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Strategy Orientation, Innovation Capacity Endowment, and International R&D Intensity of Listed Companies in China

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Abstract: Based on the endogenous factors which can affect the strategy of international R&D of China's enterprises, an analysis is carried out on the relationship between market- and technology-orientation of the strategy and the intensity of international R&D. In addition, the mediation effects of innovation capacity endowment are discussed. On this basis, 254 listed enterprises with overseas R&D institutions approved by the Ministry of Commerce of China were taken as the sample for survey administration. The poisson regression method was adopted to test the hypotheses. Additionally, we utilized the Bootstrap method to confirm the robustness of the regression models. Results show that for Chinese enterprises with significant international R&D strategy intentions, market orientation has a significant inhibitory effect on their international R&D intensity, while the technology orientation has a significant stimulating effect on international R&D. In addition, innovation capacity has a significant positive impact on the intensity of international R&D, and plays a partial mediating role in the relationship between technology orientation and international R&D. Therefore, to promote international R&D strategies in the era of high-quality economic development, Chinese enterprises are suggested to establish an innovation-oriented strategy orientation to promote innovation cultural heritage, and to strengthen the accumulation of innovative resources and capabilities.

Keywords: market orientation; technology orientation; international R&D intensity; innovation capacity endowment

1. Introduction

The increasing competition among enterprises and the continuous reconstruction of the innovation pattern make international R&D an important and competitive strategic area, especially for emerging technology enterprises in developing economies such as China and India [1]. Even in mature economies, multinational enterprises have also transferred their R&D activities in the upstream links of the industrial chain overseas, thereby increasing their international R&D investment to gradually build a global R&D system.

Within this context, the issue of international R&D has attracted scholarly attention. Among their studies, research on multinational enterprises in emerging economies focuses on the discussion

of international R&D performance [2]. In fact, it is international R&D that provides an opportunity for these “market and technical follower” enterprises in emerging economies to break the existing technological innovation and knowledge creation pattern [3]. Chinese enterprises are trying to break through the model of small-scale overseas R&D cooperation, to discuss the issue of international R&D intensity from the strategic perspective of the future development trend of industrial technology, and to increase overseas R&D investment and conduct more global R&D activities. However, from the perspective of foreign R&D investment by Chinese companies over the past 20 years, outward-looking foreign investment (OFDI) has not significantly promoted domestic technological progress. For example, Huawei has established more than ten overseas R&D centers in a number of countries, including the US, India, and Sweden, gradually forming an efficient global R&D network. In addition, Hisense has built seven R&D centers located in the United States, Germany, Canada, and other places overseas. The existing research on exploring the stimulating factors of establishing an international R&D network in emerging economies, whether it is focused on market seeking or technology acquisition, is mostly based on the analysis of the host country’s impact on the enterprise [2]—that is, international R&D is affected by the size and per capita income of the host country [4,5], R&D investment [3], and R&D human resources [6]. However, the investment in foreign R&D of most Chinese companies has not facilitated much increased cooperation and innovation. The reason for this is related to the fact that Chinese companies are more market-oriented in their foreign R&D investment. According to the statistics of the Ministry of Commerce of China, in the past 20 years, around 80% of Chinese companies’ foreign investment has been driven by the development of new markets, and they have not been focused on the search for international cutting-edge technology.

However, in addition to the host country factors, the resource endowment and strategic orientations are also the key factors affecting a company’s efforts to improve its international R&D intensity [7,8]. Although the market orientation of a corporate strategy will also guide its product innovation based on the needs of customers in the international market [9], whether this strategic orientation can support the continuous investment of enterprises in international R&D is still not certain. As a starting point of resource coordination, the strategic characteristics of the enterprise [10] affects an enterprise’s capacity endowment and the effectiveness of its allocation of R&D resources. The possession of some heterogeneous knowledge, resources, and capabilities is the premise of the enterprise’s implementation of its internationalization strategy [11]. Applicable literature has implicated the enterprise’s endogenous strategy orientations the key factor determining its capacity endowment [12], and the fact that it plays a regulatory role in the process of international R&D to enhance the innovation performance [13]. Powerful innovation capacity endowment can bestow obvious advantages for an enterprise in the process of internationalization [14,15].

Nonetheless, a number of issues remain which require further discussion, including how to build strategy orientation to promote the formulation and implementation of internationalization strategies. Fundamentally for this research, the mechanisms through which the strategy orientation’s impacts can be realized on the intensity of international R&D need to be explored and examined [16–18]. We argue that the innovation capacity endowment might be a critical factor affecting this. Indeed, having an appropriate orientation does not necessarily provide the expected outcomes. Beyond knowing the different but potential influences that different strategic orientations could have on R&D internationalization, it is even more critical to know what factor(s) are functional in achieving a company’s R&D potential.

In sum, two major reasons for why the effect should be studied follows. First, based on practical experiences in the past 20 years, Chinese companies often encounter difficulties in effective international cooperative R&D, if they operate using a strategic market orientation. In contrast, if the strategy is oriented towards technological innovation, more ideal international cooperative research and development results can be brought in. This paper attempts to prove that such a phenomenon is important enough to draw academic attention and further research. Second, there are also studies showing that the market orientation of strategy can also bring about international R&D cooperation.

Then the question becomes whether the market-oriented strategy and technology-oriented strategy have different effects on different dimensions of Chinese companies' international R&D? This is the second aspect that this article tried to examine, on an empirical basis (The research questions include: First, whether the market orientation and technology orientation of enterprise strategy can differently effectively stimulate international R&D investment decisions and the sustainability of international R&D activities. Second, how are the above-mentioned effects made conducive by the function of firm innovation capacity endowment).

2. Theoretical Background and Hypothesis

2.1. Strategy Orientation and International R&D Intensity

Strategy orientation determines the behavior of the enterprise and is deeply rooted in a set of values that guide the development of an enterprise strategy, which facilitates critical thinking for enterprises that helps them to survive and thrive in an increasingly competitive global market [19]. It has an impact on the international decision-making of enterprises [13], among which market orientation and technology orientation are two important strategy orientations that can enable enterprises to possess a competitive advantage and determine the motive, intensity, and resource allocation for international R&D activities.

