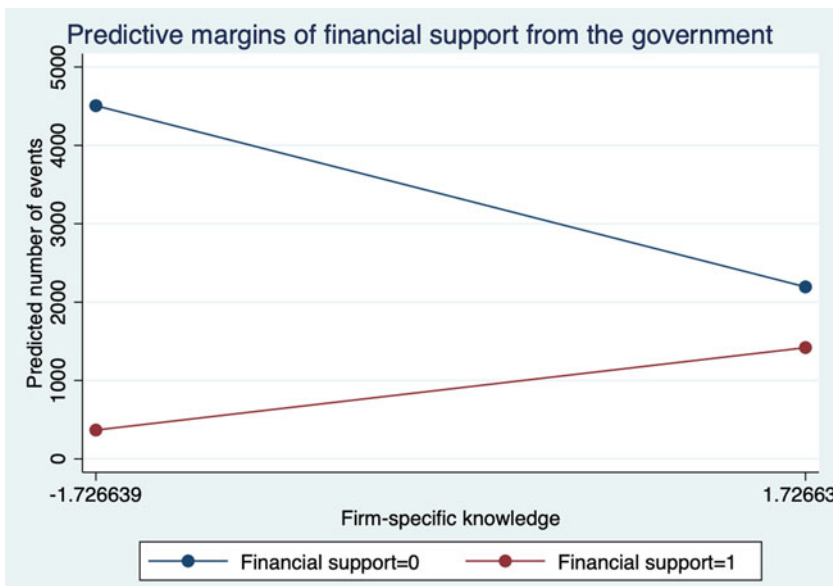


Figure 2. The moderating role of financial support for firm innovation from the government

**Table 3.** SEM estimates of the mediating role of localized attention focus

	$\beta$	SE	$p$	95% CI	
				LL	UL
Localized attention focus on:					
Firm-specific knowledge	0.010	0.005	0.052	-0.000	0.021
State ownership	-0.024	0.019	0.223	-0.061	0.014
Financial support for innovation	-0.232	0.031	0.000	-0.293	-0.171
Firm Explorative Innovation on:					
Localized attention focus	-6.016	2.573	0.019	-11.059	-0.973
Firm-specific knowledge	-0.530	0.213	0.013	-0.946	-0.113
State ownership	3.353	1.340	0.012	0.727	5.979
Financial support for innovation	1.779	2.384	0.456	-2.894	6.451

Note:  $N = 536$ .

patents (non-inventive patents), which might indicate a lower level of activity in exploring new knowledge, as the dependent variable. The results are shown in Table 4, indicating that the relationship between FSK and the number of non-inventive patents is negative but non-significant. Neither state ownership nor government financial support significantly moderates the relationship between FSK and firm non-inventive innovation outputs. We provide more explanations in the discussion section.

Second, to address the concern that the number of patents might be an inaccurate way to indicate the level of exploration, we constructed two variables, exploration and exploitation, based on the level-3 industry categories of the patents. Exploration was indicated by the accumulated number of new industry entries between 2007 and 2011, while exploitation was indicated by the accumulated number of the same industry entries between 2007 and 2011. Results of Heckman models indicate that the relationship between FSK and the accumulated number of new industry entries is positive but non-significant ( $\beta = 0.530$ ,  $p = 0.264$ ). The relationship between FSK and exploitation, however, is positive and significant ( $\beta = 0.398$ ,  $p = 0.001$ ). And, only state ownership remains significant in moderating the main effect of FSK on exploration<sup>3</sup> ( $\beta = 0.232$ ,  $p = 0.091$ ). Although the reduced sample size ( $N = 155$  firms) and the preliminary measures of exploration and exploitation may leave room for improvement of this validation, the results at least to some extent partially verify our main story.

Furthermore, our additional analyses also demonstrate that SOE and government financial support are both significantly and negatively related to firms' attention focus, suggesting that resources from the government could expand the attention resource pool of general managers. This at least partially supports our arguments about the ways through which SOE and financial support for innovation from the government could enlarge the attention resource pool and thus weaken the negative relationship between FSK and exploratory innovation.

## Discussion

FSK is an important topic for strategic management because resources, especially knowledge assets, are essential for a firm's survival and long-term development (Barney, 1991; Helfat, 1994). However, although researchers have suggested the costs, risks, and particular governance issues related to FSK (e.g., Sirmon et al., 2007; Wang et al., 2009, 2017), why firms with a high level of knowledge specificity fail in the market is not fully explained. The potential negative effects of FSK on firm innovative outcomes are rarely investigated in the literature.

