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The Impact of Global Value Chain Embedding on Corporate Risk Taking of China's A-Share Market-Listed Companies from 2000–2016

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Abstract: Moving towards the high end of the global value chain (GVC) is an inevitable trend of the development of Chinese enterprises, and the level of enterprises' risk-taking behavior is directly related to their profit acquisition in the global value chain. Based on the matching data of CSMAR and the "General Administration of Customs of the People's Republic of China", this paper explores how the embedding of the global value chain affects the risk-taking behavior of enterprises. It is found that (1) R&D investment is an important factor for listed companies to enhance their risk taking by embedding in the global value chain; however, financial constraints will negatively affect this factor. (2) The study's findings also indicated that improving innovation capacity and increasing R&D investment is crucial for enterprises in developing countries to raise their corporate value. Moreover, it is helpful for enterprises to escape the jaws of danger in the GVC wave. It is advised that the government develop a financial market or enhance the external environment to encourage enterprises' development. This study reveals the specific impact of global value chain embedding on corporate risk-taking behavior, provides new empirical evidence for understanding the micro mechanism of the relationship between global value chain embedding and economic growth, and has great practical significance for promoting Chinese enterprises to the high-end of the global value chain.

Keywords: global value chain (GVC); risk-taking; financing constraints

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1. Introduction

The embedding of the global value chain is a phenomenon where, in the process of the deepening the division of labor network of the value chain, some countries integrate into the global production network system by relying on their comparative advantages in a specific production stage in the product chain. The embedding of global value chains has an important impact on a country's competitiveness, economic development, and labor market, which is of great significance for supporting the country's industrial promotion [1]. Studies have shown that as enterprises continue to be embedded in the global value chain, it is beneficial to improve the innovation capability of enterprises [2,3], enterprises' production efficiency [4], and the quality of the enterprises' products [5,6]. Therefore, global value chain embedding is an important means for enterprises to improve their financial outcomes. However, the path for developing countries to achieve transformation as well as advancement by participating in the global value chains is not plain sailing, and they often face various risks [7–9]. Firstly, developing countries are embedded in the GVC controlled by developed countries and obstructed by leading enterprises or those administered in the value chain, especially when considering those upgrade activities that threaten the core competitiveness of leading enterprises [7,10,11]. Secondly, developing countries are prone to over-reliance on external connections, thereby losing the motivation to upgrade at higher levels and locking themselves at the lower end of the GVC [12,13]. Lastly, since 2007, a series of events such as the world economic crisis, the European debt crisis, the fall in commodity prices, Brexit, Sino–US trade frictions, and COVID-19 have caused a huge

impact on the global economy, making global economic development full of uncertainty and leading to a complex external macro environment [8]. Studies have shown that the business activities of enterprises are usually based on the judgment of risk and return. In order to obtain higher returns, enterprises must invest in more high-risk and high-yield projects, and the income profit is the compensation and return of risks and obtaining profits by taking risks is the basic logic of business operations [14,15]. This means that companies that are embedded in the GVC are increasingly able to take risks to obtain more profits. That is, GVC embedding has an important impact on enterprises' risk-taking capabilities.

Therefore, the main questions to be solved in this study are as follows:

1. Does GVC embedding increase enterprises' risk-taking behavior?
2. What is the mechanism between GVC embedding and enterprises' risk-taking behavior?
3. Is the relationship between GVC embeddedness and enterprises' risk-taking behavior influenced by other factors?

Taking the data of China's A-share market-listed companies from 2000 to 2016 as a research sample, this paper uses multiple regression analysis to explore whether and how embedding in the global value chain affects the risk assumption of enterprises. Moreover, we verify whether R&D investment plays an important mediating role and whether financing constraints inhibit the improvement of risk commitment by enterprises via participating in global value chains. The study of these issues will further explore how Chinese enterprises can enhance their competitive advantage by participating in global value chains, thereby efficiently participating in a deeper and higher level of global industrial division of labor in the "post-epidemic" era and promoting the formation of a grand and smooth domestic and foreign economic cycle in the country.

The main contributions of this article are the following:

First, this study reveals the microeconomic effects of global value chain embedding from a unique perspective. This study validates the impact of global value chain embedding on corporate risk taking, which is directly related to profit acquisition in global value chains, and ultimately affects long-term competitive advantages. Compared with previous studies that only focus on the effect of global value chain embedding on factors such as enterprise innovation, product quality, and total factor productivity, this study further explores the role of global value chain embedding on the improvement of enterprises' competitive advantage from the perspective of risk bearing.

Second, by determining the inhibitory effect of financial constraints, it proves the positive role of the government in developing the financial market. This study not only provides a more nuanced picture of the economic consequences of embedding in global value chains, but also provides timely and realistic enlightenment for policymakers, which is of great practical significance for enterprises to better participate in global value chains and move towards the high-end sector of global value chains.

Third, this paper measures the GVC embeddedness of listed companies appropriately. At present, the representative methods for measuring the GVC include the KWW method of Koopman et al. [16,17] and the WWZ method of Wang et al. [18], but these methods can only carry out industry-level analysis and are unsuitable for micro-enterprise level analysis. There have been several enterprise-level research studies, which are limited to industrial enterprises. In fact, many Chinese enterprises participate in the GVC. Therefore, the research on China-listed companies can more comprehensively reflect the participation of China enterprises in the GVC. However, there is very little literature on the GVC for a sample of Chinese-listed companies. Therefore, this paper further expands the measure of GVC embeddedness by matching data from Chinese-listed companies and the "General Administration of Customs of the People's Republic of China".

This article is outlined as follows: the first section introduces the research motivations and implications. The literature review section provides the theoretical basis and related works concerning the global value chain and enterprises' risk-taking behavior, followed by the research hypothesis. The fourth section explains the data collection and method used

in this paper. The fifth section shows the results, and the last section draws conclusions and provides a discussion of the results.

