ISSN 2959-6130

Study on the Enhancement of China's Manufacturing Global Value Chain Position under the "Belt and Road" Initiative

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Abstract:

This study takes "the Belt and Road" strategy as the background, Selects the relevant data from the National Statistical Yearbook from 2003 to 2020, and uses the VAR model for analysis. The results show that the three variables selected in this study which are Trade Freedom, R&D capability, and FDI can promote the GVC status of the manufacturing industry. Finally, this study gives relevant suggestions to promote the development of trade liberalization, and promote infrastructure connectivity to enhance the status of China's manufacturing industry in the global value chain under the background of the " Belt and Road."

Keywords: The Belt and Road, Global value chain (GVC), Value chain status, manufacturing industry, VAR mode

1 Introduction

To effectively participate in the global value chain system and keep pace with the development of economic globalization, the government proposed the "One Belt, One Road" strategic plan. Since the Belt and Road launched in 2013, China has signed a total of 195 intergovernmental cooperation agreements with 136 countries and 30 international organizations. gaining wide attention from the international community and expanding its international influence.

The Silk Road Economic Belt connects many developing countries, which is conducive to countries at the end of the value chain, such as China, to find a new way out of the European and US-dominated trade system. (Li Dan, 2015) [1].

Based on the integration of the relevant theoretical support for GVCs, this study uses the literature review method, survey and research method, and empirical analysis method to summarize the possible ways to enhance GVCs considering the current development of the "Belt and Road" strategy and examine the practical value of the theory in today's context through empirical analysis.

2 Theoretical studies on "Belt and Road" and value chain enhancement

After President Xi Jinping put forward the strategic plan of "One Belt, One Road", many scholars have discussed it and whether it can improve the status of China's value chain. Huang Xianhai and Yu Snap (2017) believe that "Belt and Road" is an opportunity for China to enhance its value chain status and reshape the pattern of the global value chain. As a core hub, China will lead and drive the countries along the Belt and Road to form a regional value chain, embedded in the GVC system dominated by the United States, Japan, and Western Europe, which can build a new system of two-way nested value chain division of labor[2]. Liu Zhibiao (2018) further analyzes the mode of embedding the "Belt and Road" in the GVC and explores China's role in shaping China's IGVC based on the "Belt and Road"[3].

The development of the manufacturing industry can reflect the changes in the status of China's global value chain, and the changes in the status of China's manufacturing industry in the division of labor in the global value chain can also reflect the changes in the development of the manufacturing industry itself.

The study of the manufacturing industry's global value chain has the following advantages: First, the changes in the status of the global value chain are more intuitive, and the data are more readily available; Second, the value chain itself is derived from the value-added analysis of the manufacturing industry from the involvement of, processing, transportation, and sales, and it is more persuasive to take the manufacturing industry as the core; Third, the changes in China's manufacturing industry and its relationship with the global value chain under the "One Belt,

One Road" strategy can reflect the changes in the status of China's manufacturing industry.

3 China's Manufacturing Global Value Chain Position Measurement

3.1 Theoretical Discussion Related to GVC Status Measurement

Hummels (2001)[4] was the first to propose the measure of vertical specialization index (HIY), which represents the ratio of the value of imported product inputs in the industry's exports to the industry's total exports. What's more, Koopman [5] utilizes input-output tables as data support to establish a GVC-position index measure to reflect a country's position in GVCs. To improve Koopman's Wang Zhi's total trade accounting method also mentioned the drawbacks of the official statistical method. Wang Zhi, Wei Shangjin, et al. (2015) proposed a new trade accounting law, which decomposes exports into different kinds of value-added and double-counting parts [6]. The Koopman (2010) [7] KPWW decomposition method is used as an example, which is accounted for through the value-added volume, combined with the OECD-ViTA database. The "GVC" index is the number of exports of intermediate goods of an industry of a country, which is accounted for in comparison with the number of imports of intermediate goods. The main expression of the formula is as follows:

$$GVC_{Position_{rh}} = ln\left(1+\frac{IV_{rh}}{E_{rh}}\right) - ln\left(1+\frac{FV_{rh}}{E_{rh}}\right) \quad (3.1)$$

