

Article

Effects of Domestic and International External Collaboration on New Product Development Performance in SMEs: Evidence from China

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Abstract: This study attempts to examine the influences of domestic and international external collaboration on new product development (NPD) performance in small and medium-sized enterprises (SMEs) and further explores the mediating mechanism of knowledge integration capability and the moderating effects of the innovation climate and organizational legitimacy. In this study, we collected data from 236 manufacturing SMEs in China by means of questionnaires, and multiple hierarchical regression analysis was used to test hypotheses. The results reveal that both domestic and international external collaboration are positively associated with SMEs' NPD performance. Knowledge integration capability mediates domestic and international external collaboration–SMEs' NPD performance relationships. Innovation climate positively moderates domestic external collaboration–SMEs' NPD performance relationship and organizational legitimacy positively moderates domestic and international external collaboration–SMEs' NPD performance relationships. This study expands the research on the relationship between external collaboration and NPD performance by categorizing external collaboration into two dimensions, domestic and international, and examining their direct influences on SMEs' NPD performance. Moreover, through examining the mediating effect of knowledge integration capabilities and moderating effects of innovation climate and organizational legitimacy, this paper explains how, and under what conditions, domestic and international external collaboration facilitates the improvement of NPD performance in SMEs.

Keywords: external collaboration; knowledge integration capability; innovation climate; organizational legitimacy; NPD performance; SMEs



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1. Introduction

Many previous researchers have indicated that new product development (NPD) is one of the key factors for firms to gain competitive advantage and achieve sustainable development [1]. In today's competitive industrial environment, due to the fast-paced technological changes, shorter product life cycle, and increasing innovation costs, firms face increasing difficulties and uncertainty in their NPD projects. NPD has become more and more complex, risky, and challenging, and its failure rates become higher, especially for small and medium-sized enterprises (SMEs) [2]. Therefore, searching for ways to enhance the rate of NPD success and improve firms' NPD performance is a vital managerial concern. In the current competitive environment, external collaboration, as the main form of open innovation, is increasingly recognized as a key way to improve NPD performance [3]. Much of the prior literature suggest that external collaboration can facilitate access to resources needed for product innovation, reduce the risks and costs of NPD, and then enhance NPD performance [4].

In recent years, many scholars have spent large amounts of effort in examining the relationship between external collaboration and NPD performance or other types of firm

performance [5]. However, few researchers have categorized external collaboration into domestic and international dimensions according to the geographical dispersal of partners and then investigated their direct influences on firms' NPD performance separately. In the past, external collaboration was often deemed as a single-dimensional concept [6], and, although some researchers have realized that external collaboration may have many different dimensions, most of them only focused on breadth and depth dimensions and formal and informal dimensions [7,8]. Actually, domestic and international dimensions of external collaboration are also very important, because many firms are starting to develop new products with the help of domestic and international collaborators, and firms' practice shows that domestic and international external collaboration are very effective to promote NPD. In addition, many scholars are only interested in the external collaboration of large firms and multinational companies, and empirical evidence related to SMEs' external collaboration remains scant and fragment [9]. In fact, due to insufficient resources and limited ability to innovate, external collaboration is more important for SMEs than for large firms and multinational companies [10]. Therefore, it is necessary to categorize external collaboration into domestic and international dimensions and explore their effects on NPD performance in SMEs.

Further, the underlying mechanism through which external collaboration affects NPD performance has not yet been adequately investigated. It may be understood by examining the mediating mechanism of knowledge integration capability, which refers to the capacity of a firm to integrate and apply old and new knowledge [11,12]. Previous research found that open innovation and external collaboration can help firms acquire external knowledge; however, this external knowledge may not be so beneficial without the capability to synthesize and utilize knowledge [12]. Existing studies indicate that collaborative activities can promote firms' ability to integrate and apply knowledge [13,14] and knowledge integration capability is very important for the improvement of innovation output [11,15]. Therefore, knowledge integration capability may serve as a mediator to connect external collaboration with NPD performance; however, few researchers have considered it as a mediator and examined its mediating role on the external collaboration–NPD performance relationship.

In addition, although many firms have adopted external collaboration strategy, the effectiveness of external collaboration varies among different firms. Based on contingent theory, we include innovation climate (internal factor) and organizational legitimacy (external factor) as two important factors that may affect the correlation between external collaboration and NPD performance. Specifically, innovation climate is defined as a firm's internal environment that encourages and supports innovation [16]. Studies have indicated that it can increase firms' enthusiasm for engaging in collaborative activities and amplify the positive influence of open innovation [17]. Organizational legitimacy is an important external institutional factor and, when a firm's organizational legitimacy is high, it means that it can gain more support and recognition from external stakeholders [18]. When the organizational legitimacy increases, the focal firm may be able to access more resources from partners and alliances, which subsequently contributes to higher innovation outcomes [19,20]. Therefore, we infer that innovation climate and organizational legitimacy may moderate domestic and international external collaboration–SMEs' NPD performance relationships; however, empirical examinations of such processes remain scarce.

Given the above arguments, we construct a theoretical framework to examine the influences of domestic and international external collaboration on NPD performance in SMEs. Furthermore, we investigate the mediating mechanism of knowledge integration capability and moderating effects of innovation climate and organizational legitimacy. This study has several contributions. First, this study categorizes external collaboration into two dimensions and examines their differential impacts on NPD performance in SMEs, which expands the current research on external collaboration–NPD performance relationship and enriches the empirical research on SMEs' open innovation. Second, this study sheds light on how and under what conditions domestic and international external collaboration

facilitate the enhancement of SMEs' NPD performance through exploring the mediating role of knowledge integration capability and the moderating effects of innovation climate and organizational legitimacy. Third, this study is helpful for managers of SMEs to utilize domestic and international external collaboration effectively to improve NPD performance.

The rest of this study is structured as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes sample, data, measures, and methods used to test the hypotheses. Section 4 provides the results of hypotheses testing. Section 5 shows the discussion, theoretical and practical implications, as well as the limitations and directions for the future research. Section 6 shows a brief conclusion of this study.

2. Literature Review and Hypotheses Development

2.1. NPD Performance

NPD refers to the activities that firms integrate into their resources and knowledge to develop new products or improve existing products. NPD performance means the extent to which new products meet management's perceptions of market share, sales growth, customer adoption rates, and profit objectives [21,22]. High NPD performance can enhance firms' competitive advantage in the market, strengthen firms' competitiveness, and contribute to sustainable business growth [23]. Therefore, most firms, including SMEs, attach great importance to NPD performance.

Traditionally, firms mainly relied on their internal research and development activities to develop new products. Such an internal route for NPD requires a lot of internal resource input, and the risks and uncertainties are pretty high. In recent years, given the fast-paced technological changes, shorter product life cycle, and increasing innovation costs, firms find that they lack sufficient internal resources to develop new products [24]. Against this background, adopting open innovation strategies and sourcing external resources to develop new products have become more common [3,25]. Open innovation strategies advocate that firms should rely on external sources both as a source of ideas and as a way to commercialize them [26]. It can help firms overcome deficiencies in resources and competencies and cope more effectively with the costs and risks of NPD, and it is especially important for NPD performance of SMEs in which internal resources are very limited [27]. External collaboration is a main form of open innovation, and many previous researchers have investigated the relationship between external collaboration and NPD performance or other types of firm performance. For example, Tran et al. [5] found that inter-firm collaboration positively affects business performance. Yang et al. [28] indicated that customer and supplier external involvement have positive impacts on NPD performance. Ozdemir et al. [29] indicated that vertical stakeholder collaborations can significantly enhance firm performance. Most previous studies regarded external collaboration as a single dimension variable, and few researches have categorized it into domestic and international dimensions according to the geographical dispersal of partners. In fact, in recent years, many firms, including SMEs, begin to improve their NPD performance through collaborating with domestic and international external partners, and domestic and international external collaboration are very common in the process of firms' product development. However, the influencing mechanism of domestic and international external collaboration on NPD performance in SMEs is understudied. Therefore, it is necessary to theoretically and empirically explore the relationships between domestic and international external collaboration and NPD performance in SMEs.