By revealing that a negative relationship exists between FSK assets and firms' exploratory innovation, our study not only fills a gap in the literature by demonstrating that exploratory innovation could potentially be difficult for firms with a high level of FSK. It also suggests the importance of

**Table 4.** Supplementary analysis: Poisson regression estimates of firm non-invention patents

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Firm age	-0.00146 (0.00120)	0.0106 (0.0173)	0.00532 (0.0180)	0.00876 (0.0173)	0.00608 (0.0165)
Firm size	0.0673*** (0.00636)	0.0380 (0.0757)	0.0599 (0.0815)	0.0338 (0.0773)	0.0881 (0.0707)
% of R&D employees	-0.783*** (0.135)	-0.234 (1.068)	0.113 (1.168)	-0.131 (1.151)	0.606 (1.242)
% of R&D outsourcing	-8.883*** (0.944)	-1.029 (3.702)	0.359 (3.732)	-0.811 (3.813)	0.540 (3.718)
Firm status	0.0248 (0.0255)	-0.480 (0.325)	-0.583 (0.328)	-0.495 (0.319)	-0.556* (0.249)
Rent generation	0.0386** (0.0136)	0.0520 (0.101)	0.102 (0.112)	0.0652 (0.0971)	0.0956 (0.103)
Patent blocking	0.0666*** (0.0129)	-0.236 (0.134)	-0.332* (0.146)	-0.240 (0.131)	-0.309** (0.109)
Concern for knowledge spillover	-0.136*** (0.0320)	0.0947 (0.270)	0.0361 (0.298)	0.115 (0.280)	0.0511 (0.290)
R&D intensity	1.784*** (0.121)	4.144** (1.589)	4.601** (1.660)	4.138** (1.572)	4.946*** (1.491)
Relative performance	2.306*** (0.114)	1.710 (1.285)	1.338 (1.332)	1.734 (1.294)	1.046 (1.187)
Localized attention focus	-1.102*** (0.0859)	-1.991** (0.772)	-1.972* (0.788)	-1.915* (0.779)	-1.927* (0.814)
State-owned	0.827*** (0.0367)	1.280*** (0.346)	0.860* (0.363)	1.270*** (0.349)	0.883* (0.360)
Financial support for innovation from the government	0.720*** (0.0513)	0.0901 (0.545)	-0.147 (0.578)	0.0448 (0.548)	-0.358 (0.599)
<b>Firm-specific knowledge</b>		-0.803 (0.513)	-0.734 (0.562)	-0.863 (0.505)	-0.653** (0.237)
<b>FSK * State-owned</b>			-0.869 (0.687)		-0.890 (0.697)
<b>FSK * Financial support for innovation from the government</b>				-0.0775 (0.903)	0.0380 (0.967)
Industry dummies	Yes	Yes	Yes	Yes	Yes
Constant	1.856*** (0.369)	9.625** (3.573)	10.41** (3.708)	9.339** (3.556)	9.649** (3.477)
<i>N</i>	501	501	501	501	501

Notes: Robust standard errors in parentheses; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

the attention mechanisms through which FSK takes effect. Moreover, firms high in specificity of knowledge assets likely have localized attention focus, providing excessive attention to internal knowledge streams and ignoring divergent and various information and knowledge from the environment. With this localized attention focus, firms likely experience mismatches between their knowledge and market demands, and suffer from escalated commitment. Consequently, firms suffer from a reduced number of exploratory innovations. However, government resources and expectations could shift a firm’s attention in the innovation process to more distant searches and thus broaden the localized

