Management International Review (2020) 60:387–425
https://doi.org/10.1007/s11575-020-00416-9

mir Management International Review

RESEARCH ARTICLE

Ambidextrous Knowledge Sharing within R&D Teams and Multinational Enterprise Performance: The Moderating Effects of Cultural Distance in Uncertainty Avoidance

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Received: 5 November 2019 / Revised: 31 March 2020 / Accepted: 28 April 2020 /
Published online: 24 June 2020

Abstract

Current debates on organizational learning distinguish between two distinct and mutually exclusive learning modes: exploration and exploitation. This paper deals with the concept of ambidextrous routines in knowledge management (KM) initiatives. Specifically, drawing on a sample of 1468 MNEs from 24 regions in China, we find that a synergetic combination of explorative and exploitative virtual knowledge is positively associated with MNE performance. In contrast, an imbalance between explorative and exploitative virtual knowledge hurts MNE performance. Furthermore, the effect of imbalanced ambidexterity in virtual knowledge sharing is moderated by the cultural distance in the uncertainty avoidance between the R&D team and the region where the team operates. This paper elaborates on the characteristics of ambidextrous KM initiatives at the micro-level; firms use ambidextrous KM practices to create a learning context, defined by guidelines and methods rather than by a definite purpose. The clear separation of KM initiatives' purpose and their embedded learning routines and methods enables them to be used ambidextrously. Furthermore, this analysis indicates that ambidextrous KM initiatives follow a path characterized by an increasing variety of purposes but a decreasing variety of underlying structures. Consequently, firms create a learning context that can be activated when necessary in ways required in an exploratory and/or in an exploitative mode.

Keywords International R&D teams · Ambidextrous virtual knowledge sharing within R&D teams · Uncertainty avoidance · Organization–environment cultural fit · International human resource management

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1 Introduction

The seminal work of March (1991) on exploration and exploitation has inspired a search for the optimal balance between these two types of activities, known as 'organizational ambidexterity' (hereafter ambidexterity). As the optimal level of ambidexterity is concurrently associated with the firm's current performance and future survival, prior research has focused on exploring the question of which organizational instruments can help to achieve an optimal balance of ambidexterity. While one stream of literature has predominantly focused on formal structure or strategy approaches (Benner and Tushman 2003; Choi et al. 2016; Rosenkopf and Nerkar 2001; Rothaermel and Deeds 2004; Siggelkow and Levinthal 2003; Tushman and O'Reilly 1996), another stream of research has paid more attention to contextual approaches (O'Reilly and Tushman 2008; Raisch and Birkinshaw 2008; Smith and Tushman 2005). The latter stream of literature posits that ambidexterity can be accomplished via creating an organizational context, such as organizational culture and supportive human resource management (HRM) practices, that encourages individuals to develop capabilities enabling the pursuit of both explorative and exploitative activities that match the needs of the firm (Junni et al. 2015; O'Reilly and Tushman 2008; Raisch and Birkinshaw 2008). In this context, the innovation and HRM literature has consistently emphasized the importance of organizational culture in recruiting, encouraging, and retaining people who are engaged in innovation activities (Amabile 1988, 1996; Choi et al. 2019; Scott and Bruce 1994).

Building upon prior research, we aim to deepen our understanding of how cultural factors influence the association between ambidexterity and firm performance. While existing literature has mainly examined the specific cultural dimension of intraorganization that potentially impacts innovation activities of employees, we instead shift our attention to the 'cultural distance' in uncertainty avoidance (hereafter UA) between the R&D teams of multinational enterprises (MNEs) and the region where those teams operate. Because innovation activities are innately associated with taking risks and challenging conventional systems, UA has been considered to be one of the most critical cultural dimensions in the context of innovation (Amabile et al. 1996; Choi et al. 2019; Maseland et al. 2018; O'Connor et al. 2008). As Amabile et al. (1996) note, even the efficacy of management instruments and practices for innovation are largely influenced by how the entire organization maintains a supportive environment for risk-taking behavior.

In addition to exploring the role of the UA distance between the region and the team, rather than on the UA cultural value itself, we expand the scope of research on ambidexterity in a few other ways. First, while prior literature on ambidexterity has mainly explored the question of what determines the balance between exploration and exploitation, recent studies investigate the inside dynamics of ambidexterity (Cao et al. 2009; He and Wong 2004). Building on the concept of joint effects between two distinctive strategic activities (Venkatraman 1989), 'strategic fit as moderating' and 'strategic fit as matching', He and Wong (2004)

and Cao et al. (2009) suggest two types of ambidexterity. 'Combined ambidexterity' refers to the interaction between exploration and exploitation, which captures the complementary effect between explorative activities and exploitative activities. 'Imbalanced ambidexterity' refers to the absolute difference between exploration and exploitation, which estimate the relative imbalance between explorative activities and exploitative activities. By using team-level data, we investigate how these distinctive dimensions of ambidexterity in R&D teams affect the performance of MNEs.

Second, our study focuses on ambidexterity in virtual knowledge sharing within the context of digitalization and recent advances in information and communication technologies (ICTs) (e.g., smartphones, tablets, computers, messengers, social networking services, etc.) rather than ambidexterity stemming from the traditional ways of co-located knowledge sharing within international R&D teams (e.g., face-to-face meetings and paper documents). Although the importance of conventional methods within a knowledge-sharing system to play in achieving ambidexterity is well-documented in prior literature, the virtual sharing of knowledge in an ambidextrous context has received relatively limited attention. Hence, we investigate how different dimensions of ambidexterity (combined and imbalanced) embedded in R&D teams affect an MNE's performance and how those relationships vary with the cultural distance between those R&D teams and the region where the R&D teams are located.

We test our theory using data from a sample of 4037 R&D teams in 1468 MNEs that operated in 24 regions of China from 2013 to 2015. Building upon prior research, the survey was conducted using the support of researchers from 14 Chinese universities and a professional survey institution specializing in international R&D teams that belong to MNEs in China.

At the team level, our findings on the relationships between two dimensions of ambidexterity (combined and imbalance) and firm performance are consistent with previous studies (Cao et al. 2009; He and Wong 2004), even though we focused on the contexts of virtual knowledge and MNEs, thus linking the micro-level and macro-level of ambidexterity. Furthermore, we also find that these relationships are distinctively moderated by the cultural value gap between the team and the regions where the team operates. More specifically, when the R&D team has a higher UA level than the region does, the association between combined ambidexterity and firm performance is weaker. In contrast, when the team's UA is lower than that of the region, the association between imbalanced ambidexterity and firm performance is stronger.

2 Literature Review and Hypotheses Development

2.1 Ambidexterity in Virtual Knowledge Sharing

The concept of exploration and exploitation has been extensively used in research since its introduction by March (1991). These two concepts have been discussed and elaborated in various contexts, such as capability-exploring and exploiting (Argyres 1996), widening and exploiting innovation (Malerba and Orsenigo 1996),

path-breaking and path-dependent innovation (Karim and Mitchell 2000), and search depth and search scope (Katila and Ahuja 2002). Although these studies have used distinctive terminologies to support their arguments, the commonly accepted notion is that exploitation and exploration are two fundamentally different types of knowledge and play different roles in a firm's sustainable competitiveness. Consistent with prior literature (e.g., Argyres 1996; Katila and Ahuja 2002; March 1991), in our study, we define exploration as a firm's activities to increase its knowledge base by acquiring new knowledge (e.g., future generations of products, new services, etc.). In contrast, we define exploitation as the firm's activities to enhance and extend its existing knowledge base for continuous improvement (e.g., improvement of an existing product or current technologies, etc.). Although many previous studies have focused on clarifying the nature of exploration and exploitation, researchers have also shifted their attention to how firms strategically use these two distinctive search behaviors. The central notion of this stream of research is how to achieve balanced exploration and exploitation—organizational ambidexterity—to maximize firm performance.

As previously mentioned, ambidexterity in virtual knowledge sharing is generated when explorative and exploitative knowledge are shared, communicated, and allowed to interact with each other in a virtual manner (e.g., ICTs). While virtual and traditional knowledge sharing have some overlapping goals and characteristics, they also differ in their tools and outcomes, and each has its own pros and cons. For example, sharing knowledge virtually allows greater flexibility and reduces travel cost (Jiménez et al. 2017), and it can also reduce conflict and social fragmentation in an intercultural context (Stahl et al. 2010). By contrast, virtual knowledge sharing may also lead to a loss of non-verbal communication, less interaction and trust, weaker social cohesion, lowered social obligation, and less reciprocity (Falk and Fischbacher 2006; Jarvenpaa and Leidner 1999). However, social cohesion, social obligation, and reciprocity are both an input and an output, and they can actually increase when participants anticipate or aim to increase future interactions (Ensign 2008).

2.2 Combine Ambidexterity in Virtual Knowledge Sharing by R&D Teams and Firm Performance

Recent studies have aimed to develop more concrete and rigorous measures for estimating a firm's degree of ambidexterity via examining the nature of the interaction between the firm's exploration and exploitation (Cao et al. 2009; He and Wong 2004). Rather than arguing generally whether the relationship between explorative and exploitative knowledge is complementary or substitutive, this stream of research examines the types of ambidexterity that can be produced through specific interaction patterns between exploration and exploitation.