Market-oriented enterprises highly emphasize attention on market demand [20]. In order to design products that can meet the requirements of overseas customers, they have to conduct international R&D. In addition, the intensity of international R&D is related to whether market-oriented enterprises can quickly and accurately collect overseas market information including that of consumers and suppliers, and effectively improve their own technologies. Note that this is a relatively specific type of market orientation, though, it is widely seen in Chinese companies and their operating contexts. Firstly, due to the differences in cultural backgrounds and customs, the consumption habits and consumption tendencies vary greatly as well. The styles and tastes of products produced by multinational enterprises in the host country must cater to local consumer needs. Increasing the scale of international R&D investment can help to access foreign market and overseas customers, so as to facilitate the understanding of market conditions. This information is the premise to achieving localization of the scientific and technological achievements of the home country [21,22]. Secondly, in order to design products in line with the host country market to support its production and sales activities in the host country, multinational enterprises must improve and innovate their technology in the home country in line with the technical differences and material performance differences of the host country. Finally, in the market research and customer development process, the higher the international R&D intensity of market-oriented enterprises, the more opportunities the enterprise will have to learn, communicate, and share with local suppliers, R&D centers, and customers [23], the more effective the attainment of the tacit knowledge that is difficult to obtain from local markets will be, and the higher the learning efficiency will become. In this way, the enterprise will be able to seize foreign market share. Therefore, in this paper, the following hypothesis are proposed:

Hypothesis 1. *The market orientation of enterprises' strategy has a positive impact on the intensity of international R&D.*

Technology-oriented enterprises focus on product R&D activities to carry out global R&D activities, so as to acquire advanced technologies and knowledge from the international market that can rapidly enhance their innovation capabilities, overcome the disadvantages of being a latecomer, and achieve great technological or market share leaps [24]. Based on the strategic intent of technology catch-up, the high-tech-oriented enterprises have higher international R&D intensity: (1) In most emerging economies, government policies tend to be focused on industry leaders rather than technologically innovative enterprises, leading to the domestic institutional environment not being conducive to enterprise R&D and innovation activities [25]. Under this context,

R&D internationalization can provide those enterprises with an opportunity to avoid these systemic constraints [26]. Therefore, in order to avoid the policy restrictions of the home country and create a conducive R&D environment, high-tech-oriented enterprises tend to increase their intensity of international R&D. (2) Technology-oriented enterprises need diverse resources and knowledge in order to develop new products and apply new technologies. Through the complementarity and integration of various kinds of knowledge in the international market, enterprises can generate new ideas and develop new technologies. Knowledge is usually embedded in external R&D activities. Therefore, increasing R&D investment, and expanding R&D activities internationally as a whole can help a enterprise to understand the latest development and trends of technology, so as to facilitate enterprises to acquire, track, and absorb diverse tacit knowledge. (3) The advanced technical knowledge acquired through international R&D activities can only obtain the reverse technology spillover effect after effective absorption and integration [27]. Therefore, technology-oriented enterprises should effectively promote the flow of technical knowledge across borders and organizational boundaries with the help of their high technical and network capabilities [28], to make full use of and integrate the international knowledge and technology information developed due to the increase of the intensity of international R&D and increased investment in R&D resources. However, enterprises with weaker technology orientation are generally weaker in technology absorption. Therefore, it is hard for them to digest, absorb, and further innovate new technology knowledge obtained from overseas R&D, and their incentive to increase the intensity of international R&D also tends to be weak. Therefore, in this paper, the following hypothesis is proposed:

Hypothesis 2. *The technical orientation of an enterprise's strategy has a positive impact on the intensity of their international R&D.*

2.2. Innovation Capacity Endowment and International R&D Intensity

Having certain heterogeneous resources and capabilities enables enterprises to implement an international strategy [11]. In order to carry out international operations, Chinese enterprises will gradually promote their internationalization strategies based on their core competencies [29]. In this process, enterprise innovation capacity endowments play a significant role in promoting their international business performance [14]. In fact, the role of innovation capacity endowment is not only reflected in low-end international business activities such as production and sales, but also in the international R&D activities that require a higher level of resource input. It is crucial for the deepening of international R&D strategies. Firstly, innovation capacity endowment can help enterprises to quickly subdivide overseas markets according to their technical characteristics, production, and product advantages, and find potential markets suitable for their own R&D activities according to strategic objectives [30]. In general, in a macro perspective, market-oriented enterprises tend to favor large-scale countries and regions, while technology-oriented enterprises aim to track and acquire competitors' technology and information, so they usually tend to favor countries and regions with higher levels of expertise to establish international R&D institutions. The stronger the innovation capacity endowment of enterprises is, the more accurate their subdivision of overseas markets will be. Secondly, an enterprise needs to conduct a careful market assessment and technical assessment of the target market based on the international R&D environment and its own technical strength to decide whether to carry out R&D investment in the target market. Enterprises with outstanding innovation capabilities often excel in information processing capabilities, using scientific analysis methods to quickly and effectively analyze data to determine whether enterprises can achieve market acquisition or technology seeking motivation in the target market [31]. Finally, after implementing an international R&D strategy, innovation capacity endowment can help enterprises to identify and acquire useful market information and external new knowledge in a highly dynamic and complex international market, or discover new combinations or new applications of existing knowledge. In turn, it generates endogenous new knowledge that can

create market value and can successfully achieve the strategic goal of international R&D. Therefore, in this paper, the following hypothesis is proposed:

Hypothesis 3. *Innovation capacity endowment has a positive impact on international R&D intensity.*

2.3. Strategy Orientation and Innovation Capacity Endowment

Strategy orientation affects the behavior and performance of an enterprise. As an organization resource allocation, an enterprise's innovation capacity endowment is endogenous to their strategy orientation. When the enterprise responds to the external environment or explores new technologies and new products, the process potentially promotes the enhancement of innovation capacity. The orientation of the enterprise's strategy is different, as is the focus and resource allocation, making the mechanism that affects the innovation capacity endowment different.

Market-oriented enterprises can achieve rapid and effective allocation of resources by focusing on market changes, thus improving the innovation capacity endowment of enterprises. This process is mainly reflected in two aspects. Firstly, market-oriented enterprises will continuously track, research, and try to satisfy customers' current and potential consumer demands. When customers' demands change, market orientation encourages enterprises to figure out these changes and make corresponding adjustment and innovations to meet customers' changing preferences. For example, it can invest the R&D resources needed to develop new products and services or to improve the product line and redesign the production process, so as to enhance its innovation capacity endowment [32]. Secondly, market-orientation encourages enterprises to actively track, acquire and collect information related to their competitors, and figure out their strengths and weaknesses through comparison with their competitors in looking at financial indicators, resources, experience, and capabilities [33]. On this basis, to respond to or catch up with competitors, enterprises have to adjust their allocation mode of resources and capabilities in a timely manner [34] to enhance their innovative capacity endowment and adapt to the changes of their competitors. In addition, changes of market information will also affect the adjustment of the enterprise management system, enabling the entire operation of the enterprise to adapt to those changes in the market. Therefore, market orientation is conducive to improving the company's ability for adaptation and R&D, that is, to enhance a company's innovation capacity endowment. Therefore, in this paper, the following hypothesis is proposed:

Hypothesis 4. *Market orientation of enterprise strategy has a positive impact on innovation capacity endowment.*

