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EDITED BY
Xuemei Li,
Ocean University of China, China

REVIEWED BY
Minghuan Shou,
Hangzhou Dianzi University, China
Yufeng Zhao,
Ocean University of China, China

*CORRESPONDENCE
Yingqin Zhao
✉ 1294962851@qq.com

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How do Chinese marine firms embed in global value chains? Peer effects perspective

Weijian Tian¹ and Yingqin Zhao^{2*}

¹School of Business, Liaoning University, Shenyang, Liaoning, China, ²Asia-Australia Business College, Liaoning University, Shenyang, Liaoning, China

Introduction: This study investigates how Chinese marine firms are motivated to embed in the global value chains from the perspective of peer effects. The motivation mechanism is examined and tested from three perspectives: learning motivation, competitive motivation and information motivation.

Methods: The marine companies that were listed between 2008 and 2016 on the Shanghai and Shenzhen A-shares serve as our samples. A number of robustness tests support the study's conclusion.

Results: Chinese marine companies' embed in the global value chains has industry peer effects. According to the mechanism analysis, the leader firms in marine enterprises embed in the GVCs peer effects for "competitive motivation" and "information motivation", while the following companies do the same for "learning motivation" and "information motivation." According to heterogeneity analysis, peer effects are particularly prominent in places with state-owned marine firms, high proportion of FDI and high degree of marketization.

Discussion: The driving forces behind marine firms' embed in global value chains are explored in this study, which also offers managers of marine enterprises decision-making resources.

KEYWORDS

marine economy, global value chains, peer effects, imitation behavior, mechanism analysis

1 Introduction

The CPC's report to the 20th National Congress emphasized the significance of maintaining a high degree of opening-up. It affirmed China's confidence and resolve to steadfastly pursue its expansion. Embedding into global value chains is currently a significant way for China to engage in international external circulation as well as a significant way to increase high-level opening-up. With over 3 million square kilometers of maritime territory, China's marine economy has grown significantly in recent years and is still growing in size. China's gross marine product is expected to reach 9909.7 billion yuan

in 2023. The development and use of marine resources are becoming increasingly global, and the marine economy is a major driver of China's economic expansion (Ding et al., 2023; Ren et al., 2018). International trade and investment are fueled by marine enterprises' embed into global value chains. However, marine firms are faced with numerous practical problems during the embedding process due to the global value chain's instability and complicated rivalry. Many fundamental technologies are monopolized by industrialized nations, and marine firms like marine engineering equipment and marine new energy have very high technological requirements. The presence of these issues limits marine firms' capacity for sustainable development and global competitiveness.

Global value chains have developed into a crucial platform for marine firms to engage in international collaboration and the division of labor (Egunjobi and Ngepah, 2022). This gives marine firms significant chances to become more competitive and integrate into the global economy. Marine firms can overcome geographic constraints, combine global resources, optimize the industrial chain structure and raise their technological level and competitiveness in the market by embedding into the global value chains (Seung, 2022; Liu et al., 2021). Marine firms encounter numerous obstacles during the embedding process, including technical hurdles, limitations on market access, and maritime power imbalances, despite the fact that global value chains offer them chances to become part of the global economic system (Egunjobi and Ngepah, 2022).

"Peer effects" describes how people's actions are influenced by both their own traits and those of people in similar situations (Leary and Roberts, 2014). According to Manski (1993), peer effects are an imitation strategy, meaning that individual behavior is prone to change in response to the conduct of other members of the group. The phenomena of enterprises maintaining their competitive position through imitation has also been explained by the peer effects correlation theory (Lieberman and Asaba, 2006). Recent studies in the subject of peer effects have demonstrated that decision-making practices of other firms in the same industry or location invariably influence the target enterprise. For instance, when it comes to enterprise ESG disclosure and IPOs, there are industry peer effects (Aghamolla and Thakor, 2022; Liang and Yang, 2024). There are regional peer effects in enterprise tax avoidance (Gao et al., 2021) and social responsibility (Li and Wang, 2022).

Marine firms embed into global value chains for a variety of reasons, including competitiveness, industrial policy, and national strategy. Exploring the motivations and influencing factors behind marine firms' embed into global value chains has a theoretical and practical perspective in order to make sensible and scientific industrial strategies and boost marine enterprises' international competitiveness. Peer effects are a crucial viewpoint for comprehending how firms make decisions, and it offers a better way to view how marine firms embed into global value chains. Do marine firms that are influenced by other firms in the same industry embed into global value chains? What is the causal mechanism if peer effects exists? What additional factors limit the extent of the peer effects? This study uses the 2008–2016 Shanghai and Shenzhen

A-share listed marine enterprises in China as research samples to examine this set of issues. It then theoretically and empirically tests the phenomenon of the peer effects of marine enterprises embedding into global value chains, as well as its motivation mechanism and boundary conditions.