For instance, based on He and Wong's (2004) work, Cao et al. (2009) introduced the concepts of combined and imbalanced ambidexterity. They illustrated this notion using an example of two hypothetical firms: firm A with a score of 10 on exploration and 5 on exploitation, and firm B with a score of 5 on both exploration and

exploitation. As we stated in our introductory section, combined ambidexterity refers to the interaction between exploration and exploitation, which reflects the complementary effect and is usually operationalized as a product of two scores. In this case, firm A's combined ambidexterity score is 50 ($=5\times10$), while firm B's score is 25 ($=5\times5$). Imbalanced ambidexterity (*less* means *more balanced*) refers to the absolute difference between exploration and exploitation. In this case, Firm A's score is 5 ($=10-5$), while firm B's score is 0 ($=5-5$). Therefore, while firm A shows a better performance of combined ambidexterity, firm B shows a better performance of imbalanced ambidexterity. This example illustrates that combined and imbalanced dimensions provide distinctive implications for estimating ambidexterity."

The discussion in this section is based on two fundamental assumptions. First, exploration and exploitation must be aligned at a certain point to support a firm's commercial success. Second, although exploitation mainly focuses on specifically targeted activities with a narrow scope, it needs to be aligned with a certain degree of exploration to find additional applications of knowledge. In this context, Argyres (1996) asserts that, despite tensions in terms of resource allocation, firms naturally increase their patent classifications over time through interactions between explorative and exploitative knowledge.

On the one hand, developing explorative knowledge often requires organizations to manage scrutinized processes for learning, absorbing and implementing newly obtained knowledge, because it generally takes a long time for new knowledge to become a core competency of a firm (Prahalad and Hamel 1990). Hence, we argue that firms that develop exploitative capabilities can more efficiently identify and use the value of explorative knowledge based on absorptive capability (Cao et al. 2009; Cohen and Levinthal 1990). On the other hand, once that explorative knowledge has been developed, the significant time put into learning it pays off because it can influence subsequent exploitation. More rigorous research on new knowledge in a specific field can broaden the scope of people engaged in ongoing projects and help them exploit this knowledge more efficiently by providing complementary knowledge (Cao et al. 2009). We argue that this synergistic effect between explorative and exploitative knowledge can be maintained when knowledge is shared and interacted virtually because the development of ICTs has enabled firms (especially large established firms such as MNEs) to enhance knowledge sharing and lower the barrier for communication and interaction (Hendriks 1999). Furthermore, ICTs also enable firms to codify, communicate, and integrate virtual knowledge (Lin 2007). Therefore, based on these arguments, we propose the following hypothesis:

Hypothesis 1: *Combined ambidexterity in the virtually shared knowledge of the R&D team is positively associated with MNE performance*.

2.3 Imbalanced Ambidexterity in Virtual Knowledge Sharing by R&D Teams and Firm Performance

As previously mentioned, prior research has focused on finding appropriate mechanisms to balance explorative and exploitative knowledge, which is critical for organizational ambidexterity. The need for balance is well-documented in the literature in

diverse fields (Benner and Tushman 2003; Cao et al. 2009; Choi et al. 2016; He and Wong 2004; Rosenkopf and Nerkar 2001; Rothaermel and Deeds 2004; Siggelkow and Levinthal 2003; Smith and Tushman 2005; Tushman and O'Reilly 1996). Cao et al. (2009, p. 784) summarize this standpoint and state that "as a consequence, these researchers see a balance between exploration and exploitation as central to the notion of organizational ambidexterity." The previous literature (e.g., Cao et al. 2009; He and Wong 2004) has operationalized the balanced-imbalanced dimension of ambidexterity by calculating the absolute difference between exploration and exploitation. Greater balance means that the difference between scores of exploration and exploitation is smaller, while greater imbalance means the difference between scores of exploration and exploitation is larger.

The knowledge stock perspective views all knowledge as an asset, regardless of whether it was obtained from exploration or exploitation. However, we argue that a firm that fails to manage the balance between exploration and exploitation is more likely to experience decreasing performance, and the reasons are twofold.

First, both exploration and exploitation are deeply associated with the strategic direction chosen by a firm, but exploration and exploitation have contradictory requirements regarding organizational structures (Benner and Tushman 2003; Siggelkow and Levinthal 2003), management processes (Choi et al. 2019), and employee mindsets (Lubatkin et al. 2006). Hence, the imbalance between the needs of exploration and exploitation leads to significant tension that can cause conflict and vicious cycles (Andriopoulos and Lewis 2009), and those tensions are nested throughout the firm (Smith and Tushman 2005) and in different contexts (Raisch et al. 2009).

Second, overemphasis on either exploration or exploitation can lead the firm to fall into traps that may make it deviated from optimal search paths (He and Wong 2004; Levinthal and March 1993; Rosenkopf and Nerkar 2001). For example, when firms maintain a skewed balance toward extreme exploration, they are likely to miss timely opportunities for current profit and growth. In contrast, when firms keep concentrating on exploitation, they can fall into the path dependence problem and failure to secure the knowledge that would enable them to pursue the next opportunity for expansion of the next area of business. As stated in hypothesis 1, we also assume that ambidexterity will not be influenced whether knowledge is shared virtually or not. Based on the argument presented above, we propose the next hypothesis:

Hypothesis 2: *Imbalanced ambidexterity in the virtually shared knowledge of a R&D team is negatively associated with firm performance.*

2.4 The Importance of Organizational Culture and Ambidexterity

The role of culture in the workplace has been well-documented. Taras et al. (2010) conducted a meta-analysis of 598 studies on the effects of culture on more than 30 types of organizational behaviors, attitudes, decision-making styles, and performance and concluded that culture explains many organizational outcomes and has stronger predictive power than either personality traits or demographics do.

Culture is a complex, multifaceted construct represented by 'visible attributes', such as art, language, clothing, traditions, protocols, and customs, and 'tacit factors', such as values, beliefs, and perceptions. Geert Hofstede, widely regarded as the pioneer of cross-cultural studies in management, defined culture as "the collective programming of the mind which distinguishes the members of one human group from another" (Hofstede 1980a, p. 25). He emphasized that cultural values govern our behaviors and decisions, and therefore cultural values require special attention in examining workplace behavior.

In ambidexterity literature, the importance of organizational culture has been widely recognized. Although many formal structures(Benner and Tushman 2003; Choi et al. 2016; Siggelkow and Levinthal 2003; Tushman and O'Reilly 1996; Smith and Tushman 2005) or strategic formulas (Rosenkopf and Nerkar 2001; Rothaermel and Deeds 2004) have been offered to help firms design systematic processes for ambidexterity, scholars have discussed an alternative approach called *contextual ambidexterity* (O'Reilly and Tushman 2008; Raisch and Birkinshaw 2008). The main argument of this stream of research is that firms can focus on the reconfiguration of assets and nurturing organizational culture to encourage employees to actively and voluntarily accept the need for balancing exploration an exploitation. For instance, Google has encouraged its employees to dedicate 20% of their time to side projects,[1] and 3M has long maintained a similar internal policy that encourages employees to devote 15% of their time to side projects.[2] Since this approach, if successful, can minimize intra-organizational conflicts based on the voluntary participation of employees in balancing the two activities, it has been an issue of great interest to both researchers and practitioners. While numerous studies have advanced our understanding of ambidexterity, limited attention has been devoted to exploring the effects of cultural context on ambidexterity. Given the critical effect of culture on innovative activities of employees (Amabile 1988, 1996; Choi et al. 2019; O'Connor et al. 2008; Scott and Bruce 1994), it is imperative to understand the role that cultural context may play as organizations strive to achieve a perfect balance between explorative and exploitative innovation strategies.

Moreover, much research lately has been devoted to regional cultural variations (Au 1992; Coon and Kemmelmeier 2001; Garreau 1981; Gastil 1975; Kaasa et al. 2014; Kozan 2002; Lau and Ngo 1996; Lenartowicz et al. 2003; Lenartowicz and Roth 2001), especially in such large and diverse countries like China (Huo and Randall 1991; Lenartowicz et al. 2003). Taras et al. (2016) address this issue in more depth.

An additional complication is that an R&D team member may not even be from the region in which they are working. In fact, it is even possible that most team members are not. This creates a distance between the predominant culture of the

[1] https://www.inc.com/adam-robinson/google-employees-dedicate-20-percent-of-their-time-to-side-projects-heres-how-it-works.html.

[2] https://www.fastcompany.com/1663137/how-3m-gave-everyone-days-off-and-created-an-innovation-dynamo.

region where the team operates and the culture of the team's members. We believe, and show in the present study, that this cultural distance can play an important role.

As another angle to consider regional differences, we can imagine a region with low uncertainty avoidance (UA) rates and another region with high UA rates. The same team with exactly the same UA might show a negative cultural misfit in one region and a positive cultural misfit in another region. Performance effects would therefore be negative in the first region and positive in the second. However, when we observe this phenomenon at a deeper level, we know that what matters most is the directionality of the difference. Much research has been devoted to showing that the direction in which one moves from one culture to another matters. To better understand this difference, we use the metaphor of a truck going uphill or downhill. Even if the distance between the two points is the same, moving downhill is much easier than moving uphill. The same applies to cultural differences. The concept of cultural tightness–looseness may be another helpful tool. As Michelle Gelfand and her team (Gelfand et al. 2006, 2011) discussed, some cultures are 'tight' (Japan and Saudi Arabia) and do not tolerate deviations from their cultural norms. Others are 'loose' (the US and France), and a certain degree of being different and not conforming to norms is acceptable. While the distance between these cultures is the same, a person from a 'loose' culture will have a much harder time adapting to a 'tight' culture than the other way around. That is, a Japanese person moving to the US will probably have fewer challenges adapting to the American culture than an American adapting to Japanese culture (Drogendijk and Zander 2010; Selmer et al. 2007; Zaheer et al. 2012; Zhang and Oczkowski 2016). Something similar is happening here. The direction of difference between the cultural values of the team and the culture of the region where the team operates plays a role.