2.2. Domestic External Collaboration and NPD Performance in SMEs

In this research scenario, domestic external collaboration refers to the collaboration with domestic partners in the process of developing new products [30]. We posit that domestic external collaboration is positively associated with NPD performance in SMEs. First, from the perspective of the strength of ties, domestic partners have similar language, cultures, and close spatial proximity, hence SMEs tend to have more repeating associations and closer interrelated ties with their domestic partners, which are beneficial to the formation

of strong ties [31]. Strong ties can motivate collaborators to share more critical knowledge and technologies, thereby increasing the focal SME's stock of knowledge needed for NPD, increasing the speed and success rate of NPD, and improving NPD performance [32,33].

Second, in the process of domestic external collaboration, SMEs are more likely to acquire tacit knowledge. According to knowledge-based theories, tacit knowledge is a crucial element for firms' innovation, and firms with access to tacit knowledge tend to have higher innovation capability and can develop new products easier [34]. However, tacit knowledge is hard to acquire, and it could be obtained only through close interactions [35]. Due to close spatial proximity, domestic external collaboration provides more opportunities for SMEs to interact with partners closely and communicate with partners face-to-face, and thereby promoting the acquirement of tacit knowledge, facilitating products innovation, and enhancing NPD performance.

Third, according to transaction cost theory, in the process of acquiring knowledge through external collaboration, costs, such as communication costs and coordination costs, are usually pretty high. However, when acquiring knowledge through domestic external collaboration, geographical proximity, cognitive proximity, and linguistic similarity can reduce the communication and coordination costs of knowledge acquisition, improve the efficiency of knowledge acquisition, and thereby increase the speed of NPD and improve NPD performance [36]. Thus, it is proposed that

H1. *There is a positive association between domestic external collaboration and NPD performance in SMEs.*

2.3. International External Collaboration and NPD Performance in SMEs

International external collaboration means collaboration with foreign partners in the process of developing new products. We argue that SMEs can achieve higher NPD performance when implementing international external collaboration. First, from the perspective of resource-based theory, international external collaboration provides access to more diverse resources and competences that are not available domestically [37]. Diverse resources and competences can increase the diversity of SMEs' resources pool, stimulate the generation of new ideas, enhance SMEs' capacity for developing new products, improve the novelty and quality of new products, and thereby enhance SMEs' NPD performance [36,38].

Second, from the perspective of organizational learning theory, international collaboration allows SMEs to learn the latest scientific knowledge and advanced technologies, learn advanced skills and competences related to products development, production, and marketing, and thereby enhance the efficiency of NPD and improve NPD performance [7,39]. Moreover, international external collaboration allows SMEs to have close interaction with foreign product developers and can provide SMEs with more opportunities for technological learning, which is conducive to improving NPD performance [40]. Additionally, outstanding foreign collaborators can promote and motivate SMEs to enhance their capability to NPD, which is beneficial to the enhancement of NPD performance.

Third, from the perspective of firm capability theory, Van et al. [41] noted that collaborating with international partners can help firms obtain knowledge related to products innovation and enhance firms' products innovation capability, and thereby enhancing improving firms' NPD performance. Iino et al. [42] indicated that strategic technology collaborations with international organizations stimulate the flow of novel knowledge and technologies and upgrade firms' technological capabilities, consequently improving firms' NPD performance. Ebersberger and Herstad [43] stated that various resources acquired through international collaboration can enhance firms' internal research and development capability, and this can greatly increase NPD performance. Thus, we hypothesize

H2. *There is a positive association between international external collaboration and NPD performance in SMEs.*

2.4. Mediating Role of Knowledge Integration Capability

Knowledge integration capability refers to the capacity of a firm to integrate and apply old and new knowledge [44]. We posit that domestic and international external collaboration are positively related to knowledge integration capability. First, according to knowledge-based theory, knowledge integration capability cannot be improved without a rich knowledge base [12]. Collaborating with domestic and international partners can help SMEs acquire heterogeneous knowledge and enrich their knowledge repositories. The enriched knowledge base provides abundant knowledge and resources for knowledge integration, and it is conducive to improving SMEs' ability to integrate and apply existing knowledge and new knowledge obtained from partners [11,45]. Second, the process of collaborating with external organizations is often accompanied by a dynamic increase of knowledge integration capability. When collaborating with external organizations, in order to utilize external knowledge effectively, SMEs tend to constantly absorb, integrate, transform, and apply external fragmented knowledge, and these behaviors tend to improve knowledge integration capability [12]. Thus, we propose that

H3a. *There is a positive association between domestic external collaboration and knowledge integration capability.*

H3b. *There is a positive association between international external collaboration and knowledge integration capability.*

There has been extensive evidence that knowledge integration capability is conducive to improving NPD performance. First, high knowledge integration capability can accelerate the integration of old and new knowledge, which is helpful to discover novel knowledge combination opportunities, transform old and new knowledge into useful knowledge required for innovation, and spur new ideas for product development, thus promoting the novel products' creation and improving NPD performance [12,45]. Second, when SMEs have high knowledge integration capability, they tend to integrate and apply existing and newly acquired knowledge more efficiently, which in turn leads to faster development of new products. Fast speed of NPD can help SMEs possess more market shares and improve their NPD performance [14,15]. Third, Zhang et al. [46] claimed that high levels of knowledge integration capability can help firms establish collaboration networks easily. Firms can acquire more resources from these collaboration networks, which are useful to enhance NPD performance. Thus, this study hypothesizes:

H4. *There is a positive association between knowledge integration capability and NPD performance in SMEs.*

Although the findings of some research indicated that domestic and international external collaboration can facilitate the enhancement of firms' performance, it may be simplistic to conclude that domestic and international external collaboration only directly contribute to beneficial performance, including NPD performance. Based on the above discussion, we infer that knowledge integration capability may act as a key intermediary mechanism linking domestic and international external collaboration with SMEs' NPD performance. As mentioned earlier, domestic and international external collaboration can enlarge firm's knowledge base, which is the basis of the improvement of knowledge integration capability. Furthermore, the process of external collaboration is usually accompanied by the dynamic improvement of knowledge integration capability [11,12]. At the same time, knowledge integration capability can facilitate the integration process of old and new knowledge, enhance the speed of new product development, help firms to establish collaboration networks, and obtain more external resources, which are beneficial to the improvement of NPD performance [12,14,46]. Thus, we predict that knowledge integration capability may act as a key intermediary mechanism linking domestic and international

external collaboration with SMEs' NPD performance, and we believe in the following hypotheses:

H5a. *Knowledge integration capability plays a mediating role between domestic external collaboration and NPD performance in SMEs.*

H5b. *Knowledge integration capability plays a mediating role between international external collaboration and NPD performance in SMEs.*

2.5. Moderating Role of Innovation Climate

The innovation climate refers to a firm's internal environment that encourages and supports innovation [16]. When a firm has a high-level innovation climate, it tends to support, encourage, and reward innovation behavior, provide enough resources for innovative activities, and have a high tolerance for risks [47].

We argue that, in a stronger innovation climate, the positive association between domestic and international external collaboration and SMEs' NPD performance will be enlarged. First, a strong innovation climate can increase organizational members' enthusiasm for innovation [48,49]. Innovation needs many resources, while internal resources are limited, organizational members tend to strive to obtain the necessary resources for innovation from the outside, and, under these circumstances, their enthusiasm for external collaboration will be greatly increased [50,51]. Organizations with strong innovation climates will spend much effort in collaborating with outside partners; this can increase the beneficial effect of external collaboration and amplify the positive associations between domestic and international external collaboration and NPD performance [16,17]. Moreover, firms with strong internal innovation climate usually put a lot of emphasis on research and development and are willing to invest many resources to support research and development activities. The increase in research and development investment is often accompanied by the improvement of firms' absorptive capacity [52]. According to absorptive capacity theory, high absorptive capacity can increase the effectiveness of external collaboration and more efficiently transform the resources gained through external collaboration into new products, and thereby magnify the positive associations between domestic and international external collaboration and NPD performance [8]. Therefore, we proposed that

H6a. *Innovation climate strengthens the positive impact of domestic external collaboration on NPD performance in SMEs.*

H6b. *Innovation climate strengthens the positive impact of international external collaboration on NPD performance in SMEs.*

2.6. Moderating Role of Organizational Legitimacy

Organizational legitimacy reflects the degree of acceptance and recognition of the firm by external environment, and it refers to perceptions or assumptions that "the actions of an entity are desirable and appropriate within some socially constructed system of norms, values, and standards" [18]. Previous research has indicated that organizational legitimacy is important for firms, and it can help them to benefit more from external collaboration [19,53].