$GVC_{Position_{rh}}$ denotes the GVC position index of country h; IV_{rh} represents the total trade of intermediate goods exported by h industry in country r; E_{rh} denotes the total value added of exports in industry h in country r, is the statistical "value added"; FV_{rh} represents the gross value added (GVA) of final goods in country h's industry. Although many researchers apply the formula 3.1 in calculating the GVCP (Global Value Chain Position), upon comparison with the UIBE-GVC database, the author found that the latest data was updated only one year after the introduction of the "Belt and Road". Therefore, to analyze the contribution of the manufacturing industry to GVCs under the "Belt and Road" policy, this study refers to the state value to make a general judgment on the status of GVCs instead of selecting 3.1 formulas for calculation.

3.2 Selection of GVC Status Measures

Due to the statistical time lag and the associated difficulties, the best way to statistically measure the global position of manufacturing as an industry is to analyze the export complexity index. Xiangtao[9] mentioned in his study that at present, the product structure index is the most responsive indicator of position in the international labor division. As the previous article mentioned, products with high technological value-added are those with higher status in the value chain, while those with lower status are those with low-end value-added and lower technological levels. According to Xuexin Qiu[10] for Hausmann's (2003) thesis the way to summarize the export complexity is divided into two steps, as shown in Equations 3.2 and 3.3.

$$theTSI_k = \sum_i \frac{x_{ik} / X_i}{\sum_i x_{ik} / X_i} Y_i \quad (3.2)$$

$$ES_i = \sum_i \frac{x_{ik}}{X_i} TSI_k \quad (3.3)$$

First, the technical complexity of the exported products should be counted TSI_k which is the sum of the export value of product category k. x_{ik} denotes the export value of product category k accounted for by country or region i. X_i denotes the total export value of all products in country or region i, and Y_i denotes the GDP per capita of a given country. In addition, Export Technological Complexity Index ES_i is used to measure GVC position.

3.3 Calculation of the Technological Complexity of China's Manufacturing Exports

This study focuses on calculating the global value chain status enhancement of the manufacturing industry, mainly focusing on the assessment of manufacturing industry data. The study integrates the relevant contents of the *National Statistical Yearbook* to obtain the different categories' export value of the manufacturing industry in China which includes data on the export value (in millions of US dollars) of primary products of the manufacturing industry and some raw materials, and so on. Based on Lauer's (2000) theory of dividing manufactured goods into nine categories with different levels of technology use, this study excludes primary products (PP) and other traded goods and then classifies the remaining manufactured goods according to the codes Resource Manufactures (RB), Low Technology(LT), Medium technology(MT), High Technology(HT) extracted and organized in the following table, in which the categorization is summarized by the relevant codes. The value of exports of weapons, ammunition, parts and accessories, art, collectibles, and antiquities in category XXI, and special trade goods and unclassified goods in category XXII were also excluded.

Table 1 Integration of selected breakdowns of manufactured goods based on NSO data

norm	2020	2019	2018	2017	2016	2015
exportation	2589952	2499482	2486682	2263345	2097631	2273468
RB	104499.86	121211.35	120468.77	103115.12	92412.65	95081.56
LT	813436.62	803819.69	790656.2	748998.98	715185.47	798072.92
MT	366545.33	348427.45	356412.39	309915.44	273312.17	299439.52
HT	1235696.95	1166690.72	1171080.88	1058388.35	971364.84	1039700.08

Source: National Statistical Office

According to the formula shown in (2), the technical complexity of each type of export product can be obtained TSI_k , and then calculated to obtain the export technical complexity ES_i . Intercepting part of the data for the period of 2002-2020 is shown in the following table:

Table 2 Selected Indicators of China's GVC Position Based on Export Complexity Calculations

Time	ES_i
2020	78794.52052
2018	68723.49944
2015	52808.95641
2012	42287.77234
2010	35640.5714

4 Empirical studies

Qiu Xuexin[10] found out through empirical analysis that the "Belt and Road" can enhance China's status of GVC through the path of trade liberalization mechanism, investment scale expansion mechanism, and infrastructure chain mechanism Through qualitative and quantitative analysis, Xiang Tao found that "One Belt & One Road" can enhance China's GVC status through R&D capacity, human capital, infrastructure investment, and other factors. Nie Lian[11] also empirically tests that human resource endowment, FDI, and trade openness can benefit China's GVC.

