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Research Article

The Role of Different Kinds of Outbound Open Innovation on Enterprise Innovation Performance with Mediating Role of Structural Hole

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With the improvement of enterprise innovation ability, enterprises have accumulated a large number of innovation achievements. The transformation and utilization of these innovation achievements have become a problem that enterprises have to face. Therefore, outbound open innovation has gradually become the focus of enterprise practice and academic research. Based on the social exchange theory, this paper regards two different forms of outbound OI (FR and SA) as a process of social exchange and illustrates how they affect the innovation performance of enterprises by influencing the structure of their innovation networks. Using data from 196 firms in the Chinese market, this study empirically examines the impact of FR and SA on innovation performance and further examines the mediating effect of structural holes. The study found that FR has a significant positive impact on enterprise innovation performance, and the number of structural holes occupied by enterprises plays a mediating role. While the impact of SA on enterprise innovation performance is not significant, this is because SA will reduce the number of structural holes occupied by enterprises, which is an important source of enterprise's innovation.

1. Introduction

According to Chesbrough, open innovation (OI) can be classified into two types based on the direction of knowledge and resource flow: inbound OI, in which knowledge and resources flow into enterprises, and outbound OI, in which enterprises export knowledge and resources [1]. Inbound OI refers to enterprises enhancing their innovation capability through the introduction of external innovation resources or the direct acquisition of external existing technologies, whereas outbound OI refers to enterprises externalizing internal accomplishments through specific contract transfer, contract authorization, gift, external licensing, and technology commercialization [2]. Many researchers have studied the antecedents and outcomes of the OI since Chesbrough's seminal study.

Previous research on OI has emphasized inbound OI [3]. This focus should not come as a surprise since acquiring knowledge or ideas entails immediate value to the firm [4–6], and the inflows of knowledge are easier for firms to control. S technology advances, organizational innovation capabilities increase, and commercializing innovation achievements becomes increasingly vital. As a result, outbound OI gradually attracts the attention of academics and management. According to the current study, the organizational structure, managerial traits, and organizational strategy can all influence outbound OI. For example, Gentile-Lüdecke et al. discover that the formalization of SMEs' organizational structure has a negative effect on outbound OI, while specialization and centralization have a positive effect on outbound OI [3]. Naqshbandi focuses on the impact of manager traits on outbound OI, and they find

that managerial ties [7, 8], empowering leadership [9, 10], and knowledge-oriented leadership can promote outbound OI [11]. Grimaldi et al. find that firms with a defensive IP strategy embraced outbound OI more than those declaring a collaborative IP strategy [12].

Other academics, however, question whether outbound OI may truly boost business innovation performance. Some of them believe that outbound OI allows firms to share resources, technology, and knowledge with other businesses, hence improving enterprise innovation performance [13]. Some academics suggest that there is a risk of technology leakage during outbound OI [14] and that creative accomplishments are easily duplicated by competitors, resulting in the loss of first-mover advantage [15]. Using data from the biopharmaceutical business, Fu et al. discover that outbound OI can have a detrimental influence on short-term company performance while having a beneficial impact in the long run [16]. Tang et al. discover that high levels of outward openness can diminish in the setting of open-source software projects [17].

We argue that the reasons for the inconsistent conclusion are as follows: (1) most studies do not subdivide outbound OI during their debate. Based on the study of Dahlander and Gann, outbound OI can be divided into selling-authorizing (SA) and free-revealing (FA) [18] since these two kinds of outbound OI are characterized by different resource integration algorithms and implemented for different purposes by firms. They will result in different outcomes. (2) Previous studies have ignored the concerns about the response of the recipients. Since outbound OI aims to commercialize of organization's expertise and capabilities [8], it is not a one-shot deal for both exporters and external recipients [12]. Thus, the different kinds of outbound innovation will affect the external recipients' response behavior, which also affects the exporters in turn. Indeed, some researchers have noticed that implementing outbound OI affects the structure of the enterprise innovation network. For example, Luo et al. discovered that outbound OI enables organizations to share technology and information with other businesses in the innovation network [13], thereby strengthening their relationship and improving the organization's degree of centrality in the innovation network [19]. Zaheer stated that the structural hole is a "weak link," resulting in an unstable structure, and the center enterprise's different behavior (e.g., outbound OI) strategies can stimulate the edge position enterprise to respond appropriately which causes the filling of the structural hole easily [20]. Unfortunately, these studies still do not discuss the outbound OI in different dimensions in detail.