In contrast to previous studies, this study contributes to the literature in three ways: (1) From the perspective of financial growth (Kersan-Škabić, 2019) and international production segmentation (Li et al., 2016), the current research primarily uncovers the motive and driving mechanism of firms' embedding in GVCs. Little research is paid to how peers' decision-making practices affect marine firms' decision-making and embed in global value chains. The industry peer effects of marine firms embedding into global value chains is examined and confirmed in this study, which also broadens the scope of research on the motivations behind these firms. (2) Another significant issue that academics are interested in is the mechanism by which the peer effects is generated. According to Lieberman and Asaba (2006), the peer effects is caused by the target firm imitating the actions of firms that have an advantage information and crucial tools for preserving their competitive position in the market. This study examines the internal motivation of marine firms to incorporate the peer effects into the global value chain industry and enhances the body of research on the group effects in the area of management decision-making from the viewpoints of information, competitiveness, and learning motivation. (3) Managers of marine firms can use this document as a helpful guide when developing their marine strategies. To help managers of marine enterprises better understand the rules and characteristics of decision making embedding in global value chains, this study examines the differences in the role of industry peer effects of marine enterprises embedding in global value chains in various contexts by the equity nature of enterprises, the proportion of FDI, and the degree of marketization where the enterprises are located into the analysis framework.

2 Research hypotheses

2.1 Existence of industry peer effects of marine enterprises embed in global value chains

Due to unfamiliar surroundings, marine firms frequently encounter external costs when embedding into global value chains. The behavioral connection between peer firms rises when managers are very motivated to learn. When they are in the same industry, marine enterprises have comparable experiences and cultural backgrounds. Therefore, imitating the successful practices of other companies in the same industry can effectively increase firms' participation in GVCs. Furthermore, in order to reduce uncertainty risk through imitative isomorphism, marine enterprises often model themselves after reputable and successful peer organizations in high-uncertainty environments (DiMaggio and Powell, 1983).

Using marine resource has the characteristics of globalization, and marine firms frequently target international markets with their goods and services. Peer pressure might thereby increase target firm to embed into global value chains when domestic peer enterprises perform well in GVCs. Marine firms may enhance the efficiency of their embeddedness, increasing revenues and preserving their competitive position, by studying and learning from the achievements of their peers. In addition to reducing the possibility of “low-end lock-in” that marine companies can experience during the embedding phase, such imitation behavior gives managers access to important information and knowledge. Marine enterprises can use the success of their domestic counterparts in the worldwide market as a guide to determine the possible returns in the global market, foster resource sharing and information synergy, and ultimately improve decision-making and global competitiveness.

In conclusion, the first obstacle to marine enterprises' embed into global value chains is their lack of international knowledge and experience (Johanson and Vahlne, 2009). Managers who are making decisions about embedding into GVCs compare themselves to other marine enterprises in the same industry and refer to the ocean-going behaviors that have already been developed and successfully implemented by the peer firms, they formulate decision-making behaviors that are more appropriate for their own way of development, forming the phenomenon of the peer effects. Additionally, peer pressure will encourage marine firms that have not expanded their overseas business to learn from those that have already benefited from embedding GVCs and have grown to become leading firms in the industry. Simultaneously, the industry's externality features can progressively spread the R&D, design, and management expertise of the leading marine companies throughout the sector through spillovers and other channels, allowing other following companies to reap significant profits and productivity boosts. Based on the previous analyses, this study proposes hypothesis 1:

Hypothesis 1: There are industry peer effects for marine firms embedding in GVCs.

2.2 Mechanisms inherent in the embeddedness of marine enterprises in global value chains and industry peer effects

From the perspective of information motivation, managers of marine firms are more likely to imitate the actions of other companies while making their own decisions due to the high costs of decision-making (Conlisk, 1980). Marine enterprise managers have restricted cognitive capacity and decision-making horizons due to the complexity and unpredictability of the marine sector. The maritime environment is dynamic and unpredictable. For instance, legislative changes, resource volatility, and climate change all make decision-making more challenging. In order to reduce the difficulty of their own decisions when embedding in

GVCs, managers are more inclined to collect information on the decisions made by other marine firms in the same group because making decisions in a short time results in incomplete information collection (Bikhchandani et al., 1998). Additionally, marine firms face the issue of information asymmetry when embedding in GVCs. For instance, there is little information available regarding the process of embedding in the value chain, as well as the possible dangers and advantages. Thus, target marine firms use other firms' decisions as a source of information. By imitating firms in the same industry, they can embed in GVCs, which reduces risk and uncertainty of embedding. It helps firms find and take advantage of new opportunities in the global marine market, and saves cost on information collection and analysis.