Technology orientation encourages enterprises to focus on the integration and R&D of new technologies, to explore development ideas of new product, or to actively apply new technologies to develop new products, which provides strong evidence for a technology orientation's positive impact on innovation capacity endowments [15]. The R&D experience of technology-oriented enterprises and their innovation of production processes have enabled them to accumulate abundant technical knowledge. On the one hand, this technical knowledge can help enterprises to acquire, identify, and digest external knowledge [35]. On the other hand, the more technical knowledge a company has, the easier it is to maintain and reactivate the knowledge that the company has already absorbed [36]. When enterprises need or want to refine this knowledge, technology-oriented enterprises can quickly mobilize relevant knowledge, reduce the cost of maintenance and activation, and increase their efficiency. The ability of enterprises to acquire, identify, digest, maintain, and reactivate knowledge is their innovation ability. Therefore, the technical orientation of an enterprise strategy can help enterprises to cultivate their innovation capacity endowment and is the key to the improvement of innovation capacity [37]. Zhou and Gao has shown that technology orientation can guide enterprises to predict and recognize future technological development trends, so as to reallocate resources and enhance their innovation capabilities [38]. Katila and Ahuja believe that technology-oriented enterprises

have high technological innovation capacity because they focus on the accumulation of technological innovation knowledge [39]. Therefore, in this paper, the following hypothesis is proposed:

Hypothesis 5. *The technical orientation of enterprise strategy has a positive impact on innovation capacity endowment.*

2.4. The Mediating Role of Innovation Capacity Endowment

According to previous scholars' research, there is a relationship between enterprise strategy orientation, innovation capacity endowment, and international R&D intensity. Specifically, the implementation of technology orientation or market orientation by enterprises can improve their innovation capacity endowment and international R&D intensity [2]. The enhancement of the innovation capacity endowment of enterprises can also enhance the intensity of international R&D. The innovation capacity endowment of enterprises is crucial to acquiring market share and seeking technology in the international R&D process.

For market-oriented enterprises, the purpose of international R&D is to collect the information of overseas customers, competitors, and markets, to improve and innovate their technologies based on this information, and to develop products and production processes suitable for the local market, so as to achieve product localization and technology localization [30]. In this process, there are two major challenges. First, the knowledge information of overseas markets is embedded in its specific cultural and society and has path dependence, which is difficult for enterprises to obtain. Second, there is a question of how enterprises can absorb and integrate such information to improve their technology [3]. Market-oriented enterprises need to have strong innovation capacity endowments, which indicates that enterprises should have a strong ability to search and obtain information, can effectively eliminate unfavorable information in complex international markets, and quickly and extensively seek knowledge and information in accordance with the product's and technical characteristics in the external environment, to segment the international market and figure out the clear and accurate market positioning for its products [7]. It can also capture the information that is beneficial to the enterprise's communication with overseas suppliers, R&D centers, customers and competitors, so as to cope with the first major challenge of market-oriented enterprises in the international R&D process. Second, market-oriented enterprises need to apply their innovative capacity endowment to make full use of external new knowledge, and to quickly process and improve original products according to their acquired information, so as to catch up with the local multinational enterprises and develop a competitive advantage. Based on the above two points, market-oriented enterprises cannot directly obtain overseas market share through the enhancement of their international R&D intensity. They need to gain the advantages of international R&D through the application of their innovation capacity endowment to collect and acquire overseas market information and improve local technology. Therefore, in this paper, the following hypothesis is proposed:

Hypothesis 6. *Enterprise innovation capacity endowment is a mediator between market orientation and international R&D intensity of enterprise strategy.*

If technology-oriented enterprises aim to acquire international innovation resources through international R&D and enhance their own technological level, innovation capacity development is inevitable. Firstly, foreign technology-leading enterprises will not cooperate with enterprises with backwards innovation capabilities, as the large technology gap will make it difficult to achieve win-win results [8]. That is to say, enterprises with strong innovation capacity can obtain more opportunities to cooperate with foreign technology-leading enterprises, and their communication and cooperation will be much more smooth and efficient [7]. Based on this analysis, technology-oriented enterprises need to have a strong innovation ability so as to obtain more advantages in finding international R&D partners. Secondly, an enterprise's innovation capacity endowment can determine whether

they can capture heterogeneous innovation resources which are rich in overseas markets while being scarce in domestic ones. These resources are critical for technology-oriented enterprises to reduce innovation costs and improve innovation performance [40]. Technology-oriented enterprises with a weak innovation capacity endowment may not have the ability to search for hidden innovation knowledge and resources in a wide range, putting them in a disadvantageous position amidst fierce international R&D competition. Finally, technology-oriented enterprises need to absorb, digest, and integrate advanced technology from overseas markets to achieve reverse technology spillovers [7]. That is, enterprises need to use existing knowledge and information to create new technologies and integrate them through innovative capacity endowments. Based on these three points, the technical orientation of enterprise strategy encourages enterprises to increase their intensity of international R&D, and the innovation capacity endowment is inevitably affected since it is a key factor affecting the size of reverse technology spillovers in the process of international R&D. It is the premise for the enterprise's acquisition and absorption of advanced technology and knowledge from overseas enterprises. Therefore, in this paper, the following hypothesis is proposed:

Hypothesis 7. *Enterprise innovation capacity endowment is a mediator between the technical orientation of enterprise strategy orientation and international R&D intensity.*

In summary, the theoretical model of this study is shown in Figure 1:

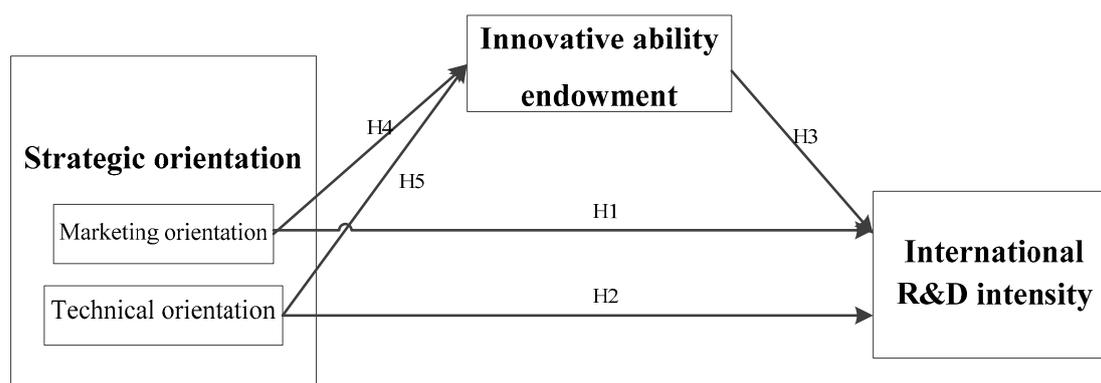


Figure 1. Research framework.