This article seeks to fill these research gaps by investigating the effects of various types of outbound OI (FR and SR) on enterprise innovation performance. Furthermore, based on social exchange theory [21], we propose that different types of outbound OI can be viewed as a process of social exchange, with different kinds of outbound OI leading to different reactions from external recipients, which can affect the structural (e.g., the structural hole) of the network in which the enterprise is located, ultimately affecting the enterprise's innovation performance.

The empirical findings have several significant consequences. First, this article introduces a novel framework that comprises two types of outbound OI. To the best of our knowledge, this is one of the few articles that investigate the impact of SR and FR on enterprise innovation performance at the same time. As a result, this article contributes to the study of outbound OI, particularly the dearth of research on FR. Second, our empirical findings reveal that FR has a considerable positive impact on enterprise innovation performance, and structural holes operate as a mediator between FR and enterprise innovation performance. However, SR does not considerably improve enterprise innovation performance. Further investigation reveals that SR can have a detrimental impact on the number of enterprises' structural holes, even though its favorable impact on corporate innovation performance has been generally acknowledged [22, 23]. This discovery explains why existing research on the impact of outbound OI is inconsistent.

2. Literature Review

2.1. Outbound Open Innovation. From a resource standpoint, open innovation refers to an innovation paradigm in which organizations integrate all critical internal and external resources and leverage internal and external market channels for innovation. According to the direction of information and resource flow, open innovation can be classified as inbound (resources/knowledge flows from outside to within the organization) or outbound (resources/knowledge flows from inside to outside the enterprise) [1]. Externalization of internal creativity is a term that refers to the process of externalizing internal creativity through the sale of intellectual property, the transfer of a portion of an investment, and other methods such as contract transfer, contact authorization, gift, external license, and technology commercialization. Additionally, enterprises are classified into two categories based on whether economic transactions occur during the implementation of outbound OI: free-revealing (FR) and selling-authorizing (SA) [18]. FR refers to the situation where an enterprise exports its internal technology, patents, knowledge, and resources to the external environment for no monetary gain. SA entails businesses commercializing new technologies and ideas through the sale or licensing of their research and development accomplishments to other organizations [24].

Although research on the impact of outbound OI on firm innovation performance has always been a core concern of field research, the findings of scholars are inconsistent. According to some scholars, commercializing internal innovation results can not only recover a significant amount of funds in a short period to compensate for the consumption of innovation but can also facilitate enterprises in adjusting the process and direction of innovation in real time by obtaining market and user demand information during the commercialization process [25]. Correspondingly, businesses that implement outbound OI have increased opportunities to collaborate with other external innovation sources and to participate in external network activities on a massive scale. Enterprise innovation performance can be

improved by sharing resources, technology, and information with other enterprises in the innovation network [13]. According to certain scholars, an enterprise that is excessively open threats not only technology leakage [5] but also being imitated by competitors, resulting in the loss of first-mover advantage [14]. Additionally, opportunistic enterprise behavior, excessive coordination costs, and insufficient capacity all have a detrimental effect on the relationship between outbound OI and innovation performance [15].

To summarize, while previous research has established that outbound OI has a significant impact on enterprise innovation performance, there are relatively few studies examining the impact of various types of outbound OI on enterprise innovation performance. Because the FR and sale of authorizations follow distinct logics and accomplish distinct objectives, the impact of the two on enterprise innovation performance requires additional research.

2.2. Structural Hole Network. Burt first proposed the concept of structural holes, which is derived from interpersonal relationship networks. If party A is connected to two unrelated parties B and C in a tripartite relationship, the relationship network formed by these three parties is referred to as a structural hole network, or A occupies a structural hole [26]. While all existing research indicates that structural holes will have an overall impact on enterprises' innovation activities, the conclusions are not uniform.

According to some scholars, structural holes can provide timely, nonredundant, and high-quality information. On the one hand, enterprises with a good extent of structural autonomy can leverage assets, information, and other network resources to create resource asymmetry and thus stay ahead of the competition [26]. On the other hand, such data enable enterprises to rapidly identify and respond to emerging external opportunities and threats, thereby lowering trial and error costs and increasing operational efficiency [22]. Zhang et al. discovered in their empirical study that structural holes promote the development of exploratory innovation activities but have no discernible effect on exploitative innovation activities [27].

Some scholars emphasize that weak relationships within structural hole networks contribute to a lack of trust and an increase in opportunistic behaviors, thus further lowering enterprise performance [23]. Dyer and Nobeoka unearthed that the fewer holes an enterprise has in its network structure, the more strenuous the relationship between its cooperative technological innovation partners is. The intensive relationship drives the development of trust and shared values, which are requisite for the enterprise's technological innovation activities [28]. Ahuja acknowledged that structural holes can benefit businesses, but the opportunism generated may result in more losses than gains [23]. Qi et al. used the social network analysis method to analyze longitudinal data from 630 ICT enterprises and concluded that structural holes in the longitudinal relationship network inhibit the input and output of innovation [29].