From the perspective of competitive motivation, marine enterprise managers tend to imitate competitors' behaviors when embedding in GVCs. On the one hand, the approach of imitating the same group of companies that are embedding in GVCs can reduce the level of competition, provide economies of scale, and keep marine firms competitive globally (Wang et al., 2023). This is due to the fact that marine firms can benefit from complementary technological advantages in the same industry and share resources like production facilities, logistical networks, and distribution channels in the global market with their peer companies, which reduces costs and boosts productivity. However, when embedding, managers of marine companies also use aggressive and confrontational imitation to overtake their peers' market positions in an effort to increase their global market share and enhance the position of competition.

According to social learning theory, which examines learning motivation, firms will imitate and learn from successful firms by seeing how other top firms behave. The pursuit of global development and embed into global value chains by marine enterprises is significantly influenced by the successful practices of leading companies (Kano et al., 2020). Marine companies have a tendency to deliberately imitate and absorb knowledge from other top companies by observing their successful practices. By imitating and learning from successful leading firms' successful embeddedness into global value chains, these following enterprises increase their social usefulness (Bursztyn et al., 2014). On the one hand, following firms leverage the knowledge, technology, and managerial expertise of leading firms embedding in GVCs to adapt to the global marine market through imitation, learning, and adoption of dynamic technology. However, marine firms may quickly learn how embedding GVCs work, including how to manage transnational supply chains and work with international partners, by learning from the methods of successful firms in the same industry. In the same industry, following firms can surpass leader firms through this type of imitation and learning (Posen et al., 2013).

Therefore, the embeddedness of marine enterprises in GVC peer effects stems from observation of similar firms in the industry for information, competitiveness, and learning motives. In light of the above analysis, Hypothesis 2 is put forth:

Hypothesis 2: Information motivation, competitive motivation and learning motivation are the main motives for marine firms to imitate their peer firms in making decisions.

3 Research design

3.1 Sample and data sources

The firm-level export data that is currently available stops in 2016 because details like enterprise code and enterprise name are no longer included in the public customs data from 2017 in China. In the meanwhile, this research chooses Chinese Shanghai and Shenzhen A-share listed marine enterprises from 2008-2016 because of a significant shift in accounting standards in 2007. The research objects are specifically 11 coastal provinces in China, and listed companies whose product lines contain ocean-related keywords in their business registration information, such as marine, marine engineering, shipbuilding, fishing, and ocean-going. Additionally, removing firms that have nothing to do with the sea but contain keywords like sponge, seafarer-free, non-vessel carriers, Hong Kong, Macao, and Taiwan. The data are handled as follows: (1) ST and ST* listed firms are not included; (2) samples with missing essential data are excluded; (3) continuous variables are shrink-tailed at the 1% and 99% deciles to reduce the impact of outliers; (4) samples with fewer than three peers within the industry and region are excluded. The China Customs and CSMAR databases provided the verified data used in this investigation.

3.2 Modeling

Referring to [Leary and Roberts \(2014\)](#), the following regression model is constructed to test in order to explore whether there is a peer effects when firms are embedding in GVCs:

$$Y_{i,j,t} = \alpha + \beta_1 Y_{-i,j,t} + \beta_2 X_{i,j,t} + \beta_3 X_{-i,j,t} + \sum Year + \sum Firm + \varepsilon_{i,j,t} \quad (1)$$

In [Equation \(1\)](#), where i represents marine firms, $-i$ represents peer marine firms other than firm i itself, j represents the industry group in which marine firm i is located, and t refers to the year. The independent variables are $Y_{-i,j,t}$, and t , which represent the average degree of global value chain embedding of other Marine enterprises in industry j , with the exception of enterprise i itself, in year t . The dependent variables are $Y_{i,j,t}$, and t , which indicate the extent to which Marine enterprise i in industry j is embedding in the global value chain in year t . To control the influential factors at the firm level, $X_{i,j,t}$ represent a set of company-level control variables of Marine enterprise i in industry j in year t ; $\sum Year$ and $\sum Firm$ are fixed effects of time and firm; and $X_{-i,j,t}$ represent the mean value of the corresponding control variables of other Marine enterprises in the j industry, with the exception of enterprise i itself, in year t . Random disturbance terms are $\varepsilon_{i,j,t}$.

3.3 Variable definitions

3.3.1 Degree of embeddedness in global value chains of marine enterprises

According to [Upward et al. \(2013\)](#), the degree of global value chain embeddedness (Gvcpa) of marine firms is measured using the

foreign value added rate of marine firms' exports. Specifically, processing trade exports use all intermediate inputs from processing trade imports, while domestic sales and general trade exports use intermediate inputs from general trade imports in equal proportions. All imports of marine enterprises are used as intermediate inputs. The following model is constructed:

$$Gvcpa = \frac{V^F}{X} = \frac{M^P + M^O \left(\frac{X^O}{D + X^O} \right)}{X} \quad (2)$$

In [Equation \(2\)](#), Gvcpa represents the foreign value-added rate of marine enterprises' exports, V^F represents the foreign value-added of marine enterprises' exports and X represents the total exports. M^P is the data of processing trade imports, X^O is the data of general trade exports, M^O is the data of general trade imports and D is the value of domestic sales. Marine firms are not embedding into GVCs if Gvcpa=0. Marine firms are deemed to embed in GVCs if Gvcpa>0. The value indicates the degree of embeddedness.