2.5 The Moderating Effect of Cultural Distance in Uncertainty Avoidance (UA)

Culture is a complex multi-dimensional phenomenon, and various models of culture have been presented in the literature to describe the different types of cultural values (e.g., Hofstede 1980a, b; House et al. 2004; Maznevski and DiStefano 1995; Schwartz 1994; Trompenaars 1993). Based on a review of 121 instruments for measuring culture, Taras et al. (2009) concluded that most models of culture could be traced back to Hofstede's original four-dimensional framework that includes individualism-collectivism (attitudes regarding group vs. self), power distance (attitudes toward authority), masculinity-femininity (attitudes toward achievement and competitiveness), and UA (comfort with risk and uncertainty). UA is of primary interest in this study and is defined as "the extent to which people feel threatened by uncertain and ambiguous situations and try to avoid these situations by establishing more formal rules and not tolerating deviant ideas and behaviors" (Hofstede 1980b, p. 45). Low UA should not be confused with risk-taking, as in gambling. Instead, UA is associated with willingness to try new things, to take a risk by deviating from established norms and breaking the rules, and to do things differently even when facing the prospect of failure (cf., Hofstede 2001, p. 149). Thus, UA has been often seen as a precursor of innovation (Conway and Nuttgens 2006; Mueller and Thomas

2001; Shane 1995; Shaw and Barrett-Power 1998), and, by extension, of ambidexterity (Kwan et al. 2018; McCarthy et al. 2018).

March (1991) argues that the degree of how conservative a culture is can significantly influence organizational orientation toward exploitation that concentrates on reliable and predictable outcomes. Numerous prior studies in various fields including innovation and HRM literature have suggested that UA dimension is most relevant in the context of organizational ambidexterity (Choi et al. 2019; Kwan et al. 2018; McCarthy et al. 2018; Miller and Friesen 1982; Schmelter et al. 2010; Wang et al. 2010).

Based on the crucial role of UA in the context of innovation, we focus our attention on the interaction between organizational ambidexterity and cultural distance along the UA dimension between international R&D teams and the regional culture where the team operates. Specifically, we argue that the association between the combined ambidextrous knowledge sharing and MNE performance will be positive when an international R&D team has a lower UA orientation than that of the subnational region where the team operates. By contrast, when an international R&D team has a higher UA orientation than that of its located (subnational) region, the relationship between combined ambidextrous knowledge sharing and MNE performance will be negative.

Research on the effects of culture on innovation in general, and exploration and exploitation approaches to creativity in particular (Kwan et al. 2018), is still very limited. Among the few studies that have explored this relationship, Bledow et al. (2011) have built a theoretical argument, and Rodriguez et al. (2014) empirically demonstrate that in countries characterized by high UA, firms tend to engage in an exploitative mode of innovation. In contrast, firms with low UA culture are more likely to pursue explorative innovation. The same effects are observed at the level of organizational culture (Pandey and Sharma 2009; Wang and Rafiq 2014).

Although the effect of UA on innovative behavior may appear straightforward, the interplay among culture, organizational ambidexterity, and performance may be quite complicated. First, based on the results of a meta-analysis by Junni et al. (2013), the effects of ambidexterity on performance may vary across industries, types of performance, and ambidexterity measures used. For example, Griffith and Rubera (2014) argue that in high-UA cultures, the effect of innovative behavior on performance may be weaker than in low-UA cultures. Further, they argue that more exploitative types of innovation may lead to increased performance in high-UA cultures, whereas the opposite is true for low-UA cultures, where explorative innovation is more likely to improve organizational performance.

This study builds on this existing theory and further explores the effects of the cultural context on the relationship between organizational ambidexterity and performance. Specifically, we explore the role of the alignment between the R&D team's culture and the culture of the larger region or environment in which the team operates, and how that alignment affects the relationship between ambidexterity and performance.

Prior studies have argued that UA affects a firm's propensity to take risks and try new things (Maseland et al. 2018; Minbaeva et al. 2018), which, in turn, aids innovation and ultimately leads to higher performance (Bledow et al. 2011;

Rodriguez et al. 2014). However, we argue that this relationship is only true if the UA level of the team is lower than that of the culture of the broader region where the team operates.

Combined ambidexterity is based on the degree of interaction between exploitation and exploration, which requires more risk-taking by the team. Because the team does not exist in a vacuum, but rather within the broader cultural environment of the region where the team operates, the interplay between the team's culture and the culture of the broader region becomes quite important (Parkes et al. 2001). Thus, the alignment (or lack of thereof) with the national cultural value orientation shapes employees' reactions and outcomes (Lincoln et al. 1981; Minbaeva et al. 2018). Thus, we argue, under conditions when there is distance between the regional culture and the team culture, even though the team may engage in risky explorative innovation beyond what is usually seen as acceptable in the cultural environment where the team operates, such a team would be seen as brave initiative takers, and thus the cultural misfit will not affect team performance adversely. This would enable the team to avoid cultural inertia and deviate from a path that would be more acceptable in the high-UA climate of the region, leading to our next hypothesis:

Hypothesis 3a: *When the R&D team has a lower uncertainty avoidance level than that of the region where the R&D team operates, combined ambidexterity in virtual knowledge sharing will be positively associated with MNE performance.*

UA and combined ambidextrous knowledge sharing are interlinked (Kwan et al. 2018). A higher UA level impedes explorative virtual knowledge sharing by blocking creative inspiration, instead depending too much on exploitative virtual knowledge sharing by emphasizing the usefulness of incremental procedures and routines (Adair and Xiong 2018). Indeed, if the UA level of the team is higher than that of the cultural environment where it operates, we argue that organizational performance will suffer. Under these conditions, the R&D teams with high-UA orientation will be perceived as excessively cautious and risk-averse, outdated, conservative, or lacking initiative and incapable of making important decisions (Javidan and House 2001; Triandis 1995). In this case, the organizational environment may not be able to activate a particular set of its own creativity-related cultural values (Liou and Lan 2018). Thus, the misfit between the R&D team and regional cultures will lead to negative perceptions, which would in turn hinder organizational performance. Cultural value incongruence between an R&D team and its host culture cannot be given credit for creating a common frame and routines of references that facilitate combined ambidextrous knowledge sharing (Meglino et al. 1989; Mustafa et al. 2017). Thus, this incongruence adversely affects organizational performance:

Hypothesis 3b: *When the R&D team has a higher uncertainty avoidance level than that of the region where the R&D team operates, combined ambidexterity in virtual knowledge sharing will be negatively associated with MNE performance.*

When the UA level of international teams is lower than that of their surrounding region, there is a substantial trade-off between explorative and exploitative knowledge sharing. An imbalance in favor of explorative learning places too much emphasis on an idea's novelty, which fits this lower UA level, while exploitative learning focuses too much on an idea's usefulness (McCarthy et al. 2018). The moderating effects of cultural cognition can be strengthened by contextual factors such as multicultural exposure, cognitive team diversity, and team climate, all of which create an environment where explorative virtual knowledge-sharing can instigate creative innovation within multicultural, international teams (McCarthy et al. 2018).

Empirical findings have indicated that in reality, risk-averse teams may not be able to perform optimally when engaging in explorative versus exploitative knowledge sharing (Rietzschel et al. 2010), and they often fail to recognize the value of the balance between creative ideas and usefulness (Mueller et al. 2012). In contrast, the opposite is true for risk-taking teams since these innovators think a balance between the two is crucial. Cross-cultural researchers have begun to underline a balance between explorative novelty and exploitative usefulness (Erez and Nouri 2010). If international teams' UA is low, we would expect these multicultural teams to pay more attention not only to the explorative idea generation itself but also to the exploitative usefulness context in which the explorative idea will be applied. These teams' innovative behaviors require both radical and incremental innovative learning since radical and incremental innovative learning can nurture each other mutually (cf., McCarthy et al. 2018). When teams have more risk-taking tendencies, an unbalanced portfolio between exploration and exploitation prevents them from pursuing and testing more diverse possibilities. Sizeable imbalances between the two types of knowledge do not fit well with how the team wants to work, which will adversely affect the MNE's performance:

Hypothesis 4a: *When the international R&D team has a lower uncertainty avoidance distance than that of the region where it operates, imbalanced ambidexterity in virtual knowledge sharing will be negatively associated with MNE performance.*

Conversely, if a team is more risk-averse than is common in their region, the team would be inclined to emphasize only the intrinsic properties of ideas and routines and depend on a more stable approach (cf., McCarthy et al. 2018). Such teams are less likely to think comprehensively regarding possible interdependencies between creativity and the status quo. Instead, they tend to consider a narrower range of relevant factors and hence do not pursue possibilities for innovativeness and risk. Hence, these teams perceive more significant independence between the explorative learning of novelty and exploitative learning of usefulness. Moreover, these teams are inclined to have the most conspicuous characteristics of ambidextrous learning (Mueller et al. 2012), which involve potential advantages that improve the performance of a particular task. These teams may therefore perceive exploitative routines and processes as relevant to the task at hand and, as a result, may come up with more useful ideas and determine if these useful ideas will support creative ideas (cf., McCarthy et al. 2018). Therefore, when an international R&D team's level of UA is higher than that of the culture of the region where the team operates, the relationship

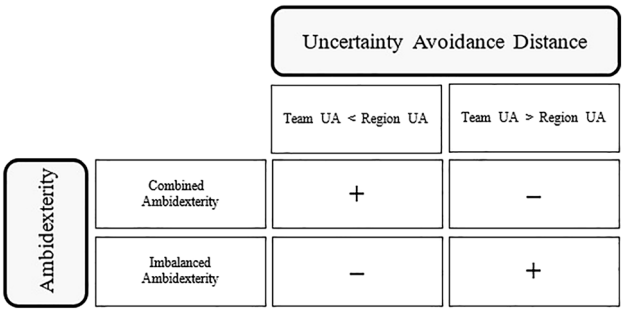

Fig. 1 The effects of the interplay between ambidexterity dimensions and team-environment gaps on MNE performance

between imbalanced ambidextrous knowledge sharing and MNE performance is positive:

> Hypothesis 4b: *When the international R&D team has a higher uncertainty avoidance than that of the region where it operates, greater imbalanced ambidexterity in virtual knowledge sharing is positively associated with MNE performance.*

Figure 1 illustrates these contingencies. Specifically, companies that balance and integrate exploration and exploitation tend to hire R&D team members whose UA orientation is lower than that of the culture of the region where the unit operates. In contrast, companies with a greater exploration–exploitation imbalance would be better served by hiring people with a higher UA orientation than that of the region.

