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How do intermediaries drive corporate innovation? A moderated mediating examination

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ABSTRACT

Although intermediaries frequently bridge knowledge gaps and enhance innovation searches as important sources of external knowledge, the mechanisms regarding how and when intermediaries become effective drivers of corporate innovation still remain indistinct. Using a sample of Chinese manufacturing firms, this study proposes and empirically tests a theoretical framework for understanding the effects of intermediaries on corporate innovation performance. The results of a moderated mediation analysis show that firms' ties to intermediaries can contribute to innovation by enhancing the scope of external innovation searches and reducing search costs. Absorptive capacity acts as a mediator in the relationship between intermediaries and innovation performance. Environmental munificence and complexity negatively moderate this mediation effect.

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1. Introduction

Firms rarely innovate by themselves and increasingly rely on external sources to strengthen and accelerate their internal innovation (Fritsch & Franke, 2004; Zeng, Xie, & Tam, 2010). Within this more complex realm, intermediaries have emerged and performed diverse tasks within the innovation process (Lichtenthaler, 2013). These intermediaries gather, develop, control, and disseminate knowledge in addition to collecting and dispensing financial, technical, and institutional resources (Colombo, Dell'Era, & Frattini, 2015). They are key players in the knowledge transfer among organizations and provide opportunities for mutual learning that may stimulate the creation of new knowledge while simultaneously contributing to an organization's innovation capability (Gassmann, Daiber, & Enkel, 2011). However, despite the potentially critical role of intermediaries in innovation as well as information or technology marketing, the mechanisms about how and when they become effective drivers of corporate innovation remain unclear.

This study aims to develop a better understanding of these mechanisms and the conditions under which the intermediaries could

efficiently and effectively influence corporate innovation performance. Specifically, this study answers three questions. First, do stronger ties with intermediaries actually lead to better innovation performance? Second, how can a firm convert its ties with intermediaries into a real improvement in innovation performance? Third, how does environmental heterogeneity influence the path from intermediaries to corporate innovation?

Next, Section 2 describes the theory and hypotheses development. Section 3 indicates the methodology and Section 4 provides the results. Sections 5 and 6 discuss the conclusions and limitations of the study, respectively.

2. Theory development and hypotheses

2.1. Ties with intermediaries and corporate innovation performance

Intermediaries for innovation refer to agents or brokers who are “helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding, and support for the innovation outcomes of such collaborations” (Howells, 2006; p. 720).

These intermediaries include technology service, accounting and financial service, law, talent search, and other such firms (Zhang & Li, 2010). They either gather, develop, control, and disseminate knowledge; or collect and disseminate financial, technical, and institutional resources (Stewart & Hyysalo, 2008). Consequently, these intermediaries often

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promote innovation by adapting the existing ideas, principles, and concepts from other industrial ambits (Tran, Hsuan, & Mahnke, 2011).

In the present knowledge economy, no firm can internally develop and commercialize all the existing knowledge across diverse functional and multidisciplinary domains (Caner & Tyler, 2015). Thus, external innovation searches become increasingly important. By connecting to intermediaries, firms can significantly improve their innovation performance. First, intermediaries broaden the scope of firms' external search. Since intermediaries sit at the intersection of firms, organizations, and industries, they maintain extensive networks with different parts of the socioeconomic system. This position advantage facilitates firms to utilize these networks, serving as an "entry ticket." Second, intermediaries reduce firms' external search costs. Given their extensive networks, intermediaries can process information more professionally and locate targets more rapidly. Firms that have close ties with intermediaries may source their requirements more quickly and thus enhance their capacity, speed, and flexibility in innovation-related activities (Zhang & Li, 2010).

In summary, innovating firms can benefit from broad external innovation. Therefore, the study presents that:

H1. Ties with intermediaries positively influence firms' innovation performance.

