RESEARCH-ARTICLE

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Research on the Impact Mechanism of Anti-globalization Impact on the Restructuring of Manufacturing Industry Chain

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Abstract

Based on the database of the Asian Development Bank and the Global Value Chain Research Institute of the University of International Business and Economics, this paper uses panel data from 2008 to 2018 to investigate the impact of anti-globalization on the industrial chain restructuring of China's manufacturing industry and its mechanism from two aspects of connection and status. It is found that the impact of anti-globalization has a significant negative impact on the restructuring of China's manufacturing industry chain, and its degree of inhibition on the status restructuring of the industry chain is deeper than that on the linkage restructuring of the industry chain. The reverse impact of globalization mainly affects the level of industrial chain reconstruction through three channels: restricting technology spillover effect, enhancing financing constraint effect and weakening human capital enhancement effect.

CCS Concepts

• **Applied computing** → Operations research; Industry and manufacturing; Command and control.

Keywords

Anti-globalization, Industrial chain reconstruction, Manufacturing industry

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1 Introduction and Literature Review

The outbreak of the international financial crisis in 2008 plunged the world economic development into a predicament. Some countries attributed it to the uneven distribution of globalization dividends. A series of "black swan" events such as Brexit, the obstruction of the Doha Round negotiations of the World Trade Organization (WTO), and the Sino-US trade disputes have shattered people's illusions about globalization. The globalization process with the division of labor in global value chains (GVC) as its core characteristic is being impacted by the anti-globalization wave characterized by localization, regionalization and decentralization. The COVID-19 epidemic in 2019 has even accelerated the pace of isolation and decoupling among countries around the world. The future development trend of the world economy is elusive.

Under the background of major adjustments in the world economic pattern and increased uncertainty in the international environment, China clearly pointed out in the report of the 20th National Party Congress that "we must focus on developing the real economy to drive economic growth, promote a new type of industrialization, and accelerate efforts to build China into a manufacturer of quality. In this context, clarifying the influence mechanism and specific impact effects of the anti-globalization impact on China's industrial chain reconstruction, making scientific judgments and decisions, and thus buffering the risks brought by external shocks are of great theoretical and practical significance for China to reconstruct an open, independent, safe and efficient industrial chain and boost high-quality economic development.

From the existing literature, research on anti-globalization and the reconstruction of the manufacturing industry chain mainly focuses on the following three aspects. First, the connotation, causes and manifestations of anti-globalization(Stiglitz and Joseph,2018;Torslov et al.,2018).Second, research on the measurement and influencing factors of industrial chain reconstruction(Koopman et al.,2014). Third, research on the impact of anti-globalization shocks on the reconstruction of the manufacturing industry chain(Rodrik,2018). In summary, the existing research results on anti-globalization and industrial chain reconstruction are already relatively abundant. However, research on the impact of anti-globalization on industrial chain reconstruction is mostly limited to the macro-theoretical level, and there are few empirical studies, which urgently need further exploration. Based on this, this paper attempts to explore the influence mechanism of anti-globalization shocks on the reconstruction of China's manufacturing industry chain. And using the value-added method, it describes the characteristics of industrial chain reconstruction from two dimensions of industrial chain connection and industrial chain status, and empirically tests the specific impact effect of anti-globalization shocks on the reconstruction of China's manufacturing industry chain from the industry level.The possible marginal contributions of this paper lie in the following three aspects: (1) It

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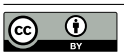

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explores the mechanism by which anti-globalization shocks affect the restructuring of manufacturing industry chain linkages and status through the technology spillover effect, financing constraint effect, and human capital enhancement effect, expanding the theoretical system of the economic effects of anti-globalization. (2) Compared with the existing studies that examine the restructuring of the industrial chain from a single dimension, this paper describes the trend of industrial chain restructuring from the two aspects of linkage and status, taking into account both the linkage attribute and the profitability attribute of industrial chain restructuring, and more comprehensively describes the situation of industrial chain restructuring. (3) It empirically tests the impact of anti-globalization shocks on the restructuring of China's manufacturing industry chain at the industry level, enriching the empirical research results of anti-globalization and industrial chain restructuring.