3 Methods

3.1 Empirical Context

We examine our hypotheses using data from a sample of Chinese MNEs. The Chinese context is particularly suitable for an empirical assessment of ambidextrous knowledge-sharing hypotheses of international R&D teams for several reasons. First, the Chinese government establishes policies, such as the Thousand Talents Plan, that proactively encourage Chinese firms' R&D activities by attracting R&D personnel and scientific scholars from across the globe.[3] Second, China is one of the largest countries in terms of FDI inflows and outflows (Gaur et al. 2018). According to the United Nations Conference on Trade and Development (UNCTAD 2018), the

[3] The Thousand Talents Plan/Program was established in 2008 by the central government of China to recognize and recruit leading international experts in scientific research, innovation, and entrepreneurship (Jia 2018).

foreign direct investment (FDI) inflows into China reached $144 billion in 2017, and the FDI outflows reached $183.1 billion in 2016 (UNCTAD 2017). Third, during the last several decades, MNEs from China have increasingly hired foreign engineers and R&D personnel, and China has gradually become a 'hot spot' for R&D and innovation activities (Luo and Tung 2007, 2018). Therefore, China provides an ideal empirical context to test our hypotheses.

Also, prior literature has mainly concentrated on cultural differences at the national level while inherently speculating within-country cultural homogeneity (Shenkar 2001; Tung 2008). This research has been proven delusive as other researches have described the presence of within-country cultural heterogeneity (Kwon 2012; Tung et al. 2008). As a particular example, the subnational regions of China, the largest emerging economy in the world both economically and geographically, has a long history of lingual, cultural, and institutional barriers among different provinces/municipalities, e.g., even between major cities such as Beijing and Shanghai. Chinese MNEs located in each of these subnational regions have no choice but to be influenced by these different norms and cultures, which also affect innovation projects in these globalized organizations (Miao et al. 2016). Hence, the subnational regional culture of China is the perfect context for this study.

3.2 Sample and Data Collection

To test our hypotheses, we used a sample of 4037 teams operating in 1468 MNEs in 24 regions (provinces/municipalities) of China that undertook outward FDI. We formulated the questionnaire for the survey based on previous ambidextrous knowledge-sharing literature (Im and Rai 2008; Lee et al. 2010, 2014), especially those concerning an explorative and exploitative innovation orientation (Cao et al. 2009; He and Wong 2004). However, our construct of ambidextrous virtual knowledge sharing is based on the R&D teams' ambidextrous knowledge sharing, which has not previously been empirically examined. Therefore, we developed a questionnaire as an extension to the literature on individual- and team-level ambidexterity (Huang and Cummings 2011; Mom et al. 2009).

Next, prior research (e.g., Hoskisson et al. 2000) suggests that in emerging markets such as China, cooperation with local entities provides a critical means of acquiring valid, reliable information and data. Thus, together with the support of our academic networks of 14 Chinese universities, we hired a leading survey institution with a team of 35 professionally trained staff members to conduct a massive survey of top management team members who took charge of international R&D teams within their MNEs in China during the years 2013 and 2015. We developed our questionnaire in English first, then translated it into Chinese, and finally back-translated it into English to ensure the validity of the translation (Li and Atuahene-Gima 2001). The initial survey targeted a total of 4457 teams in 1593 Chinese MNEs from 24 regions (provinces/municipalities) that undertook outward FDI and that were included in at least one of our four major secondary data sources: the China Stock Market & Accounting Research (CSMAR) Database, the Annual Industrial Survey Database (compiled by the National Bureau of Statistics of China), publications of

the National Economic Research Institute (NERI), and company annual reports.[4] We supplemented the secondary data sources with additional information obtained by searching company web pages.

We pretested the questionnaire in five in-depth pilot interviews with three chief executive officers (CEOs) and three chief technology officers (CTOs). Based on feedback from these pilot interviews, we modified the questionnaire by removing questions that were unclear and erroneous to the respondents (see more details in the subsection on independent variables). We identified CEOs, CTOs, or other senior managers who could confirm the virtual and traditional ambidextrous knowledge sharing within their international R&D teams, and then we interviewed them regarding which of their R&D teams led main R&D project tasks related to innovation activities. We asked them to choose their major R&D teams, then answer a set of questions for each team in face-to-face and/or phone interviews with the assistance of a structured questionnaire. Our final collection of complete usable questionnaires with no missing values or unclear answers resulted in our sample of 4037 teams in 1468 MNEs. Thus, the final response rate was 91%.

Following the procedures used by prior researchers (e.g., Kanuk and Berenson 1975), we evaluated the potential nonresponse bias by checking differences between early and late respondents and found it to be insignificantly correlated with both the size and the age of the organization, indicating a minimal nonresponse bias concern (Combs and Ketchen 1999). In addition, we also cross-checked the final results with a sample of questionnaire surveys of R&D team leaders in those MNEs for which we found qualitatively equivalent results. Finally, to avoid potential common-method bias, we used different data sources for independent, moderating, and dependent variables, respectively.

Additionally, there is a lag effect for our independent variables since our independent variables were collected in the years of 2013 through 2015, while our dependent variable was measured by the fiscal year of 2016. Table 1 shows the descriptive statistics of the distribution of team members' nationality.

3.3 Measures

3.3.1 Dependent Variable

As our dependent variable, we used *firm profitability* to measure of MNE performance. Firm profitability was operationalized as the net profit divided by the organizational size (i.e., the total number of employees) for the fiscal year 2015 (D'Souza and Megginson 1999; Gibbs et al. 2004). This is a suitable performance measure in our empirical context because profit per employee denotes organizational operating efficiency for firms' capitalization of their international human capital practices (Kim et al. 2015) as well as the firm's financial performance in the market. To check the robustness of our proxy of organizational performance,

[4] Scholars (e.g., Qian et al. 2017; Yan and Chang 2018) have used these data sources frequently in previous studies on Chinese firms.

Table 1 Descriptive statistics for the distribution of team members' nationality

Country of nationality	Team member number	Percent (%)
China	44,138	80.49
USA	1884	3.44
Japan	1521	2.77
Korea	1203	2.19
Singapore	1167	2.13
Taiwan	1117	2.04
UK	454	0.83
Germany	392	0.71
Hong Kong	267	0.49
Netherlands	261	0.48
France	258	0.47
Canada	243	0.44
Australia	202	0.37
Malaysia	171	0.31
Italy	161	0.29
India	152	0.28
Croatia	127	0.23
Spain	121	0.22
Denmark	119	0.22
Philippines	107	0.20
Sweden	96	0.18
Thailand	94	0.17
Brazil	89	0.16
Russia	88	0.16
Luxembourg	84	0.15
Austria	76	0.14
Indonesia	67	0.12
Others	178	0.32
Total	54,837	100.00

we used Tobin's *q,* which is defined as the ratio of the market value of a firm's assets to their replacement value (Tobin 1969), *workforce productivity* measured by dividing the net sales for fiscal year 2015 by the total number of employees (Shaw et al. 2013), as well as the *net income*. However, the results remained qualitatively unchanged.

3.3.2 Independent Variables

3.3.2.1 Explorative and Exploitative Virtual Knowledge Sharing Because a suitable scale at the team level was not available in previous studies, we constructed

our own scales to measure an international R&D team's ambidextrous knowledge sharing. International R&D teams' organizational ambidextrous knowledge sharing is a combinatory construct of explorative and exploitative knowledge sharing within R&D teams. We divided this knowledge sharing into virtual and traditional knowledge sharing based on whether team member communications occur within offline or online interfaces.[5] Given the focus of our study, we employed explorative and exploitative virtual knowledge sharing as an independent variable to test our hypotheses, but we also controlled for the explorative and exploitative traditional knowledge sharing counterparts. The international team members can be located in the same or different offices, building(s), city(-ies), subnational region(s), or country(-ies). We constructed scales to measure firm- or business group-level ambidextrous knowledge sharing (Im and Rai 2008; Lee et al. 2010, 2014) by integrating applied measures of explorative and exploitative activities (Cao et al. 2009; He and Wong 2004). Following this existing practice, we began by developing measures for virtual ways of sharing explorative and exploitative knowledge versus traditional ways of sharing explorative and exploitative knowledge at the team level of analysis.