2.2. Mediating role of absorptive capacity

A major source of differences in profiting is absorptive capacity, which reflects a firm's ability to utilize external knowledge through the sequential processes of exploratory, transformative, and exploitative learning (Lane, Koka, & Pathak, 2006; Lichtenhaler, 2009). This definition denotes the ability to recognize, assimilate, and then commercialize the value of new knowledge. Thus, absorptive capacity is the mechanism that enables identifying and translating knowledge inflows from intermediaries into tangible benefits, as well as a means of achieving superior innovation (Kostopoulos, Papalexandris, Papachroni, & Ioannou, 2011). First, the successful acquisition of knowledge from intermediaries relies on exploratory learning, and hence requires a firm to reconfigure its prior knowledge. A high level of exploratory learning enables firms to generate value from otherwise purposeless external knowledge flows when new external knowledge functions as an antecedent of absorptive capacity (Zahra & George, 2002). Second, the successful transformation of knowledge from intermediaries also relies on transformative learning. The complexity and volume of knowledge is increasing rapidly in today's external environment, making it increasingly difficult for a firm to hold all relevant knowledge (Lane et al., 2006). Third, the successful adoption of knowledge from intermediaries relies on exploitative learning. After assimilating the external knowledge, firms need to combine both the existing and new knowledge to produce innovation. The different impact of external knowledge is likely due to the capabilities of firms to transmute and apply this knowledge.

In summary, the successful utilization of knowledge from intermediaries relies heavily on firms' absorptive capacity. Therefore, the study presents that:

H2. : Firms' absorptive capacity mediates the positive relationships between ties with intermediaries and firms' innovation performance.

2.3. Moderating role of the external environment

The management of innovation is relatively heterogeneous across industries. The relationships between firms' ties with intermediaries, absorptive capacity, and innovation performance may differ substantially depending on aspects of the external environment such as munificence and complexity.

Munificence refers to the extent to which the external environment can support sustained organizational growth with abundant and available resources (Dess & Beard, 1984). Industries with a higher rate of sales growth are more munificent and can provide intra-industrial organizations with slack resources for exploration and innovation (Xue, Ray, & Sambamurthy, 2012).

In rapidly growing markets, firms can easily reap financial benefits that can offer sufficient capital to invest directly or indirectly in innovation. Environmental munificence boosts organizational investments in capacity-building and innovation activities. In contrast, a hostile environment tends to possess fewer slack resources for innovation activities, which limits the scope and flexibility of decision-making and strategic options. Facing such a hostile environment, firms pay greater attention to conservative methods and hesitate to invest in innovation activities, avoiding the deployment of resources away from their core operational areas. Improvement in innovation performance is therefore difficult to achieve.

Complexity refers to the homogeneity-heterogeneity or the concentration-dispersion of the external environment (Tan & Littschert, 1994). Arising from the large number of external entities that a firm must interact with, complexity derives from the higher levels of competitive rivalry in an industry.

In a highly complex environment, firms face fiercer competition and consequently more rigid resource constraints. Such an environment often forces firms to reduce the resources available for innovation while maintaining their traditional core business. Firms are also under stressful conditions by such fierce competition and hesitate to behave in innovative ways with uncertain returns. On the other hand, when complexity is lower, firms are under less survival pressure. The simplicity enables firms to obtain information much more easily and follow the trends in cross-industrial technologies. Under this easier condition, firms are more likely to benefit from extensive risk-taking, proactive strategies, and technology innovation, which lead to useful and distinct marketing information and eventually, better innovation performance. Therefore, the study presents that:

H3a. The mediating effect of firms' absorptive capacity on the relationship between ties with intermediaries and firms' innovation performance is stronger when environmental munificence is higher.

H3b. The mediating effect of firms' absorptive capacity on the relationship between ties with intermediaries and firms' innovation performance is weaker when environmental complexity is higher.

3. Methodology

3.1. Sample and data collection

To investigate the hypotheses, this study uses a set of survey data from manufacturing firms in the Yangtze Delta in China. To avoid cultural bias and ensure validity, the survey design follows the standard procedure of Zhang and Li (2010). The final dataset includes 289 firms, with an effective response rate of 67.25%. Of the responding firms, 31.3% are in the machine and equipment industry, 18.3% in metals and nonmetals manufacturing, 16.6% in the electronic products industry, 7.5% in petroleum and chemicals, 5.9% in the textile and garment industry, and 5.4% in the paper-making and printing industries; the remainder belong to other industries such as wood and furniture, pharmaceuticals, and food. In terms of ownership, 65.4% are private, 26.4% are foreign-invested, and 8.2% are state-owned enterprises. No response bias is present by comparing responding and non-responding firms in terms of size or age. Using recommended *ex ante* procedural remedies (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), the potential common method bias is negligible. For each firm, two top managers participate in the survey. One completes Part I (external environment, innovation, and organizational demography) and the other completes Part II (ties with

Table 1
Construct measurement and CFA results.