3.3.2 Control variables

Firm size (Size) is determined by taking the natural logarithm of the total assets of the company. The natural logarithm of the duration from the firm's founding to the observation year is used to express the firm age (Age). Cash Flow (Cash) is calculated by dividing the total assets of the company by the sum of its monetary funds and transactional financial assets. The ratio of R&D inputs to total operational revenues is used to quantify absorptive capacity (AC). Capital per capita (CPC) is determined by taking the natural logarithm of the ratio of total fixed assets to total employees. Percentage of independent directors (Outside) is determined by dividing the total number of board members by the number of independent directors. [Table 1](#) presents a summary and explanation of the variables' definitions.

4 Empirical analysis

4.1 Descriptive statistics

[Table 2](#) shows the descriptive statistics of the primary variables. The maximum variance inflation factor (VIF) between dependent, independent, and control variables is 3.22, which is less than 10. This suggests that there isn't a significant multicollinearity issue among the variables in the model ([O'brien, 2007](#)).

4.2 Baseline regression

The results of the baseline regression are shown in [Table 3](#). Column (1) shows the results of the regression that only contains the explanatory and interpreted variables for year and firm. Column (2) shows the results of the regression that adds the control variables for this firm and firms in the same industry to column (1). For column (1) and column (2), the estimated coefficients of the independent variables Gvcpa_peer are 0.594 ($p < 0.01$) and 0.376 ($p < 0.05$). The baseline regression findings show significant peer

TABLE 1 Variable definitions.

Variable category	Variable name	Variable symbol	Description of variables
Y_{ijt}	Degree of Embeddedness in Global Value Chains of Marine Enterprises	Gvcpa	Value Added Rate of Marine Enterprises Exporting Abroad
Y_{-ijt}	Global Value Chain Embeddedness of Marine Enterprises in the Same Industry	Gvcpa_peer	Average Value of GVC Embeddedness of Other Marine Enterprises in the Same Industry
X_{ijt}	Enterprise Size	Size	Expressed as the Natural Logarithm of the Total Assets of the Enterprise
	Age of Business	Age	Expressed as the Natural Logarithm of the Time Elapsed from the Establishment of the Enterprise to the Year of Observation.
	Cash Flows	Cash	(Monetary Funds+ Trading Financial Assets)/ Total Assets
	Absorptive Capacity	AC	R&D Investment/Gross Operating Income
	Capitalization Per Capita	CPC	Logarithmic Expression of the Ratio of Total Fixed Assets to the Number of Employees
	Percentage of Independent Directors	Outside	Number of Independent Directors/Number of Directors
X_{-ijt}	Size of Enterprises in the Same Industry	Size_peer	Average Value of the Corresponding Indicator for Other Marine Enterprises in the Same Industry
	Age of Enterprises in the same Industry	Age_peer	
	Cash Flow of Companies in the Same Industry	Cash_peer	
	Absorptive Capacity of Enterprises in the Same Industry	AC_peer	
	Capital Per Capita of Enterprises in the Same Industry	CPC_peer	
	Percentage of Independent Directors of Companies in the Same Industry	Outside_peer	
Σ Year	Time FE	Year	Year Dummy Variables
Σ Firm	Firm FE	Firm	Firm Dummy Variables

TABLE 2 Descriptive statistics.

Variable name	Obs	Mean	Sd	Min	Max
Gvcpa	1571	0.106	0.283	0.000	1.000
Gvcpa_peer	1571	0.101	0.048	0.000	0.200
Size	1571	7.668	1.414	4.511	10.735
Age	1571	2.797	0.350	1.099	4.762
Cash	1571	0.182	0.133	0.000	0.758
AC	1571	0.018	0.026	0.000	0.211
CPC	1571	12.880	1.131	9.750	15.192
Outside	1571	0.366	0.048	0.000	0.571
Size_peer	1571	7.624	0.414	5.715	10.085
Age_peer	1571	2.717	0.173	2.194	3.202
Cash_peer	1571	0.194	0.052	0.081	0.496
AC_peer	1571	0.022	0.020	0.000	0.112
CPC_peer	1571	12.589	0.589	11.034	14.537
Outside_peer	1571	0.368	0.009	0.304	0.425

effects in the embeddedness of marine enterprises in GVCs, which is consistent with Hypothesis 1.