3. Design

3.1. Sample Selection

The R&D internationalization of Chinese enterprises is mainly carried out through the establishment of international R&D institutions, cross-border M&A, multinational technology alliances, and offshore R&D outsourcing [29]. These international investments need to be approved and filed by the Ministry of Commerce. Therefore, for legitimacy and representativeness, this paper used this above-mentioned list released by the Ministry of Commerce as the sampling structure. Firstly, we filtered out enterprises hosted in Macau, Hong Kong, Cayman Islands, and BVI (British Virgin Islands) to erase the impact of tax avoidance. Secondly, enterprises using R&D as one of its core businesses were selected (which is 1486 as of 2016). Then, through searching on Baidu, Tianyancha, Sina, and the enterprises' official websites, only 265 were found to be listed enterprises among the 1486 enterprises mentioned above, including 126 enterprises listed on the Shenzhen Stock Exchange, 47 listed on the Shanghai Stock Exchange and 92 listed on New OTC (Over the Counter) Market. Finally, the ST company samples, and the sample which lacks the information of international market income and the R&D investment in the company annual report are excluded. In the end, a total of 254 samples were obtained.

3.2. Variable Setting and Data Source

3.2.1. International R&D Intensity

Regarding the measurement of the international R&D of multinational enterprises in emerging economies, the most common method is to apply the binary method (yes/no) to see whether the enterprise has international R&D activities. If the enterprise has an independent subsidiary with R&D function overseas, or has conducted R&D alliance cooperation with foreign enterprises, it will be regarded as having international R&D activities, and the value will be 1, otherwise the value will be 0 [1]. The purpose of this paper is to explore the stimulating effect of different orientations of enterprise strategy on the intensity of international R&D and the mediating role of innovation endowment. It is impossible to apply virtual variables to measure the intensity of international R&D. In view of the fact that international R&D institutions are the most direct expression of international R&D, Chen Yantai et al. (2016) used overseas R&D investment institutions to measure the international R&D behavior of Chinese enterprises [5]. Therefore, the number of international R&D institutions of listed enterprises is applied to measure the intensity of international R&D (ORD). The more institutions, the greater the intensity of international R&D, and vice versa. Note that because we intended to test for the absolute degree but not the relative degree of intensity, so we used number counts to measure this variable.

3.2.2. Strategy Orientation

Nowadays, most scholars use questionnaires and interviews to obtain data. However, the quality of questionnaires can be influenced by the designer, and the emotions or perceptions of the interviewers and interviewees. Therefore, the data obtained may not be objective and comparable. In order to increase the accuracy of the research, two objective indicators of marketing intensity and R&D intensity were applied to measure the market orientation (MO) and technology orientation (TO) of the strategy, while the marketing intensity was obtained from the sales cost/total sales, and the R&D intensity was derived from R&D cost/total sales. The data applied were from the Guotaian database and the company's annual reports.

3.2.3. Innovative Capacity Endowment

With regard to the measurement of enterprise innovation capacity endowment, scholars have not reached a consensus. Innovative capacity endowment is a key factor for an enterprise's profit. Through a literature review, there are main two methods to measure innovation capacity endowment: First, through the number of patents applied for by the enterprise [36]; second, through the proportion of enterprise R&D technicians out of the total number of employees [38,39]. Although data of patent application of the enterprise can be obtained from the Chinese State Intellectual Property Office, it is difficult to determine overseas R&D application of an enterprise's patent. Therefore, from the perspective of data availability and accuracy, in this paper, the proportion of R&D technicians in the total number of employees was applied to measure the company's innovation capacity (IC). Data applied are from Guotaian database and the company's annual reports.

3.2.4. Control Variables

(1) The scale of the enterprise: The scale of the enterprise is positively related to the absorption capacity of the enterprise, and thus affects the decisions of the enterprise on international R&D [26]. Therefore, in this paper, the logarithm of the company's total assets (in billions) is applied to indicate the size of the company (SIZE), and then the impact brought by the size of the enterprise can be controlled. Data applied were from the Guotaian database and an enterprise's annual reports.

(2) The age of the enterprise: The older an enterprise is, the more extensive its experience will be, and the stronger its innovation capacity endowment will be. In addition, overseas R&D partners are more inclined to cooperate with enterprises with a rich historical heritage, so the age of the enterprise can affect the intensity of international R&D. In light of this, the difference caused by the

age of the enterprise (AGE) needs to be controlled for, and the natural logarithm of “the year 2016 minus the year of establishment of the enterprise (reserved to the month)” was applied as a surrogate variable [26,40–45]. The data applied were from the Guotaian Database and enterprises’ annual reports.

(3) Types of ownership: Most scholars have shown that national policies usually tend to favor state-owned enterprises, while non-state-owned enterprises are more motivated to increase their intensity of international R&D [1], so we set up a virtual variables of ownership (STATE): when the enterprise is a state-owned enterprise, the value is 1, otherwise it is 0 [26,45]. The data applied are from the Guotaian database and enterprises’ annual reports.

(4) Ownership Concentration: The controlling shareholder has to bear the main benefits and the cost and risk brought about by strategic decisions as they own large amount of shares of the enterprise, thus affecting the formulation of its international R&D strategy. Therefore, Equity Concentration (CR) is set as a control variable and is expressed by the shareholding ratio of the enterprise’s largest shareholder [46]. The data applied are from the annual reports of enterprises and the Guotaian database.

A detailed description of the above variable settings is shown in Table 1.

Table 1. Description of variable definition.

Category	Variable	Symbol	Variable Description	Literature Basis
Dependent variable	International R&D intensity	ORD	ORD = Number of companies’ international R&D institutions	Chen Yantai (2016)
Independent variable	Strategic market orientation	MO	MO = Marketing Expenses/Total Sales	Thomas et al. (1991) and Qin (2012)
	Strategic technology orientation	TO	TO = R&D investment/total sales	Thomas et al. (1991) and Qin (2012)
Mediator variable	Innovation capacity endowment	IC	IC = Enterprise R&D staff/Total staff	Zhang (2014), Pan, etc. (2015)
Moderator	International experience	EXP	EXP = Internationalized operating income/operating income	Sambharya, R.B (1996), Song, Li(2010)
Control variable	Enterprise scale	SIZE	SIZE = ln (the total assets of the company at the end of each year)	Hsu et al. (2015) and Li et al. (2016)
	Enterprise age	AGE	AGE = ln (2015-the establishment date of the enterprise)	Hsu et al. (2015) and Li et al. (2016)
	Ownership	STATE	State-owned enterprises = 1; Non-state-owned enterprises = 0	Hsu et al. (2015) and Li et al. (2016)
	Equity concentration	CR	CR = shareholding ratio of the largest shareholder	FaccioM, Lang (2002), Zhang, Lv (2017)
Category	Variable	Symbol	Variable description	Literature basis
Dependent variable	International R&D intensity	ORD	ORD = Number of companies’ international R&D institutions	Chen (2016)
Independent variable	Strategic market orientation	MO	MO = Marketing Expenses / Total Sales	Thomas et al. (1991) and Qin (2012)
	Strategic technology orientation	TO	TO = R&D investment/total sales	Thomas et al. (1991) and Qin (2012)

Table 1. Cont.