2. Literature Review

2.1. The Risks of Embedding in Global Value Chains

According to the enterprise upgrade theory of Humphrey [19], GVC embedding in the process of upgrading by embedding into the GVC is divided into four stages: process upgrading, product upgrading, functional upgrading, and inter-sectoral upgrading. The risk is uncertain harmfulness that exists and occurs in the process of the subject's decision making and practices that oppose and deviate from the subject's value goal. Its existence and occurrence pose a particular threat and hazard to the existence and development of the subject [20]. Based on the above definition, this paper defines the risk of GVC embedding as the process whereby the enterprises embedded in the GVC dominated by multinational enterprises in developed countries fail to achieve the expected goal in upgrading activities due to the uncertainty caused by internal and external factors. Due to these risks, enterprises cannot successfully accomplish the purpose of being embedded in the GVC, so they fail to occupy the higher value-added links in the GVC and obtain higher profits. Generally, companies encounter two types of risks as they upgrade by embedding themselves in the GVC.

The first type comprises exogenous risks. Enterprises in developing countries can use their own resources and learning ability to complete process upgrading and thereby achieve product upgrading. If they want to continue to promote functional upgrading and inter-sectional upgrading, they will be easily obstructed by leading companies or governors, especially when considering those upgrade activities that violate their own core competitiveness.

The main methods include controlling the spillover of knowledge related to R&D and sales through strategic isolation, thereby locking enterprises in developing countries in a specific value chain [11]; (2) strengthening the property rights protection system; patent thicket strategies; or conducting strict industry technical standards [21]. In this way, enterprises embedded in the GVC can only carry out upgrading activities in a minimal space and may eventually move to a low-end competitive environment.

Another type comprises endogenous risks, which are mainly manifested in the lack of innovation motivation of enterprises and self-locking in low value-added links. The fundamental reason for these behaviors lies in the limited ability of the enterprise itself, which includes their strategic decision-making ability, technical ability, market development ability, resource integration ability, and so on. Enterprises in developing countries can obtain well-designed products and high-tech key components by being embedded in the GVC controlled by developed countries, such that they can compensate for the above weaknesses in the short term.

There is a significant substitution relationship between the independent R&D of enterprises and the intermediate trade of products, which prompts enterprises to further use imported inputs to replace the original highly priced domestic inputs. Therefore, enterprises gradually give up the initiative to climb up the high value-added links of the GVC, which will eventually lead to the failure of enterprises to complete higher-level independent innovation activities [12,13].

2.2. Enterprise Risk Taking

Corporate risk taking reflects the tendency of companies to chase high profits and their willingness to pay for them [11]. This is reflected in the investment decisions of enterprises as actively selecting high-risk and high-yield projects [22]. From a macro perspective, risk taking is the fundamental driving force for long-term sustained economic growth. The high returns from high-risk projects can promote technological progress, accelerate capital accumulation in society, and maintain social productivity at high levels [23]. At the micro level, risk taking is the inevitable result of the enterprise's decision-making process

concerning profit, and it is the basic logic of enterprise operation to obtain profits by taking risks. Therefore, risk taking is an important factor in promoting the performance and growth of enterprises [14].

When it comes to the influencing factors of corporate risk assumption, businesses exist in a specific social environment, and the theory of resource dependence suggests that their business development is the result of their interaction with their surroundings. The level of macroeconomic operation, the degree of perfection in the political system, and the uncertainty brought about by environmental changes will all affect the decision making of enterprises. Second, factors such as size, industry category, growth opportunities, and internal governance structure can also lead to differences in the level of risk-related decision making. Finally, management is the ultimate executor of corporate decision making. Due to different risk tendencies, coupled with different individual abilities and motivations, management will take different policy measures.

2.3. Research on GVC Measurement

The measurement methods of GVC embeddedness can be classified into two types according to the data used: (1) The first one is the macro estimation method. With the advent of large-scale multinational input–output tables such as the Global Trade Analysis Project (GTAP) and the World Input–Output Database (WIOD), increasingly more studies have investigated the GVC under the framework of multinational analysis. Johnson and Noguera [24] used the ratio of domestic value-added exports to total domestic exports to measure the degree of vertical specialization. Koopman et al. (2010; 2014) created an export decomposition model (KWW model) based on the value-added trade theory and forward linkages to quantitatively assess a country's participation and division of labor in the GVC. Wang et al. [18] extended the analysis framework of the GVC from the export stage to the production stage and established an accounting framework for a production decomposition model (WWZ model). This model decomposed the added value created by domestic production (forward linkage) and value-added sources used in domestic production (backward linkages). Moreover, this research redefined country sector level GVC-related indices. (2) The second measurement method comprises micro-estimation methods. Since traditional methods can only conduct industry-level analysis, they are not suitable for micro-enterprise-level analysis. With the availability of Chinese firm-level customs trade data, it is possible to estimate GVC embedding directly at the micro level. Based on the KWW method, Upward et al. [25] used China's customs data and industrial enterprise consolidation data to measure the foreign value-added of Chinese enterprises. On this basis, Zhang et al. [7] considered the problem of intermediary traders and improved the model of Upward et al. [25]. Given that some of the domestic raw materials used by enterprises also contain a share of foreign products [16], Lv et al. [26] assumed this proportion to be 5% and further improved the calculation method at the enterprise level.