attention focus for firms high in FSK, weakening the negative effects of FSK on exploratory innovation. Our study indicates the importance of distant new knowledge and ideas from the environment in the innovation process and emphasizes the possible traps faced by firms when they pursue the development of firm-specificity in knowledge – those firms might focus on local, familiar, and narrow searches for knowledge and become less productive in exploratory innovation. Furthermore, our supplementary analysis shows that the relationship between FSK and non-inventive patents is negative but non-significant. This finding might support our earlier speculation that both inventive and non-inventive patents possess the ‘newness’ required by Chinese patent law. But the impact of FSK seems to exist only for inventive patents, suggesting that the localized attention focus resulting from developing FSK seems to be more likely to hamper innovations of high novelty. The non-significant effects of the moderators for non-inventive patents suggest that the impact of resources from the government on attention shifts within the firm in the innovation process is less obvious for non-inventive patents. In addition, while the effect of FSK is stronger for inventive patents, other variables such as SOE and government financial support for innovation seem to have stronger effects for non-inventive patents than inventive patents. These results suggest that firms may distribute attention unevenly even among exploratory activities due to the nature of the activities and different organizational factors. Our additional robust checks to measure exploration and exploitation using a firm’s accumulated entries into new industries and repeated entries into existing industries do suggest that FSK might have different impacts on exploration and exploitation. Although the sample was small and the measures preliminary, the results ensure some confidence in the findings of this study. Further studies with better measures and a bigger sample could further explore the attention distribution among different types of exploratory innovations and verify our preliminary findings regarding the impact of FSK on exploration versus exploitation.

This study first contributes to the literature on resource-based theory (Barney, 1991, 2001; Helfat, 1994; Kogut & Zander, 1992) by using attention mechanisms to explain the role of FSK in firm innovation. The importance of organizational attention has been highlighted in classic and recent organizational studies (Cyert & March, 1963; Ocasio, 1997; Sullivan, 2010). By incorporating the role of organization attention, we bring in behavioral and cognitive foundations to understand a few fundamental strategic ideas, such as FSK.

While previous studies have generally used patents and patent self-citation information to measure FSK which restricts our ability to understand whether FSK may have effects on firm innovation, we could directly investigate the impact of knowledge specificity of firms on firm innovation outputs using the survey items of FSK. We have thus addressed an important measurement issue raised by other scholars (Wang et al., 2009, 2017) and provide new theoretical understandings of the effect of firm knowledge structure on firm innovation outcomes. The survey items, however, could be further improved in future studies. For instance, in future research, we could ask the managers of a focal firm if the firm’s knowledge creates more value for the focal firm than for other firms in addition to the current items to better capture the specificity of knowledge to a focal firm.

We also contribute to the RBV literature by highlighting the dark side of FSK and empirically investigating its effects. Accordingly, we are among the first to provide new angles to understand the double-edged impacts of high specificity in firm knowledge structure. Researchers have asserted the importance of differentiating firm-specific and general knowledge (e.g., Wang et al., 2017), whereas we advance understanding of FSK by showing that too much of a good thing can be harmful to firms. We also provide empirical evidence that the impact of FSK is contingent on institutional environmental factors, such as government resource support for firm innovation.

By revealing the negative influence of developing firm FSK on exploratory firm innovation, we also contribute to the FSK literature. As we have theorized in this study, developing FSK is associated with many risks. Researchers in this area have suggested that mismatch between firm knowledge assets and market preference may be detrimental to firm survival (e.g., Sirmon et al., 2007; Wang et al., 2009). However, one missing point is why firms fail to develop other innovations to cope with changes in the market. We address this question by showing that firms with FSK have fewer exploratory innovations, which require a great deal of effort to search for new knowledge and information and to notice

new emerging trends in the surrounding environment. Subsequently, the failure of firms with a high level of knowledge specificity as a result of market mismatch is possibly due to the difficulty of innovation associated with FSK. Therefore, we contribute to the FSK literature by moving one step further to open the ‘black box’ of the failures associated with FSK for firms.

Apart from the contributions to the RBV literature, this study also enriches our understanding of ABV (Ocasio, 1997, 2011). We have theorized and demonstrated that managerial attention can be shifted by the nature of a firm’s knowledge assets, and contextual factors can further moderate it. The findings of this study further support the importance of selective and situated attention in managerial decision-making (Ocasio, 1997): organizational attention can be guided by familiarity and salience experienced by the decision-makers and can be channeled by contextual factors. The findings also provide support to the argument that allocation of organizational attention could be influenced by the availability of resources (Cyert & March, 1963; Ocasio, 1997; Sullivan, 2010). The moderating effect of government support further empirically demonstrated that the influence of attention could be dependent on an organization’s resource pool (Sullivan, 2010).