Category	Variable	Symbol	Variable Description	Literature Basis
Mediator variable	Innovation capacity endowment	IC	IC = Enterprise R&D staff/Total staff	Zhang (2014), Pan etc. (2015)
Moderator	International experience	EXP	EXP = Internationalized operating income/operating income	Sambharya, R.B (1996), Song, Li (2010)
Control variable	Enterprise scale	SIZE	SIZE = ln (the total assets of the company at the end of each year)	Hsu et al. (2015) and Li et al. (2016)
	Enterprise age	AGE	AGE = ln (2015-the establishment date of the enterprise)	Hsu et al. (2015) and Li et al. (2016)
	Ownership	STATE	State-owned enterprises = 1; Non-state-owned enterprises = 0	Hsu et al. (2015) and Li et al. (2016)
	Equity concentration	CR	CR = shareholding ratio of the largest shareholder	FaccioM, Lang (2002), Zhang, Lv (2017)

3.3. Model Construction

Considering the fact that the dependent variable applied in this paper is the number of international R&D institutions of listed companies in China as of 2016, it is a discrete variable of non-negative integer, for this type of enumeration data, Poisson regression mode is usually applied in the counting mode [5,47]. The Poisson regression model assumes that each y_i is extracted from a Poisson distribution with the parameter λ_i , which is related to the explanatory variable x_i . This mode is applied when the expectation of the distribution is equal to the variance. After calculation, the sample expectation of this strategy orientation is slightly larger than the variance without being excessively dispersed. In addition, the negative binomial regression model test found that $\text{Prob} \geq \text{chibar2} = 1.000$, does not reject the null hypothesis orientation of “alpha = 0” (corresponding to Poisson Distribution), then the Poisson regression model is thought to be applicable. In order to eliminate the heteroscedasticity caused by the cross-section data, a Poisson distribution with a robust standard deviation is applied. Combined with the general method of mediating effect test, a causal regression model is constructed as follows:

Model: 1: The Poisson regression mode of different orientations of strategy and international R&D intensity

$$ORD_i = \exp(\alpha_0 + \alpha_1 MO_i + \alpha_2 TO_i + \alpha_3 SIZE_i + \alpha_4 AGE_i + \alpha_5 STATE_i + \xi_1)$$

Model 2: The Linear Regression Mode of different orientations of strategy and innovation capacity endowment

$$IC_i = \beta_0 + \beta_1 MO_i + \beta_2 TO_i + \beta_3 SIZE_i + \beta_4 AGE_i + \beta_5 STATE_i + \xi_2)$$

Model 3: The Poisson regression mode of different orientations of strategy, innovation capacity endowment and international R&D

$$ORD_i = \exp(\gamma_0 + \gamma_1 MO_i + \gamma_2 TO_i + \gamma_3 IC_i + \gamma_4 SIZE_i + \gamma_5 AGE_i + \gamma_6 STATE_i + \xi_3)$$

where i represents the enterprise, ORD_i represents the number of international R&D institutions of the i -th enterprise in 2016, α_0, β_0 and are constants, $MO_i, TO_i, IC_i, SIZE_i, AGE_i$, and $STATE_i$ represent the strategic market orientation of the i -th enterprise in 2016, the strategic technology orientation, innovation capacity endowment, enterprise scale, enterprise age and ownership type, respectively, and ξ is a random disturbance. At the same time, to eliminate the impact of the dimension and the variation of the variable itself and the numerical value, all the variables except the dependent variable were standardized and input into Stata12.0 for regression analysis.

4. Empirical Results and Analysis

4.1. Descriptive Statistics of the Variable

First, the mean, standard deviation, variance expansion factor and correlation coefficient matrix of each variable are shown in Table 2. It can be seen from Table 2 that the average number of international R&D institutions in the sample is 1.276, which indicates the international R&D level is low. The average of market orientation is 9.05%, the average of technology orientation is 8.18%, and the average of innovation capacity endowment is 20.29%. These data show that international R&D enterprises have strong market orientation and technology orientation, and the level of innovation capacity endowment was high, which is consistent with our hypothesis. The variance expansion factor (VIF) of all variables was less than 10, indicating that there was non-multicollinearity intervention of the variable.

Table 2. Descriptive statistics and correlation coefficient.

Variables	Mean	Std.Dev.	VIF	1	2	3	4	5	6	7	8
1.ORD	1.2795	0.8783		1							
2.MO	0.0905	0.1576	1.06	-0.199 ***	1						
3.TO	0.0818	0.0866	1.24	0.399 ***	0.182 ***	1					
4.IC	0.2029	0.1701	1.30	0.276 ***	0.079	0.355 ***	1				
5.SIZE	1.2324	0.8867	1.99	-0.136 **	-0.077	-0.306 ***	0.395 ***	1			
6.AGE	1.0849	0.207	1.46	-0.056	0.064	-0.077	-0.266 ***	0.517 ***	1		
7.STATE	0.1417	0.3495	1.23	-0.038	-0.072	-0.044	-0.06	0.392 ***	0.160 **	1	
8.CR	0.3835	0.1757	1.21	0.041	-0.108 *	0.071	0.133 **	-0.339 ***	-0.328 ***	-0.01	1

Note: In parentheses, it is a standard error; ***, **, * indicate that the significance test is passed at significant levels of 1%, 5%, and 10%, respectively.

4.2. Results & Discussions

4.2.1. Direct Effects

The one-dimensional Poisson regression is applied to verify the impact of individual factors of different orientations of the strategy and innovation capacity endowment on the intensity of international R&D. Model 1 first regresses the control variables, Model 2 adds strategic market orientation on the basis of Model 1, Model 3 adds strategic technology orientation on the basis of Model 2, and Model 5 adds innovative capacity endowment on the basis of Model 2. The results are shown in Table 3.