Others believe that while structural holes can provide enterprises with such a variety of information and resources, these resources and information are still only effective when enterprises actively develop and possess the requisite capabilities. Swaminathan believes that enterprises' development and utilization of resources and knowledge brought about through the structural holes may conflict with their strategic objectives, resulting in an inverted U-shaped effect of structural holes on enterprise innovation performance [30]. And the inverted U-shaped relationship will be adjusted to account for enterprises' absorptive capacity [31].

To sum up, the impact of structural holes on enterprise innovation performance depends on the specific situation. However, few scholars have discussed the relationship between different types of outbound OI and structural holes. The structural hole is an unstable network structure. The implementation of different kinds of outbound OI by enterprises will stimulate the response, cooperation, or resistance of other members in the innovation network, which will have different effects on the structural hole. Therefore, it is necessary to further explore the impact of different types of outbound OI on structural holes.

Beyond everything, the influence of structural holes on enterprise innovation performance must be contextualized, but few scholars have examined the relationship between different types of hole structures and enterprise outbound OI. Structural hole is an unstable network structure, and the enterprise's different outbound OI will arouse other members of the innovation network to cooperate or resist, resulting in diverse influences on structural holes. Further discussion is made of the relationship between innovation performance and innovation performance.

3. Hypothesis

3.1. FR and Innovative Performance. Whereas enterprises cannot derive direct economic benefits from FR, they can improve their innovation performance tangentially. This article argues that open access can bump up innovation performance by promoting technology adoption as an industry standard and enhancing external competition and collaboration relationships.

To begin, industry standards based on their technology can provide enterprises with new business opportunities and expansion in developing countries. When an enterprise's innovation becomes industry standard, enhancing its social honor and market position not only means helping the enterprise attract more and better innovation resources (such as talent and investment) but also delivers more comprehensive and accurate information about user needs, thereby promoting innovative technologies and perfection. Correspondingly, maximizing profit motivation drives enterprises to continuously advance and innovate relevant technologies to secure the industry's technology standard and reap continuous benefits. Dahlander and Gann revealed that publishing and sharing internal innovation resources enable enterprises to allocate and obtain support for external organizational resources that promote innovation formation [18]. According to Hienerth and Lettl's research, FR

behavior in the community can stimulate users,' industries,' and enterprises' innovation efficiency [32].

Second, according to signal theory, an enterprise's FR behavior sends a signal of goodwill, trustworthiness, and strength to other external enterprises, assisting the enterprise in improving its external competition and cooperation relationships, and thereby attracting additional partners. In comparison to domestic open innovation, outbound OI on information and partner access tends to be ad hoc, allowing for greater heterogeneity and thus increasing enterprise value through cross-border knowledge search for diverse opportunities [18]. Henkel made a quantitative analysis of the FR in the innovation process of Linux software and found that enterprises that release their innovation achievements for free will get informal software development support from other enterprises [33]. On the contrary, an overemphasis on protection will result in a closed and isolated situation, a lack of diverse resources and information input, and thus negatively impact their own innovation process [34]. Thus, in the context of FR, both enterprises and their competitors contribute to the formation of the joint intellectual invention by disclosing their research ideas and accomplishments to one another, thereby contributing to the formation of an informal innovation network of cooperation [33]. Technological advancement and breakthroughs can be accelerated by studying competitors' ideas and accomplishments [34].

Based on the above analysis, this paper proposes the following hypotheses.

H1: FR has a significant positive impact on enterprise innovation performance.

3.2. SA and Innovation Performance. For licensing, businesses commercialize their internal innovation accomplishments through technology licensing, franchising, and outsourcing services in order to generate direct economic returns and form cooperative relationships with a variety of other businesses. As a result, licensing has a positive effect on innovation performance. It is primarily accomplished through three methods: external market identification, resource optimization, and the establishment of external innovation networks.

First, as product iteration speeds up, the enterprise becomes critical to the success of the innovation's market diffusion effect. When businesses can continue to commercialize innovations via SA, they will receive timely and accurate market and user demand information, enabling them to grasp future development trends and focus on promoting the development of new technology or new products and applications [1, 2].

On the other hand, when an enterprise seems unable to commercialize its internal innovation through licensing, it indicates that its current technology and products are unable to meet market demand, compelling the enterprise to pivot its innovation direction and progress in real time. Chen and Jin's research also discovered that the output of creativity can assist enterprises in determining the true value of innovation, thereby forming the basis for pertinent investment decisions [35].