Item description summary	Standardized loading	t-Value
<i>Innovation performance</i> ($\alpha = 0.90$)		
Rate the extent to which your firm is successful relative to its major competitors in terms of the following		
1. Introducing new products	0.76	4.24***
2. Applying for new patents	0.92	5.31***
3. Developing new technology or processes	0.92	6.12***
<i>Ties with intermediaries</i> ($\alpha = 0.86$)		
Rate the extent to which your firm has close relationships with the following		
1. Technology service firms	0.80	5.28***
2. Accounting and financial service firms	0.86	5.77***
3. Law firms	0.72	4.31***
4. Talent search firms	0.69	4.11***
<i>Absorptive capacity</i> ($\alpha = 0.92$)		
Rate the degree to which each of these statements describes your firm over the last 3 years		
<i>Exploratory learning</i> ($\alpha = 0.92$)		
<i>Recognize</i> ($\alpha = 0.92$)		
1. We frequently scan the environment for new technologies	0.79	4.98***
2. We thoroughly observe technological trends	0.86	6.33***
3. We observe in detail the external sources of new technologies	0.88	7.10***
4. We collect industry information thoroughly	0.85	6.21***
5. We have information on state-of-the-art external technologies	0.83	5.76***
<i>Assimilate</i> ($\alpha = 0.83$)		
1. We frequently acquire technologies from external sources	0.72	5.01***
2. We periodically organize special meetings with external partners to acquire new technologies	0.72	4.88***
3. Employees regularly approach external institutions to acquire technological knowledge	0.71	5.13***
4. We often transfer technological knowledge to our firm in response to technology acquisition opportunities	0.80	6.78***
<i>Transformative learning</i> ($\alpha = 0.91$)		
<i>Maintain</i> ($\alpha = 0.91$)		
1. We thoroughly maintain relevant knowledge over time	0.83	8.10***
2. Employees store technological knowledge for future reference	0.88	8.22***
3. We communicate relevant knowledge across the units of our firm	0.86	7.74***
4. Knowledge management is functioning well in our firm	0.86	7.99***
<i>Reactivate</i> ($\alpha = 0.92$)		
1. When recognizing a business opportunity, we can quickly rely on our existing knowledge	0.84	8.55***
2. We are proficient in reactivating existing knowledge for new uses	0.90	8.32***
3. We quickly analyze and interpret changing market demands for our technologies	0.87	8.10***
4. New opportunities to serve our customers with existing technologies are quickly understood	0.86	9.18***
<i>Exploitative learning</i> ($\alpha = 0.91$)		
<i>Transmute</i> ($\alpha = 0.92$)		
1. We are proficient in transforming technological knowledge into new products	0.84	8.65***
2. We regularly match new technologies with ideas for new products	0.89	9.10***
3. We quickly recognize the usefulness of new technological knowledge for existing knowledge	0.87	8.86***
4. Our employees are capable of sharing their expertise to develop new products	0.86	8.71***
<i>Apply</i> ($\alpha = 0.91$)		
1. We regularly apply technologies in new products	0.89	9.31***
2. We constantly consider how to better exploit technologies	0.88	9.00***
3. We easily implement technologies in new products	0.87	8.93***
4. It is well known who can best exploit new technologies within our firm	0.78	8.01***

Table 1 (continued)