4.1 Selection of Indicators

In this study, we screened the related studies about the path of "Belt and Road" to improve the status of GVC, and chose the factors of trade freedom, R&D capacity, and foreign direct investment to be analyzed, and the indicators related to the manufacturing industry are used to respond to the above-mentioned paths of improvement.

Table 3 Main variables and calculation methods

	variable	Meaning	Calculating Method
explanatory variable	ES	GVC status	Export Technology Complexity Value ES
explanatory variable	MOFDI	Manufacturing OFDI	Total outward investment in manufacturing
	FI	overseas foreign direct investment (OFDI)	Utilization of foreign investment
	TI	R&D Technology Innovation	Total annual investment in R&D and manufacturing in China

4.2 Process of empirical analysis

This study selects the data related to the global value chain status of China's manufacturing industry from 2003 to 2020 and uses the VAR model to launch the analysis, all the data come from the National Bureau of Statistics and uses the econometric software Eviews10 to construct the model.

(i) ADF unit root test

To eliminate data heteroskedasticity and volatility, all indicators are subjected to natural logarithmic treatment, and to ensure the smoothness of the data, the indicators will also be subjected to first-order differencing after natural logarithmication. As can be seen from the table below, all data passed the ADF unit root test after first-order dif-

ferencing.

(ii) Maximum lag order test

According to the Akaike criterion and the principle of SC minimum, the maximum lag order of this study is selected to be 2nd order, and likewise when carrying out the VAR model, the VAR (2) model should be carried out.

Table 4 ADF unit root test

variable name	ADF value	P-value	smoothness
D(ES)	-2.81392	0.0085	smoothly
D(M_OFDI)	-2.354925	0.0221	smoothly
D(TI)	-2.081319	0.0394	smoothly
D(FI)	-5.045157	0.0052	smoothly

Table 5 Maximum lag order test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	67.19318	NA	2.58E-09	-8.42576	-8.23694	-8.42777
1	95.0489	37.14095*	5.89E-10	-10.0065	-9.06245	-10.0166
2	119.1969	19.31837	3.77e-10*	-11.09291*	-9.393594*	-11.11102*

(iii) Granger causality tests

From the Granger causality test, foreign direct investment and manufacturing R&D investment show unidirectional Granger causality on the global manufacturing value chain position.

Table 6 Granger causality test

Dependent variable: D(ES)			
Excluded	Chi-sq	df	Prob.
D(FI)	0.324334	2	0.8503
D(M_OFDI)	0.064803	2	0.9681
D(TI)	0.402813	2	0.8176
All	2.636785	6	0.8529
Dependent variable: D(FI)			
Excluded	Chi-sq	df	Prob.
D(ES)	20.71656	2	0
D(M_OFDI)	14.18914	2	0.0008
D(TI)	0.642104	2	0.7254
All	46.53263	6	0
Dependent variable: D(M_OFDI)			
Excluded	Chi-sq	df	Prob.
D(ES)	1.867567	2	0.3931
D(FI)	2.961764	2	0.2274
D(TI)	2.686982	2	0.2609
All	6.211374	6	0.3999
Dependent variable: D(TI)			
Excluded	Chi-sq	df	Prob.
D(ES)	6.478031	2	0.0392
D(FI)	4.270419	2	0.1182
D(M_OFDI)	0.040655	2	0.9799
All	13.89993	6	0.0308

(iv) Unit circle and root mode inverse tests

In the unit circle test, all the landing points are within the unit circle and all the root mode inverses are less than 1, which proves that the unit circle test and the root mode inverse test are passed and the VAR model analysis can be carried out.