We argue that, when the focal SME's organizational legitimacy is high, domestic and international external collaboration will exert more positive influences on NPD performance. First, according to legitimacy theory, collaborators are more willing to deeply communicate and share critical resources with organizations that appear legitimate [53]. Therefore, high organizational legitimacy can facilitate resource acquisition and organizations with strong organizational legitimacy can acquire more critical resources which are beneficial to product innovation through domestic and international collaboration [19,54,55]. Hence,

when organizational legitimacy is high, the positive correlation between external collaboration and NPD performance is stronger than that when organizational legitimacy is low. Moreover, when SMEs have high organizational legitimacy, they are more likely to gain the trust of external organizations and thus more likely to establish collaboration relationships with them [56,57]. This means strong organizational legitimacy can lower the costs of establishing partnerships, raise external collaboration efficiency, and consequently enlarge the positive influence of external collaboration on NPD performance. In addition, SMEs with strong organizational legitimacy can win public support and approval easily, and this will increase employee loyalty and enhance the sense of corporate identity [58]. The sense of loyalty and identity stimulate employees to spend much time and effort in firms' activities such as external collaboration, which can further amplify the beneficial influence of external collaboration. Hence, we hypothesize that

H7a. *Organizational legitimacy strengthens the positive impact of domestic external collaboration on NPD performance in SMEs.*

H7b. *Organizational legitimacy strengthens the positive impact of international external collaboration on NPD performance in SMEs.*

Figure 1 shows the research model of this paper.

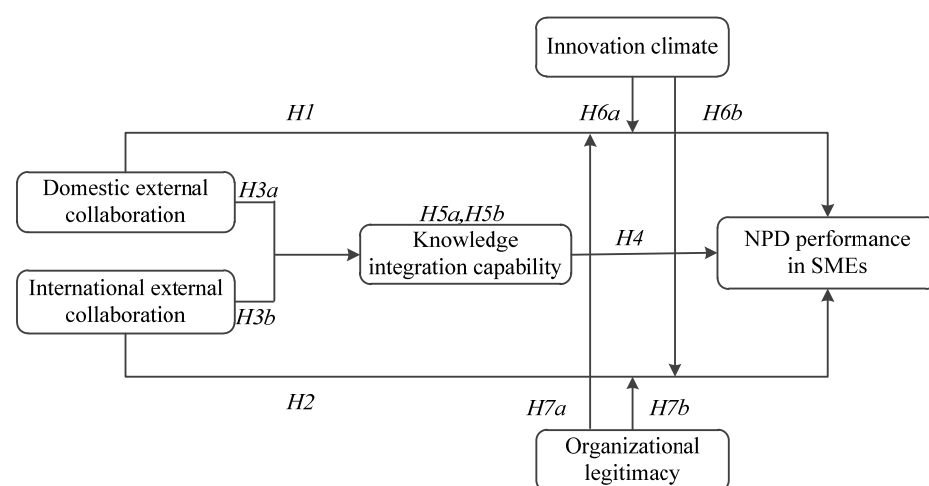


Figure 1. Research model.

3. Research Methodology

3.1. Sample and Data Collection

In this study, data were collected using a large-scale questionnaire survey. All measurement items in the questionnaire were referred to scales in previous researches. Before the survey, we invited four academics whose research interests lie in open innovation to check all items. According to their feedback, we revised the items. Moreover, we undertook a pilot test with 20 senior or middle managers from 12 Chinese manufacturing SMEs. Based on the results of the pilot test, we modified the questionnaire again. Finally, we formed the formal questionnaire, and we used it to conduct the formal large-scale survey.

The research sample are manufacturing SMEs in China, and we chose them as our sample due to two reasons. First, manufacturing firms usually undertake product innovation activities. In recent years, market competition has become increasingly fierce, thus improving NPD performance has become important for manufacturing firms to maintain sustainable development. Second, due to the limited internal resources, many SMEs, including Chinese manufacturing SMEs, have realized that their products innovation needs to rely on external collaboration and most of them began to collaborate with domestic and international partners.

We sent out the formal questionnaire to manufacturing SMEs located in China's northern, eastern, southern, and central regions (11 municipalities and provinces in total) from June to October 2022. We only invited the middle and senior managers to complete the questionnaire, because they know the firms better. The questionnaires were distributed in two ways. First, in each region we mentioned above, we randomly selected 200 manufacturing SMEs from the local business directory, 800 manufacturing SMEs in total. We contacted with these firms and 341 manufacturing SMEs that have implemented domestic and international collaboration and developed new products in the past three years agreed to help us finish the questionnaire. Then, we sent a questionnaire as well as a cover letter to each firm's middle or senior manager through the email and invited them to complete the questionnaire. Second, we entrusted a professional Chinese questionnaire collecting platform named Sojump to distribute 300 questionnaires. In total, we distributed 641 questionnaires and finally received 452 questionnaires. After removing some questionable questionnaires, we received 236 valid questionnaires, and the respond rate was 36.82%. The sample characteristics are summarized in Table 1.

Table 1. Sample characteristics. (N = 236).

Variable	Items	Quantity	Percentage (%)
Industry sector	High technology sector	138	58.47
	Traditional sector	98	41.53
Ownership	State-owned	54	22.88
	Private-owned	132	55.93
	Foreign-owned	50	21.19
Firm size (number of employees)	<50	20	7.20
	50–300	87	36.87
	301–1000	129	55.93
Firm age (number of years)	<5	42	17.80
	5–10	91	38.56
	>10	103	43.64

3.2. Measurement of Variables

We used five-point Likert scales to measure all items in this study, and the measurement items for the main variables are presented in Table 2.

NPD performance. Drawing on the studies by Ferreras-Méndez et al. [59] and Frishammar and Åke Hörte [60], we adopted a six-item scale to measure NPD performance. The scale assesses the market share, sales, customer adoption, sales growth, profit, and performance of new products. The construct indicators were assessed using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Domestic and international external collaboration. Based on previous researches by Laursen and Salter [61] and Audretsch et al. [51] and the interviews with managers of Chinese manufacturing SMEs, these two variables were measured using six-item scales, respectively. Respondents were asked to assess the extent to which their firms have collaborated with six types of domestic and international organizations in past three years, and gave their choices on a five-point Likert scale (1 = very low, 5 = very high).

Knowledge integration capability. We used a four-item scale adapted from Grant [62], Wang et al. [12], and Guo et al. [44] to measure this variable. The scale mainly reflects the ability of firms to integrate and apply internal and external knowledge. Respondents provided their responses on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Table 2. Measures of constructs.

Constructs	Items	Factor Loadings
NPD performance Cronbach's $\alpha = 0.889$ CR = 0.916; AVE = 0.647	New products at our firm generally achieve its market share objectives.	0.868
	New products at our firm generally achieve its sales and customer use objectives.	0.777
	New products at our firm generally achieve its sales growth objectives.	0.785
	New products at our firm generally achieve its profit objectives.	0.756
	Our new products meet the performance objectives set for them.	0.763
	Overall, our new products are successful.	0.868
Domestic external collaboration Cronbach's $\alpha = 0.933$ CR = 0.949; AVE = 0.755	Collaboration with domestic suppliers.	0.805
	Collaboration with domestic customers.	0.833
	Collaboration with domestic competitors.	0.918
	Collaboration with domestic firms in other industries.	0.819
	Collaboration with domestic universities and research institutes.	0.912
	Collaboration with domestic governments.	0.918
International external collaboration Cronbach's $\alpha = 0.913$ CR = 0.932; AVE = 0.697	Collaboration with international suppliers.	0.807
	Collaboration with international customers.	0.797
	Collaboration with international competitors.	0.813
	Collaboration with international firms in other industries.	0.892
	Collaboration with international universities and research institutes.	0.801
	Collaboration with international governments.	0.892
Knowledge integration capability Cronbach's $\alpha = 0.884$ CR = 0.921; AVE = 0.745	Our firm could integrate internal and external knowledge.	0.864
	Our firm could integrate knowledge in different technological or market fields.	0.858
	Our firm could incorporate the partners' knowledge into new products.	0.865
	Our firm could apply different skills to the development of new products.	0.865
Innovation climate Cronbach's $\alpha = 0.823$ CR = 0.883; AVE = 0.653	Managers of our firm encourage innovation and often emphasize the importance of innovation.	0.807
	Our firm provides time and resources for employees to generate, share/exchange, and experiment with innovative ideas/solutions.	0.803
	Our employees are working in diversely skilled work groups where there is free and open communication among the group members.	0.814
	Our employees are recognized and rewarded for their innovation.	0.808
	Government speaks highly of our firm.	0.776
Organizational legitimacy Cronbach's $\alpha = 0.899$ CR = 0.929; AVE = 0.723	Suppliers want to do business with our firm.	0.844
	Customers highly value the products produced by our firm.	0.869
	Competitors view our firm with respect.	0.875
	Most of the general public highly approve our firm.	0.882
Market competitive intensity Cronbach's $\alpha = 0.853$ CR = 0.901; AVE = 0.696	Competition in our local market is cut-throat.	0.825
	Price competition in our industry is very frequent.	0.834
	We hear of new competitive moves in terms of new product development every day.	0.835
	Anything that our firm can offer, another firm can match readily.	0.842