Item description summary	Standardized loading	t-Value
<i>Environmental munificence</i> ($\alpha = 0.88$)		
Rate the degree to which you think these factors are munificent to your firm		
1. Competitors (all competitors and competitive actions among firms)	0.56	3.65***
2. Customers (retailers, wholesalers, and final consumers)	0.72	6.77***
3. Suppliers (sources of labor and materials)	0.74	7.01***
4. Technology (new techniques, innovations, and re-search work)	0.77	7.22***
5. Regulations (regulations and policies at all levels of government)	0.68	6.54***
6. Economic (factors such as market and economic growth)	0.73	7.19***
7. Social-culture (social values, work ethics, and demographics)	0.72	7.15***
8. International (world economy, imports, and foreign exchange)	0.64	4.45***
<i>Environmental complexity</i> ($\alpha = 0.85$)		
Rate the degree to which you think these factors are complex for your firm		
1. Competitors (all competitors and competitive actions among firms)	0.58	3.92***
2. Customers (retailers, wholesalers, and final consumers)	0.72	5.22***
3. Suppliers (sources of labor and materials)	0.72	7.66***
4. Technology (new techniques, innovations, and re-search work)	0.64	6.49***
5. Regulations (regulations and policies at all levels of government)	0.65	6.53***
6. Economic (factors such as market and economic growth)	0.63	6.75***
7. Social-culture (social values, work ethics, and demographics)	0.64	6.12***
8. International (world economy, imports, and foreign exchange)	0.59**	4.45***
<i>Model fit index</i>		
$\chi^2 = 740.20, p = 0.00, \chi^2/df = 2.78, GFI = 0.82, CFI = 0.93, IFI = 0.93, RMSEA = 0.08$		

*** $p < 0.01$.
** $p < 0.05$.

intermediaries and organizational capacity). Finally, the confidentiality of responses minimizes the informant bias.

3.2. Measures

This study uses a seven-point Likert-type scale to rate all the perceptual measures and calculates the average score for every multi-item construct.

Innovation performance ($\alpha = 0.90$) includes three items: (1) introducing new products, (2) applying new patents, and (3) developing new technology or processes.

To measure *ties with intermediaries* ($\alpha = 0.86$), the respondents rate the extent to which their firm has close relationships with (1) technology service firms (i.e., technology commercialization and brokering), (2) accounting and financial service firms, (3) law firms, and (4) talent search firms (Zhang & Li, 2010).

To measure *absorptive capacity*, the respondents rate the extent to which they agree with the following statements regarding their firm's performance over the last 3 years (Lichtenthaler, 2009). The statements include 25 questions derived from the process-based definition of absorptive capacity, which emphasize its multidimensional nature. Table 1 shows the results.

Following Tan and Littschert (1994), this study uses eight factors to measure the external environment: (1) competitors; (2) customers; (3) suppliers; (4) technology; (5) regulations; (6) economic; (7) social-culture; and (8) international. The Cronbach's alpha

Table 2
Descriptive statistics and Pearson correlation matrix.

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Innovation performance	4.2	1.55	1																		
2. Ties with intermediaries	4.6	1.30	.42**	1																	
3. Absorptive capacity	4.9	1.11	.44**	.52**	1																
4. Environmental munificence	4.2	1.08	.44**	.39**	.49**	1															
5. Environmental complexity	4.4	1.03	.22**	.09	.20**	.38**	1														
6. Pharmaceuticals and food industry	0.1	0.24	-.02	.06	.03	.02	.02	1													
7. Textile and garment industry	0.0	0.17	.11	-.01	.03	-.04	-.04	-.04	1												
8. Wood and furniture industry	0.1	0.22	-.11	-.19	-.12*	-.14*	-.06	-.06	-.06	1											
9. Paper-making and printing industry	0.1	0.26	-.02	-.03	.03	.00	.05	-.07	-.07	-.05	1										
10. Petroleum and chemical industry	0.2	0.37	-.03	-.01	.01	-.08	-.07	-.12	-.11	-.08	-.08	1									
11. Electronics industry	0.2	0.39	.01	.06	.04	.17**	.12*	.12*	.12*	-.08	-.11	-.14*	1								
12. Metal and non-metal industry	0.3	0.47	-.03	.03	.03	.01	-.03	-.18**	-.17**	-.12	-.16**	-.19**	-.30**	1							
13. Machine and equipment industry	0.1	0.23	-.07	-.02	-.15*	-.06	-.06	-.06	-.04	-.06	-.04	-.07	-.11	-.12	1						
14. Other industries	4.6	1.35	.43**	.29**	.34**	.43**	.19**	.02	-.08	-.03	-.09	-.03	.06	.09	.01	1					
15. Financial performance	3.2	0.83	.25**	.13*	.16**	.16**	.07	.08	.04	-.06	-.05	-.11	-.01	.02	-.03	.14*	1				
16. Firm size	16.0	21.35	.14*	-.03	.03	.04	.10	.26**	-.04	-.02	-.03	-.01	-.10	.05	.04	.05	.25**	1			
17. Firm age	0.1	0.28	-.06	-.00	-.16**	-.10	.01	.03	-.02	.03	-.02	-.03	-.09	-.14*	-.09	-.08	.09	.08	1		
18. State ownership	0.3	0.44	.06	.04	.01	-.05	.04	.23**	-.04	.04	-.03	.06	.08	-.22**	.05	-.11	.01	.06	.27**	1	
19. Foreign ownership	4.3	1.56	.30**	.32*	.41**	.37**	.18*	.05	-.04	-.01	.04	-.09	.11	-.01	-.03	-.04	.22**	.14**	-.03	-.11	-.05
20. R&D intensity																					