The following steps were taken to develop the surveys and collect the data. First, by applying the concept of ambidextrous knowledge sharing at the team level of analysis, we developed four items of explorative virtual knowledge sharing, five items of exploitative virtual knowledge sharing, four items of explorative traditional knowledge sharing, and five items of exploitative traditional knowledge sharing. In order to improve the content validity, these items were developed as an extension of the literature on rare individual- and team-level ambidexterity (Huang and Cummings 2011; Mom et al. 2009) categorizing managers' and knowledge-intensive teams' ambidextrous behaviors/activities in terms of exploration and exploitation (Cao et al. 2009; He and Wong 2004). Second, to improve the content validity and lingual expressions of the items, five in-depth interviews were conducted with senior managers who led their international R&D teams at the headquarters of five Chinese MNEs. Those senior managers were requested to fill out our questionnaire to indicate whether our items were relevant and whether there was any unclear wording concerning each item. We further improved the subject matters and lingual expressions for our items, grounded in those in-depth interviews, which resulted in the final trial version of our questionnaire for this survey. Third, to ensure the reliability, unidimensionality, and convergent and discriminant validities of explorative and exploitative virtual versus traditional knowledge sharing scales, we tested the scales on a sample of 17 senior managers who led their international R&D teams at five Chinese MNEs. After analyzing reliability and validity, we identified six unclear items among the explorative and

[5] When we conducted the surveys for this study, we also included brief but clear explanations for the respondents. For example, we explained that our meaning of virtual knowledge sharing is the context of digitalization and recent advances in communication technologies, such as smartphones, tablet personal computers (PCs), laptop computers, etc., and social media, such as messengers, social networking services (SNS), etc. Meanwhile, our meaning of traditional knowledge sharing is focused on co-located face-to-face knowledge sharing and paper documents, but not including other types of traditional but non-co-located knowledge sharing methods, such as a fax machine and postage.

exploitative virtual versus traditional knowledge sharing items. We requested that our senior management interviewees at the five Chinese MNEs propose enhancements for the unclear items that had been recognized in the prior round. Using those subsequent interviews, we created the final version of our scales by integrating the improved items' wording and phrasing.

We used a 7-point Likert scale when collecting responses from the CEOs, CTOs, or other senior managers responsible for R&D teams to assess the degree to which the 18 different items included in the questionnaire were true regarding their engagement in knowledge sharing-related activities in their organization over the past year.

To check convergent and discriminant validity, we conducted exploratory and confirmatory factor analyses (EFAs and CFAs). According to our survey data, the EFA with the Varimax rotation for all 18 different items showed that four compiled scales were constructed: (1) four items pertaining to the international R&D teams' explorative virtual knowledge sharing, (2) five items pertaining to the international R&D teams' exploitative virtual knowledge sharing, (3) four items relating to the international R&D teams' explorative traditional knowledge sharing, and (4) five of the items relating to the international R&D teams' exploitative traditional knowledge sharing (see the list of all items in Table 2). Eigenvalues for each factor were greater than 1.36, and all items were loaded on their suitable factors at greater than 0.62. The Cronbach's alpha for all four scales were generally close to or above 0.70, the commonly accepted cut-off point (Peterson 1994); the Cronbach alphas for each of the four variables are (1) 0.88, (2) 0.84, (3) 0.85, and (4) 0.90, respectively. Next, we employed a CFA of 18 items to check for the discriminant validity of the constructs. Specifically, we compared the proposed four-factor model (including international R&D teams' explorative and exploitative virtual versus traditional knowledge sharing) to alternative models. Absolute fit indexes for the proposed four-factor model were adequate ($\chi^2 = 491.85$, df = 119, $p < 0.001$, $\chi^2/df = 4.13$, GFI = 0.92, CFI = 0.95, IFI = 0.947, RMSEA = 0.06) (Malhotra 2010), and these fit indices were superior to alternative models, giving evidence of discriminant validity (Andrews 1984). Also, no items were deleted because all items loaded significantly ($p < 0.001$) as expected, and all of the proposed model items in these four constructs have highly significant standardized loadings. These results indicate that the four-factor model provided a better fit with the data than its plausible rival specifications did (Fornell and Larker 1981). In addition, we assessed composite reliability (CR) and average variance extracted (AVE), and the results were that all constructs exceeded their standard value (CR > 0.50; AVE > 0.70), and every measured item was found to be confirmed to possess CR (Hair et al. 2005). When the value of AVE for each factor is greater than the square value of two factors' coefficients, that may indicate discriminant validity; however, every factor's AVE exceeded the square value of the correlation coefficient, which confirms the discriminant validity of the data in the present study.

3.3.2.2 Agglomeration Each of the independent variables in our model represents the firm's characteristics, but we used team-level ratings of these characteristics. To justify the aggregation and to use these team-level data as a measure of within-

Table 2 Exploratory factor analysis for international R&D teams' ambidexterity

Measurement items[a]	Factors[b]			
	1	2	3	4
To what extent did your major international R&D team performing the most important R&D project, last year, engage in knowledge-sharing related activities within your team that can be characterized as follows:				
International R&D team's explorative virtual knowledge-sharing activities (Cronbach α = 0.88)				
Your team's electronic devices-mediated exchanges of ideas/know-hows in various locations to search for new possibilities with next generations of products	0.24	0.21	*0.85*	0.07
Your team's electronic devices-mediated exchanges of ideas/know-hows in multinational locations to evaluate diverse options with opening up new product/service markets	0.31	0.19	*0.84*	0.08
Your team's electronic devices-mediated communication in geographically dispersed locations to focus on strong renewal of products/services or processes	0.30	0.16	*0.86*	0.08
Your team's electronic devices-mediated exchanges of ideas/know-hows in diverse locations with respect to researching basic or fundamental technologies	0.20	0.15	*0.83*	0.06
International R&D team's exploitative virtual knowledge-sharing activities (Cronbach α = 0.84)				
Your team's electronic devices-mediated knowledge-sharing activities in multinational locations which your team carries out as if they were routine	−0.08	0.30	0.30	0.63
Your team's electronic devices-mediated knowledge-sharing activities in diverse locations which serve existing customers with existing services/products	0.35	−0.05	0.16	0.72
Your team's electronic devices-mediated knowledge-sharing activities in various locations of which it is clear to your team how to conduct them	0.37	0.35	0.02	0.66
Your team's electronic devices-mediated knowledge-sharing activities primarily focused on achieving short-term goals	0.08	0.25	0.38	0.64
Your team's electronic devices-mediated knowledge-sharing activities in different locations which your team can properly conduct by using your team's present knowledge	0.09	0.24	0.39	0.62
International R&D team's explorative traditional knowledge-sharing activities (Cronbach α = 0.85)				
Your team's face-to-face knowledge sharing with respect to introducing next generations of products	−0.10	*0.64*	0.38	0.41
Your team's face-to-face knowledge sharing to search for new possibilities with opening up new product markets	0.39	*0.62*	−0.02	0.43

Table 2 (continued)

Measurement items[a]	Factors[b]			
	1	2	3	4
Your team's face-to-face knowledge sharing to evaluate diverse options with respect to entering new technology fields with a long-term perspective	0.18	*0.91*	0.13	0.08
Your team's face-to-face knowledge sharing activities of extending product range (for example, through researching basic or fundamental technologies)	0.11	*0.85*	0.23	0.25
International R&D team's exploitative traditional knowledge-sharing activities (Cronbach $\alpha = 0.90$)				
Your team's face-to-face knowledge sharing activities with respect to improving existing product quality	*0.86*	0.14	0.17	0.21
Your team's face-to-face knowledge sharing activities which improve production flexibility	*0.89*	0.13	0.07	0.12
Your team's face-to-face knowledge sharing activities which reduce production cost	*0.90*	0.21	0.04	0.07
Your team's face-to-face knowledge sharing activities improve yield	*0.89*	0.28	0.09	0.06
Your team's face-to-face knowledge sharing activities reduce material consumption	*0.78*	0.25	0.15	0.15

All italics for Factor 1–3 are good

[a]Items are quoted from our survey. All items were measured on a seven-point scale (1 = to a very small extent to 7 = to a very large extent)

[b]Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization. Explained variance: 78.7%

organizational unit agreement and between-organizational unit differences (Gibson and Brikinshaw 2004), we tested the intraclass correlation coefficients using one-way ANOVA on the team-level data, with the organizational unit as the independent variable and the scale scores as the dependent variables. Analyses justified aggregation for all four independent variables. The ICC(1) and the ICC(2) for explorative virtual knowledge sharing were 0.20 and 0.72, while the ICC(1) and the ICC(2) for exploitative virtual knowledge sharing were 0.26 and 0.77; the ICC(1) and the ICC(2) for explorative traditional knowledge sharing were 0.23 and 0.73, and the ICC(1) and the ICC(2) for exploitative traditional knowledge sharing were 0.25 and 0.76. According to James's survey on publications (1982), ICC(1) has been reported as a range of 0.00 to 0.50, while ICC(2) is expected to exceed the 0.70 reliability convention (Stewart and Barrick 2000). Therefore, our results "indicat[e] that means for the sets of perceptions for each variable were accurate representations of the true score for the organizational unit" (Gibson and Brikinshaw 2004, p. 218).

3.3.2.3 Combined Ambidexterity in Virtual Knowledge Sharing As previously mentioned, combined ambidextrous knowledge sharing refers to international R&D teams' synergistic magnitudes of explorative and exploitative virtual versus traditional knowledge sharing. In such a case, high levels of explorative and exploitative knowledge sharing within R&D teams can complement and augment the performance-amplifying effect of the other. Thus, (1) we multiplied explorative and exploitative virtual knowledge sharing and (2) explorative and exploitative traditional knowledge sharing within R&D teams to operationalize combined ambidexterity. This method is consistent with previous studies (Cao et al. 2009; He and Wong 2004; Lee et al. 2010).

3.3.2.4 Imbalanced Ambidexterity in Virtual Knowledge Sharing Imbalanced ambidextrous knowledge sharing relates to the imbalance, or relative magnitudes, of explorative and exploitative virtual versus traditional knowledge sharing within R&D teams. To operationalize this variable, we followed prior studies' (Cao et al. 2009; He and Wong 2004) methods so that we calculated (1) the absolute difference between explorative and exploitative virtual knowledge sharing and (2) the absolute difference between explorative and exploitative traditional knowledge sharing within R&D teams.