2 Research hypothesis

In the process of economic globalization since World War II, developed economies have always been the main recipients of globalization dividends. However, with the rise of emerging economies and the slowdown of their own economic growth, the dividends they can enjoy are gradually decreasing. For a while, the "decoupling theory" and the "China threat theory" were rampant, fueling this round of anti-globalization wave. The actions of developed economies are intended for a redistribution of interests. That is, through the anti-globalization wave, countries that pose a threat to their own development will be squeezed out of the global industrial chain they dominate, and the position of other countries in the industrial chain will be continuously suppressed, so that they can continuously master the core links of the industrial chain, maintain industrial competitiveness, and seize more trade benefits. Therefore, under the impact of anti-globalization, the reconstruction of China's manufacturing industry chain is mainly manifested in two aspects: connection and status. Industrial chain connection (ICC) refers to the degree of tightness of cross-border production links between a country or its departments and other countries. Industrial chain status (ICS) refers to the size of a country and its departments' ability to obtain benefits in international production activities. Anti-globalization is another suppression of China's economic development by developed countries led by the United States. It has a huge impact on the reconstruction of China's manufacturing industry chain connection and status by restricting technology spillover effects, generating financing constraint effects, and weakening human capital improvement effects.

2.1 Upgraded technology blockade restricts technology spillover effects

Under the impact of anti-globalization, Western developed countries led by the United States have continuously upgraded their technological blockade against China. They have hindered normal international technological exchanges by setting up technical trade and investment barriers and formulating strict intellectual property protection systems, which has severely restricted the full play of technology spillover effects and then affected the reconstruction of China's industrial chain connection and status.

2.2 The investment policy is "tight externally and loose internally", enhancing the financing constraint effect

Under the impact of anti-globalization, major developed countries have exhibited the characteristic of being "tight externally and loose internally" in their investment policies. "Tight externally" means that foreign investment policies are becoming more restrictive. To maintain their international competitive edge, developed countries strive to keep the key and core technologies that affect economic development in their own hands. Therefore, for medium- and high-tech industries such as semiconductors, artificial intelligence, and quantum computing, they generally adopt relatively strict foreign investment policies and even reject the entry of foreign capital. "Loose internally" means that domestic investment policies tend to be more lenient. To alleviate the intensified social distribution contradictions within the country and promote domestic economic development, developed countries have implemented the "re-industrialization" policy, calling for the return of industrial capital to their home countries. Consequently, in terms of domestic investment policies, the government generally provides substantial support. Under the influence of these "tight externally and loose internally" investment policies, the flow of transnational capital has been severely hampered, and the financing constraints faced by Chinese manufacturing enterprises in the international market have been continuously strengthened, thereby affecting the restructuring of the connections and status of China's industrial chains.

2.3 Restricted population flow weakens the effect of human capital improvement

Under the impact of anti-globalization, in order to maintain core human resources and maintain their dominant position in the global industrial chain, developed countries have strengthened the control of talent flow, increased the difficulties for Chinese students to study abroad, and also disrupted the normal mid-to-high-end talent introduction plan, weakening the effect of human capital improvement that China can obtain, and then affecting the reconstruction of China's manufacturing industry chain.

Based on the above analysis, this paper puts forward the following hypotheses:

Assumption 1: Anti-globalization has a negative impact on the reconstruction of industrial chain connections and status reconstruction of China's manufacturing industry.

Assumption 2: Under the impact of anti-globalization, the technology blockade of major developed countries against China has been upgraded, which restricts the technology spillover effect and then affects the reconstruction of China's industrial chain.

Assumption 3: Under the impact of anti-globalization, the investment policies of major developed countries show the characteristics of being "tight externally and loose internally", which increases the financing constraints on China and then affects the reconstruction of the industrial chain.

Assumption 4: Under the impact of anti-globalization, the flow of international human capital is restricted, weakening the effect of human capital improvement and then affecting the reconstruction of China's industrial chain.