Innovation climate. This study used a four-item scale adapted from Popa et al. [17] and Wang et al. [16] to measure innovation climate, and the scale captures the degree to which the firm's internal environment supports innovation. Respondents were asked to assess (1 = strongly disagree, 5 = strongly agree) each statement.

Organizational legitimacy. We adapted the measurement items developed by Yu et al. [63] and Wang et al. [64] and measured organizational legitimacy with a five-item scale assessing the extent to which a firm gain acceptance by different stakeholders. Respondents were asked to indicate the degree to which they agree with the statements using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Control variables. Based on previous research, we chose firm size, firm age, industry type, and market competitive intensity as control variables. Firm size was measured using

the current number of employees. Firm age was measured via subtracting the year of establishment from the year of 2022. Industry type was measured by dummy variables (coded “1” for high technology industry and “0” for traditional industry). For market competitive intensity, drawing on the study of Jansen et al. [65], we adopted a four-item scale to measure it and respondents provided their responses on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

3.3. Reliability and Validity

We assessed the reliability of the constructs using Cronbach’s alpha and composite reliability (CR). The results indicated that the Cronbach’s alpha values of all variables were above 0.7 and all CR values exceeded 0.7, suggesting good reliability of measurement items. For convergent validity, we used factor loading and average variance extracted (AVE) to examine it. The factor loadings of all variables were higher than 0.7 threshold, and all AVE values were above 0.5. Therefore, we concluded that convergent validity is fine. For discriminant validity, Table 3 showed that the square root of AVE of each variable was larger than the correlation coefficients of its row and column. Therefore, we concluded that discriminant validity is acceptable.

Table 3. Descriptive statistics and correlations.

Variables	1	2	3	4	5	6	7	8	9	10
1. SIZE	N/A									
2. AGE	0.173 **	N/A								
3. Industry	0.012	−0.047	N/A							
4. CI	0.030	0.125	0.093	0.834						
5. Domestic EC	0.043	0.109	0.055	0.060	0.869					
6. International EC	0.070	0.079	−0.014	0.123	0.251 **	0.835				
7. KIC	0.109	0.156 *	0.025	0.144 *	0.254 **	0.264 **	0.863			
8. IC	−0.002	0.052	0.032	0.101	0.031	0.056	0.014	0.808		
9. OL	0.137	−0.017	−0.105	−0.092	−0.081	0.101	−0.085	0.063	0.850	
10. NPD Performance	0.157 *	0.138 *	0.025	0.022	0.340 **	0.300 **	0.376 **	0.141 *	0.050 *	0.804
Mean	5.412	9.710	0.580	3.765	3.367	3.007	3.716	2.828	2.894	3.525
SD	0.903	5.264	0.495	0.851	0.942	0.948	0.735	0.816	0.824	0.780

Note(s). * $p < 0.05$; ** $p < 0.01$; Domestic EC = domestic external collaboration; International EC = international external collaboration; KIC = knowledge integration capability; IC = innovation climate; OL = organizational legitimacy; CI = competitive intensity; N/A: not suitable to analysis; The diagonal elements (in bold) are square roots of the AVE values.

3.4. Common Method Bias

In this study, we applied Harman’s single factor test to examine common method bias [66]. We found that the first principal component only accounted for 21.48% of the total variance, and it did not exceed the threshold of 50%. Therefore, we think common method bias is not a serious issue.

4. Results

Table 3 presents the descriptive statistical results. We used hierarchical regression analysis to test the proposed hypotheses, and results can be seen in Tables 4 and 5.

Table 4. Mediation regression models.

Variables	NPD Performance						KIC	
	Mode 11	Mode 12	Mode 13	Mode 14	Mode 15	Mode 16	Mode 17	Mode 18
Size	0.137 *	0.130	0.120	0.107	0.106	0.099	0.078	0.070
Age	0.116	0.082	0.100	0.070	0.052	0.065	0.103	0.114
Industry	0.029	0.011	0.036	0.022	0.009	0.028	0.006	0.024
CI	0.001	−0.013	−0.033	−0.044	−0.047	−0.062	0.114	0.096
Domestic EC		0.326 ***			0.257 ***		0.232 ***	
International EC			0.288 ***			0.215 **		0.238 ***
KIC				0.359 ***	0.298 ***	0.307 ***		
R ²	0.038	0.143	0.119	0.161	0.223	0.204	0.100	0.102
Adj.R ²	0.022	0.124	0.100	0.143	0.202	0.183	0.081	0.083
F	2.299	7.660 ***	6.242 ***	8.854 ***	10.930 ***	9.782 ***	5.116 ***	5.252 ***

Note(s). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.**Table 5.** Moderation regression models.

Variables	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
Size	0.120 *	0.123 *	0.127 *	0.128 *	0.113	0.119 *
Age	0.069	0.068	0.058	0.075	0.072	0.096
Industry	0.015	0.011	0.004	0.025	0.017	0.026
CI	−0.049	−0.049	−0.049	−0.030	−0.028	−0.040
Domestic EC	0.280 ***	0.283 ***	0.281 ***	0.280 ***	0.265 ***	0.254 ***
International EC	0.214 **	0.214 **	0.225 ***	0.212 **	0.201 **	0.184 **
IC	0.138 *	0.140 *	0.128 *			
OL				0.070	0.073	0.070
Domestic EC × IC		0.133 *				
International EC × IC			0.126			
Domestic EC × OL					0.145 **	
International EC × OL						0.283 ***
R ²	0.207	0.218	0.202	0.193	0.213	0.271
Adj.R ²	0.183	0.190	0.185	0.168	0.185	0.245
F	8.501 ***	7.454 ***	8.115 ***	7.780 ***	7.677 ***	10.532 ***

Note(s). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4 shows the results of the main effects and the mediating effects. Model 1 used four control variables as independent variables and NPD performance as dependent variable. To examine the direct influences of domestic and international external collaboration on NPD performance, on the basis of Model 1, in Model 2, we added domestic external collaboration as independent variable, and, in Model 3, we added international external collaboration as independent variable. The results suggest that both domestic external collaboration ($\beta = 0.326$, $p < 0.001$) and international external collaboration ($\beta = 0.288$, $p < 0.001$) positively affect NPD performance of SMEs, thereby leading support to H1 and H2. To examine the mediating role of knowledge integration capability, we conducted a three-step regression analysis proposed by Baron and Kenny [67]. First, we examined independent variable-mediator relationship. Model 7 and Model 8 indicate that both domestic external collaboration ($\beta = 0.232$, $p < 0.001$) and international external collaboration ($\beta = 0.238$, $p < 0.001$) positively affect knowledge integration capability, which support H3a and H3b. Second, we examined the mediator-dependent variable relationship. Model 4 indicates that knowledge integration capability is positively related to NPD performance of SMEs ($\beta = 0.359$, $p < 0.001$). Thus, H4 is supported. Third, based on Model 2, Model 5 added knowledge integration capability as independent variable, and based on Model 3, Model 6 added knowledge integration capability as independent variable. We find after adding knowledge integration capability, the positive influence of domestic external collaboration on SMEs' NPD performance decreases from 0.326 ($p < 0.001$) to 0.257 ($p < 0.001$), and

the positive influence of international external collaboration on SMEs' NPD performance decreases from 0.288 ($p < 0.001$) to 0.215 ($p < 0.01$). Thus, knowledge integration capability mediates domestic and international external collaboration–SMEs' NPD performance relationships, and H5a and H5b are supported.