4.3 Robustness tests

4.3.1 Endogenous issues

4.3.1.1 Instrumental variables

The issue of endogeneity may affect the regression results of the peer effects of marine companies included in GVCs. This study develops the estimation utilizing the GMM model and builds instrumental variables based on the spatial weight matrix W^2Y in order to mitigate the issue (Kapoor et al., 2007; Lee, 2007; Yang and Lee, 2017). Table 4's columns (1-2) show the outcomes of the 2SLS regression. The results of the first-stage regression, which regresses the endogenous factors as explanatory variables, are shown in column (1). The instrumental variables' regression coefficient on Gvcpa_peer is 0.992 ($p < 0.01$). The estimates from the first stage are regressed against Gvcpa in the second stage of regression, and the results are shown in column (2). At this point, the regression coefficient for Gvcpa_peer is 1.111 ($p < 0.01$), passing both the weak instrumental variable test [Wald F statistic of 36956.910

TABLE 3 Baseline regression results.

Variant	(1)	(2)
	Gvcpa	Gvcpa
Gvcpa_peer	0.594*** (0.183)	0.376*** (0.189)
Size		0.009 (0.013)
Age		-0.032 (0.082)
Cash		-0.086 (0.055)
AC		0.229 (0.253)
CPC		0.006 (0.009)
Outside		-0.091 (0.216)
Size_peer		-0.042 (0.029)
Age_peer		0.030 (0.151)
Cash_peer		-0.055 (0.258)
AC_peer		-1.072 (0.770)
CPC_peer		-0.022 (0.031)
Outside_peer		0.274 (0.858)
Constant	0.046** (0.019)	0.493 (0.777)
Year	Yes	Yes
Firm	Yes	Yes
N	1571	1571
Adj_R ²	0.012	0.015

Robust standard errors peered at the firm level are in parentheses, ** and *** denote significant at the 5%, and 1% levels.

($p < 0.01$) and the under-recognition test [LM statistic of 1294.755 ($p < 0.01$)], demonstrating the validity of the instrumental variables.

4.3.1.2 Heckman’s two stages

The sample selection bias issue in this paper may have resulted from the deletion of some samples during the data cleaning procedure

TABLE 4 Instrumental Variable Regression Results.

Variant	(1) IV-2SLS	(2) IV-2SLS
	Phase I	Phase II
Instrument	0.992*** (0.000)	
Gvcpa_peer		1.111*** (0.226)
Control	Yes	Yes
Control_peer	Yes	Yes
Year	Yes	Yes
Firm	Yes	Yes
N	1554	1554

*** denote significant at the 1% levels.

because they contained missing values for the dependent variable. In light of this, the Heckman two-stage method is applied to address the issue of possible selection bias. The IMR is calculated using the probability density function and the cumulative distribution function, and the results are shown in Table 5, column (1). The first-stage probit regression uses whether or not the dependent variable is missing as the criterion for delineation, and the dummy variable Select (0 for missing and 1 for not missing) is set as the independent variables. Column (1) of Table 5 shows the findings of the second step, which involves incorporating the IMR determined following the first stage regression into the baseline regression model. The presence of sample selection bias is indicated by the IMR’s coefficient of -0.315 ($p < 0.05$). The independent variables’ regression coefficient is 0.278 ($p < 0.01$), indicating that the phenomenon of peer effects remains present and that hypothesis 1 is further confirmed even after adjusting for the endogeneity issue brought on by sample selection bias.

4.3.1.3 Replacement of industry-wide samples

We further use the entire industry sample in order to address the potential sample selection bias issue. The results are shown in Column (2) of Table 5. After rerunning the regression using the entire industry sample, the coefficient of the independent variables is 0.148 ($p < 0.01$), indicating that the results still support Hypothesis 1.

4.3.2 Other robustness tests

4.3.2.1 Independent variables are substituted

Dummy variables are used in place of the independent variables in this study and are used in the regression for testing. The logistic model is used to do the regression. The results can be seen in Table 6, column (1). The regression results support hypothesis 1, and the coefficient of the independent variables is 5.104 ($p < 0.01$), indicating that the target marine firms can be considerably motivated to embed into GVCs by the embedding of other marine enterprises in the same industry.

4.3.2.2 Regression to Tobit

The distribution of the variables is described by a subsumption distribution with 0 as the column since a specific number of marine

TABLE 5 Sample selection bias test.

Variant	(1) Heckman Phase II	(2) Industry-wide sample
	Gvcpa	Gvcpa
Gvcpa_peer	0.278***	0.148***
	(0.085)	(0.053)
IMR	-0.315**	/
	(0.131)	/
Control	Yes	Yes
Control_Peer	Yes	Yes
Year	Yes	Yes
Firm	Yes	Yes
N	5885	16268
Adj_R ²	/	0.022

** and *** denote significant at the 5%, and 1% levels.

firms in the sample are not participating in embedding GVCs. Tobit regression is selected to re-estimate model (1) based on this distribution, and the regression's results are shown in Table 6, column (2). Hypothesis 1 is supported by the calculated coefficient of the independent variables, which is 2.046 ($p < 0.01$).