From what has been reviewed above, it has been found that (1) some researchers have recognized that developing countries will encounter many risk factors in the process of embedding the GVC. By controlling the risks, the acquisition of profits can be improved. Therefore, the embedding of the GVC is essential to enhancing the risk-taking behavior of enterprises. Still, few studies are devoted to the relationship between global value chain embedding and corporate risk taking. (2) Less is known regarding what factors influence enterprise risk taking, especially corporate strategic decision making. Participation in global value chains plays an important role in improving the quality of export products and technology, alleviating employment pressure, and improving the economy, which is a very important strategic decision for enterprises in developing countries. However, few studies have explored its impact on enterprise risk taking from this perspective. (3) The WWZ model is one of the appropriate methods for measuring GVC embeddedness at present, but it is not suitable for the enterprise level. Most of the existing calculation methods at the enterprise level are based on industrial enterprises. In fact, since China joined the WTO

in 2001, Chinese enterprises in various industries have actively participated in the GVC. Therefore, the use of sample data for industrial enterprises is not a good way to conduct relevant research on Chinese enterprises' participation in the GVC.

3. Research Hypothesis

3.1. The Impact of Global Value Chain Embedding on Enterprise Risk-Taking Behavior

The impact of global value chain embedding on enterprise risk-taking behavior can be divided into three effects: spillover effects, the scale effect, and the competitive effect.

(1) Spillover effects. Multinational companies optimize the allocation of industrial chain layouts on a global scale. In the process of investing in the host country, they often form a technology spillover effect on the host country [2,27], the primary purpose of which is to ensure the overall efficiency of the value chain network operation [28]. According to this spillover effect, enterprises in developing countries can import advanced machinery and equipment. Raw materials and other intermediate inputs from developed countries that dominate the value chain by embedding in the global value chain, on the one hand, can improve the labor productivity of developing countries through input–output effects. On the other hand, developing countries can learn and absorb the advanced technologies existing in developed countries at a lower cost and reduce the former's own production costs. Constantinescu et al. [29] showed how embedding companies in global value chains could boost productivity growth in a country. Therefore, this positive spillover effect helps companies overcome uncertainty and improve their risk-taking capacity.

(2) Scale effect. The embedding of the global value chain can increase market size, leading to economies of scale or an increased scope of production [30]. On the one hand, economies of scale are conducive to helping enterprises increase the number of export products, thereby reducing their dependence on a single product. On the other hand, the economic cycle of the domestic market and the foreign market is often different. An economy of scale is conducive to enterprises' ability to open a more diversified market, which helps to disperse the operational risks of enterprises, reduce their dependence on individual markets, and improve the ability of enterprises to cope with environmental uncertainties and enhance their risk-bearing capabilities.

(3) Competitive effect. Local enterprises in developing countries will inevitably face a harsh market environment when exporting their products to foreign markets, especially to developed countries. To cope with this competitive pressure from foreign markets, enterprises usually take the initiative to enhance their competitiveness in all aspects to avoid competition from enterprises with similar technological levels in the value chain and consolidate the upgrading of their monopoly [13]. Therefore, with an improvement in enterprises' competitiveness, the level of risk bearing of enterprises gradually improves.

In summary, this paper proposes the following first research hypothesis:

Hypothesis 1 (H1). *Global value chain embedding is positively related to corporate risk taking.*

3.2. The Impact of Global Value Chain Embedding on Corporate Risk Taking: The Mediating Effect of R&D Investment

With the deep participation of enterprises in the global value chain, the position of the global value chain rises upwards. The core consequence of this is that the enterprise moves from the low-end of the value chain to the high-end position, and a status and role change occur, which means that the enterprise participates in the global value chain more through forward embedding activities. The forward participation activities are mainly composed of high-value-added links such as the supply of raw materials; product research, development, and design; the production and supply of key components; and brand innovation [31,32]. The key for emerging economies to improve their position in global value chains is to

increase their R&D efforts and cultivate innovation capabilities to obtain higher added value [33].

On the one hand, the process of engaging in R&D activities has a high risk, such as huge employment risks, high silent costs, high failure rates, and other unforeseeable problems; consequently, R&D investment may not necessarily receive corresponding returns, which is often manifested as a long-term, uncertain output and significant fluctuations in return investments [34]. Therefore, developing R&D activities requires enterprises to have a high tolerance for failure. It also means that once decision making involves enterprise R&D investment, it is necessary to consider appropriately increasing the enterprise's risk-bearing level. Moreover, it is better to ensure that the risk-bearing level of enterprises is limited to an appropriate guarantee and is suitable for achieving the sustainable and healthy development of enterprises.

On the other hand, the output of the R&D input is usually intangible assets, and in general, intangible assets have strong specificity [35]. A high asset specificity matches the relationship-based governance method, which improves the requirements of enterprises regarding their level of risk taking. Asset specificity is a kind of relationship-type specialty: once a certain type of special investment occurs, the enterprise will lose their strong bargaining power, resulting in a large number of irreparable costs [36,37]. In order to prevent opportunistic behavior in the execution of the contract, it is reasonably expected that the enterprise will face a higher risk of being "extorted", which fully reflects the high risk of asset specificity. Therefore, from the analysis of the governance-matching method of asset specificity, the contractual relationship reflected in asset specificity has to improve the risk-bearing level of enterprises.

In summary, this paper proposes the second research hypothesis:

Hypothesis 2 (H2). *The R&D investment mediates the relationship between global value chain embedding and corporate risk taking.*

3.3. Global Value Chain Embedding and Corporate Risk Taking: The Moderating Effect of Financing Constraints

Hall [38] gives two key characteristics of corporate R&D activities, revealing the high financing costs and high adjustment costs of R&D activities. The first key feature of R&D activities is that R&D activities are highly uncertain. First of all, in R&D activities, investors face more serious information asymmetry. Due to the non-exclusivity of knowledge and information leakage prevention, R&D activities, as trade secrets, generally will not be disclosed. Consequently, it is difficult for external investors to obtain R&D-related information and supervise the efforts of R&D personnel, such that R&D process contains information asymmetry. Therefore, R&D activities face serious financing costs. The second characteristic is that the "knowledge" formed by the R&D process is difficult to "store" and the commercialization process takes a long time. It often takes a long time to progress from "new knowledge" to commercialization, so R&D activities are a long-term investment, and the benefits cannot be accurately measured in the short term. This feature implies that R&D activities' investment should be continuous, and any interruption that causes the loss of R&D personnel and other situations will cause losses to enterprises; thus, R&D activities have high adjustment costs.