Second, through the sale of authorizations, enterprises could even quickly obtain the resources required for innovation, reduce the cost of internal research and development, and increase the efficiency with which internal research and development resources are utilized, thereby improving the enterprise's innovation performance, which is primarily reflected in the following two dimensions.

To begin, the sale of licenses enables firms to raise a substantial quantity of cash quickly to meet their enormous need for funding for technological research and development. Lichtenthaler discovered that MOTOROLA could generate capital income of ten billion dollars per year from the sale of patents or technology authorizations, significantly increasing the enterprise's available capital for R&D [36] and that the enterprise's internal R&D investment had a significant positive effect on technological innovation efficiency [37].

Second, the enterprise, through the transfer of incomplete or nonessential technology, activates the redundancy of "useless" innovation achievements, increases the enterprise's return on research and development, and also reduces the enterprise's management costs, allowing the enterprise to focus resources on maintaining and developing the enterprise's core business, improving existing products and technology, and breaking new ground. Zhang et al. empirical research of 164 organizations in the Pearl River Delta area discovered that via the adoption of outbound OI, businesses may achieve persistent competitive advantages [38].

Third, enterprises establish open innovation networks through the transfer and authorization of intellectual property rights, the formation of innovation alliances, and cooperative production in the context of SA [39], allowing enterprises to connect with external knowledge more freely and systematically. To increase the likelihood of successful research and development, firms will create strong relationships with other enterprises and maintain a high degree of engagement and trust. This network enables unrestricted movement of resources, information, and expertise, which is favorable to encouraging the development and breakthrough of critical technologies in the sector [40]. Song and Thieme's research discovered that obtaining market knowledge from suppliers had a considerable favorable effect on product design and commercialization [41]. Inauen and Schenker-Wicki's research further demonstrates that partnerships and joint ventures may significantly enhance technology and manufacturing practices [42]. Additionally, with the spread of information through the network, firms' technical advantage is easily lost, compelling enterprises to engage in continual innovation.

Based on the above analysis, this paper proposes the following hypotheses:

H2: SA has a significant positive impact on the innovation performance of enterprises.

3.3. The Mediate Role of the Structural Hole. Based on the social exchange theory, this study proposes the mediating variable of the structural hole and explains how different types of outbound OI alter the structural hole of firms in

order to explain the impact of outbound OI on innovation performance [21]. According to the social exchange theory, the social interaction among individuals is a social exchange process accompanied by the exchange of valued items, and individuals achieve their personal goals through social exchange [43, 44]. In the process of social exchange, individuals know well what they can get from social interactions. The premise for the stable existence of social relations is that individuals benefit more from social relations than they contribute. If an individual feels unfairly treated throughout the exchange process, he would endeavor to restore fairness, changing the social relationship between the two parties [21].

For FR, the goal of enterprises is to improve the external competition relationship and promote their technology to become an industry standard. Enterprises do not emphasize control and restriction on recipients during this process. The main enterprise's interest motive is disguised in this sort of social exchange activity, and the recipient does not feel threatened or unfair. Furthermore, recipients are more likely to believe that the benefits they gain from maintaining the relationship outweigh the expenditures they incur. As a result, in order to continue to reap profits, their drive to fill the structural holes will wane, and they will actively transfer resources and information to the focus firms to maintain the status quo. Besides, FR's actions will send a positive message, attracting more and more businesses to join the innovation network. The size of the innovation network is growing, as is the number of structural holes controlled by the enterprise. According to Liu and Ipe, individuals' social interaction actions that provide advice or assistance to other network members will help them occupy a more important position in the network [45].

For SA, according to its definition, the goal of the enterprise is to generate long-term profits. In this type of social exchange activity, the core enterprises hold the technical resources required by the recipients, which will form a power asymmetry. Enterprises tend to use this power advantage to maximize the benefits of the exchange process and may even engage in activities that are detrimental to the recipients. Therefore, the recipients will perceive unfairness in the exchange process, which will motivate them to restore fairness, such as balancing each other's social power by filling structural holes to achieve fairness. Jiang et al. also found that when enterprises are in a low position in the network, they will try to fill the structural hole to form a balance with the focus enterprises in order to break the unequal relationship [20]. Besides, since there is no information asymmetry among enterprises that maintain strong ties and they bear strong mutual trust [28], enterprises tend to establish strong ties with recipients rather than weak ties (the structural hole is a typical kind of weak relationship).