3.3.2.5 The Cultural Gap Between the International R&D Team and the Subnational Region We relied on a combination of secondary data that describes the subnational regional cultural values in China and the nationalities of the R&D team members to operationalize the UA distance between the team and the region where the team operates. First, we used the data from Miao et al. (2016) study, which surveyed more than 25,000 Chinese managers of domestic Chinese firms operating in 26 regions of China during 2011 and 2013. Prior work has shown that China is very culturally diverse with distinct cultural regions (see Kwon 2012), and Miao et al. (2016) further advanced that line of thinking by providing cul-

tural value rankings for different Chinese regions, similar to what Hofstede did for national cultural rankings earlier (see Hofstede 1980a, 2001). Although Hofstede's framework has been criticized (Shenkar 2001), it remains the most influential framework, and scholars have confirmed its explanatory power (Drogendijk and Slangen 2006) and stability over time (Beugelsdijk et al. 2015). Following in Hofstede's footsteps, Miao and colleagues relied on Hofstede's (1980a) model and used the 1994 version of Hofstede's value survey module (Hofstede 1994) to collect the data.

After obtaining data that rate each Chinese region's UA orientation, we proceeded with operationalizing cultural orientations of the R&D teams in our MNE sample. With the help of the CEO, CTO, or other senior managers in each MNE in our sample, we collected data on nationality for 10,467 members of the R&D teams included in our study. Using the nationality as a proxy, we then made generalizations about individual cultural values of the people in our sample. Although this approach is prone to ecological fallacy (Jargowsky 2004; Thorndike 1939), the risk in our case was likely minimal.

Indeed, using a group (national) average to estimate individual traits could lead to mistakes, because within-country variations in culture tend to be rather substantial (Taras et al. 2016). A person's age, education, profession, and socioeconomic status can affect one's values and sway individual cultural orientations away from the national average. However, such deviations are likely to be systemic because all of these factors have a predictable and robust effect on one's values (Steel and Taras 2010). The members of the R&D teams in our sample were remarkably similar in terms of their education level (all had at least a college degree), socioeconomic status (similar salaries), age (most were between 30 and 45 years old), and professional background. Thus, although these team members may have developed personal values that differ from those of the countries where they grew up, the deviations were likely consistent as a consequence of a relatively high education level, upper-middle-class socioeconomic status, middle age, and professional background. Thus, although their cultural averages on UA could have been different from their national averages of their home countries, their relative cultural rankings likely were not greatly affected. We certainly recognize that this is a suboptimal approach to operationalizing individual cultural values, but these are the best data we could obtain for the study, and our analysis indicates that the threat of ecological fallacy is rather low in our particular case.

To determine these deviations more specifically, we calculated the cultural distance between an international R&D team and the region where the team operates as the respective difference *between* the mean of R&D team members' nationality-based culture for each MNE *and* the culture of the subnational region where their MNE is located. For example, to operationalize the distance between a team's UA and its located region's UA, if MNE A has six R&D team members and three come from China (UA = 30), two from South Korea (UA = 85), and one from the US (UA = 46) (Hofstede 2001, 2018), the team's UA is calculated as the mean of $3 \times 30 + 2 \times 85 + 1 \times 46 = (90 + 170 + 46)/6 = 51$. If that MNE is located in the Sichuan province [Sichuan's UA score is 31, according to Miao et al.'s (2016)

Table 3 Scores of 24 regional culture dimensions in China

Region		Power distance	Individualism	Masculinity	Uncertainty avoidance
1	Anhui	29	71	21	43
2	Beijing	−5	82	54	79
3	Fujian	61	18	49	73
4	Gansu	50	3	135	45
5	Guangdong	3	69	43	58
6	Guizhou	44	19	132	50
7	Hainan	2	67	41	56
8	Hebei	−12	79	52	74
9	Heilongjiang	185	73	1	93
10	Henan	25	54	34	62
11	Hunan	21	74	15	61
12	Inner Mongolia	37	40	−1	76
13	Jiangsu	35	85	16	60
14	Jilin	14	81	39	63
15	Liaoning	−6	98	53	19
16	Qinghai	51	11	99	47
17	Shaanxi	43	20	131	49
18	Shandong	34	72	7	54
19	Shanghai	32	61	−5	64
20	Shanxi	18	70	−10	59
21	Sichuan	43	29	114	31
22	Tianjin	7	68	20	55
23	Tibet	46	31	113	34
24	Zhejiang	36	87	17	65

These scores are based on 25,172 respondents from 24 regions in mainland China (Miao et al. 2016)

study (see Table 3)], the distance between the R&D team UA and regional UA is $|51-31|=20$.[6]

To explicitly allow for a difference in the effect of lower versus higher distances in R&D teams' UA and the UA of the regions where the teams operate, we split the UA distance variable into two: *higher* UA distance $=y_{\text{Team-UA}}-y_{\text{Region-UA}}$ if $y_{\text{Team-UA}}\geq y_{\text{Region-UA}}$ and $=0$ if $y_{\text{Team-UA}}<y_{\text{Region-UA}}$ and *lower* UA distance $=y_{\text{Region-UA}}-y_{\text{Team-UA}}$ if $y_{\text{Region-UA}}\geq y_{\text{Team-UA}}$ and $=0$ if $y_{\text{Region-UA}}<y_{\text{Team-UA}}$. The former is equivalent to (distance between team UA and regional UA × dummy of 1 if team UA is *higher* than regional UA), and the latter is (distance between team UA and regional UA × dummy of 1 if team UA is *lower* than regional UA). This

[6] Following Huang and Cummings (2011), we measured team-level cultural distance (i.e., cultural distance among team members in a single team) using Hofstede's country-level four cultural dimensions (i.e., power distance, individualism, masculinity, and uncertainty avoidance).

method is consistent with Tsang and Yip's (2007) study, which empirically tested economic distance with a holistic view, and they operationalized higher versus lower economic distance based on the same method as ours.

3.3.3 Control Variables

As our control variables, we included organization size and age, state-owned enterprise dummy, region's growth domestic product (GDP) per capita, and region and industry dummies, together with the traditional knowledge sharing variables. A larger, older organization may have abundant tangible and intangible resources as well as accumulated learning experiences, slack resources and experiential learning effects that may enhance its performance. *Organization size* was measured as the logarithm of number of employees, and *organization age* was measured by the number of years since the organization's establishment (Chung et al. 2015). Being a state-owned enterprise can give an organization institutional benefits due to robust support by the Chinese government or the communist party, which may also increase the organization's performance. A *state-owned enterprise* dummy was assigned as 1 if an organization is a state-owned enterprise, 0 otherwise (Chung et al. 2016). Larger subnational region markets have more business opportunities domestically, another factor that may enhance an organization's performance. Hence, we included the region's GDP per capita, which was measured by the logarithm of each province/municipality's GDP per capita. Because the Chinese economy is unevenly developed across different regions (Nee and Cao 2005), we controlled for the organization's geographic locations using *region dummies*. We also included industry dummies using the two-digit standard industry code to account for the potential impact of unobserved differences in capital intensity or competition associated with different industrial characteristics on organizational performance (Song and Lee 2017).

4 Results

Table 4 reports the descriptive statistics and correlation matrix among all hypothesized and control variables. No correlation coefficient is above the 0.65 threshold, indicating that our estimations are not likely to be biased by multicollinearity (Tabachnick and Fidell 1996). To diagnose any potential multicollinearity among variables, we also checked the variance inflation factor (VIF) for each variable. A VIF above 10 is indicative of a multicollinearity problem (Menard 1995). Our results show that the VIFs associated with our independent variables did not exceed 1.92, and we concluded that our sample is devoid of multicollinearity problems.

We used the OLS regression to investigate our hypotheses and the holistic moderation method (Tsang and Yip 2007). To test our interaction hypotheses, we split the distance between the team's UA and regional UA orientation into lower versus higher UA. Table 5 presents the results of these analyses.

Model 1 (Table 5) includes only the control variables. Explorative traditional knowledge sharing is negatively and significantly associated with financial performance ($\beta = -0.174$, $p = 0.018$). By contrast, exploitative traditional knowledge

Table 4 Descriptive statistics and Pearson correlation matrix

Variable		Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Financial performance	0.06	0.24	1																
2	Explorative virtual KS[a]	4.95	1.29	0.09	1															
3	Exploitative virtual KS[a]	5.16	1.14	0.22	0.39	1														
4	Combined virtual KS[a]	26.23	9.91	0.14	0.48	0.40	1													
5	Imbalanced virtual KS[a]	1.01	0.74	−0.12	−0.30	−0.03	−0.10	1												
6	UA distance[b]	26.05	11.94	0.04	0.02	0.03	−0.01	−0.01	1											
7	Explorative traditional KS[a]	4.33	1.44	−0.09	−0.35	−0.42	−0.23	0.12	−0.13	1										
8	Exploitative traditional KS[a]	4.18	1.56	0.08	0.34	0.24	0.25	−0.22	0.03	0.37	1									
9	Combined traditional KS[a]	23.76	10.56	0.15	0.27	0.33	0.31	0.00	0.19	0.47	0.39	1								
10	Imbalanced of traditional KS[a,c]	1.46	1.08	−0.06	−0.16	−0.17	−0.15	0.14	−0.02	−0.31	−0.31	−0.11	1							

Table 4 (continued)