High financing costs require enterprises to maintain sufficient and continuous funds; thus, enterprises' R&D activities will face many financing constraints. According to the theory of resource dependence, when a firm faces financing constraints, the financing constraints lead to the availability of fewer resources to the enterprise, increased financial pressures, liquidity constraints, and more cautious management of its investment activities [39]. Therefore, as enterprises are deeply embedded in the global value chain, when they face a shortage of funds and cannot meet their own investment needs at an acceptable cost of capital, they usually choose a sound financial policy, use an internal cash flow and funds, and may be forced to abandon R&D investment projects with a positive cash flow in order to maintain the normal production and operation of the enterprise. Conversely,

when corporate financing constraints are eased, companies tend to invest more money in high-risk and positive-yield projects, thereby increasing their level of risk tolerance.

In summary, this paper proposes the third research hypothesis:

Hypothesis 3 (H3). *Financing constraints negatively moderate the positive impact of global value chain embedding on R&D Investment.*

To sum up, the conceptual framework of this study is shown in Figure 1.

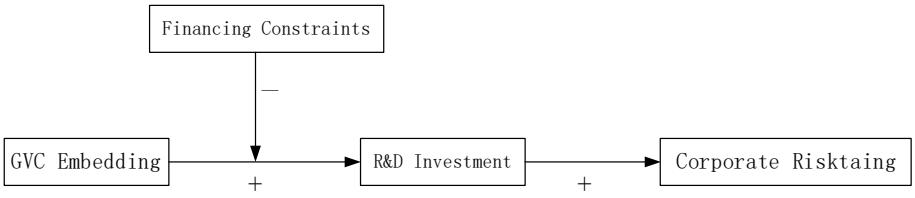

Figure 1. Theoretical framework diagram.

4. Research Design

4.1. Variables and Models

To verify hypothesis 1, we use the OLS model. First, to examine the impact of global value chain embedding on corporate risk taking, the model is designed as follows:

$$\text{RiskTaking} = \beta 0 + \beta 1\text{GVC} + \beta\text{Control} + \beta\text{Year} + \beta\text{Ind} + e \quad (1)$$

In model (1), the dependent variable in this article is risk taking. A company with a high level of risk taking implies that the company tends to choose investment projects with high risk and high return. By summarizing the existing literature, the indicators commonly used include surplus volatility [14,40], the volatility of stock returns, etc. [41,42]. Due to the great volatility of the Chinese stock market, the level of risk assumption of Chinese enterprises is widely measured by Roa volatility. This paper also uses the degree of Roa volatility of enterprises during the observation period to measure the level of corporate risk taking. The greater the volatility of the Roa, the higher the level of corporate risk taking. The Roa is measured by the EBIT divided by the total assets at the end of the year. According to John et al.'s [30] research, in order to mitigate the impact of the industry and the cycle, one should subtract the company's Annual Industry mean from the corporate's Roa to obtain the Adj_Roa. Specifically, with every five years (t − 4 to t years) as an observation period, the observations of the Roa without 5 consecutive years are excluded, and then the standard deviation and range of the industry-adjusted Roa (Adj_Roa) are calculated on a rolling basis. Referring to Facio et al. [43], we multiply the result by 100 to obtain the level of risk-taking.

The formula is as follows:

$$\text{Adj\_Roa}_{i,t} = \frac{\text{EBIT}_{i,t}}{\text{ASSET}_{i,t}} - \frac{1}{X}\sum_{k=1}^{X}\frac{\text{EBIT}_{i,t}}{\text{ASSET}_{i,t}}$$

$$\text{RiskT1}_{i,t} = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}\left(\text{Adj\_Roa}_{i,t} - \frac{1}{T}\sum_{t=1}^{T}\text{Adj\_Roa}_{i,t}\right)^2} \mid T = 5$$

$$\text{RiskT2}_{i,t} = \text{Max}(\text{Adj\_Roa}_{i,t}) - \text{Min}(\text{Adj\_Roa}_{i,t})$$

The independent variable in this article is GVC embedding, which represents the degree of enterprises' global value chain embedment. Since the traditional method is based on the macro estimation method of the World Input–Output Database (WIOD), this type of method is represented by the KWW method of Koopman et al. [16,17] and

the WWZ method of Wang et al. [18]. But this method can only carry out industry-level analysis and is unsuitable for micro-enterprise-level analysis. With the availability of Chinese enterprise-level customs trade data, it is possible to estimate the FVAR of enterprise exports directly at the micro-level. This paper is based on the matching data of the CSMAR database and the China Customs import and export database, referring to Upward et al. [16], Zhang et al. [26], Lv et al. [7], and other that studies used enterprise micro-data to measure the GVC-embedding degree of 1102 listed companies in China from 2000 to 2016. The specific calculation method is as follows:

$$\text{GVC} = \text{In}\,(1 + \text{D VAR}) - \text{In}\,(1 + \text{FVAR})$$

$$\text{DVAR} = 1 - \text{FVAR}$$

$$FVAR = \frac{V_A^f}{X_A^t} = \frac{M_A^p + M_{Am}^g \times \left[X_A^g / \left(D + X_A^g\right)\right]}{X_A^t}$$

V_A^f represents the real import value of intermediate goods, X_A^t represents the real export value, M_A^p represents the real processing trade import value, M_{Am}^g represents the real general trade import value, and X_A^g represents the real import value of general trade. D represents the domestic sales value.