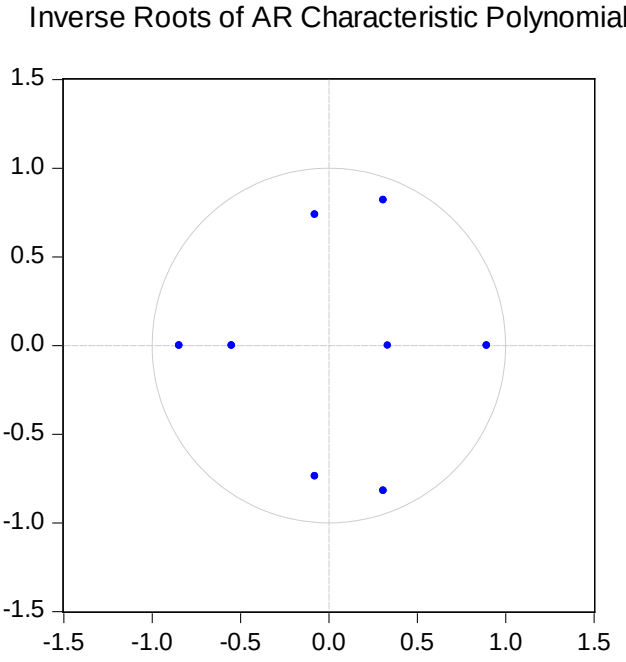

Figure 1 Unit circle test

Table 7 Root mode inverse test

Root	Modulus
0.893685	0.893685
0.308596 - 0.819148i	0.875348
0.308596 + 0.819148i	0.875348
-0.84509	0.845091
-0.078848 - 0.737532i	0.741735
-0.078848 + 0.737532i	0.741735
-0.54934	0.54934
0.334553	0.334553

(v) Impulse response analysis

Through the image of impulse response analysis, it can be observed that foreign OFDI in manufacturing has little impact on the GVC position.