Based on this, the following hypotheses are proposed in this paper:

H3: FR positively affects the number of structural holes occupied by enterprises

H4: SA negatively affects the number of structural holes occupied by enterprises

Within the structural hole network, focal enterprises can leverage their information and status advantages to manage innovation partner resources effectively by the environment and their own needs, ensuring the acquisition of innovation resources and improving their innovation performance [46].

In terms of information advantage, on the one hand, enterprises with structural holes are more likely to obtain more comprehensive information. The more structural holes enterprises occupy, the more timely, richer, and more specific information enterprises can obtain. Moreover, through cross-verification between information from different sources and channels, they can quickly eliminate false information, significantly reduce the search cost of enterprises, help enterprises quickly find partners, and accurately meet the needs of the market and users, thus speeding up the innovation process of their own. On the other hand, because the structural hole is the gap of information flow, the enterprises occupying the structural hole are in the position of information hub, which is more likely to obtain heterogeneous information and promote the emergence of new concepts, new ideas, and new technologies. Zaheer and Bell's research shows that enterprises occupying structural holes have more frequent contact with external innovation sources, and enterprises can improve their innovation ability with the help of the learning effect, and then, they can quickly identify and respond to external emerging opportunities and threats, to reduce risks and costs [22].

By its "intermediary" position and information advantage, the firm occupying the structural hole may perform the "third party role" of information exchange in the network. The conventional wisdom is that focal companies control the flow of information via a network of structural gaps to coerce or compete with others. Due to the more frequent changes in technology today, the enterprise's focus on occupying a position may soon be reversed; as a result, businesses that occupy structural holes do not adopt a beggar-thy-neighbor attitude but actively encourage structural holes in the network so that each subject can improve communication and the overall network's efficiency, benefiting both the principals. In this kind of profit-driven structural hole network, knowledge, technology, information, and other resources flow freely and completely among stakeholders, fostering innovation synergy among topics and so improving total innovation performance [19].

Based on this, the following hypotheses are proposed in this paper:

H5: structural hole can positively affect enterprise innovation performance

H6: structural hole plays an mediate role in the relationship between FR and enterprise innovation performance

H7: structural hole plays an mediate role in the relationship between SA and enterprise innovation performance

To sum up, the model of this paper is shown in Figure 1.

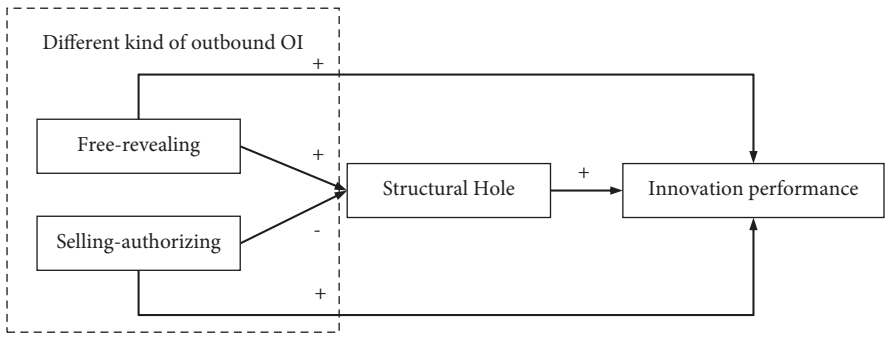

Figure 1: The hypothetical model.

4. Research Design

4.1. Measurement of Variables. For the measurement of SA, this paper adopts the scale developed by Lichtenthaler [2]. For the measurement of FR, this paper refers to the relevant scale of Chen and Jin [47]. For the measurement of innovation performance, this paper refers to the scale of Lin [48]. For the measurement of structural holes, this paper refers to the scale of Cui and Shi [24]. For the Reference English scale, the bidirectional compilation was done to ensure the accuracy of the items, and Likert 7 scales were used for measurement.

In terms of the selection of control variables, according to existing studies, enterprise size, enterprise nature, and the industry to which an enterprise belongs all have an impact on the innovation practice of an enterprise. Therefore, to make the research results more accurate, the above four variables are treated as control variables in this paper.

4.2. Data Collection. This paper takes enterprises in Tangshan, Tianjin, Qingdao, Dongying, and other places as the investigation object. The questionnaire survey was conducted by combining online and offline methods. Offline, field visits to distribute questionnaires. Online, this paper distributed the questionnaire through the We Chat group and e-mail of university MBA. A total of 320 questionnaires were sent out, and 205 were recovered with a recovery rate of 64.06%. Considering the accuracy of data collection, preliminary screening of the questionnaire was carried out, excluding the questionnaires with incorrect answers to attention test questions and those with obvious unserious answers. Finally, 196 valid questionnaires were obtained. Table 1 describes the descriptive statistics of the samples.