Drawing on the existing literature, we have controlled for other factors that affect the risk assumption of the enterprises in our models. The firm age is the operating life of the enterprise; the longer the operating life of the enterprise, the higher the level of risk assumption, and its regression coefficient is expected to be significantly positive [44]. Cap is a cash payment made by a company for constructing fixed assets, intangible assets, and other long-term assets, measured by the ratio of capital expenditure to total assets at the end of the period [45]. The higher the risk-taking level of the enterprise, the more capital expenditures formed by its long-term investment in fixed assets, intangible assets, and other long-term assets; thus, the regression coefficient is expected to be significantly positive [46]. PPE stands for fixed asset ratio, which is equal to the ratio of fixed assets to the total assets at the end of the period [41,47]. The regression coefficient is expected to be significantly positive. Growth is the growth of the enterprise, which is expressed by the growth rate of the sales revenue of the enterprise [41,45,47]. The faster the company's sales revenue grows, the stronger the company's profitability, and the weaker the company's motivation to obtain income through venture capital. The estimated coefficient is expected to be significantly negative [46]. Ownership is the degree of equity concentration, which is equal to the sum of the shareholding ratios of the top five shareholders [46]. Major shareholders may choose more stable investment projects because of the pursuit of private income [28]; so, the regression coefficient is expected to be significantly negative. Indratio is the proportion of independent directors, which is equal to the ratio of the number of independent directors to the total number of board members [48]. The larger the proportion of independent directors, the stronger the independence of the board of directors, the more effective the exercise of rights to supervise the management, the more restrictive the management's risk-averse behavior, and the higher the level of risk taking of the enterprise. Therefore, the regression coefficient is expected to be significantly positive.

To verify Hypothesis 2, we also use the OLS regression model:

$$\text{Risk-taking} = \beta 0 + \beta 1\text{GVC} + \beta 2\text{R\&D} + \beta\text{Control} + \beta\text{Year} + \beta\text{Ind} + \text{e} \quad (2)$$

Model (2) adds R&D to model (1), which represents the company's R&D investment, measured by the proportion of R&D expenditure to the primary business income. Through global value chain embedding, companies invest more in R&D activities, thereby increasing the level of corporate risk taking. If β2 is positive, it means that R&D investment plays an intermediary role in promoting corporate risk assumptions in global value chains. Based

on assumption 2, we expect β2 to be significantly positive. The definition of the remaining variables in model (2) is the same as in model (1).

$$\text{R\&D Investment} = \beta 0 + \beta 1\text{GVC} + \beta 2\text{SA} + \beta 3\text{GVC} * \text{SA} + \beta\text{Control} + \beta\text{Year} + \beta\text{Ind} + e \quad (3)$$

Model (3) adds the variable SA and its interaction term with the GVP to model (1). Among them, SA is the level of corporate-financing constraints. Hadlock and Pierce divided the types of corporate-financing constraints based on corporate financial reports, and constructed a financing constraint index using the size and age of enterprises, calculated as: SA = 0.737 × size + 0.043 × size^2 − 0.04age. Compared with other financing constraint composite indices, the two variables used in the SA index, the size of the enterprise and the age of the enterprise, do not change much over time, are highly exogenous, and have good characteristics for the financing constraints of Chinese enterprises, so this paper uses the SA index to measure the financing constraints of enterprises. The higher the financing constraints of the enterprise, the more difficult it is for the enterprise to obtain funds, which is not conducive to the research and development activities of the enterprise. If the coefficient of GVC ∗ SA is significantly negative: the higher the financing constraint, the weaker the promotion effect of GVC ∗ SA on the risk assumption of enterprises. Based on assumption 3, we expect β3 to be significantly negative. The definition of the remaining variables in model (3) is the same as in model (1).

4.2. Sample Selection and Descriptive Statistics

The independent variable GVC embedding is derived from the CSMAR China Listed Company Database and China Customs Import and Export Data. After matching the company name, the enterprise's legal person, and further matching the post code and company phone number, we eliminated unreasonable matching data and missing values. Finally, the panel data of 1102 listed companies from 2000 to 2016, a total of 5292 valid samples, were sorted out.

It should be noted that the processing method of database matching in this paper refers to the related research of Zhang et al. [7,26]. The data-matching process is listed as follows: first of all, this paper matches the enterprise name and the enterprise legal person, which is not easy to change in the short term. Secondly, this paper further uses the postal code of the company's location and the company's phone number to match the companies that were not successfully matched the first time. The consolidation of the listed company information with the income statement, balance sheet, etc., is calculated based on the year-end value of the parent company's statement. For a situation wherein the company name changes during the year, we determine the individual company based on the company's security code that will not change. The consolidated enterprise data also include the financial information and import and export information of the enterprise. Finally, this paper selects the panel data of listed companies that meet the research requirement.

The data on the dependent, moderate, and controlled variables were derived from the CSMAR Database, and the mediated variable R&D was obtained from the China Wonder Database (Wind) for the initial data. For the above data, we have carried out the following processing scheme: (1) exclude enterprises in the financial industry, (2) exclude companies with relevant financial data, (3) eliminate missing data values, and (4) winsorize the processing of 1% for continuity variables. Consequently, we obtained a total of 8485 samples from 1111 companies.

Table 1 reports the descriptive statistical results for the main variables. Judging from the statistical results of the entire sample description, the average value of RiskT1 is 2.871, the maximum value is 33.34, and the minimum value is 0.131. The average value of RiskT2 is 7.064, the maximum value is 82.28, and the minimum value is 0.321, indicating that there is a significant difference in the risk-taking level of enterprises. The average value of the GVC is 0.185, the maximum value is 1, and the minimum value is 0, indicating that China as a whole is still in the downstream position of the global value chain. The remaining variables are within the normal range and have no extreme values.

Table 1. Descriptive analysis.