Finally, this study makes contributions to the firm innovation literature. Various determinants at the individual, group, organizational, or environmental level have been found to be positively related to firm innovation (e.g., Anderson, Dreu, & Nijstad, 2004; Cohen & Levin, 1989; Cohen & Levinthal, 1990; Damanpour, 1991; Lam, 2005; Simmie, 2005). Different theories, such as upper echelons theory, RBV, and dynamic capabilities and process theory, were utilized to explain the antecedents of innovation (Crossan & Apaydin, 2010). By focusing on the role of FSK in firm innovation, we provide a new angle from the attention perspective to understand the dynamics of firm innovation. We also advanced the understanding of the role of government resource support in firm innovation. Thus, the latter suggests that the existence of government innovation policies is not the only important factor. In fact, the impact of government resources on the allocation of firm attention in the innovation process is also important to the role of FSK in firm innovation.

### *Practical Implications*

The results of this study have important practical implications for firms. First, they suggest that achieving a balance between firm-specific and general knowledge is important for firm innovation. Excessive attention on either side is unhealthy and impedes a firm from generating innovative outcomes. On the one hand, the optimal degree of FSK will help firms obtain rents and superior economic performance; on the other, it will alert firms to be cautious of technological trends or market preferences.

Second, considering that our sample is based on firms in China, the findings of our study can provide insights for firm innovations in China. To further stimulate economic development, a national strategy of innovation-driven development has been proposed by the Chinese government and is becoming a key strategy for the future of China. Innovation is identified as the most important factor driving economic and social development. However, our findings suggest that there is a delicate relationship between government policies and firm innovation. Although Chinese firms are becoming increasingly engaged in firm innovation, it is also suggested to search beyond firm boundaries to generate genuine inventions. Firms must carefully monitor the trends in government innovation policies. And policymakers should also ensure the availability of resources to firms in need so that they can engage in more distant searches and overcome the traps of localized attention focus in the process of exploratory innovation.

### *Limitations and Future Research Directions*

This study certainly has a few limitations. First, we proposed theoretical arguments for why FSK might negatively influence firm innovation through the attention mechanism. However, we found that a firm’s localized attention focus partially mediates the relationship between FSK and exploratory firm innovations. This indicates the potential existence of other mechanisms through which firm



knowledge specificity affects exploratory firm innovation or firm innovation in general. Future research can further explore and use qualitative methods to better understand the process.

Second, although our item-based measure may be imperfect, it does, to a certain degree, prove that firms with a high level of FSK tend to pay less attention to external trends and consequently generate fewer inventive patents. This finding enhances our confidence in the attention mechanisms described in this study. Future research might benefit from other comprehensive models as well as refined and better-designed items of firm attention focus to capture the attention mechanisms proposed in this article. Due to the cross-sectional nature of our data, we were not able to provide causal evidence of our theoretical mechanisms. Future research with other research designs (e.g., an experimental approach) could better demonstrate the causality between FSK, attention focus, and firm innovation.

Due to data limitations, current research is unable to specifically test certain possible mechanisms related to the attention allocation process, such as differences in search depth or breadth. For instance, it is possible that high levels of FSK might be related to search depth and breadth differently, and subsequently lead to different innovation outcomes. Future studies with available data could further explore such differences.

Third, although our measure of FSK is somewhat of an improvement on previous studies, future research can further improve the measurement for FSK. The neat part of our measure is that our FSK variable is constructed totally independent of the patent data, thereby possibly allowing us to safely use the patent data to indicate innovation outcomes. Accordingly, we avoided compounding problems faced by scholars who utilized patent data to construct the FSK variable. Indeed, self-citations could mean different things to firms aside from suggesting the extent of FSK. In addition, since self-citation information is not publicly available for Chinese patent data, we were unable to use self-citations to construct the measure of FSK as done in prior research. Future research can use both the objective measures used in our study and subjective measures employed by earlier research (e.g., Wang et al., 2009) to test our theory. Furthermore, considering that FSK may exist at both firm and industry levels (Wang et al., 2017), future research could also consider using other alternatives to fully capture FSK. Our survey data on the two moderators are also limited in terms of detail. We were only able to acquire binary answers to questions about state ownership and government financial support for firm innovation. Future research with more detailed information could improve the analyses. A final caution is that the use of Chinese firms for our study during a particular time may raise concerns about the generalizability of the findings to firms in other time periods and other countries. While we controlled for many factors that may affect a firm's innovation and motivation to file patents and this generalizability concern can be eased to some extent, we do need to remain cautious in interpreting our findings, associated with a particular institutional environment in a particular time.