4.3. Empirical Analysis

4.3.1. Reliability and Validity Analysis. SPSS 22 was used to test the reliability of each item. The overall Cronbach's alpha of the scale reached 0.875, and the Cronbach's alpha of each variable was over 0.7 (minimum 0.711), indicating that the scale had good internal consistency and high reliability.

AMOS 22 was used to construct a measurement model containing five latent variables for confirmatory factor analysis. The CR of all latent variables was >0.7, indicating that each latent variable had good construction validity. In addition, $\chi^2/df = 1.226 < 4$, RMSEA = 0.034 < 0.08, GFI = 0.943, NFI = 0.904, IFI = 0.981, TLI = 0.972, and CFI = 0.980. All indicators are greater than 0.9, so it can be judged that the fitting degree of the model is good.

The results of the discriminant validity test are shown in Table 2. The average variance extracted (AVE) value of each variable is above 0.5 and bigger than the correlation coefficient between the variables. This result indicates that the discriminant validity between variables is good.

4.3.2. Common Method Bias Test and Nonresponse Bias Test. When data are acquired via a questionnaire, a typical technique bias occurs frequently. Despite being completed anonymously, this survey breached the criteria for controlling common method variation. Harman's single-factor test was used in this study to measure the severity of this condition, which implies that all questionnaire questions were analyzed without rotation. The variance of the first principal component explanation was 31.492%, but it did not account for half of the total variation explanation (69.715%), indicating that no clear common technique bias problem existed.

Since there is a limitation in Harman's single-factor method [49], we conduct a common latent factor (CLF) test additionally. We added a single latent factor during the confirmatory factor analysis. The result is shown in Table 3. We can see that the model fit become poor when we add a CLF to the model, thus confirming that the common method bias is not serious.

A comparison of the means of the first 95 respondents and the last 101 respondents using a *t*-test [9] showed that no significant differences existed in the mean variable scores of the early and late respondents (see Table 4), thus ruling out nonresponse bias.

4.3.3. Hypothesis Testing. To test the hypothesis, this paper constructs Model 1—Model 6. In model 1, the dependent variable is enterprise innovation performance, and control factors (enterprise size, enterprise nature, enterprise industry, and enterprise age) are included. Model 2, Model 3, and Model 4 take enterprise innovation as dependent variables. On the basis of adding control variables, they take FR, SA, and structural hole as independent variables, respectively.

Table 1: The descriptive statistics of the sample.

Enterprise characteristics		Sample size	Proportion (%)
Enterprise nature	Private enterprise	72	36.73
	State-owned enterprise	64	32.65
	Foreign-owned enterprise	44	22.45
	Others	16	8.16
Enterprise scale	Less 50 persons	60	30.61
	50–100 persons	22	11.22
	100–500 persons	26	13.27
	500–1000 persons	14	7.14
	More than 1000 persons	74	37.76
Enterprise age	1–3 year	21	10.71
	3–5 year	22	11.22
	5–10 year	22	11.22
	Above 10 years	131	66.84

Table 2: Combined reliability, descriptive statistics, and correlation coefficient matrix of variables.

Variable	CR	Mean	SD	1	2	3	4
FR	0.843	3.778	1.679	(0.857)			
SA	0.888	3.554	1.829	−0.175**	(0.895)		
Structural hole	0.772	3.515	1.769	0.327***	−0.325***	(0.715)	
Innovation performance	0.796	3.989	1.131	0.298***	0.020	0.295***	(0.894)

Note. *** indicates that the correlation is significant at 0.01, ** indicates that the correlation is significant at 0.05, and * indicates that the correlation is significant at 0.1. The square root of AVE is in the parentheses.

Table 3: The result of the common latent factor test.

Model type	χ^2/df	RMSEA	GFI	NFI	IFI	TLI	CFI
Without CLF	1.226	0.034	0.943	0.904	0.981	0.972	0.980
With CLF	1.243	0.035	0.943	0.907	0.980	0.970	0.980

Table 4: The result of the nonresponse bias test.