The results of Model 2 show that the market orientation of the strategy has a significant negative impact on the intensity of international R&D, and Hypothesis 1 is not supported. The possible reason for this is that the extensive international R&D based on market-seeking motives is not suitable for Chinese enterprises as they do not have the ability and conditions for large-scale implementation of technology-applied international R&D for foreign market information and technical information, which is consistent with other similar studies [2,47]. On the one hand, China's market-oriented enterprises have disadvantages in selecting overseas R&D partners. If they cooperate with foreign enterprises with weak R&D capacities, China's enterprises shall have strong technological processes to

achieve “utilization”, that is, through the application of their own technological advantages, to make micro adjustments and obtain more information on the needs of foreign users. However, there is a certain gap between the technology of Chinese enterprises and those in the developed countries in Europe and the United States. Enterprises weaker than those in China tend to choose enterprises from developed countries in Europe and the US to carry out R&D cooperation and to learn advanced knowledge and skills from them. To cooperate with foreign powerful multinational enterprises, international cooperation experience is necessary. Without good platforms for R&D cooperation and equal dialogue, foreign enterprises will not tend to choose Chinese enterprises with weak strength for R&D cooperation. Based on this, it is difficult for China’s market-oriented enterprises to seek market shares through the enhancement of international R&D intensity. On the other hand, from the perspective of transaction cost theory, due to differences in cultural backgrounds and customs, consumption habits and consumption tendencies also vary greatly. It is difficult for enterprises to obtain information from foreign customers and foreign markets, and the cost of the coordination between R&D partners from different regions or countries will be high. However, there remains a certain gap between China’s market-oriented enterprises and those in developed countries in terms of information acquisition and collection. Chinese enterprises tend to make simple adjustments and changes in the international R&D process. This is because the user preferences, technical standards, and policy regulations in a single country are usually similar and easily satisfied. Therefore, China’s market-oriented enterprises are more inclined to choose R&D partners from a single country or from host countries with similar cultural backgrounds for international R&D investment and low international R&D intensity.

Table 3. Poisson regression results.

Variable	Model 1	Model 2	Model 3	Model 4
SIZE	−0.1081 *	−0.1355 **	−0.0038	−0.0375
	(0.0643)	(0.0640)	(0.0611)	(0.0596)
AGE	0.01396	0.0306	−0.0237	0.0294
	(0.0452)	(0.039)	(0.0418)	(0.0423)
STATE	0.0138	0.0102	−0.0101	−0.0068
	(0.0355)	(0.0347)	(0.0317)	(0.0320)
CR	−0.0051	−0.0259	0.0007	0.0016
	(0.0290)	(0.0420)	(0.0343)	(0.0366)
MO		−0.4087 ***		
		(0.1155)		
TO			0.6092 ***	
			(0.0944)	
IC				0.1585 ***
				(0.0358)
N	254	254	254	254
Log likelihood	−313.4671	−309.5593	−307.1078	−309.4802
Waldchi2	5.02	18.38	79.30	23.50
Prob > chi2	0.0047	0.0171	0.0248	0.0003

Note: In parentheses, it is a standard error, ***, **, * indicate that the significance test is passed at a significant level of 1%, 5%, and 10%, respectively.

The results of Model 3 show that the technology orientation of the strategy is highly significant at the 1% level, and the coefficient is positive, which indicates that compared with low-tech oriented enterprises, high-tech oriented enterprises are more likely to conduct international R&D, and the strategic technical orientation has a stimulating effect on the intensity of international R&D, meaning the orientation hypothesis is supported. In most emerging economies, the environmental system is poor, so technology-oriented enterprises can better improve their international R&D and innovation activities by carrying out R&D activities in developed countries, which will ultimately help enterprises to improve their innovation performance. At the same time, by conducting R&D activities all over the world, enterprises can quickly track and acquire the latest developments of technical knowledge, so as to figure out the development trends of technology and obtain various types of knowledge. Furthermore, generally speaking, technology-oriented enterprises tend to have strong technology absorption capabilities, and can quickly absorb and integrate various types of knowledge acquired by enterprises from overseas, which can help enterprises to generate new ideas and develop new technologies. Based on the analysis above, technology-oriented enterprises in emerging economies have the motivation and ability to increase their international R&D investment.

The results of Model 4 show that the innovation capacity endowment is significantly positive at the 1% level, and Hypothesis 3 is supported. Enterprises with a strong innovation capacity endowment have strong capacity in information collection, data processing, and self-cognition, which is essential for enterprises to quickly and accurately divide overseas R&D markets and effectively evaluate target markets according to the international market environment and their own technical characteristics. At the same time, after expanding the scope of overseas R&D activities, innovative capacity endowment is required in a highly dynamic and complex overseas environment to quickly acquire external market and technical knowledge information, seek potential markets and potential needs, identify the development momentum of new technologies, and take the lead in responding to changes in the external environment to make corresponding adjustments to achieve market-seeking or technology-acquisition goals for international R&D.

4.2.2. The Mediating Effect

According to the step of causal stepwise regression, model 5 is a Poisson regression of strategic market orientation and technology orientation to the intensity of international R&D. Model 6 is a multiple linear regression of market orientation and technology orientation to innovation capacity endowment. Model 7 is a Poisson regression of market orientation, technology orientation, and innovation capacity endowment for international R&D intensity. Results are shown in Table 4.

The results of Model 5 show that when technology orientation is controlled, the market orientation can still have significant negative impacts on the international R&D intensity. When the market orientation is controlled, the technology orientation can still have significant positive impacts on the international R&D intensity. The symbol of Hypothesis 1 and Hypothesis 2 remain unchanged, indicating that the results are stable within a certain degree.

The results of Model 6 show that the positive impact of market orientation of enterprise strategy on innovation capacity endowment is not significant, and Hypothesis 4 is not supported. The possible reasons for this are that many enterprises in China cannot fully implement the concept of market orientation in the process of new product development. After obtaining information from customers and competitors, they will ignore or cannot adjust the allocation of enterprise resources and capabilities effectively and in a timely manner, causing their innovation capacity to be inadequate for adapting to the changes in the market, and their innovation capacity endowment therefore cannot be improved. In addition, the influence of market-oriented strategies on their innovation activities in enterprises of different sizes is quite different [48]. When they have a market strategy orientation, smaller sized firms tend to pay major attention to the markets they serve. Therefore, their market information is often limited to their existing customers and competitors, while new knowledge and new technology which is required for a company's long-term development is often ignored. This is not conducive to

the improvement of a company's innovation capacity endowment. The technical orientation of an enterprise strategy has a significant positive impact on innovation capacity endowment, which indicates that the technical orientation of enterprise strategy has a stimulating effect on innovation capacity endowment, meaning Hypothesis 5 is supported. On the one hand, technology-oriented enterprises focus on the cultivation of innovation capacity endowment through the application of advanced technologies in new product development, the rapid integration of new technologies, and the active development of new technologies. On the other hand, the rich technical knowledge accumulated by technology-oriented enterprises' previous R&D experience and processes can help them to acquire, identify, and digest external knowledge [35], and to maintain and reactivate knowledge [36], which can further promote the enhancement of their innovation capacity endowment.

Table 4. Results of causal gradual regression.