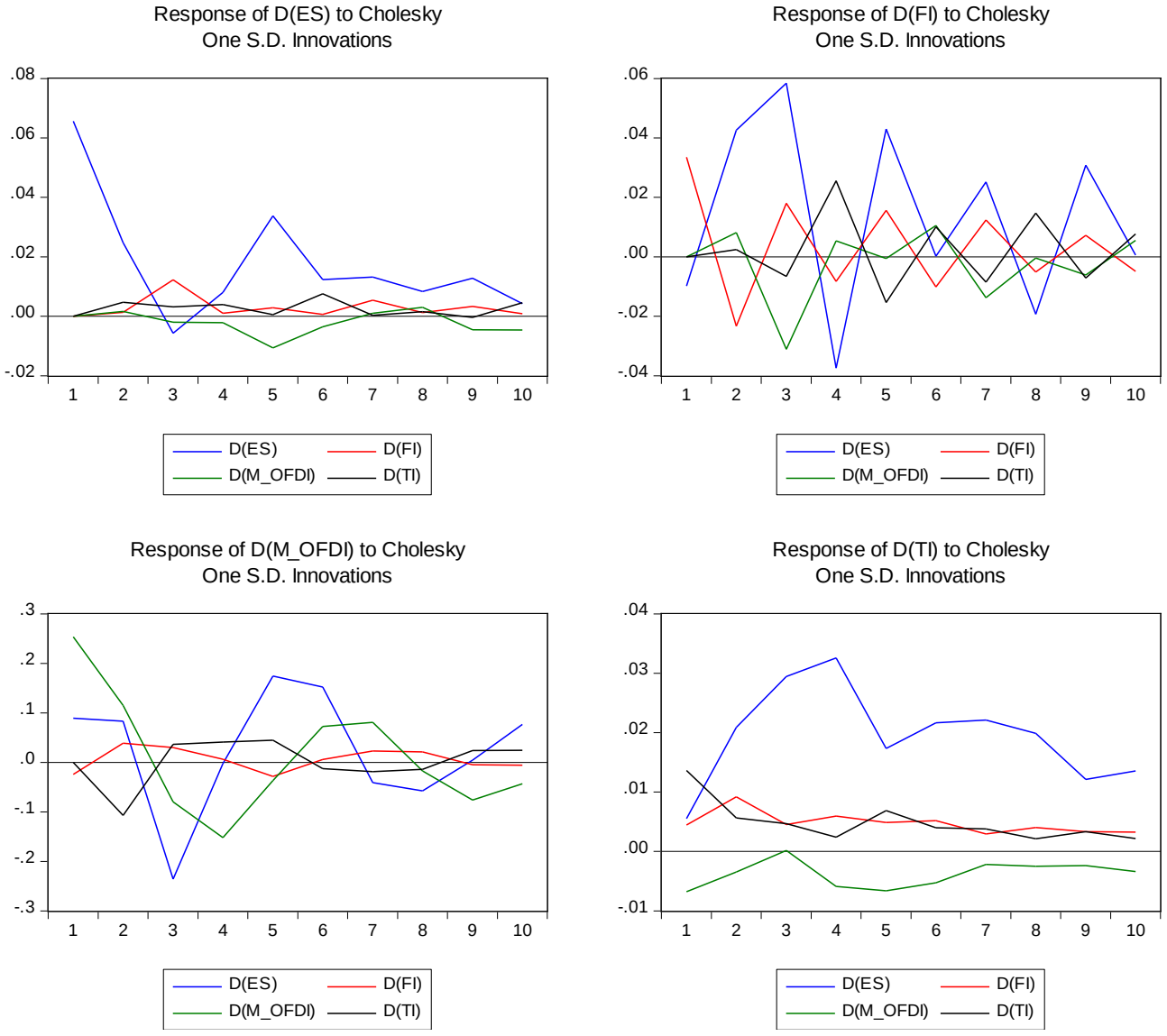

Figure 2 Impulse Response Analysis

(vi) variance decomposition analysis (VDA)