Variable	P value	T value	95% confidence interval
FR	0.543	−0.035	[−0.483, 0.466]
SR	0.927	0.110	[−0.488, 0.546]
Structural hole	0.283	0.407	[−0.397, 0.603]
Innovation performance	0.569	−0.693	[−0.507, 0.243]

Model 5 and Model 6 take structural holes as dependent variables and FR and SA as independent variables. Table 5 summarizes the regression results. The results indicate that H1 is supported. FR ($\beta = 0.259$, $p = 0.001 < 0.01$) has a significant positive effect on enterprise innovation performance. SA ($\beta = -0.023$, $p = 0.666 > 0.1$) has no significant effect on enterprise innovation performance, and H2 is not supported. FR ($\beta = 0.397$, $p = 0.001 < 0.01$) has a significant positive impact on the structural hole, and H3 is supported. SA ($\beta = -0.311$, $p = 0.001 < 0.01$) has a significant negative impact on the structural hole, and H4 is supported. The structural hole ($\beta = 0.285$, $p = 0.001 < 0.01$) has a significant positive effect on enterprise innovation performance, and H5 is supported. We do not need to test hypothesis H7 again, because the impact of SA on enterprise innovation performance is not significant.

In order to test hypothesis H6, the analysis method of stepwise hierarchical regression proposed by Baron and Kenny is used to test the mediate effect [50]. When SPSS was used, the Andrew F. Hayes-developed Model 4 in process plug-in was used to take enterprise innovation performance as the dependent variable, FR as the independent variable, structural hole as the mediating variable, and enterprise size, nature, industry, and age as the control variables and then analyzing in "Model 4." Table 6 summarizes the test results. The results in the table indicate that FR ($\beta = 0.397$, $p < 0.001$) has a significant positive effect on structural holes. Structural hole significantly mediates the relationship between FR and innovative performance (confidence interval excludes 0), with an effect size of 0.091.

4.3.4. Robust Check. To guarantee that the results are robust, the structural equation approach is employed to retest the hypotheses. The results are shown in Table 7. Comparing the test results to the regression findings reveals that while the test results for each hypothesis remain significant, the coefficient has changed. This demonstrates that the conclusion of this paper is reasonably sound.

Additionally, given the degree of attention given to innovation by different enterprises in different industries, such as a lower demand for innovation in financial sector enterprises and a lower likelihood of implementing export-oriented open innovation, we used a new regression analysis to eliminate the financial industry and logistics industry samples ($N = 152$).

Table 5: Regression results

Variable	DV: innovation performance				DV: structural hole	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Enterprise scale	−0.015	−0.005	−0.013	−0.047	0.128	0.1327
Enterprise nature	−0.220*	−0.082	−0.224	−0.267**	**0.378** **	0.109
Industry	−0.003	−0.003	−0.002	0.006	−0.030	−0.016
Enterprise age	0.077	0.029	0.079	0.075	−0.068	0.039
FR		0.259***			**0.397** ***	
SA			−0.023			**−0.311** ***
Structural hole				0.285***		
Adjusted R^2	0.002	0.098	−0.002	0.142	0.148	0.118
F value	1.110	5.259***	0.922	7.475***	6.600***	5.091***

Note. ***indicates $p < 0.01$, **indicates $p < 0.05$, and *indicates $p < 0.1$.

Table 6: The result of "Model 4."

Variable	Dependent variable: structural hole					Dependent variable: innovation performance				
	Effect	t	p	LLCI	ULCI	Effect	t	p	LLCI	ULCI
Enterprise scale	0.128	1.263	0.208	−0.072	0.327	−0.034	−0.459	0.647	−0.180	0.112
Enterprise nature	**0.378** **	2.523	0.013	0.083	0.674	−0.169	−1.516	0.131	−0.388	0.051
Industry	−0.030	−1.148	0.252	−0.082	0.022	0.004	0.215	0.830	−0.034	0.042
Enterprise age	−0.068	−0.501	0.617	−0.334	0.199	0.045	0.452	0.652	−0.150	0.239
FR	**0.397** ***	5.400	0.001	0.252	0.543	**0.169** ***	2.925	0.004	0.055	0.282
Structural hole	—	—	—	—	—	**0.229** ***	4.322	0.001	0.124	0.333
R^2			0.148					0.201		
MSE			2.735					1.454		
F			**6.600** ***					**7.903** ***		
Direct effect	FR⟶enterprise innovation performance: Effect = 0.169; $t = 2.925$; $p = 0.0039$; LLCI = 0.055; ULCI = 0.282									
Indirect effect	FR⟶structural hole⟶enterprise innovation performance: Effect = 0.091; BootSE = 0.031; BootLLCI = 0.038; BootULCI = 0.157									

Note. ***indicates $p < 0.01$, **indicates $p < 0.05$, and *indicates $p < 0.1$.

Table 7: Test results of structural equation method.