** $p < 0.01$ level.
* $p < 0.05$ level.

coefficients for *environmental munificence* and *complexity* are 0.88 and 0.85, respectively.

Control variables include firm age, firm size (i.e., the number of full-time employees relative to major competitors), financial performance (return on equity [ROE] relative to major competitors), state-ownership (1 = yes, 0 = no), foreign investment (1 = yes, 0 = no), and R&D intensity (i.e., the level of R&D investment relative to major competitors). This study uses nine dummy variables to control for industrial heterogeneity and uses *other industry* as the base group in the analysis.

3.3. Adequacy of the measures: reliability, validity, and common method variance

This study conducts a confirmatory factor analysis (CFA) to assess the convergent and discriminant validity of the multi-item constructs. As shown in Table 1, the results of the CFA show that the measurement model is a good fit for the data ($\chi^2 = 740.20, p = 0.00, \chi^2/df = 2.78, GFI = 0.82, CFI = 0.93, IFI = 0.93, RMSEA = 0.08$). All t -values of standardized loading for items on their corresponding latent construct are larger than three, thereby providing significant evidence of convergent validity. Furthermore, this study employs the latent variable approach to rule out common method variance (Podsakoff et al., 2003).

4. Results

Table 2 presents the results of the descriptive statistics, including the means and standard deviations, and Pearson correlation coefficients among the variables. All the correlations between the variables are smaller than 0.50 and within acceptable limits.

Table 3 shows the results of the analysis. Model 1(a–c) employs a three-step regression to test H1 and H2. The results in Model 1b clearly show a significant relationship between ties with intermediaries and innovation performance ($\beta = 0.38, p = 0.00$). Thus, the results support H1. Firm size also positively influences corporate innovation performance ($\beta = 0.22, p < 0.05$), and so do financial performance ($\beta = 0.34, p = 0.00$) and R&D intensity ($\beta = 0.10, p < 0.05$). Model 1a shows that ties with intermediaries positively influence absorptive capacity ($\beta = 0.38, p = 0.00$). Controlling absorptive capacity (Model 1c), the relationship between ties with intermediaries and innovation performance remains significant ($\beta = 0.25, p < 0.05$). However, the value of the coefficient of intermediaries changes (from 0.27 to 0.25), and so does the significance (from $p = 0.00$ to $p = 0.03 < 0.05$). Taken together, the combination of Models a–c satisfies the three conditions for Baron and Kenny's (1986) mediator test. Additionally, following the three-step statistical test (Baron & Kenny, 1986), the indirect effect of ties with intermediaries on corporate innovation through absorptive capacity is significantly different from zero ($z = 3.08, p = 0.00$), indicating a partial mediation effect. Thus, the results support H2.

To test H3a and H3b, this study conducts an integrated moderated mediation analysis, with ties with intermediaries as the independent variable, environmental munificence (complexity) as the moderator, absorptive capacity as the mediator, and innovation performance as the dependent variable (Process Model 14; Hayes, 2013). To reduce the potential problem of multicollinearity, this study uses the mean-centered mediator and moderator to create the interaction terms. Consistent with the previous results, ties with intermediaries still positively influence corporate innovation ($\beta = 0.25, p < 0.05$ for Model 2a; $\beta = 0.26, p < 0.05$ for Model 2b). Absorptive capacity is also a vital factor driving innovation ($\beta = 0.15, p < 0.01$ for Model 2a; $\beta = 0.20, p < 0.01$ for Model 2b). As predicted, environmental munificence positively influences innovation performance ($\beta = 0.34, p < 0.001$), and complexity also plays a positive role ($\beta = 0.16, p < 0.01$). More interestingly, the significance of the interaction between absorptive capacity and environmental munificence suggests that the latter negatively moderates the former ($\beta = -0.14, p < 0.05$). Similarly, the coefficient of the interaction

Table 3
Results of the moderated mediation analysis.