5 Further research

5.1 Motivational mechanism test

According to the prior analysis, marine enterprises embedding in GVCs are subject to an industry peer effects. They are motivated to make decisions by mutual imitation behaviors out of self-interest, which can be further classified into passive responses based on competition and active imitation behaviors based on learning. The market position of marine firms is further examined in this article,

TABLE 6 Robustness test results.

Variant	(1) Logistic regression	(2) Tobit regression
	Gvcpa	Gvcpa
Gvcpa_peer	5.104***	2.046***
	(0.617)	(0.786)
Control	Yes	Yes
Control_peer	Yes	Yes
Year	Yes	Yes
Firm	Yes	Yes
N	1571	1571
Pseude_R ²	0.169	/

*** denote significant at the 1% levels.

along with the peer effects' interpretation of the intrinsic motive for marine firms' decisions to embed in GVCs.

Marine companies are divided into leader and follower enterprises based on their market position (Leary and Roberts, 2014). In particular, firms in the top 50% of the ranking are referred to as leader firms, which have a value of 1, and firms in the bottom 50% of the ranking are referred to as following firms, which have a value of 0, based on the enterprise size and operating income in ascending order. After recalculating the industry mean value according to the various groups, the data are classified into regressions, and the outcomes are shown in Table 7.

The influence of the same industry leaders' mean value (Gvcpa_peer_L) on the followers' global value chain (Gvcpa) embeddedness is listed in Table 7 (1-2). The regression coefficients of the independent variables are 0.965 ($p < 0.01$) and 1.123 ($p < 0.01$), respectively. This suggests that followers significantly imitate the embedding GVC behavior of leaders within the group. The mean value of other followers in the same industry (Gvcpa_peer_F) has an impact on the Gvcpa of followers in the group of followers given in (3-4). The regression coefficients of independent variables are -0.103 and -0.035, respectively, but neither is significant. In other words, members of the group do not imitate the embedding GVC behavior of other members.

This finding supports hypothesis 2 and aligns with the paper's "information motivation" and "learning motivation"-based decision-making rationale. In other words, leaders' decision-making practices have a modeling effects and typically reflect the group's superior decision-making as compared to its followers. Managers of following firms can increase decision-making effectiveness, reduce decision-making cost, and minimize risks by "hitchhiking" in decision-making. On the other hand, by adopting and learning from the leader's decision-making process, marine firms can also catch up more quickly in the future.

Regression coefficients of the independent variables are in order of -0.006 ($p > 0.1$) and -0.059 ($p > 0.1$), and Table 8 columns (1-2) illustrate the impact of the mean value of the degree of embeddedness of GVCs of leaders in the same industry (Gvcpa_peer_L) on the embeddedness of following firms in GVCs (Gvcpa) in the group of leader firms. This suggests that leaders imitate other following companies in the group's GVC embedding behavior. With independent variables regression coefficients of 0.335 ($p < 0.01$) and 0.228 ($p < 0.05$), respectively, columns (3-4) illustrate the impact of the mean value of the degree of embeddedness in global value chains of other leaders in the same industry (Gvcpa_peer_F) on the embeddedness of leader firms in the group of leader firms (Gvcpa). It suggests that in order to embed into GVCs, in-group leaders imitate other leaders.

The "information motive" and "competitive motive" used in this study's decision-making logic are consistent with this outcome, and Hypothesis 2 is further supported. Leader firms have the motivation and capacity to mimic other leaders and followers in the industry through learning and competition. Because they are at the top of the industry in terms of asset and revenue size. They also have the decision-making goals of maintaining their competitive position and growing their market share, as well as collecting

TABLE 7 Responses of Following Firms.

Variant	Following firms' responses to leader firms		Following firms' responses to following firms	
	Gvcpa		Gvcpa	
	(1) Size	(2) Income	(3) Size	(4) Income
Gvcpa_peer_L	0.965***	1.123***		
	(0.03)	(0.082)		
Gvcpa_peer_F			-0.103	-0.035
			(0.147)	(0.137)
Control	Yes	Yes	Yes	Yes
Control_peer	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
N	924	932	641	632
Adj_R ²	0.241	0.256	0.088	0.047

*** denote significant at the 1% levels.

information to reduce decision-making costs and improve decision-making efficiency.

5.2 Heterogeneity analysis

5.2.1 Equity's nature

In terms of incentives, oversight, and limitations, as well as how they make decisions on industry entry and exit, state-owned firms (SOEs) and non-state-owned enterprises (NSOEs) differ greatly. SOEs need to learn from other firms and embed into GVCs because of the high internal agency costs, the long principal-agent chain, and the inconsistent corporate ownership, which have created a great deal of uncertainty regarding the returns that SOEs can expect

from taking part in the process. Because of their institutional advantages and flexible market orientation, non-SOEs are more likely to venture into new markets without exhibiting the signs of industry convergence.