	Path	Path coefficient	P value
Direct effect	FR⟶enterprise innovation performance	0.282***	0.001
	SA⟶enterprise innovation performance	0.139	0.056
	Structural hole⟶enterprise innovation performance	0.324***	0.001
	FR⟶structural hole	0.297***	0.001
	SA⟶structural hole	−0.277***	0.001
Indirect effect	FR⟶structural hole⟶enterprise innovation performance	0.096***	0.002
	SA⟶structural hole⟶enterprise innovation performance	−0.090***	0.001
Total effect	FR⟶enterprise innovation performance	0.378***	0.001
	SA⟶enterprise innovation performance	0.050	0.480

Note. ***indicates $p < 0.01$, **indicates $p < 0.05$, and *indicates $p < 0.1$.

5. Conclusions and Future Developments

5.1. Theoretical Implications. This paper makes significant theoretical advances that advance outbound OI research. First, we combine the two types of outbound OI, FR, and SA into a single research framework and analyze and test their impact on enterprise innovation performance. We are one of the few researchers that examine the effects of both SR and FR on enterprise innovation. Existing studies either consider the impact of outbound OI on enterprise innovation performance as a whole [3, 11, 17] or only consider the impact of one kind of outbound OI alone [6]. Our manuscript leverages social exchange theory to offer evidence that outbound OI should be investigated at a more fine-grained level. Our research undoubtedly enriched the research on outbound OI, which responded to the appeal of Gentile-Lüdecke et al. [3]. Meanwhile, the separate discussion on SR and FR also advances the research on outbound OI.

Second, empirical findings suggest that FR can greatly boost enterprise innovation performance by increasing the number of structural holes occupied by enterprises. This finding is congruent with the findings of Sheng and Fan who discovered that the FR can assist firms in creating a high number of cobeneficial structural holes in the innovation network [19]. This structural hole demonstrates stability, and organizations can constantly obtain heterogeneous

resources and knowledge from it, hence enhancing enterprise innovation performance. However, the influence of SR on enterprise innovation performance is not significant. Although some studies have shown that SR can bring resources needed by enterprises for innovation, our research discovered that SR can reduce the number of structural holes occupied by enterprises in the innovation network, whose positive impact on enterprise innovation performance has been widely confirmed [22, 23], leaving the impact on enterprise innovation performance uncertain. This conclusion explains why the impact of outbound OI is inconsistent in certain prior research.

Third, we introduced a new theoretical perspective to consider the impact of recipients' response behavior in the study of outbound OI. Based on the social exchange theory, we regard the implementation of outbound OI by enterprises as a process of social exchange and propose that different outbound OI will lead to different response behaviors of recipients, thus affecting the structure of the innovation network (for example, the number of structural holes) in which the enterprises are embedded [21], thus affecting the innovation performance of enterprises. Our manuscript offers evidence that when conducting research on outbound OI, we should not only consider the interaction of resources but also the changes in social relations brought about by it. From this point of view, our study provides a new research direction.

5.2. Managerial Implications. With the progress of technology and the increase of innovation uncertainty, OI has become the dominant paradigm of enterprise innovation. More and more enterprises have begun to embrace OI, especially in developing countries. At the same time, we should see that with the improvement of the enterprise's innovation ability, the enterprise has accumulated a large number of innovative achievements. Exporting and commercializing these achievements through outbound OI can reduce the enterprise's management costs and promote its innovation efficiency. According to our study, enterprises should actively explore outbound OI and seek partners outside the enterprise to promote the transformation and application of their technology or knowledge.

When implementing outbound OI, enterprises should carefully choose the mode. Although SR can obtain resources and income immediately, its impact on enterprise innovation performance is unstable. Similarly, although FR cannot obtain resources immediately, it can improve the position of enterprises in the innovation network, thus promoting enterprises' innovation performance. Enterprises should choose specific ways according to their actual needs. At the same time, when implementing different types of outbound OI, they should pay attention to the response behavior of the recipient, keep an equal relationship with external recipients as far as possible, avoid imposing too many constraints on them by relying on resource dependence, attract them to access the enterprise's innovation network, and reduce their motivation to fill the structural hole.

5.3. Limitations. Although this work reached several significant results through scientific and empirical investigation, it nevertheless has major shortcomings. To begin, the data utilized in this research are cross-sectional, and the model's longitudinal study is not based on time series data. Because the growth of a business is a dynamic process, this paper's assistance in the practice of enterprise management is limited. Given that enhancing an organization's capacity for innovation is a process, the outbound OI of a business should exhibit distinct features at various phases of its growth. In the future study, a single business may be chosen, and longitudinal data from the enterprise are utilized to integrate qualitative and quantitative research. The impact of various types of outbound OI on various periods is investigated [51].

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Three authors made equal contributions to the paper.

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