## Conclusion

While scholars all agree that FSK is extremely important for firms to generate economic value and to achieve competitive advantage, few have studied the negative consequences of FSK. Strategy researchers stated long ago that firm knowledge can easily turn to mismatch and hinder performance when the environment is rapidly changing (e.g., Gavetti, Greve, Levinthal, & Ocasio, 2012; Poppo & Zenger, 1998). However, we still know little of the process of such downsides, especially the underlying mechanisms. Without such understanding, our understanding of the role of FSK in strategic management is limited. With a carefully designed study, we have made important contributions to the study of FSK by revealing that it has a negative impact on the number of exploratory firm innovations. Moreover, this effect is weakened when the firm receives more resource support from the government. We also provide evidence that a firm's localized attention focus partially mediates the relationship between FSK and exploratory innovation outputs. This study makes important theoretical contributions to the literatures on FSK, managerial attention, management of resources, and firm innovation. The findings also have important implications for managers facing choices between firm-specific and general knowledge in the innovation process.

**Data Availability Statement.** Data and code for this article are available via Open Science Framework at <https://osf.io/3t4zq/>

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## Notes

1. Anecdotal evidence from our sampled firms suggests that state-owned enterprises (SOEs) and privately owned enterprises (POEs) have different access to resource support and their subsequent exploratory activities were therefore different. One SOE focusing on one type of industry technology was requested by the government to participate in a nationwide program through which they had to help one local area with updating industry technologies, education, and infrastructure building. In return, they were granted the exclusive opportunity to develop a new advanced system for the region, which was a new business area for the company. As an SOE, they not only gained the opportunity to access unique resources such as subsidies and exclusive rights to use local resources as well as guaranteed procurement, but also used the chance and additional resources to expand their business and technologies beyond their current state. On the other hand, one new material development company informed us that although they received seed money for new material development, they have trouble commercializing their products as they need to find market opportunities. Given the concerns of successful commercialization with no promised procurement, they are reluctant to spend R&D expenditures on further exploring and adding new products.
2. While these results to some extent show the validity of our measurement and enhance our confidence in using the two items to measure firm-specific knowledge, there are two concerns about reporting the results with this measure. First, as mentioned in the introduction, patent-based firm-specific knowledge measurements have been criticized by scholars in the field. Second, we only had 281 firms in the sample when we used the heterogeneity score as the independent variable in the models. With this significantly reduced sample size, we are concerned that the results might not be as accurate as those reported here. For these reasons, we report the results with the survey item-based measure of FSK as the independent variable in the analyses.
3. Detailed results are available upon request.

## Appendix I. Scale for measuring localized attention focus

1. Top managers spent a large amount of time envisioning the future.
2. Top managers allocated energy to analyze what will happen.
3. Top managers spent time thinking about innovation activities in the future.
4. Top managers allocated a large number of resources to observe innovation trends.
5. Top managers always attended to temporal factors when contemplating questions.
6. Top managers always predicted future events based on current situations.
7. Top managers of the firm emphasized the understanding of the complexity of innovation.
8. Top managers searched a variety of information to understand industry trends.
9. Top managers noticed information that people in other firms may have ignored.
10. Top managers had vague knowledge regarding changes in the external environment.
11. Top managers continually allocated mental resources to a specific issue.
12. Top managers focused attention on one task for a long time.
13. Top managers continued investing financial and human resources in one particular project.

Note: Items 1 to 9 were reverse coded.

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**Bilian Ni Sullivan** ([mnbilian@ust.hk](mailto:mnbilian@ust.hk)) is an Associate Professor of Organization Theory and Strategy at the Department of Management, Hong Kong University of Science and Technology. She received her PhD from the Graduate School of Business at Stanford University. Her research interests include behavioral theory of the firm, organizational learning and adaptation, social networks, institutional theory, and firm innovation.

**Kaixian Mao** ([kxm@ruc.edu.cn](mailto:kxm@ruc.edu.cn)) is an Assistant Professor of Management at the School of Labor and Human Resources, Renmin University of China. He received his PhD in management from the Hong Kong University of Science and Technology. His research interests include corporate social responsibility, business ethics and firm innovation.

**Heli Wang** ([hlwang@smu.edu.sg](mailto:hlwang@smu.edu.sg)) is Janice Bellace Professor of Strategic Management at Lee Kong Chian School of Business of Singapore Management University. She received her PhD in Strategic Management from the Fisher College of Business at Ohio State University. She is interested in topics including resource-based theory of the firm and employee governance, strategic human capital, corporate social responsibility and business ethics, and knowledge and innovation.

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