Table 5 shows the results of moderating effects. To avoid multicollinearity, we have mean centered all interaction terms [68]. The coefficients of interaction terms in Model 10 and Model 11 show that the moderating role of innovation climate in domestic external collaboration–SMEs' NPD performance relationship is positive and significant ($\beta = 0.133$, $p < 0.05$), but its moderating role in international external collaboration–SMEs' NPD performance relationship is not significant ($\beta = 0.126$, $p > 0.05$). Thus, H6a is supported and H6b is not supported. Figure 2 depicts the moderating effect of innovation climate, indicating that when the degree of innovation climate is high, domestic external collaboration is more helpful to facilitate SMEs' NPD performance. Thus, H6a is further supported.

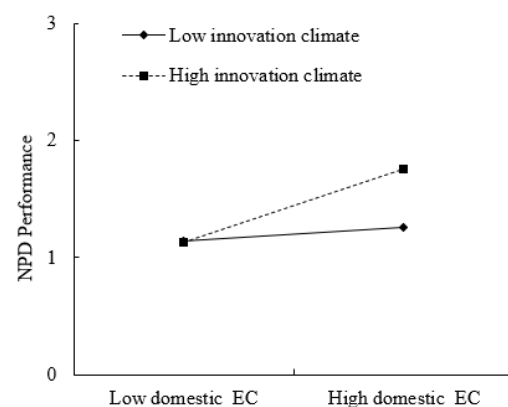


Figure 2. Moderating role of innovation climate on the relationship between domestic external collaboration (EC) and NPD performance of SMEs.

According to the moderating effects of organizational legitimacy, the coefficients of interaction terms in Model 13 and Model 14 show that organizational legitimacy positively moderates domestic external collaboration–NPD performance of SMEs relationship ($\beta = 0.145$, $p < 0.01$) and international external collaboration–NPD performance of SMEs relationship ($\beta = 0.283$, $p < 0.001$). Figures 3 and 4 depict the moderating effects of organizational legitimacy, indicating that when the degree of organizational legitimacy is high, domestic and international external collaboration have more positive effects on NPD performance in SMEs. Therefore, H7a and H7b are further supported.

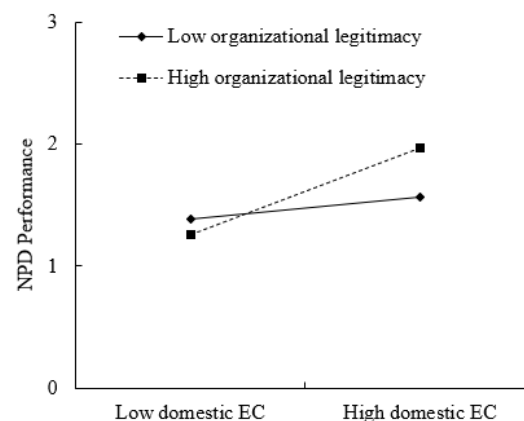


Figure 3. Moderating role of organizational legitimacy on the relationship between domestic external collaboration (EC) and NPD performance of SMEs.

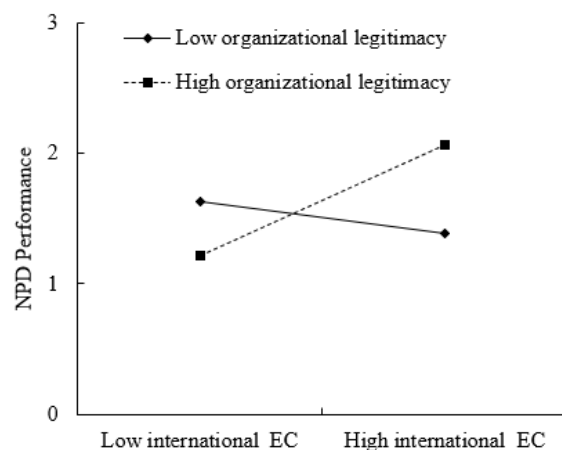


Figure 4. Moderating role of organizational legitimacy on the relationship between international external collaboration (EC) and NPD performance of SMEs.

5. Discussion, Implications and Limitations

5.1. Discussion

This study tries to investigate the effects of domestic and international external collaboration on NPD performance in SMEs. It also examines the mediating effect of knowledge integration capability and the moderating effects of innovation climate and organizational legitimacy. The empirical analysis reveals that both domestic and international external collaboration positively influence SMEs' NPD performance. These findings are similar to studies which stated that international innovation collaboration, domestic cooperation and Sino-foreign cooperation, domestic and international external knowledge can promote firms' innovation performance and business growth [43,69,70]. Moreover, the results show that knowledge integration capability mediates the domestic and international external collaboration–SMEs' NPD performance relationships. These findings support the existing literatures which found that collaboration activities and open innovation activities contribute to the improvement of knowledge integration capability [12–14] and knowledge integration capability can promote NPD and innovation performance [15,71,72]. In addition, the results indicate that organizational legitimacy strengthens the positive impacts of domestic and international external collaboration on SMEs' NPD performance. These findings are consistent with the results found by Lu and Yu [73] that high organizational legitimacy can amplify the positive effect of external collaboration on SMEs' innovation performance. Additionally, the results show that innovation climate magnifies the positive impact of domestic external collaboration on SMEs' NPD performance. This finding is in line with the result found by Huang and Chen [74] that the positive effect of university–industry collaboration on innovation performance can be improved when innovation climate is strong. Unexpectedly, the empirical analysis indicates that innovation climate has no moderating impact on the association between international external collaboration and SMEs' NPD performance. The possible explanation is that although high degree of innovation climate can enhance SMEs' enthusiasm for international external collaboration and help SMEs acquire much external resources which are helpful for NPD, these resources may not be effectively transformed into new products. Specifically, when compared with domestic external collaboration, resources obtained through international collaboration have high heterogeneity, and these resources usually are difficult to absorb [35]. SMEs' absorptive capacity is relatively low, and therefore resources obtained through international collaboration may not be effectively absorbed and exploited by SMEs [75,76]. Therefore, a strong innovation climate alone cannot magnify the positive influence of international external collaboration on SMEs' NPD performance.

5.2. Theoretical Implications

This study has some theoretical contributions. First, through categorizing external collaboration into domestic and international dimensions according to the geographical dispersal of partners and examining their influences on SMEs' NPD performance, this study complements and extends the existing literature on external collaboration-NPD performance relationship. Existing studies have mainly conceptualized external collaboration as a single-dimensional concept, or only paid attention to the breadth and depth dimensions and formal and informal dimensions of external collaboration [7,8], and few studies have focused on the classification of domestic and international external collaboration. This study examines the direct influences of domestic and international external collaboration on SMEs' NPD performance, which leads to a more complete understanding of the relationship between external collaboration and NPD performance. Furthermore, as few existing researchers have explored SMEs' open innovation and external collaboration empirically [77,78], this study provides empirically evidence for SMEs' external collaboration, and it also provides an effective response to the latest calls that research on open innovation should be expanded with new research objects, such as SMEs [79].

Second, this study identifies knowledge integration capability as a vital mediator between domestic and international external collaboration and SMEs' NPD performance, which is comparatively new in the existing literature. Previous studies have mainly examined the direct influence of external collaboration on firms' NPD performance, few studies have explored the internal mechanism by which external collaboration influences NPD performance [80]. This study enriches the existing mediating literature on the value of knowledge integration capability and supplements the research on the inner mechanisms of relationships between domestic and international external collaboration and NPD performance. Furthermore, it provides a theoretical explanation on how domestic and international external collaboration affect NPD performance in SMEs.

Third, through verifying the moderating effects of innovation climate and organizational legitimacy, this study provides a better understanding of the boundary conditions in the effect of external collaboration on NPD performance. Existing research on contingency factors that affect external collaboration firms' performance relationship have mainly paid attention to internal capacity factors and external environment factors, and few researches paid attention to innovation climate and organizational legitimacy [81,82]. Through investigating the moderating roles of innovation climate and organizational legitimacy, this study paints a more complete picture of the associations between domestic and international external collaboration and SMEs' NPD performance and provides the much-needed logical arguments to explain why some SMEs more successfully utilize domestic and international external collaboration activities to achieve high NPD performance than others.