Variable	Model 5: DV = ORD	Model 6: DV = IC	Model 7: DV = ORD
SIZE	−0.0281 (0.0575)	−0.2955 *** (0.0681)	0.0154 (0.0515)
AGE	−0.0081 (0.0389)	−0.1168 (0.0765)	0.0114 (0.0371)
STATE	−0.0147 (0.0298)	0.0857 (0.0599)	−0.0296 (0.0273)
CR	−0.0240 (0.0365)	−0.0207 (0.0568)	−0.0178 (0.0342)
MO	−0.4929 *** (0.1255)	0.0483 (0.1253)	−0.5119 *** (0.1289)
TO	0.6700 *** (0.1027)	1.0790 ** (0.5883)	0.6028 *** (0.1040)
IC	- -	- -	0.1296 *** (0.0283)
N	254	254	254
Log likelihood/R2	−301.7024	0.2330	−299.0917
Wald chi2/F	70.40 **	8.36 ***	80.08 ***

Note: Standard errors in parentheses, ***, **, * indicate that the significance test is passed at a significant level of 1%, 5%, and 10%, respectively.

The market orientation of the strategy in Model 6 has no significant effect on innovation capacity endowment, that is, it does not meet the condition of causal stepwise regression, indicating that innovation capacity endowment has no mediating role in the relationship between strategic market orientation and international R&D intensity. It is true that market-oriented enterprises need to rely on the innovation capacity endowment of enterprises to search for and obtain market and resource information in line with the positioning of their products in overseas markets, and to absorb and integrate such information to improve their technology. However, as has been previously analyzed, a market orientation cannot increase an innovation capacity endowment, nor can it slow down the restraining effect of market-oriented enterprises in China on the intensity of international R&D. In other words, to from and enhance an innovation capacity endowment, it is far from enough for enterprises to pay attention to customers and competitors existing in the market. It is also necessary to collect new technologies and new knowledge, strengthen the cultivation of the innovation capacity endowment, and adjust their resource allocation in a timely manner to enable the innovation capacity system to adapt to the changes in the environment.

The results of Model 7 show that when the market orientation, technology orientation, and innovation capacity endowment of strategy are added to the explanatory variables, the regression coefficient of the median variable's innovation capacity endowment is significant, and the technology-oriented regression coefficient of the independent variable is 0.6028, which is reduced compared with 0.67, the regression coefficient of model 5. In addition, the technical orientation of Model 5 is significantly positive for international R&D, and the technical orientation of Model 6 is significantly positive for innovation capacity endowment, indicating that innovation capacity endowment plays a partial intermediary role in the relationship between strategic technology orientation and international R&D intensity, meaning that Hypothesis 7 is supported. Enterprises with strong technology orientation tend to attach major importance to R&D since they believe that R&D innovations and improvement of technical solutions are the best way for enterprises to obtain customer value and maintain a long-term competitive advantage [17]. Therefore, technology-oriented enterprises pay attention to internal technical resources and external technology opportunities, and create unique innovation capacity endowments from both internal and external sources, forming unique heterogeneous capabilities. In the process of developing international R&D, technology-oriented enterprises will have more opportunities to cooperate with leading foreign technology enterprises thanks to their strong innovation capacity endowment, and their communication and cooperation with foreign R&D partners will be smoother and more efficient. At the same time, they can better capture, acquire, absorb, and integrate the advanced technical knowledge and innovation resources obtained from the international market.

4.2.3. Robustness Test

Although the most common method for testing intermediaries is the causal stepwise analysis method, some scholars have pointed out that the method lacks validity and fails to clarify the complex mediating effects [35,47]. Therefore, the Bootstrap method proposed by Preacher and Hayes (2004) is proposed to conduct the intermediary test. The Bootstrap method requires that the mediation variable must be a continuous variable, and when the dependent variable is a multi-class variable, the operation cannot be carried out. The mediation variable in this strategy orientation is a continuous variable of innovation capacity endowment, and when the dependent variable is the international R&D intensity, the count variable can be processed as a continuous variable, and the data can meet the requirements of Bootstrap. Based on the analysis above, in this strategy orientation, the Bootstrap method is applied to re-verify the "different orientations of strategy—the innovation capacity endowment—the intensity of international R&D". The different orientations of the enterprise strategy are tested through the robustness test of the indirect effect of innovation capacity endowment based on international R&D intensity, and the results are shown in Table 5.

The results of model *a* show that the indirect effect of market orientation on international R&D through innovation capacity endowment is not significant since at the 90%, 95%, and 99% confidence levels, the confidence interval includes 0. As such, the indirect effect is $P > 0.1$ and Hypothesis 6 is not supported, which is inconsistent with the conclusion of the causal stepwise regression analysis of model 7. The results of model *b* show that the indirect effect of market orientation on international R&D through innovation capacity endowment is significant since at the 90% and 95% confidence levels, the confidence interval does not include 0, and at the 99% confidence level, the confidence interval includes 0, meaning the indirect effect is significant at the 95% level ($\beta = 0.0942$, $p < 0.05$, 95% CI [0.0158, 0.3101]), Hypothesis 7 is supported, which is in consistent with the conclusion of the causal stepwise regression analysis of model 7. Therefore, the robustness test based on Bootstrap analysis was passed.

Table 5. Robustness test based on Bootstrap analysis.

Bootstrap estimation	Model a		Model b	
	Market Orientation-Innovation Capacity Endowment-International R&D Intensity	Technology Orientation-Innovation Capacity Endowment-International R&D Intensity	b	HE
Control variable				
MO	-	-	-0.2901	0.0449
TO	0.6984 ***	0.0888	-	-
SIZE	0.0161	0.0267	0.0161	0.0267
AGE	0.011	0.0233	0.011	0.0233
STATE	-0.0154	0.0207	-0.0154	0.0207
CR	0.0006	0.0207	0.0006	0.0207
Path analysis				
X-M	0.0483	0.1316	1.079 ***	2.2512
M-Y	0.0837 ***	0.0217	0.0837 ***	0.0217
Total effect	-0.2859 ***	0.046	0.7926 ***	0.088
Direct effect	-0.2901 ***	0.0449	0.6984 ***	0.0888
Indirect effect	0.0042	0.0117	0.0942 **	0.0758
Bootstrap 90% CI	[-0.0109,0.0273]		[0.0241,0.2652]	
Bootstrap 95% CI	[-0.0153,0.0314]		[0.0158,0.3101]	
Bootstrap 99% CI	[-0.0248,0.0421]		[-0.0072,0.4500]	
R2	0.3582		0.3852	

Note: In parentheses, it is a standard error, ***, **, * indicate that the significance test is passed at a significant level of 1%, 5%, and 10%, respectively.