Variable	N	Min	Max	Mean	SD
RiskT1	5292	0.131	33.34	2.871	2.460
RiskT2	5292	0.321	82.28	7.064	6.020
GVC	5292	0	1	0.185	0.350
R&D	5292	0	1.950	0.0716	0.0956
SA	5292	1.087	8.469	3.510	1.257
ownership	5292	18.99	91.41	54.16	14.47
growth	5292	−0.493	4.226	0.198	0.355
ppe	5292	0.00254	0.743	0.267	0.151
indratio	5292	0.250	0.571	0.365	0.0517
firm age	5292	2	48	13.09	4.902
cap	5292	0.0207	0.0321	0.0292	0.000839

Table 2 reports the correlation coefficients between the variables. Among them, the level of corporate risk commitment (RiskT1 and RiskT2) is significantly positively correlated with the GVC, indicating that as enterprises become more deeply involved in global value chains, their risk level also gradually increases, which is consistent with assumption 1. In addition, the level of corporate risk taking (RiskT1 and RiskT2) is also significantly positively correlated with the R&D level, which confirms hypothesis 2 to some extent. The correlation coefficients between the relevant control variables in this paper are all lower than 0.6, indicating that there is no serious multicollinearity problem between the related control variables.

Table 2. Correlation analysis.

	1	2	3	4	5	6	7	8	9	10	11
RiskT1	1										
RiskT2	0.994 ***	1									
GVC	0.054 ***	0.054 ***	1								
R&D	0.066 ***	0.070 ***	−0.004	1							
SA	−0.157 ***	−0.157 ***	0.123 ***	−0.069 ***	1						
ownership	−0.036 ***	−0.038 ***	0.051 ***	−0.024 *	0.107 ***	1					
growth	−0.046 **	−0.047 **	0.039 **	−0.030 **	0.030 **	0.113 ***	1				
ppe	0.097 ***	0.100 ***	0.068 ***	−0.026 *	0.016	−0.003	−0.048 ***	1			
firm age	0.068 ***	0.068 ***	0.038 ***	−0.010	0.159 ***	−0.220 ***	−0.127 ***	0.001	1		
indratio	0.022	0.023	0.011	0.080 ***	0.082 ***	0.046 ***	−0.015	−0.059 ***	0.038 ***	1	
cap	0.199 **	0.196 **	0.098 ***	0.008	0.705 ***	0.119 ***	0.066 ***	0.213 ***	0.025 *	0.043 ***	1

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5. Empirical Results and Analysis

5.1. Basic Analysis Results

Table 3 reports the regression results of model (1): the explanatory variable is and GVC, the explanatory variables are RiskT1 and RiskT2, and the control variable and year dummy variables are gradually added. Column (1) reports the regression results with the dependent variable as RiskT1, while column (2) reports regression the results with the dependent variable as RiskT2. The regression results are consistent with the previous theoretical analysis, and GVC embedding is significantly positively correlated with RiseT1 and RiskT2 (both significant at the 1% level), indicating that global value chain embedding can improve the level of corporate risk taking, which supports hypothesis 1. The regression results of the control variables are as follows: the estimation coefficient of the firm age is significantly positive, indicating that the longer the operating life of the enterprise, the higher the level of risk assumption of the enterprise, which is consistent with the expectation. The estimated coefficient of enterprise growth is significantly negative, indicating that the stronger the profitability of the enterprise, the lower the level of risk taking of the enterprise, which is consistent with the expectation. The estimated coefficient of the cap is significantly positive, which is consistent with the expectation.

Table 3. Basic results' analysis.

	RiskT1	**RiskT2**
GVC	0.6582 ***	1.6474 ***
	(4.3354)	(4.5209)
ownership	−0.0073	−0.0168
	(−1.1389)	(−1.0450)
growth	−0.0128 *	−0.1301 *
	(−1.7789)	(−1.8450)
ppe	0.9194	2.2671
	(1.4679)	(1.4868)
firm age	0.0066 *	0.0268 *
	(1.8679)	(1.8868)
indratio	0.4406	1.0521
	(0.5128)	(0.4928)
cap	410.7268 ***	994.4743 ***
	(2.9469)	(2.9868)
Observations	5292	5292
R-squared	0.0679	0.0682
Number of id	1102	1102
Industry	YES	YES
Year	YES	YES

Note: Standard errors in parentheses; * $p < 0.1$, *** $p < 0.01$.

5.2. Mediating Effect Test

Table 4 reports the regression results for model (2). As mentioned in the previous theoretical analysis, the R&D input is an important mechanism by which global value chain embedding affects corporate risk taking. This paper examines the mediating effect of the R&D input based on a three-step method. In the first step, to test the relationship between the global value chain-embedding index and the risk assumption of enterprises, the results of column (1) and (4) show that the global value chain-embedding index has a significant positive correlation with RiskT1 and RiskT2, which is consistent with the main effects' test results, indicating that global value chain embedding can improve the level of risk tolerance of enterprises. In the second step, to test the regression of the intermediary variable to the independent variable, it can be seen from Column (2) and (5) of Table 4 that there is a significant positive correlation between the GVC's embedded index and R&D, indicating that as firms participate in the global value chain, the investment in R&D will increase accordingly. The third step examines the regression of the dependent variable to the independent and mediating variables, and column (3) and (6) of the table shows a significant positive correlation between the GVA-embedding index and RiskT1 and RiskT2, and a significant positive correlation between the R&D inputs and RiskT1 and RiskT2.

In addition, it can be seen from the table that after the addition of the intermediary variable, the influence coefficient of the independent variable on the dependent variable is reduced. Through the test of the mediation effect, it was found that R&D investment plays an intermediary role between the embedding of the global value chain and enterprise risk taking. Table 4 further reports the results of the Sobel test, which proves that the intermediaries' results are accurate, and that global value chain embedding can contribute to the level of corporate risk taking by increasing R&D investment. The above results support hypothesis 2.

Table 4. Intermediary effect test.