	Model 1a		Model 1b		Model 1c		Model 2a		Model 2b	
	Absorptive capacity		Innovation performance		Innovation performance		Innovation performance		Innovation performance	
	Estimate	p-Value	Estimate	p-Value	Estimate	p-Value	Estimate	p-Value	Estimate	p-Value
Constant	-2.90	0.00	0.91	0.00	1.27	0.00	1.88	0.00	-1.65	0.01
Firm size	0.12	0.15	0.22	0.04	0.21	0.04	0.13	0.08	0.18	0.01
Firm age	0.00	0.32	0.01	0.11	0.01	0.11	0.01	0.12	0.01	0.12
Financial performance	0.13	0.11	0.34	0.00	0.31	0.00	0.24	0.00	0.28	0.00
R&D intensity	0.09	0.19	0.10	0.01	0.12	0.02	0.10	0.02	0.12	0.01
State ownership	-0.22	0.02	-0.26	0.41	-0.18	0.80	-0.06	0.86	-0.11	0.48
Foreign ownership	-0.19	0.20	-0.10	0.61	-0.05	0.80	-0.05	0.78	-0.09	0.62
Ties with intermediaries	0.38	0.00	0.38	0.00	0.25	0.03	0.25	0.03	0.26	0.04
Absorptive capacity					0.28	0.00	0.15	0.01	0.20	0.01
Environmental munificence							0.34	0.00		
Environmental complexity									0.16	0.00
Absorptive capacity × environmental munificence							-0.14	0.02		
Absorptive capacity × environmental complexity									-0.03	0.02
Industry dummy	Included		Included		Included		Included		Included	
	R ² = 0.34		R ² = 0.31		R ² = 0.30		R ² = 0.34		R ² = 0.34	
	F = 11.25, p = 0.00		F = 10.81, p = 0.00		F = 9.38, p = 0.00		F = 9.89, p = 0.00		F = 9.18, p = 0.00	

item between absorptive capacity and environmental complexity is also significantly negative ($\beta = -0.03, p < 0.05$). Conditional indirect effects further demonstrate that the indirect effect of ties with intermediaries on innovation performance through absorptive capacity is contingent on environmental munificence and complexity. Tables 4 and 5 report how the indirect effects vary according to the level of environmental munificence and complexity, respectively. These results indicate support for the relationship in H3b, but not the proposed moderated mediation effect in H3a.

As suggested by the famous quote, “necessity is the mother of invention.” Abundant resources can weaken the incentive to improve managerial and technical capabilities. In a munificent environment, firms tend to benefit from temporal benefits and seek to maintain their status quo by using resources to set barriers to entry in order to limit potential competitors. Organizations are likely to be larger in rapidly growing industries. The quick growth makes organizational structures inflexible, bureaucratic, and hierarchical. Consequently, organizational inertia hampers the efficiency of innovation. On the other hand, when free from resource limitations, firms do not consider the cost of innovation searches, and ties with intermediaries are not the main source of external knowledge. If a munificent environment can easily stimulate the maturation of new technology, the relationship between ties with intermediaries and innovation performance through absorptive capacity becomes less context-dependent. This logic may explain why the moderating role of munificence is negative.

5. Conclusion

This study contributes to the existing literature on corporate innovation in several ways. First, it contributes to the research on innovation. By theorizing and testing both the direct and indirect effects of intermediaries on substantive outcomes, this study provides a better understanding of external innovation search strategies and suggests that

innovating firms should focus on this area; and should also take advantage of intermediaries to broaden their external search scope and depth without incurring high costs. Hence, firms' capacity plays a critical role in the processes when external knowledge leads to substantive outcomes. Intermediaries only play the role of a complement, rather than a substitute, for internal activities of knowledge management. The outcomes of innovation search are context-dependent. Aspects of the external environment (e.g., munificence and complexity) exert a significant but distinctive influence. This result answers the call of *Caner and Tyler (2015)* by including industrial heterogeneity.