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
11 PD distance[c]	45.20	23.79	−0.07	−0.03	−0.04	−0.03	−0.03	0.04	0.00	−0.04	−0.04	−0.03	1						
12 IDV distance[d]	57.98	12.48	−0.11	0.01	−0.14	−0.06	−0.02	0.02	−0.01	−0.05	−0.03	−0.00	0.18	1					
13 MSC distance[e]	22.19	12.92	0.09	0.04	0.02	0.03	−0.07	−0.03	0.01	0.01	0.02	−0.06	−0.50	−0.34	1				
14 Organization size	7.34	0.94	0.04	0.00	−0.02	−0.01	−0.01	−0.04	−0.04	−0.04	−0.04	−0.05	−0.42	0.04	0.08	1			
15 Organization age	18.25	17.94	0.01	0.02	0.00	0.01	−0.00	0.07	0.00	0.01	−0.01	0.04	0.03	0.02	−0.17	0.06	1		
16 State-owned enterprise	0.29	0.45	−0.08	0.02	−0.08	−0.03	−0.03	0.01	−0.02	−0.07	−0.03	0.02	0.29	0.03	−0.03	0.04	−0.05	1	
17 Region GDP per capita	1.51	0.62	0.08	0.01	0.03	0.02	0.00	−0.02	0.11	0.10	0.13	−0.04	0.04	−0.20	0.25	−0.40	0.01	0.28	1

Coefficients above 0.054 and below −0.054 are significant at $p < 0.05$, and those above 0.066 and below −0.066 are significant at $p < 0.01$ (two-tailed significance levels)

[a]KS refers to knowledge sharing

[b]UA refers to uncertainty avoidance

[c]PD refers to power distance

[d]IDV refers to individualism

[e]MSC refers to masculinity

Table 5 Regression for net profit per employees of Chinese MNEs

Variables; DV = net profit per employees	Hypotheses	Model 1			Model 2			Model 3			Model 4		
		Beta	SE	Sig	Beta	SE	Sig	Beta	SE	Sig	Beta	SE	Sig
Explorative virtual knowledge sharing within international R&D team					0.054	0.006	0.084	0.351	0.017	0.000	0.368	0.017	0.000
Exploitative virtual knowledge sharing within international R&D team					0.210	0.007	0.000	0.175	0.018	0.043	0.117	0.018	0.163
Combined ambidextrous virtual knowledge sharing	H1							0.577	0.004	0.000	0.608	0.004	0.000
Imbalanced ambidextrous virtual knowledge sharing	H2							−0.160	0.011	0.000	−0.092	0.013	0.022
Distance between team uncertainty avoidance and regional uncertainty avoidance					0.023	0.001	0.583	0.067	0.001	0.185	0.028	0.001	0.678
Combined ambidextrous virtual KS x Lower UA distance (Team UA < Region UA)	H3A										0.035	0.001	0.527
Combined ambidextrous virtual KS x Higher UA distance (Team UA > Region UA)	H3B										−0.118	0.001	0.059
Imbalanced ambidextrous virtual KS x Lower UA distance (Team UA < Region UA)	H4A										−0.146	0.014	0.000
Imbalanced ambidextrous virtual KS x Higher UA distance (Team UA > Region UA)	H4B										0.137	0.014	0.002
Explorative traditional knowledge sharing within international R&D team		−0.174	0.012	0.018	−0.172	0.012	0.019	−0.116	0.012	0.123	−0.130	0.012	0.084
Exploitative traditional knowledge sharing within international R&D team		0.002	0.005	0.961	0.001	0.005	0.979	0.000	0.005	0.998	0.004	0.005	0.903
Combined ambidextrous traditional knowledge sharing		0.290	0.001	0.000	0.177	0.001	0.002	0.103	0.001	0.089	0.104	0.001	0.083
Imbalanced ambidextrous traditional knowledge sharing		−0.004	0.008	0.901	−0.070	0.008	0.052	−0.033	0.008	0.351	−0.038	0.008	0.294

Table 5 (continued)

Variables; DV = net profit per employees	Hypotheses	Model 1			Model 2			Model 3			Model 4		
		Beta	SE	Sig	Beta	SE	Sig	Beta	SE	Sig	Beta	SE	Sig
Distance between team power distance and regional power distance		−0.099	0.001	0.002	−0.039	0.001	0.533	−0.059	0.001	0.068	−0.080	0.001	0.223
Distance between team individualism and regional individualism		−0.118	0.001	0.001	−0.059	0.001	0.073	−0.079	0.001	0.022	−0.099	0.001	0.021
Distance between team masculinity and regional masculinity		0.075	0.000	0.035	0.143	0.001	0.001	0.059	0.000	0.093	0.147	0.001	0.001
Organization size (logarithm of employee number)		0.032	0.010	0.405	0.011	0.010	0.783	0.002	0.010	0.964	0.019	0.010	0.618
Organization age		0.014	0.000	0.592	0.013	0.000	0.615	0.003	0.000	0.922	0.005	0.000	0.858
State-owned enterprise		−0.063	0.017	0.044	−0.057	0.017	0.071	−0.056	0.016	0.071	−0.046	0.016	0.140
Region's GDP per capita		0.080	0.014	0.033	0.073	0.015	0.064	0.049	0.015	0.194	0.084	0.016	0.041
Region dummies		Included			Included			Included			Included		
Industry dummies		Included			Included			Included			Included		
N		1468			1468			1468			1468		
R^2		0.355			0.395			0.429			0.477		
Adjusted R^2		0.296			0.332			0.358			0.403		
Model F		9.478***			11.196***			12.865***			13.922***		

Standardized beta coefficients reported, and standard errors and t-statistics corrected by White's heteroskedastic consistent covariance matrix. All tests are two-tailed

KS knowledge sharing, *UA* to uncertainty avoidance

***$p < 0.001$

sharing is positively but insignificantly associated with financial performance ($\beta = 0.002$, $p = 0.961$). Combined ambidextrous traditional knowledge sharing is positively and significantly associated with financial performance ($\beta = 0.290$, $p = 0.000$), whereas imbalanced ambidextrous traditional knowledge sharing is negatively but insignificantly associated with financial performance ($\beta = -0.004$, $p = 0.901$). The distance between R&D team power distance and regional power distance, the distance between R&D team individualism and regional individualism, and state-owned enterprise dummy are negatively and significantly associated with financial performance. In contrast, the distance between R&D team masculinity and regional masculinity and the region's GDP per capita are positively and significantly associated with financial performance.

Model 2 adds the explorative and exploitative virtual knowledge sharing within international R&D teams and distance between R&D team UA and regional UA. Both explorative and exploitative virtual knowledge sharing within R&D teams are positively and significantly associated with financial performance. However, the beta coefficient of explorative virtual knowledge sharing ($\beta = 0.054$, $p = 0.084$) is much smaller and less significant than that of exploitative virtual knowledge sharing ($\beta = 0.210$, $p = 0.000$), indicating a stronger positive impact of exploitative virtual knowledge sharing on short-term performance. Combined ambidextrous traditional knowledge sharing within R&D teams is positively and significantly associated with financial performance. In contrast, imbalanced ambidextrous traditional knowledge sharing is negatively and significantly associated with the financial performance, although the beta coefficient of combined ambidexterity ($\beta = 0.177$, $p = 0.002$) is larger and more significant than that of imbalanced ambidexterity ($\beta = -0.070$, $p = 0.052$), suggesting a stronger impact of the former.

Model 3 adds combined and imbalanced ambidexterity in virtual knowledge sharing within R&D teams. Unlike the results of combined and imbalanced ambidextrous traditional knowledge sharing, combined ambidexterity in virtual knowledge sharing is positively and significantly associated with financial performance ($\beta = 0.577$, $p = 0.000$). By contrast, imbalanced ambidexterity in virtual knowledge sharing is negatively and significantly associated with financial performance ($\beta = -0.160$, $p = 0.000$). These results strongly support hypothesis 1 and hypothesis 2.

Finally, Model 4 is the full model in which all the variables of the main effects and interaction terms, as well as control variables, are included. To test Model 4, we followed the analytical method of Tsang and Yip (2007) of lower versus higher distance; namely, we split the distance between R&D team UA and regional UA into lower UA distance (Team UA < Region UA) and higher UA distance (Team UA > Region UA). Then, we tested the interaction effects of combined and imbalanced ambidexterity in virtual knowledge sharing and lower versus higher UA distance. This allowed us to assess four interaction terms. The interaction term between combined ambidexterity in virtual knowledge sharing and lower UA distance is positive but insignificant ($\beta = 0.035$, $p = 0.527$). The interaction term between combined ambidexterity in virtual knowledge sharing and higher UA distance is negative and significant ($\beta = -0.118$, $p = 0.059$). These results reject hypothesis 3a but support hypothesis 3b. Model 4 also shows that the interaction term between imbalanced

ambidexterity in virtual knowledge sharing and lower UA distance is negative and highly significant ($\beta = -0.146$, $p = 0.000$). By contrast, the interaction term between imbalanced ambidexterity in virtual knowledge-sharing and higher UA distance is positive and highly significant ($\beta = 0.137$, $p = 0.002$). These results strongly support hypothesis 4a and hypothesis 4b.

5 Discussion

Ambidexterity has received much attention from researchers, and recent research has begun to investigate the nature of ambidexterity itself by suggesting two distinctive types of ambidexterity (Cao et al. 2009; He and Wong 2004): combined ambidexterity, which focuses on the degree of the interaction between exploration and exploitation, and imbalanced ambidexterity, which focuses on estimating the absolute amount of difference of efforts that a firm spends for exploration and exploitation, respectively. From academic and practical perspectives, we consider that this investigation of the nature of ambidexterity can show significant and meaningful progress, and we suggest further pursuing an understanding of this issue by investigating the influence of cultural aspects on ambidexterity. The results of our investigation suggest the following:

First, although combined ambidexterity enhances employee performance, imbalanced ambidexterity negatively affects employee performance. By using team-level data, we find that these relationships are consistent with implications from previous studies (Cao et al. 2009; He and Wong 2004) even in the context of virtual knowledge, thus linking the micro- and macro-level of ambidexterity. Second, even the same cultural situations differently influence distinctive types of ambidexterity. The R&D team having a higher UA level than the region negatively moderates the association between combined ambidexterity and firm performance (hypothesis 3b), and it positively moderates the association between imbalanced ambidexterity and firm performance (hypothesis 4b). Although hypothesis 3a fails to achieve empirical support, because hypothesis 4a is supported, we believe this finding holds important implications for managers of R&D teams because it shows that cultural situations matter.