5.3. Practical Implications

This study has some practical implications. First, the positive associations between domestic and international external collaboration and SMEs' NPD performance suggest that SMEs should attach the importance of external collaboration, both domestic and international, and strategically seek increased domestic and international openness in the process of NPD. Managers of SMEs should invest more resources and time in collaborating with domestic and international partners; for example, they should spend considerable time and effort in searching domestic and international partners, acquiring useful external knowledge, and maintaining long-term collaborative relationships with domestic and international partners. Moreover, managers of SMEs should take some measures to stimulate their employees to collaborate with external partners. For instance, they can build a corporate culture that values open collaboration and reward employees who establish collaborative relationships with domestic and international organizations. Moreover, the process of domestic and international external collaboration is complex, managers of SMEs can provide training to employees and equip them with capabilities to search suitable collaborators and manage collaborative relationships with domestic and international partners.

Second, the findings regarding the mediating effect of knowledge integration capability indicate that managers of SMEs should strengthen their firms' knowledge integration capability, as knowledge integration capability is crucial in shaping the impacts of domestic and international external collaboration on SMEs' NPD performance. In other words, knowledge integration capability is a link, if SMEs fail to enhance its knowledge integration capability, they cannot harvest the whole positive impacts of domestic and international external collaboration on NPD performance. Therefore, managers of SMEs should place emphasis on developing their firms' knowledge integration capability, and equip their firms with the ability to synthesize, process, and apply the acquired new knowledge. They can improve their firms' knowledge integration capability through several ways, such as building good knowledge management systems, increasing research and development investments to enhance ability to absorb, and integrate and transform external knowledge, providing training for employees to enhance their knowledge integration capability.

Third, the moderating role of innovation climate implies that managers should understand the importance of innovation climate and try hard to foster a strong innovation climate. For instance, they can cultivate the corporate culture that values innovation and repeatedly emphasize the importance of innovation within the organization. Additionally, in order to stimulate innovation behaviors and foster innovation climate, they can reward employees who are active to present new ideas and develop new products. The moderating role of organizational legitimacy indicates that managers should pay attention to organizational legitimacy when focusing on domestic and international external collaboration–NPD performance relationships. For example, they should require their firms to strictly obey the rules established by the governments. Furthermore, they should keep good relationships with key stakeholders such as suppliers, customers, competitors and local governments through frequent interaction, complying with market rules and providing high quality products. Moreover, SMEs should actively undertake social responsibilities, which is helpful to gain social recognition and enhance organizational legitimacy.

5.4. Limitations and Future Research

Similar to other studies, this study also has some limitations. First, this study based on survey data to test the hypotheses, which neglects the potential dynamics effects of domestic and international external collaboration on SMEs' NPD performance, because of the cross-sectional nature of the survey data. Future studies should use longitudinal secondary data to elaborate on these effects in the temporal dimension. Second, this study only collected data from Chinese manufacturing SMEs, which may affect the generalizability of our findings and present challenges in applying these findings to different cultural context and industries. Future research should collect data in other emerging economies and other industries such as biomedicine industry and service industry to enhance the generalizability of our findings. Third, this study only examined the mediating role of knowledge integration capability on the relationships between domestic and international external collaboration and SMEs' NPD performance. Other potential mediators such as business model innovation and innovation capability can be examined in the future research. Fourth, this study only explored the moderating effects of innovation climate and organizational legitimacy on domestic and international external collaboration–SMEs' NPD performance relationships. Other potential moderators such as organizational flexibility and intellectual property protection capability can be examined in the future research. Finally, our study explored the effects of domestic and international external collaboration on NPD performance. Future research can explore the effects of such collaborations on other type of organizational outcomes such as innovation performance and overall market performance.

6. Conclusions

This study examined the influences of domestic and international external collaboration on NPD performance in SMEs. Besides, this study explored the mediating effect of

knowledge integration capability and the moderating effects of innovation climate and organizational legitimacy. This study found that both domestic and international external collaboration positively affect SMEs' NPD performance. Knowledge integration capability mediates domestic and international external collaboration–SMEs' NPD performance correlations. Innovation climate positively moderates domestic external collaboration–SMEs' NPD performance correlation and organizational legitimacy positively moderates domestic and international external collaboration–SMEs' NPD performance correlations. Through categorizing external collaboration into two dimensions, domestic and international, and examining their direct influences on SMEs' NPD performance, this study expands the research on external collaboration–NPD performance relationship. Moreover, this study deepens our understanding of how and under what conditions domestic and international external collaboration facilitate the improvement of NPD performance in SMEs.

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References

1. Lyu, C.; Zhang, F.; Ji, J.; Teo, T.S.; Wang, T.; Liu, Z. Competitive intensity and new product development outcomes: The roles of knowledge integration and organizational unlearning. *J. Bus. Res.* **2022**, *139*, 121–133. [\[CrossRef\]](#)
2. Ferreras-Méndez, J.L.; Llopis, O.; Alegre, J. Speeding up new product development through entrepreneurial orientation in SMEs: The moderating role of ambidexterity. *Ind. Market. Manag.* **2022**, *102*, 240–251. [\[CrossRef\]](#)
3. Cooper, R.G. The drivers of success in new-product development. *Ind. Market. Manag.* **2019**, *76*, 36–47. [\[CrossRef\]](#)
4. Tsai, K.H. Collaborative networks and product innovation performance: Toward a contingency perspective. *Res. Policy* **2009**, *38*, 765–778. [\[CrossRef\]](#)
5. Tran, T.M.T.; Woo, S.H.; Yuen, K.F. The impacts of sustainable inter-firm collaboration on business performance of shipping companies. *Int. J. Logist. Manag.* **2021**, *32*, 766–789. [\[CrossRef\]](#)
6. Wang, G.; Dou, W.; Zhu, W.; Zhou, N. The effects of firm capabilities on external collaboration and performance: The moderating role of market turbulence. *J. Bus. Res.* **2015**, *68*, 1928–1936. [\[CrossRef\]](#)
7. Kobarg, S.; Stumpf-Wollersheim, J.; Welp, I.M. More is not always better: Effects of collaboration breadth and depth on radical and incremental innovation performance at the project level. *Res. Policy* **2019**, *48*, 1–10. [\[CrossRef\]](#)
8. Santoro, G.; Bresciani, S.; Papa, A. Collaborative modes with cultural and creative industries and innovation performance: The moderating role of heterogeneous sources of knowledge and absorptive capacity. *Technovation* **2020**, *92*, 102040. [\[CrossRef\]](#)
9. Obradović, T.; Vlačić, B.; Dabić, M. Open innovation in the manufacturing industry: A review and research agenda. *Technovation* **2021**, *102*, 102221. [\[CrossRef\]](#)
10. Tsai, F.S.; Cabrilo, S.; Chou, H.H.; Hu, F.; Tang, A.D. Open innovation and SME performance: The roles of reverse knowledge sharing and stakeholder relationships. *J. Bus. Res.* **2022**, *148*, 433–443. [\[CrossRef\]](#)
11. Salunke, S.; Weerawardena, J.; McColl-Kennedy, J.R. The central role of knowledge integration capability in service innovation-based competitive strategy. *Ind. Market. Manag.* **2019**, *76*, 144–156. [\[CrossRef\]](#)
12. Wang, M.C.; Chen, P.C.; Fang, S.C. A critical view of knowledge networks and innovation performance: The mediation role of firms' knowledge integration capability. *J. Bus. Res.* **2018**, *88*, 222–233. [\[CrossRef\]](#)
13. Sun, Y.; Liu, J.; Ding, Y. Analysis of the relationship between open innovation, knowledge management capability and dual innovation. *Technol. Anal. Strateg. Manag.* **2020**, *32*, 15–28. [\[CrossRef\]](#)
14. Parente, R.; Murray, J.Y.; Zhao, Y.; Kotabe, M.; Dias, R. Relational resources, tacit knowledge integration capability, and business performance. *J. Knowl. Manag.* **2022**, *26*, 805–823. [\[CrossRef\]](#)