Second, this study contributes to the research on firms' external ties. As generally acknowledged, no firm possesses all the necessary resources internally; even the most innovative firms with the most extensive internal capabilities cannot undertake all innovation activities alone (*Teece, 1986*). Scanning, tracking, and acquiring external resources can cover the weak areas in a firm's technology portfolio and is a valid way to foster and advance innovation performance. Firms' ties with intermediaries may enable them to search for the broader scope of organizations and delve deeper into external knowledge, but these ties are not sufficient to simply acquire outside knowledge. A successful transformation of these external advantages into substantive innovation requires effective and efficient knowledge integration. Firms need to invest to develop their absorptive capacity to track, evaluate, assimilate, and apply external knowledge (*Chen, Chen, & Vanhaverbeke, 2011*). Additionally, substantive outcomes depend on the match between external support and internal capacity. This study provides a fine-grained and panoramic picture of innovation management by identifying the latent mechanisms and restraint conditions. The results explain why firms benefit from intermediaries in widely distinguished ways.

Third, this study contributes to the research on emerging economies. By addressing the innovation issues in China, this study advances the research on strategies beyond developed nations. In China, one of the

Table 4
Indirect effect of ties with intermediaries on innovation performance through absorptive capacity moderated by environmental munificence.

Mediator	Conditional indirect effects of munificence			
	Condition	b	SE	95% CI
Absorptive capacity	Low	0.01	0.01	[0.06–0.12]
Absorptive capacity	Middle	-0.06	0.03	[-0.18 to -0.07]
Absorptive capacity	High	-0.13	0.05	[-0.23 to -0.05]

Note: SE = Standard error; CI = Confidence interval.

Table 5
Indirect effect of ties with intermediaries on innovation performance through absorptive capacity moderated by environmental complexity.

Mediator	Conditional indirect effects of complexity			
	Condition	b	SE	95% CI
Absorptive capacity	Low	0.05	0.05	[0.08–0.18]
Absorptive capacity	Middle	-0.05	-0.02	[-0.10 to -0.04]
Absorptive capacity	High	-0.06	-0.02	[-0.15 to -0.07]

Note: SE = Standard error; CI = Confidence interval.

largest economies in the world, innovation has been a national strategy to drive economic development in recent years. Employing open innovation generates advantages not only for firms in developed countries, but also for those in China. Since the institutional and technological infrastructure to support innovation activities are still not complete, external ties are valuable as substitutes for institutional voids. Ties with intermediaries represent a relevant strategy for corporate innovation and a means to promote corporate innovation in developing as well as developed economies.

This study provides important guidance and practical implications for policymakers and managers. The results highlight that intermediaries can help innovating firms visualize new opportunities and ideas, and best practices for doing business. Managers should think out-of-the-box and learn how to leverage intermediaries for innovation searching. Furthermore, developing and maintaining absorptive capacity is critical to firms' long-term survival and success because absorptive capacity enables firms to reinforce, complement, and refocus the knowledge base (Lane et al., 2006). Firms need to foster internal capabilities, particularly absorptive capacity, to facilitate the integration of knowledge from intermediaries even when growth is high.

Meanwhile, this study also shows that policymakers should emphasize more on creating effective institutional arrangements or policies to facilitate the emergence of intermediaries in service marketing. Policy initiatives must focus on the need to promote collaboration between innovating firms and intermediaries through means such as establishing a stable platform, improving the functions and service quality of intermediaries, and/or lowering transaction costs.

6. Limitations

Several limitations are worth addressing in future research. First, the research design is cross-sectional. The data only describes one point in time and cannot reflect dynamic changes. Future studies should use multiple data sources and a longitudinal research design to ensure the robustness and validation of the findings. Second, the findings reflect the current situation in the Yangtze Delta, which is one of the most developed regions in China. The confident generalization of the findings needs replication in different areas in China and even in other countries. Exploring the influence of several institutional or cultural factors would be very meaningful in future work. Third, this research uses perceptual scales to measure the variables. Future research may seek to use objective data to measure these constructs.

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