The sample in this research is separated into SOEs and NSOEs, and Table 9 shows the regression results. The state-owned enterprise group's regression results are shown in column (1), where the estimated coefficient of the explanatory variable Gvcpa_peer is 0.56 (p<0.01); the non-state-owned enterprise group's regression results are shown in column (2), where the estimated coefficient of the independent variable Gvcpa_peer is 0.136 (p>0.1). This result suggests that when deciding whether to embed in GVCs, state-owned marine firms are more likely to imitate their peer enterprises and create a peer effects than non-state-owned marine enterprises.

TABLE 8 Responses of Leading Companies.

Variant	Leader firms' responses to following firms		Leader firms' responses to leader firms	
	Gvcpa		Gvcpa	
	(1) Size	(2) Income	(3) Size	(4) Income
Gvcpa_peer_L	-0.006	-0.059		
	(0.116)	(0.104)		
Gvcpa_peer_F			0.335***	0.228**
			(0.095)	(0.102)
Control	Yes	Yes	Yes	Yes
Control_peer	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
N	626	618	898	907
Adj_R ²	0.107	0.060	0.108	0.104

** and *** denote significant at the 5%, and 1% levels.

TABLE 9 Subgroup Regression Results for Nature of Equity.

Variant	(1)	(2)
	State-owned firms	Non-state-owned firms
Gvcpa_peer	0.561***	0.136
	(0.271)	(0.253)
Control	Yes	Yes
Control_peer	Yes	Yes
Year	Yes	Yes
Firm	Yes	Yes
N	880	689
Adj_R ²	0.022	0.012

*** denote significant at the 1% levels.

5.2.2 Proportion of FDI

Firms located in regions with a comparatively high proportion of FDI can access funding channels through foreign investment, which helps to alleviate the financial limitations faced by marine businesses. According to [Fernandes et al. \(2022\)](#), technology diffusion and spillover are frequently created through inter-industry talent flow and other means after foreign experience, technology, and knowledge enter China through investment. This encourages imitation and learning among Marine enterprises in the same industry, increasing the degree of peer effects embedding in global value chains. This study calculates the proportion of FDI using the net FDI inflow to GDP ratio. The samples were split into groups with high and low FDI proportions based on the median proportion of foreign capital in the locations of marine firms. [Table 10](#) shows the grouping regression results.

The regression results for the high FDI group are shown in column (1) of [Table 10](#), with an estimated coefficient of 0.383 ($p < 0.1$) for the independent variable Gvcpa_peer; the regression results for the low FDI group are shown in column (2), with an estimated

TABLE 10 Regression results for the grouping of foreign firms.

Variant	(1)	(2)
	High proportion of FDI	Low proportion of FDI
Gvcpa_peer	0.383*	0.112
	(0.223)	(0.360)
Control	Yes	Yes
Control_peer	Yes	Yes
Year	Yes	Yes
Firm	Yes	Yes
N	924	647
Adj_R ²	0.018	0.021

*, **, and *** denote significant at the 10%, 5%, and 1% levels.

coefficient of 0.112 ($p > 0.1$) for the independent variable Gvcpa_peer, which is not significant. The results indicate that, in comparison to marine enterprises in regions with low FDI ratios, the industry peer effects of marine enterprises embedding in GVCs are significant in regions with high FDI ratios. This is because, for high FDI ratio enterprises, their parent companies will offer some financial support for their decision to embed GVCs and better assist them in imitating and embedding GVCs from their peer marine enterprises.

5.2.3 Degree of marketization

One important external environmental aspect that affects a firm's growth is the degree of marketization. It functions as an indicator of an organization's external environment. Greater information transparency and less information asymmetry are typically found in more marketized regions. Because the market and pricing mechanism are more significant in these areas, businesses in the same industry can learn from and imitate one another. Based on the mean value, the sample is split into two groups: one for high marketization and one for low marketization. [Table 11](#) shows the regression results of a group regression test that was conducted.

The regression results for the high marketization group are shown in column (1) of [Table 11](#), where the estimated coefficient for the independent variable Gvcpa_peer is 0.430 ($p < 0.1$); the regression results for the low marketization group are shown in column (2), where the estimated coefficient is -1.074 ($p < 0.1$). The results show that in areas with a higher degree of marketization, managers of marine businesses can more easily learn from the successful experiences of other businesses during the process of embedding in GVCs. As a result, there is a greater willingness and degree of imitation to peer marine businesses, and the phenomenon of peer effects is more positively significant. However, because information sharing is obstructed in regions with low degree of marketization, it is difficult for marine businesses to attain proper communication. As a result, the peer effects are detrimental and insignificant in regions with low degree of marketization.