	(1)	(2)	(3)	(4)	(5)	(6)
	RiskT1	R&D	RiskT1	RiskT2	R&D	RiskT2
GVC	0.658 *** (4.335)	0.009 *** (2.712)	0.625 *** (4.095)	1.647 *** (4.521)	0.009 *** (2.712)	1.560 *** (4.257)
Ownership	−0.007 (−1.139)	−0.0003 (−1.308)	−0.006 (−0.983)	−0.017 (−1.045)	−0.0003 (−1.308)	−0.014 (−0.882)
Growth	−0.013 * (−1.778)	−0.008 * (−1.787)	−0.092 * (−1.883)	−0.130 * (−1.845)	−0.008 * (−1.817)	−0.204 * (−1.912)
PPE	0.919 (1.468)	0.007 (0.459)	0.894 (1.439)	2.267 (1.487)	0.007 (0.459)	2.200 (1.456)
Firm age	0.007 * (1.868)	0.002 *** (2.859)	0.012 * (1.739)	0.027 * (1.887)	0.002 *** (2.859)	0.0419 * (1.856)
Indratio	0.441 (0.513)	0.066 * (1.830)	0.199 (0.233)	1.052 (0.493)	0.066 * (1.830)	0.421 (0.199)
Cap	410.727 *** (2.947)	3.099 *** (3.459)	422.023 *** (3.839)	994.474 *** (2.987)	3.099 *** (3.459)	1023.976 *** (3.146)
R&D			3.6456 *** (4.104)			9.5210 *** (4.257)
Constant	14.214 *** (4.179)	−0.043 (−0.333)	14.372 *** (4.548)	34.565 *** (4.223)	−0.043 (−0.333)	34.976 *** (4.637)
Sobel test *p*-value		0.024			0.022	
Sobel test Test statistic		2.262			2.287	
Observations	5292	5292	5292	5292	5292	5292
R-squared	0.068	0.039	0.079	0.068	0.039	0.081
Number of id	1102	1102	1102	1102	1102	1102
Industry	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES

Note: Standard errors in parentheses; * $p < 0.1$, *** $p < 0.01$.

5.3. Moderating Effect Test

Table 5 reports the regression results for model (3). As mentioned in the previous theoretical analysis, the negative direction of financing constraints affects the relationship between global value chain embedding and corporate risk assumption. The explanatory variables for columns (1) and (2) are RiskT1 and RiskT2, respectively, and their explanatory variables are GVC and its interaction with the financing constraint SA. The regression results show that the regression coefficients of the GVC with RiskT1 and RiskT2 are all positive, which is consistent with the above results. At the same time, the regression coefficients of the interaction items between GVC and the financing constraint SA are significantly negative at the level of 1%, indicating that the higher the financing constraints faced by enterprises in the process of participating in global value chains, the weaker their role in promoting the level of risk taking. The above results support hypothesis 3.

Table 5. Moderation effect test.

	Moderation
	Model 1
GVC	0.041 *** (3.900)
Ownership	−0.0003 (−1.292)

Table 5. *Cont.*

Growth	−0.009 * (−1.892)
PPE	0.009 (0.5701)
Firm age	0.0007 * (1.870)
Indratio	0.069 * (1.863)
Cap	1.090 *** (3.570)
GVC * SA	−0.009 *** (−3.220)
SA	−0.008 * (−1.845)
Constant	−0.004 (−0.026)
Observations	5299
R-squared	0.043
Number of id	1103
Industry	YES
Year	YES

Note: Standard errors in parentheses; * $p < 0.1$, *** $p < 0.01$.

5.4. Endogenous Test

The impact of GVC embeddedness on corporate risk taking may be disturbed by endogenous issues. As the level of corporate risk taking increases, it may deepen the degree of corporate embeddedness in GVCs. That is, GVC embeddedness interacts with corporate risk taking. In order to alleviate the influence and interference of this endogenous problem on the research conclusions, this paper uses the instrumental variable method for testing. Drawing on the research of Lv et al. [26], this paper uses three types of instrumental variables to carry out a 2SLS instrumental variable regression: PT (the ratio of processing trade exports to total exports), the industry average of GVC embeddedness, and the lag term of GVC embeddedness. These three instrumental variables are strongly related to the endogenous variable, but there is no significant correlation with the dependent variable. Table 6 shows that the impact of GVC embedding on corporate risk taking remains robust after employing the instrumental variables. The F-value of the weak identification test is more than 15, indicating that there is no weak instrumental variable problem in the instrumental variables selected in this paper.

Table 6. Endogenous test.

	Endogenous Industry Mean of GVC		**Endogenous the Lag Phase of GVC**		**Endogenous PT**	
	RiskT1	**RiskT2**	**RiskT1**	**RiskT2**	**RiskT1**	**RiskT2**
GVC	1.811 * (1.911)	4.006 * (1.841)	1.215 ** (2.322)	3.240 ** (2.563)	2.4233 ** (2.6706)	6.1188 ** (2.7802)
Ownership	−0.007 (−1.086)	−0.016 (−1.004)	−0.007 (−1.129)	−0.014 (−0.947)	−0.008 (−1.232)	−0.017 (−1.076)
Growth	−0.037 * (−1.856)	−0.076 * (−1.846)	−0.024 * (−1.857)	−0.043 * (−1.832)	−0.043 * (−1.932)	−0.098 * (−1.896)

Table 6. *Cont.*

	Endogenous Industry Mean of GVC		Endogenous the Lag Phase of GVC		Endogenous PT	
	RiskT1	**RiskT2**	**RiskT1**	**RiskT2**	**RiskT1**	**RiskT2**
PPE	0.857 (1.356)	2.143 (1.393)	1.014 (1.507)	2.523 (1.544)	0.826 (1.226)	2.002 (1.220)
Firm age	0.0055 * (1.756)	0.0782 * (1.793)	0.0331 * (1.807)	0.1386 * (1.844)	0.0173 * (1.826)	0.0218 * (1.820)
Indratio	0.468 (0.542)	1.114 (0.521)	0.708 (0.851)	1.805 (0.881)	0.420 (0.470)	1.152 (0.520)
Cap	406.098 *** (3.356)	986.059 *** (3.393)	407.750 *** (4.507)	987.869 *** (3.244)	432.251 *** (3.226)	1024.548 *** (4.220)
Weak-F	199.874	199.874	345.784	345.784	242.028	242.028
Observations	5152	5152	4807	4807	4625	4625
R-squared	0.0469	0.0532	0.0590	0.0587	0.0515	0.0523
Number of id	962	962	918	918	865	865
Industry	YES	YES	YES	YES	YES	YES