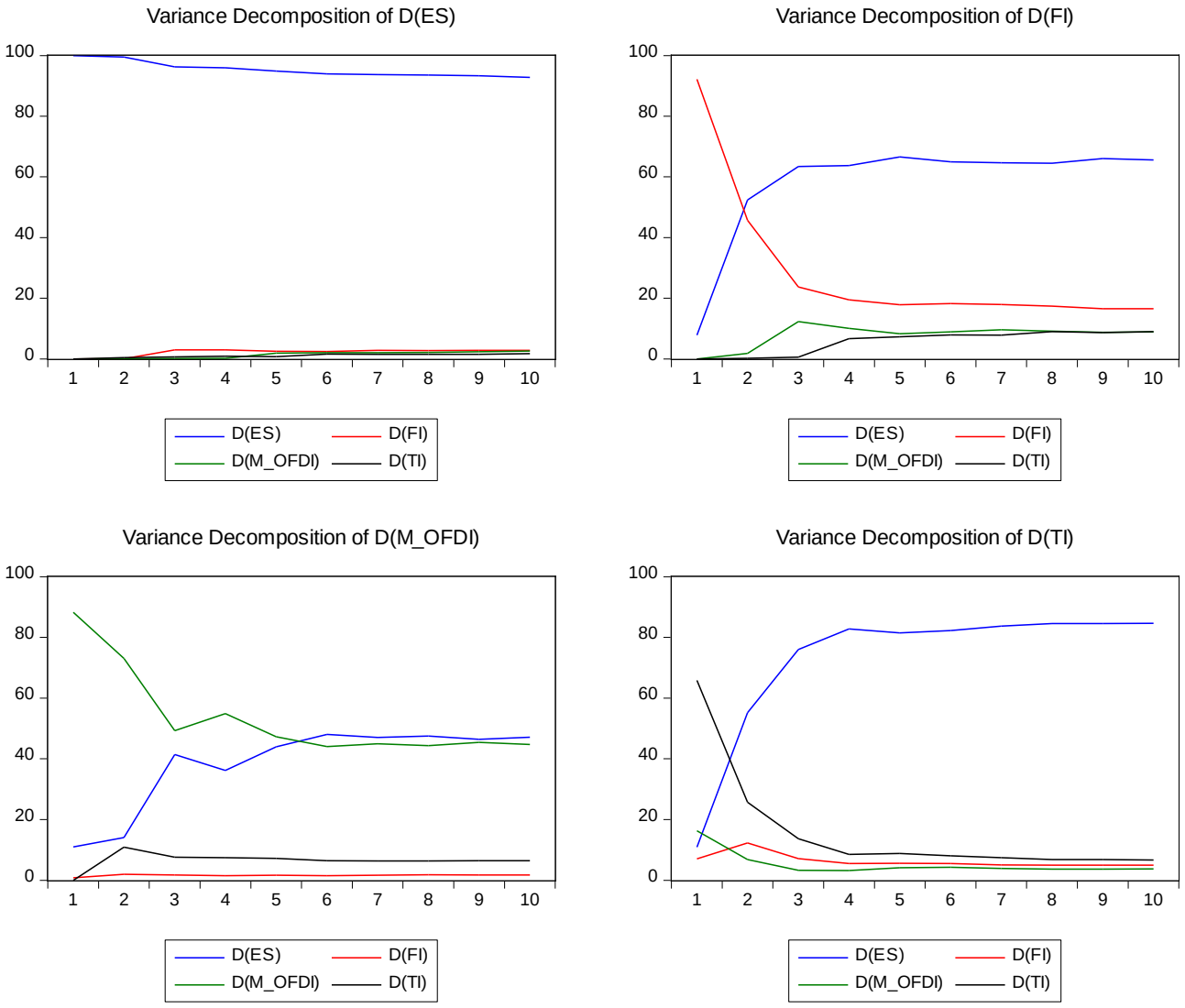

Figure 3 Analysis of variance decomposition

Table 8 ANOVA results

Period	S.E.	D(ES)	D(FI)	D(M_OFDI)	D(TI)
1	0.065619	100	0	0	0
2	0.070337	99.46194	0.034954	0.054423	0.448679
3	0.071729	96.27456	2.972032	0.129949	0.623457
4	0.072326	95.93263	2.943135	0.216925	0.907314
5	0.080581	94.83849	2.498799	1.927318	0.735398
6	0.081948	93.96415	2.421819	2.051282	1.562749
7	0.083188	93.69968	2.7762	2.006292	1.517831
8	0.083678	93.58997	2.764595	2.111543	1.533895
9	0.084834	93.32256	2.839927	2.34334	1.494173
10	0.085192	92.78871	2.825953	2.617577	1.767764

4.3 Results of empirical analysis

Since "Belt and Road" can enhance the GVC status through the three variables discussed above, after utilizing the data related to the manufacturing industry, the result is that the "Belt & Road" can indeed enhance the GVC status of manufacturing industry in China. Through VAR analysis of the three variables of foreign investment (FI), manufacturing outward foreign direct investment (M-OFDI), and R&D technology investment (TI) on the indicator of technological complexity (SE), which can reflect the status of GVC, the three variables can play a role in promoting the manufacturing industry's GVC, among which the impact of R&D technology investment on the manufacturing industry's GVC status is the least significant.

5 Suggestions related to "One Belt, One Road" to enhance China's value chain

5.1 Advancing the development of trade liberalization.

We should continue to promote trade liberalization, make full use of the existing opening-up policy, and expand opening-up at a higher level and with higher quality. We should actively build a "Belt and Road" multilateral trading system to meet the development needs of different economic bases.we should introduce tax reduction policies tailored to local conditions and give full play to the cost-saving and market-expanding effects of free trade.

5.2 Complete value chain support system

It is necessary to continuously promote more and more high-quality companies to carry out OFDI, and it is also necessary to cultivate more multinational enterprises with stronger competitiveness, to transfer the surplus or low-end industries, and to effectively upgrade the value chain. China can introduce some mature and relatively advanced business models through effective experiments, and even make more scientific and technological achievements directly landing and development.

5.3 Promote the training of human resources and investment in R&D technology.

At present, China wants to continuously upgrade the industrial chain, there is no way to leave the high-end production factors, especially with high-end quality of talent, effectively enhancing the city, enterprises, and even our society in the scientific and technological innovation and cultural creativity ability.

At the same time, it is also necessary to continuously improve the construction of communication infrastructure facilities, improve the information exchange and interaction between cities, especially in the eastern and western regions of China, and effectively promote the integrated development of policies and regulations between the regions of China.

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