TABLE 11 Regression Results for the Degree of Marketization Subgroups.

Variant	(1)	(2)
	High degree of marketization	Low degree of marketization
Gvcpa_peer	0.430*	-1.074
	(0.225)	(0.641)
Control	Yes	Yes
Control_peer	Yes	Yes
Year	Yes	Yes
Firm	Yes	Yes
N	1226	345
Adj_R ²	0.019	0.001

*, **, and *** denote significant at the 10%, 5%, and 1% levels.

6 Conclusions and insights

6.1 Main findings

This study examines the existence, mechanism, and boundary conditions of the peer effects of marine enterprises embedding in global value chains, using Shanghai and Shenzhen A-share listed marine companies from 2008 to 2016 as the research object. The following are the results: (1) China's listed marine companies that embed into the global value chain are subject to industry peer effects. Managers are greatly influenced by the actions of other marine businesses that are embedding into global value chains in the same industry, but they do not make decisions on their own. A number of robustness tests have confirmed that the result remains valid. (2) "Information motivation," "competitive motivation," and "learning motivation" are the intrinsic mechanisms used by marine firms that embed the GVC peer effects. From the perspective of peer impacts, the mechanism test demonstrates that the motivation mechanism for marine firms to make decisions embedding in global value chains are competition-based passive reaction and information-based active learning. In order to reduce decision-making costs and other factors, followers are more likely to learn from and imitate leaders in the same industry. Leaders are motivated by competition to not only imitate other leaders in the same industry, but also to constantly observe and imitate the behavioral patterns of followers in order to preserve their own market position and competitive advantages. (3) Three significant boundary factors that influence the extent of peer effects of marine firms in GVCS are the equity's nature, the proportion of FDI, and the degree of marketization. When deciding to embed global value chains or not, managers of state-owned marine companies primarily imitate similar practices of marine enterprises in the same industry, and the peer effects are more significant than that of non-state-owned marine enterprises. Marine businesses in areas with a relatively high proportion of FDI are able to take on more expertise and technology spillover and have fewer financial limitations than those in areas with a relatively low proportion. The peer group impact is more important, and marine businesses are more able to learn from and imitate their peers. Higher degree of marketization are associated with greater information transparency and flow speed, More frequent communication amongst regional marine enterprises and a more significant peer effects than lower degree.

6.2 Discussion

This study contributes to the existing literature in such ways. First, this study broadens the research framework on marine enterprises' embed into global value chains from the perspective of peer effects. It also reveals that marine enterprises are greatly influenced by the actions of other businesses in the same industry when deciding whether or not to embed into global value chains, which strengthens the theoretical meaning of the motivation behind doing so. Second, the three main mechanisms behind the peer effects—"information motivation," "competitive motivation," and "learning motivation"—are discovered

to be effective. This offers a fresh theoretical viewpoint on how marine firms make decisions. Third, this study also shows how boundary factors affect the peer effects, which serves as a crucial theoretical foundation for business strategy and policymaking.

This study has significant practical implications. First, when making decisions about embedding into global value chains, managers of marine firms should take into account not only the internal and external environments of their companies, but also reference the decision-making practices and dynamic changes of their peers in the industry. It's possible that other marine businesses have discovered efficient embedding approaches that have allowed them to successfully embed global value chains. Instead of mindlessly following the trend, managers of marine businesses need to learn from and imitate their peers' successful experiences based on their own developmental circumstances. By doing this, marine businesses may preserve their market position and competitive advantages while reducing decision-making expenses and increasing decision-making efficiency. Second, in order to support the growth of the marine economy, managers of marine businesses in various market positions should be able to adapt their business plans to the shifting global market. Learning from leaders can help followers make better decisions, minimize knowledge acquisition costs, and increase the effectiveness of global value chain embedding. Leaders also need to take competitive needs into account. To preserve the competitive position of marine enterprises, leading businesses should not only keep an eye on other industry leaders but also on followers and follow up if necessary. Third, other leaders and followers will learn from the actions of leaders who are part of the global value chains. Its demonstration and pulling effect is essential to the development of the entire industry, which can not only promote the innovation and progress of the industry but also the collaborative development of enterprises in the industry. The new market or new business model developed by the leading enterprises overseas will attract other marine enterprises to follow and imitate, thus expanding the market scope of the entire industry. Policymakers should concentrate on the top marine companies, create and enhance relevant policies, and help these companies embed global value chains. This will allow them to play an important role in the sector and have positively influence on other marine companies.

This study has several limitations. On the one hand, future research can broaden the sample size and time period, and it is still necessary to analyze the mechanism that motivates non-listed companies or marine companies from various countries and regions to embed into global value chains. Future research can also integrate case studies and cross-national comparisons to better understand the factors that motivate marine businesses to embed into global value chains.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

WT: Writing – original draft, Writing – review & editing. YZ: Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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