This study makes several contributions to the literature. First, to date, there have been only two studies on individual- and team-level ambidexterity. At the individual level, Mom et al. (2009), drawing on a sample of 716 managers from five large firms among the top 25 of the Fortune Global 500, studied how different types and combinations of coordination mechanism relate to variation in managers' ambidexterity. At the team level, Huang and Cummings (2011), with a sample of 177 knowledge-intensive teams in a multinational food company, found that the negative relationship between centralized critical knowledge structures and team performance is exacerbated when critical knowledge shared within the team is explorative rather than exploitative. However, these studies do not address the degree to which ambidexterity concerns the combined magnitude of explorative and exploitative activities or matching the magnitude of both activities on a relatively imbalanced basis. Based on a sample of 4037 international R&D teams from 1468 emerging-market MNEs

(here, Chinese MNEs), we fill this gap in the literature by comprising two distinct but related dimensions—one pertaining to combined ambidexterity in virtual knowledge sharing and the other pertaining to imbalanced ambidexterity in virtual knowledge sharing of international R&D teams.

Second, we contribute to the literature on ambidextrous knowledge sharing (Im and Rai 2008; Lee et al. 2010, 2014). Previous studies have generally dealt with explorative and exploitative knowledge sharing separately but have not conceptually clarified the construct of ambidextrous knowledge sharing, nor have they investigated the combined and imbalanced dimensions of ambidextrous knowledge sharing. We further contribute to this stream of the literature by focusing on virtual knowledge sharing, which, as previously mentioned, is increasingly common in most workplaces (Klitmøller and Lauring 2013; Voelpel et al. 2005). Compared to traditional knowledge sharing, virtual knowledge sharing has some specific characteristics, both in terms of advantages and disadvantages (Jiménez et al. 2017), which make it distinct and worthy of study.

Third, we tested the main and interaction effects of cultural distance between the international R&D team and the region where the R&D team is located. This is a meaningful construct that, to the best of our knowledge, no study has conceptually or empirically investigated to date. In the previous literature on innovation, scholars have emphasized the importance of UA (Amabile 1988, 1996; Choi et al. 2019; O'Connor et al. 2008; Scott and Bruce 1994), and our article contributes to this field by focusing on the moderating effect of the UA distance between an R&D team and the region where the R&D team is located.

5.1 Implications for Practice

Based on our findings and conceptual contributions, our study has four practical implications. First, in the competitive innovation scene worldwide, R&D activities are becoming increasingly performed by international R&D teams in which team members come from different ethnic, cultural, and national backgrounds, and in which their moderating roles may connect their innovation performances under different cultural environments. Because innovation is correlated with the innovation entities in the surrounding environment, our comparison of international R&D team culture and the culture of the subnational region where teams are located can be meaningful and insightful to MNE senior managers.

Second, ambidextrous virtual knowledge sharing within international R&D teams occurs when team members use electronic devices and other ICT platforms to exchange ideas and know-how with each other, whereas traditional ambidextrous knowledge occurs when team members interact with each other in face-to-face knowledge exchanges within R&D teams. Traditionally, managers have valued face-to-face knowledge exchanges among team members, but in the modern era of ICT ecosystems, ambidextrous virtual knowledge sharing has become increasingly critical for international R&D teams. Senior managers who take charge of international R&D teams should keep in mind the usefulness of virtual environments when they pursue the optimal efficiency of ambidextrous knowledge sharing within their team.

Third, our context is China and Chinese MNEs, where and which our research could be especially useful. These days Chinese central leadership has led via 'mass entrepreneurship and innovation policy', referring to the fact that "the Chinese government is determined to innovate its institutional mechanisms to facilitate mass entrepreneurship and innovation," and the government "aims at creating a better environment for fair competition, deepening business system reforms, strengthening intellectual property protection and establishing a mechanism for the training and hiring of talented professionals" and innovations (*China* Daily 2016). Hence, our study of Chinese MNEs' international R&D teams and their surrounding subnational regional cultures is in line with the present Chinese government's policy, so this study may allow Chinese policymakers to understand effective ways to operate international R&D teams of Chinese MNEs and to leverage the cultural differences between R&D teams and subnational regions where R&D teams are located.

Finally, the Chinese central government has created national programs for attracting international R&D teams and innovation experts and scientists, including both Chinese and foreigners who live overseas, through the Thousand Talents Plan (Jia 2018). Some experts have mentioned that this program needs to be improved because the performance has not been fruitful. Our study should also be of interest to Chinese policymakers, providing insight on how to develop national programs that fund search and recruitment to spur innovation in and from China.

5.2 Limitations and Implications for Future Research

Our study contributes to the existing literature in the field of international business and human resource management, but it has some limitations that open up opportunities for future research. First, our data are only for international R&D teams in Chinese MNEs, so we do not know studying other types of Chinese MNE teams would reveal differences. For example, human resources teams in a personnel department can have different characteristics than R&D teams because they are less likely to have ambidexterity particularity. Our concept of combined and imbalanced explorative and exploitative virtual knowledge sharing within the international R&D team can be interpreted and applied in different ways. Future research should conceptually and empirically apply our comparative study from international R&D teams to other types of teams.

Second, when we compare team culture and regional culture, we omit other dimensions of culture—for example, individualism–collectivism, power distance, masculinity, long-term orientation, and so on—because we have chosen to focus on UA, the element of culture that is most highly related to innovation and R&D. However, other cultural dimensions could be related to international R&D teams' ambidexterity, so future researchers should test the moderating role of these cultural dimensions.

Third, Table 3 displays that the cultural differences between the 24 Chinese regions are great when it comes to power distance and masculinity, but they are less dissimilar when it comes to uncertainty avoidance. Thus, it is debatable whether it makes sense to assume measurable differences here. However, even country-level

UA values of Hofstede range between 23 and 96 (when we exclude six outliers) while our region-level UA values range between 19 and 79. This means that there is not much difference between Hofstede's UA and our regional UA values. Also, Hofstede's UA index is based on 50-year-old data. Thus, we assume that the gap between the minimum and maximum values of Hofstede's UA has been substantially reduced over time due to the 'global village' phenomenon and rapid digitalization and Industry 4.0. Therefore, we believe that the gaps between subnational UA values in China are still substantial enough to test our hypotheses.

Fourth, it is questionable whether it is difficult to derive our conclusions about individual cultural values from nationality in our measure of team culture. It is possible that a foreigner who has lived for a long time in China may have adapted to Chinese culture. However, in the context of this study, the foreigners we study are not just ordinary employees but rather a foreign team member on an international R&D team. If they have enough expertise in a certain area, these individuals may have a relatively high job flipping rate. They may frequently move not only between different companies but also between countries, depending on how much they are paid for their expertise. For example, in recent years, many Chinese companies have scouted capable R&D personnel from Samsung Electronics and LG Electronics and vice versa. This evidence may support our measurement of cultural values.

Fifth, in this study, we do not include the mean culture for a team and the variance/dispersion within a team's culture in our empirical analyses, but given that we have the data to do so, it would be worth including a team's mean culture and variance/dispersion within that culture as a subject for future analysis.

Sixth, our dependent variable is firm profitability as measured for the fiscal year 2015 or 2016, which is very close to the dates for the independent variables (2013–2015). It may not be reasonable to expect to find a measurable effect of ambidextrous knowledge sharing in R&D teams on net profit only 1 or 2 years later. More likely, we should assume that those teams are stable in terms of knowledge sharing over time and have completed the same activities as in previous years. This is a limitation that future research should address.[7]

Lastly, given the cross-sectional nature of our study, we cannot empirically explore how international R&D teams' ambidextrous knowledge sharing dimensions evolve. Hence, in future studies, researchers should investigate longitudinal panel data because a time trend may not be revealed through a cross-sectional study like ours.

6 Conclusion

In this study, we further develop previous studies of rare individual- and team-level ambidexterity research (Huang and Cummings 2011; Mom et al. 2009) to extend our understanding of the effects of ambidextrous knowledge sharing on the performance of employees, specifically related to the role of culture (i.e., UA) within international R&D teams of massive Chinese MNEs. In particular,

[7] We thank an anonymous reviewer for his/her insightful comment.

we focused on dual distinct but interrelated dimensions of ambidextrous virtual knowledge sharing within international R&D teams and the moderating role of lower versus higher UA distances. Dissimilar underlying mechanisms affect combined and imbalanced ambidexterity in virtual knowledge sharing within an international R&D team, further complicated by the relative difference between R&D team culture and the culture of the subnational region where the R&D team is located. Our empirical results generally support our conceptual arguments with the exception of one hypothesis regarding the interplay between combined ambidexterity in virtual knowledge-sharing and low UA distance (Team UA < Region UA). By empirically exploring our hypotheses, this study clarifies the conceptual ambiguity of different types of ambidextrous knowledge sharing within international R&D teams and the moderating role of culture on innovation and employee performance. Our study is particularly meaningful because it provides insight that would help with building these teams in MNEs and that would help policymakers of national governments create R&D ecosystems in their countries.

Funding This work was supported by Hankuk University of Foreign Studies Research Fund (0f 2020).

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