5. Conclusions and Suggestion

5.1. Conclusions

This study takes the stimulating factors of the international R&D intensity of Chinese enterprises as the focus and discusses the influence of enterprise strategy orientation and endogenous innovation capacity endowment on their international R&D. Overall, we conclude that different types of strategy orientations can generate different impacts on R&D internationalization intensity, involving the intervening effects of a firm's innovation capacity endowment. We discuss the details of these points below.

(1) The market orientation of an enterprise strategy has a significant inhibitory effect on the intensity of international R&D, while the technical orientation of enterprise strategy has a significant stimulating effect on the intensity of international R&D. Compared with the market-seeking international R&D investment of multinational enterprises in developed countries, the main motive of international R&D investment in emerging economies is to make full use of overseas markets to obtain innovative resources and technology [2]. Chinese enterprises do not have the ability and conditions to implement the international application of technology for large-scale implementation of foreign market information and technical information. China's market-oriented enterprises are usually in a disadvantageous negotiating position when selecting R&D partners, and their ability to collect and obtain information from foreign customers, suppliers, and competitors is left behind by multinationals in developed countries, causing their international R&D intensity to be lower. High-tech-oriented enterprises, thanks to their higher willingness to innovate and higher technical capabilities, can better integrate and utilize the advanced technical knowledge brought by the global R&D network, to promote the improvement

of product production processes and the development of new technologies, thereby enhancing their products' innovative performances and the intensity of international R&D.

(2) Innovation capacity endowment has a significant stimulating effect on the intensity of international R&D, and plays a partial intermediary role between strategic technology orientation and international R&D intensity, while plays no intermediary role between strategic market orientation and international R&D intensity. Enterprises with outstanding innovation capabilities often excel in seeking market information, exploring new knowledge, and developing the ability to process and absorb external knowledge in the international R&D process. On the one hand, China's market-oriented enterprises usually pay too much attention to the information of existing customers and competitors in the markets they serve while ignoring the new knowledge and new technologies needed for long-term development. On the other hand, they cannot fully implement market-oriented strategic intentions [49], failing to adapt their innovation capacity systems to market changes, and their innovation capacity endowment therefore cannot be improved, thus failing to improve the relationship between market orientation and international R&D intensity. Technology-oriented enterprises focus on the cultivation of innovative capacity endowments and the rich technical knowledge accumulated by their previous R&D experience and processes is conducive to improving their innovative capacity endowments. And the innovative capacity endowments play a non-negligible role in the process of acquiring, allocating, and absorbing technical resources from the international market. They are also related to whether the enterprise can obtain the synergy effect of the global R&D network and catch up with their development. Therefore, technology-oriented enterprises can enhance the intensity of international R&D by improving their level of innovation capacity endowment, obtain the reverse effect of international technology R&D, and improve the level of technology industrialization.

Compared with the existing research, this paper takes Chinese enterprises in the emerging economics as a sample, and focuses on their catching up and the endogenous factors of the enterprises to explore strategy orientation and a innovation capacity endowment's effects on international R&D. This contributes beyond previous studies which take the resources and environmental attractiveness of the host country as the core elements [2]. Moreover, according to the procedural law of enterprise innovation evolution, the authors use the innovation capacity endowment as the scene factor, to discuss the relationship between different strategies of enterprise strategy, innovation capacity endowment, and international R&D intensity. It reveals the non-linear characteristics of the strategy orientation of enterprises which impact the intensity of international R&D. With such contributions, the theoretical boundary of R&D internationalization theory has been expanded.

5.2. Policy Suggestions

The study has some practical implications and associated suggestions.

(1) Because the market orientation of a strategy has an inhibitory effect on the intensity of international R&D and the technical orientation of strategy has a stimulating effect on the intensity of international R&D, it is not suitable for large-scale implementation of market-seeking international R&D of the information and technical information in a foreign market, as far as emerging economies are concerned. Therefore, enterprises should adjust their strategic behaviors in two areas. First, they should re-examine their own motives or goals of internationalization and research strategy, eliminate the goal of obtaining short-term market share, and persist in pursuing long-term knowledge learning and innovation. Resource agglomeration is the goal. In the process of developing international R&D, Chinese enterprises should aim at improving their innovation capacities and achieving technological catch-up. They should obtain advanced technologies, knowledge and innovative resources that can enhance their innovative capacities in the international market, and absorb and utilize them to achieve reverse technology spillovers. Second, they should optimize or reorganize their strategic decision-making teams, and recruit managers with technological innovation orientation to enter strategic decision-making teams to ensure that their corporate strategies have a stable technical orientation. Enterprises should pay attention to the stimulating effect of strategic technology orientation

on international R&D investment instead of their market orientation and the development of new technologies in the future and the improvement of product innovation performance. Enterprises can invest more resources into creating a high-tech-oriented culture to better play the role of facilitating international R&D investment.

(2) Technology-oriented enterprises should pay attention to the cultivation and promotion of their own innovation capacity endowments in the process of developing international R&D. The conclusions of this study show that an innovation capacity endowment has a stimulating effect on the intensity of international R&D, and mediates between technology orientation and international R&D intensity. If technology-oriented enterprises want to promote an international R&D strategy to achieve technological acquisition, an innovation capacity endowment is indispensable, and from the perspective of resources it serves as the basis for acquiring, absorbing, and integrating the advanced technologies acquired from international R&D. Therefore, on the one hand, enterprises should continue to increase investment in research and development, recruit or train technical R&D personnel in the global human resources market, and effectively enhance their talent for innovation. On the other hand, when the number of R&D personnel recruit able in the market is insufficient, companies can take acquisitions. Other independent research and development institutions, and the establishment of cooperation mechanisms with universities and other extension strategies to enhance the ability to innovate. This strategy orientation focuses on the impact of endogenous elements of the enterprise on its international R&D behavior. In practice, these endogenous factors may interact with exogenous factors such as host country location, alliances, and cooperation between enterprises and external organizations. This kind of interaction may change the way in which the endogenous elements of the enterprise impact their international R&D behavior. This is a question worthy of further discussion. At the same time, factors such as the heterogeneity of the industry and the technical gap may also change the process of these endogenous factors impacting on international R&D and become disturbance factors, which is another question worthy of further discussion.

There is a potential issue in our research design that may warrant further examination in the future. Some may note that our research on the relationship between strategic orientation and the intensity of international R & D is largely based on the exploration of possible endogenous factors. Such a potential failure to study the possible reverse relationship between strategic orientation and the intensity of international R&D is also an issue that may cause endogeneity. When considering endogenous factors, studies may need to introduce more factors such as managerial traits and a corporate capability to explore the formation of international R&D intensity. Due to the limitation of a study's scope, we have not covered endogenous issues such as whether there is a reverse causality between strategic orientation and the international R&D intensity, or whether there are other factors that more strongly affect international R&D intensity. We humbly call for future research to extend or complement this current study by examining these issues regarding causality.

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