15. Gong, Y.; Yao, Y.; Zan, A. The too-much-of-a-good-thing effect of digitalization capability on radical innovation: The role of knowledge accumulation and knowledge integration capability. *J. Knowl. Manag.* **2023**, *27*, 1680–1701. [\[CrossRef\]](#)
16. Wang, X.; Li, J.; Qi, Y. Fostering knowledge creation through network capability ambidexterity with the moderation of an innovation climate. *J. Knowl. Manag.* **2023**, *27*, 613–631. [\[CrossRef\]](#)
17. Popa, S.; Soto-Acosta, P.; Martinez-Conesa, I. Antecedents, moderators, and outcomes of innovation climate and open innovation: An empirical study in SMEs. *Technol. Forecast. Soc. Chang.* **2017**, *118*, 134–142. [\[CrossRef\]](#)
18. Suchman, M.C. Managing legitimacy: Strategic and institutional approaches. *Acad. Manag. Rev.* **1995**, *20*, 571–610. [\[CrossRef\]](#)
19. Donbesuur, F.; Hultman, M.; Oghazi, P.; Boso, N. External knowledge resources and new venture success in developing economies: Leveraging innovative opportunities and legitimacy strategies. *Technol. Forecast. Soc. Chang.* **2022**, *185*, 122034. [\[CrossRef\]](#)
20. Wang, T.; Thornhill, S.; De Castro, J.O. Entrepreneurial orientation, legitimation, and new venture performance. *Strateg. Entrep. J.* **2017**, *4*, 373–392. [\[CrossRef\]](#)
21. Atuahene-Gima, K.; Ko, A. An empirical investigation of the effect of market orientation and entrepreneurship orientation alignment on product innovation. *Organ. Sci.* **2001**, *12*, 54–74. [\[CrossRef\]](#)
22. Morgan, T.; Obal, M.; Anokhin, S. Customer participation and new product performance: Towards the understanding of the mechanisms and key contingencies. *Res. Policy* **2018**, *47*, 498–510. [\[CrossRef\]](#)
23. Liu, Y.; Wang, M. Entrepreneurial orientation, new product development and firm performance: The moderating role of legitimacy in Chinese high-tech SMEs. *Eur. J. Innov. Manag.* **2022**, *25*, 130–149. [\[CrossRef\]](#)
24. Thakur-Wernz, P.; Bruyaka, O.; Contractor, F. Sourcing portfolio diversity in new product development: Antecedents and performance implications. *J. Bus. Res.* **2022**, *150*, 179–193. [\[CrossRef\]](#)
25. Huang, J.; Hu, H.; Wang, Y. Fuzzy front-end vertical external involvement, corporate social responsibility and firms' new product development performance in the VUCA age: From an organizational learning perspective. *Sustainability* **2022**, *15*, 280. [\[CrossRef\]](#)
26. Chesbrough, H.W. The era of open innovation. *MIT Sloan Manag. Rev.* **2003**, *44*, 35–41.
27. Bigliardi, B.; Filippelli, S. Sustainability and open innovation: Main themes and research trajectories. *Sustainability* **2022**, *14*, 6763. [\[CrossRef\]](#)
28. Yang, F.; Zhang, H.; Xiao, T.; Liu, J.; Chai, C.; Zhou, P. Impacts of external involvement on new product development performance: Moderating role of organisational culture. *Technol. Anal. Strateg. Manag.* **2021**, *33*, 70–83. [\[CrossRef\]](#)
29. Ozdemir, S.; Kandemir, D.; Eng, T.Y.; Gupta, S. Vertical stakeholder collaborations for firm innovativeness in new product development: The moderating roles of legal bonds and operational linkages. *J. Bus. Res.* **2020**, *119*, 172–184. [\[CrossRef\]](#)
30. Hsieh, W.L.; Ganotakis, P.; Kafouros, M.; Wang, C. Foreign and domestic collaboration, product innovation novelty, and firm growth. *J. Prod. Innov. Manag.* **2018**, *35*, 652–672. [\[CrossRef\]](#)
31. Nestle, V.; Täube, F.A.; Heidenreich, S.; Bogers, M. Establishing open innovation culture in cluster initiatives: The role of trust and information asymmetry. *Technol. Forecast. Soc. Chang.* **2019**, *146*, 563–572. [\[CrossRef\]](#)
32. Shen, G.C.C.; Chiou, J.S.; Hsiao, C.H.; Wang, C.H.; Li, H.N. Effective marketing communication via social networking site: The moderating role of the social tie. *J. Bus. Res.* **2016**, *69*, 2265–2270. [\[CrossRef\]](#)
33. Leckel, A.; Veilleux, S.; Dana, L.P. Local Open Innovation: A means for public policy to increase collaboration for innovation in SMEs. *Technol. Forecast. Soc. Chang.* **2020**, *153*, 119891. [\[CrossRef\]](#)
34. Kucharska, W. Tacit knowledge influence on intellectual capital and innovativeness in the healthcare sector: A cross-country study of Poland and the US. *J. Bus. Res.* **2022**, *149*, 869–883. [\[CrossRef\]](#)
35. Chen, Z.; Vogel, D.; Yang, T.; Deng, J. The effect of social media-enabled mentoring on online tacit knowledge acquisition within sustainable organizations: A moderated mediation model. *Sustainability* **2020**, *12*, 616. [\[CrossRef\]](#)
36. Ascani, A.; Bettarelli, L.; Resmini, L.; Balland, P.A. Global networks, local specialisation and regional patterns of innovation. *Res. Policy* **2020**, *49*, 104031. [\[CrossRef\]](#)
37. Fu, X.; Fu, X.M.; Ghauri, P.; Hou, J. International collaboration and innovation: Evidence from a leading Chinese multinational enterprise. *J. World Bus.* **2022**, *57*, 101329. [\[CrossRef\]](#)
38. Gao, X.; Rai, V. Knowledge acquisition and innovation quality: The moderating role of geographical characteristics of technology. *Technovation* **2023**, *125*, 102766. [\[CrossRef\]](#)
39. Van Beers, C.; Zand, F. R&D cooperation, partner diversity, and innovation performance: An empirical analysis. *J. Prod. Innov. Manag.* **2014**, *31*, 292–312.
40. Chiang, Y.H.; Hung, K.P. Exploring open search strategies and perceived innovation performance from the perspective of inter-organizational knowledge flows. *R&D Manag.* **2010**, *40*, 292–299.
41. Van Wijk, R.; Jansen, J.J.; Lyles, M.A. Inter-and intra-organizational knowledge transfer: A meta-analytic review and assessment of its antecedents and consequences. *J. Manag. Stud.* **2008**, *45*, 830–853. [\[CrossRef\]](#)
42. Iino, T.; Inoue, H.; Saito, Y.U.; Todo, Y. How does the global network of research collaboration affect the quality of innovation? *Jpn. Econ. Rev.* **2021**, *72*, 5–48. [\[CrossRef\]](#)
43. Ebersberger, B.; Herstad, S.J. The relationship between international innovation collaboration, intramural R&D and SMEs' innovation performance: A quantile regression approach. *Appl. Econ. Lett.* **2013**, *20*, 626–630.
44. Guo, J.; Zhou, S.; Chen, J.; Chen, Q. How information technology capability and knowledge integration capability interact to affect business model design: A polynomial regression with response surface analysis. *Technol. Forecast. Soc. Chang.* **2021**, *170*, 120935. [\[CrossRef\]](#)