Note: Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6. Conclusions and Discussion

With the deep participation of Chinese enterprises in the global value chain, moving towards the high end of the global value chain is an inevitable trend for the development of Chinese enterprises. This study explores the economic consequences of global value chain embedding from a micro perspective, which is of great reference value for developing countries to improve their economic level. Based on the data of China's 2000–2016 A-share market-listed companies, this study examines how global value chains' embedment affects corporate risk taking. The conclusion of the study shows that the embedding of the global value chain has a significant role in improving corporate risk taking. Secondly, through the analysis of the mediating effect, the embedding of the global value chain has an impact on corporate risk taking by strengthening the level of R&D investment. Finally, we observed that the financing constraints will inhibit the positive effect of global value chain embedding on corporate risk taking. Thus, our study offers essential and timely implications for both theories and practices.

6.1. Implications for Theory

First, this study enriches the literature on the economic consequences of embedment in the global value chain. Although scholars' discussions on the participation of enterprises in global value chains have achieved fruitful results, the relevant research mainly focuses on innovation, productivity, and product quality. This paper examines the relationship between global value chain embedding and corporate risk taking through multiple regression analysis methods. Additionally, the level of corporate risk taking is directly related to its profit acquisition in the global value chain. Therefore, based on new research perspectives, this study further enriches the microscopic effects of global value chain embedding and supplements the existing literature to a certain extent.

Second, this study expands the research framework in the field of corporate risk taking. Since risk taking reflects the investment of decision makers' control of risk and return, when companies choose to take on higher risks, they can achieve a high level of capital allocation efficiency. Moreover, they have greater opportunities to obtain investment returns, expand financial performance, and influence other related decisions. The existing literature in the field of risk taking is mainly based on the principal-agent framework, and studies how to improve management's willingness to take risks from the perspectives of management incentives, decision-making autonomy, and the personal characteristics of executives. This

study found that global value chain embedding helps to improve the level of risk taking and enriches the literature on the factors influencing corporate risk taking.

6.2. Practical Implications

First, this study is of great practical significance for Chinese enterprises' ability to improve their economic performance and move towards the high-end position in the global value chain. The pursuit of a profit-making process of risk taking is one of the driving forces to support long-term economic growth, and global value chain embedding is a critical way to effectively improve the level of risk taking of enterprises. China should do its best to actively embed the GVC's division of labor, strengthen economic cooperation with other countries, actively absorb the spillover effect of participation in the global value chain, use external resources to enhance their capabilities, enhance enterprises' risk-taking level, and better promote enterprises' ability to move towards the high-end position of the global value chain.

Second, this paper provides a theoretical basis for improving relevant policies in China's financial market. Since R&D investment is an essential mechanism for enterprises to participate in global value enhancement at the risk-taking level, a developed financial market can reduce corporate financing constraints, alleviate the financial impact of enterprises, and ensure the continuity of enterprises' investment in R&D, while the development level of China's financial market is not perfect enough. Therefore, the development of financial markets and the improvement of financing systems can help more enterprises participating in global value chains to improve their investment in R&D activities, thereby improving their level of risk taking.

6.3. Limitations and Suggestions for Future Research

First, the specific process of enterprise risk assumption is mainly manifested in the two aspects of corporate financing and enterprise investment; the research findings of this paper verify the impact of global value chain embedding on the investment status of enterprises to a certain extent. Therefore, future research can explore how global value chain embedding affects the financing status of enterprises. For example, the capital structure reflects the proportional relationship between corporate debt and equity, which largely determines the enterprises' financing ability. In the future, the process by which the embedding of global value chains affects the capital structure of enterprises can be explored.

Second, the relationship between global value chain embedding and corporate risk assumption is not only affected by external factors such as financing constraints, but also internal factors, such as internal governance structure, manager characteristics, and other factors, which will cause differences in the level of risk-based decision making. Therefore, future research will explore the regulatory effect of influencing factors within enterprises and provide relevant suggestions for enterprises to improve their participation in global value chains from multiple perspectives.

Third, based on the limited data availability, this paper's data are from 2000–2016. However, after 2016, the world economy has undergone great changes, and problems such as trade protectionism, the COVID-19 epidemic, stock market volatility, and environmental pollution have followed. Since then, the external environment that enterprises face has also undergone tremendous changes, including unfavorable factors such as industrial backflow, unfair technological competition, and layout adjustments. Therefore, future research can extend the data window to enhance the timeliness of this research when the data are available. For example, it can explore how the COVID-19 epidemic affects the process of Chinese enterprises' participation in the GVC, and what measures have been taken by the Chinese market to minimize its economic impact on China and its key allies to better participate in the GVC.

Fourth, the research object of this paper is Chinese A-share listed companies. Although an overall research conclusion has been obtained, due to the significant heterogeneity of enterprises, the degree of participation of different types of enterprises in the GVC may be

different. The paths of its transformation and upgrading will also be various, and the risks it faces may also be different. Therefore, future research can further analyze the issues related to the participation of different types of enterprises in the GVC. For example, how does the problem of industrial hollowing in developed countries affect the global industrial layout of multinational companies, and what risks will private companies face when they are embedded in the GVC? The research on these issues can help different types of enterprises to improve their participation in the GVC from a more comprehensive perspective.

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