45. Sun, X.; Zhao, D.; Zhang, D.; Tian, F. Entrepreneurship and sustainable innovation capabilities in platform enterprises: The mediating role of knowledge integration. *Chin. Manag. Stud.* **2022**, *16*, 627–652. [[CrossRef](#)]
46. Zhang, G.; Zhao, S.; Xi, Y.; Liu, N.; Xu, X. Relating science and technology resources integration and polarization effect to innovation ability in emerging economies: An empirical study of Chinese enterprises. *Technol. Forecast. Soc. Chang.* **2018**, *135*, 188–198. [[CrossRef](#)]
47. Ye, P.; Liu, L.; Tan, J. Creative leadership, innovation climate and innovation behaviour: The moderating role of knowledge sharing in management. *Eur. J. Innov. Manag.* **2022**, *25*, 1092–1114. [[CrossRef](#)]
48. Diesel, R.; Scheepers, C.B. Innovation climate mediating complexity leadership and ambidexterity. *Pers. Rev.* **2019**, *48*, 1782–1808. [[CrossRef](#)]
49. Newman, A.; Round, H.; Wang, S.; Mount, M. Innovation climate: A systematic review of the literature and agenda for future research. *J. Occup. Organ. Psych.* **2020**, *93*, 73–109. [[CrossRef](#)]
50. Wan, Y.; Gao, Y.; Hu, Y. Blockchain application and collaborative innovation in the manufacturing industry: Based on the perspective of social trust. *Technol. Forecast. Soc. Chang.* **2022**, *177*, 121540. [[CrossRef](#)]
51. Audretsch, D.B.; Belitski, M.; Caiazza, R.; Phan, P. Collaboration strategies and SME innovation performance. *J. Bus. Res.* **2023**, *164*, 114018. [[CrossRef](#)]
52. Cohen, W.M.; Levinthal, D.A. Absorptive capacity: A new perspective on learning and innovation. *Admin. Sci. Quart.* **1990**, *35*, 128–152. [[CrossRef](#)]
53. Desai, V.M. Collaborative stakeholder engagement: An integration between theories of organizational legitimacy and learning. *Acad. Manag. J.* **2018**, *61*, 220–244. [[CrossRef](#)]
54. Ito, Y. Interorganizational business development utilizing legitimacy for resource mobilization in large firms: Successful and unsuccessful cases. *Ind. Market. Manag.* **2018**, *75*, 80–89. [[CrossRef](#)]
55. Ma, H.; Guo, H.; Shen, R. Organisational regulatory legitimacy, entrepreneurial orientation, and SME innovation: An optimal distinctiveness perspective. *Technol. Anal. Strateg. Manag.* **2019**, *31*, 833–847. [[CrossRef](#)]
56. Fisher, G.; Kotha, S.; Lahiri, A. Changing with the times: An integrated view of identity, legitimacy, and new venture life cycles. *Acad. Manag. Rev.* **2016**, *41*, 383–409. [[CrossRef](#)]
57. Tsinopoulos, C.; Sousa, C.M.; Yan, J. Process innovation: Open innovation and the moderating role of the motivation to achieve legitimacy. *J. Prod. Innov. Manag.* **2018**, *35*, 27–48. [[CrossRef](#)]
58. Dacin, M.T.; Oliver, C.; Roy, J.P. The legitimacy of strategic alliances: An institutional perspective. *Strateg. Manag. J.* **2007**, *28*, 169–187. [[CrossRef](#)]
59. Ferreras-Méndez, J.L.; Olmos-Penuela, J.; Salas-Vallina, A.; Alegre, J. Entrepreneurial orientation and new product development performance in SMEs: The mediating role of business model innovation. *Technovation* **2021**, *108*, 102325. [[CrossRef](#)]
60. Frishammar, J.; Åke Hörte, S. The role of market orientation and entrepreneurial orientation for new product development performance in manufacturing firms. *Technol. Anal. Strateg. Manag.* **2007**, *19*, 765–788. [[CrossRef](#)]
61. Laursen, K.; Salter, A. Open for innovation: The role of openness in explaining innovation performance among UK manufacturing firms. *Strateg. Manag. J.* **2006**, *27*, 131–150. [[CrossRef](#)]
62. Grant, R.M. Prospering in dynamically-competitive environments: Organizational capability as knowledge integration. *Organ. Sci.* **1996**, *7*, 375–387. [[CrossRef](#)]
63. Yu, X.; Meng, X.; Chen, Y.; Chen, Y.; Nguyen, B. Work-family conflict, organizational ambidexterity and new venture legitimacy in emerging economies. *Technol. Forecast. Soc. Chang.* **2018**, *135*, 229–240. [[CrossRef](#)]
64. Wang, T.; Gao, J.; Jia, Y.; Wang, C.L. The double-edged sword effect of adaptation strategy on performance: The mediation of legitimacy and synergy. *J. Bus. Res.* **2022**, *139*, 448–456. [[CrossRef](#)]
65. Jansen, J.J.P.; Van Den Bosch, F.A.J.; Volberda, H.W. Exploratory Innovation, Exploitative Innovation, and Performance: Effects of Organizational Antecedents and Environmental Moderators. *Manag. Sci.* **2006**, *52*, 1661–1674. [[CrossRef](#)]
66. Podsakoff, P.M.; Mackenzie, S.B.; Lee, J.Y.; Podsakoff, N.P. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879–903. [[CrossRef](#)]
67. Baron, R.M.; Kenny, D.A. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J. Pers. Soc. Psychol.* **1986**, *51*, 1173. [[CrossRef](#)]
68. Aiken, L.; West, S. *Multiple Regression: Testing and Interpreting Interactions*; Sage Publications: Newbury Park, CA, USA, 1991; pp. 320–331.
69. Li, H.; Wang, Z.; Lin, W. How Sino-foreign cooperation networks affect innovation performance of Chinese enterprises? Evidence from biomedical industry. *IEEE Trans. Eng. Manag.* **2023**, *11*, 1–17. [[CrossRef](#)]
70. Rodríguez, A.; Hernández, V.; Nieto, M.J. International and domestic external knowledge in the innovation performance of firms from transition economies: The role of institutions. *Technol. Forecast. Soc. Chang.* **2022**, *176*, 121442. [[CrossRef](#)]
71. Wu, S.J.; Ragatz, G.L. The role of integrative capabilities in involving suppliers in new product development: A knowledge integration perspective. *J. Manuf. Technol. Manag.* **2021**, *19*, 82–101. [[CrossRef](#)]
72. Li, M.S.; Li, J.; Li, J.M.; Liu, Z.W.; Deng, X.T. The impact of team learning climate on innovation performance—Mediating role of knowledge integration capability. *Front. Psychol.* **2023**, *13*, 1104073. [[CrossRef](#)] [[PubMed](#)]
73. Lu, C.; Yu, B. The effect of formal and informal external collaboration on innovation performance of SMEs: Evidence from China. *Sustainability* **2020**, *12*, 9636. [[CrossRef](#)]

74. Huang, M.H.; Chen, D.Z. How can academic innovation performance in university–industry collaboration be improved? *Technol. Forecast. Soc. Chang.* **2017**, *123*, 210–215. [[CrossRef](#)]
75. Benhayoun, L.; Le Dain, M.A.; Dominguez-Péry, C.; Lyons, A.C. SMEs embedded in collaborative innovation networks: How to measure their absorptive capacity? *Technol. Forecast. Soc. Chang.* **2020**, *159*, 120196. [[CrossRef](#)]
76. Hock-Doepgen, M.; Clauss, T.; Kraus, S.; Cheng, C.F. Knowledge management capabilities and organizational risk-taking for business model innovation in SMEs. *J. Bus. Res.* **2021**, *130*, 683–697. [[CrossRef](#)]
77. Hervás-Oliver, J.L.; Sempere-Ripoll, F.; Boronat-Moll, C. Technological innovation typologies and open innovation in SMEs: Beyond internal and external sources of knowledge. *Technol. Forecast. Soc. Chang.* **2021**, *162*, 120338. [[CrossRef](#)]
78. Radziwon, A.; Bogers, M. Open innovation in SMEs: Exploring inter-organizational relationships in an ecosystem. *Technol. Forecast. Soc. Chang.* **2019**, *146*, 573–587. [[CrossRef](#)]
79. Albats, E.; Podmetina, D.; Vanhaverbeke, W. Open innovation in SMEs: A process view towards business model innovation. *J. Small. Bus. Manag.* **2023**, *61*, 2519–2560. [[CrossRef](#)]
80. Yang, M.M.; Yang, F.; Li, X. Open innovation and de-escalation of commitment in underperforming new product development projects. *J. Bus. Res.* **2023**, *164*, 113989. [[CrossRef](#)]
81. Hung, K.P.; Chou, C. The impact of open innovation on firm performance: The moderating effects of internal R&D and environmental turbulence. *Technovation* **2013**, *33*, 368–380.
82. Kafourous, M.; Love, J.H.; Ganotakis, P.; Konara, P. Experience in R&D collaborations, innovative performance and the moderating effect of different dimensions of absorptive capacity. *Technol. Forecast. Soc. Chang.* **2020**, *150*, 119757.

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