3 Research Design

3.1 Model Specification

This paper further examines how anti-globalization affects the reconstruction of the manufacturing industry chain. For this purpose, the following empirical research model is constructed:

$$ICC_{it} = \alpha_1 + \beta_1 Anti\_global_{it} + \gamma_1 Z_{it} + \varphi_i + \varphi_t + \varepsilon_{it} \quad (1)$$

$$ICS_{it} = \alpha_2 + \beta_2 Anti\_global_{it} + \gamma_2 Z_{it} + \varphi_i + \varphi_t + \delta_{it} \quad (2)$$

Among them, ICC_{it}represents the industrial chain connection of industry i in period t, ICS_{it}represents the industrial chain status of industry i in period t,$Anti\_global_{it}$ represents the level of anti-globalization impact on industry i in period t,Z_{it}represents the set of control variables that affect the reconstruction of the manufacturing industry chain,$\varphi_i$represents the industry fixed effect,$\varphi_t$represents the time fixed effect, $\varepsilon_{it}$and δ_{it} are random disturbance terms.

3.2 Variable measurement

3.2.1 Dependent variables: Industrial - chain connection and industrial - chain position. According to the analysis framework proposed by Wang et al. (2017), this paper constructs indicators for the reconstruction of global industrial chain connections and status reconstruction. This analysis framework can better solve problems such as overestimating the participation of industry sectors in the global industrial chain in countries with relatively few direct exports, ignoring international shared production activities, and double-counting production activities that may occur in traditional analysis frameworks.

Reconstruction of industrial chain connection

Industrial chain connection refers to the degree of tightness of cross-border production connections between a country or its sectors and other countries. It can be reflected by the characteristics of industrial linkages generated between a country and other countries in international production activities. The calculation formula is as follows:

$$ICC_{it} = ICC_f + ICC_b = \frac{V\_GVC}{\hat{V}X} + \frac{Y\_GVC}{Y} = \frac{V\_GVC\_S}{\hat{V}X} + \frac{V\_GVC\_C}{\hat{V}X} + \frac{Y\_GVC\_S}{Y} + \frac{Y\_GVC\_C}{Y} \quad (3)$$

Among them,ICC_frepresents the forward linkage index of the industrial chain,ICC_brepresents the backward linkage index of the industrial chain,V_GVC_SandY_GVC_Srespectively represent the forward and backward participation of simple products that only cross national borders once and will not be processed and then imported and exported again.V_GVC_CandY_GVC_Crespectively represent the forward and backward participation of complex products that cross national borders multiple times and are processed again and exported after being exported from one country to an importing country. $\hat{V}X$represents a country's domestic value added andY represents final product production.

Reconstruction of industrial chain positio

The industrial chain position refers to the degree of a country and its sectors' ability to obtain benefits in international production activities. It is usually measured by the value chain position index. The calculation formula is as follows:

$$ICS_{it} = GVC_{ps_i} \times DVA_{Fsi} = \left(\frac{X_v\_GVC}{V\_GVC} / \frac{X_y\_GVC}{Y\_GVC} \right) \times DVA_{Fsi} \quad (4)$$

Among them,GVC_{ps_i}represents the global value chain position index,DVA_{Fsi}represents the export domestic value-added rate,X_v_GVCrepresents the sum of total global output corresponding to the value added of a specific sector of a country,X_y_GVCrepresents the sum of total output generated by the value added of a specific sector of a country in an importing country. The meanings of other symbols are the same as above.

3.2.2 Core explanatory variable: anti-globalization index. Anti-globalization is the reversal of globalization. Regarding the globalization index, the more authoritative statistic in the academic community is the KOF globalization index released by the Institute of Economic Research at the Swiss Federal Institute of Technology in Zurich. Since this paper focuses on analyzing the impact of anti-globalization from the economic level, and the flow of economic factors is often related to changes in political, cultural and policy, the economic globalization index can generally cover the globalization level at the overall level. In addition, this paper further draws on the practice of Chen Qifei et al.(2019), takes the reciprocal of the selected KOF economic globalization index, and finally forms the anti-globalization index.

3.2.3 Mechanism variable. Regarding the technology spillover effect, following the practice of Wang Zhiyu et al.(2017), the growth rate of patent applications is used to measure the level of technology spillover. Regarding the financing constraint effect, the ratio of net fixed assets to total assets is used to measure the level of financing constraints. Since enterprises can obtain external financing through fixed asset mortgages, the larger this indicator is, the smaller the financing constraints on enterprises. Regarding the human capital improvement effect, there is a high consensus and a solid economic theory foundation for measuring the human capital improvement effect with the full-time equivalent of R&D personnel.

3.2.4 Control variables. According to the literature review, factors such as industry scale, technological level, and capital density will affect the reconstruction level of a country's industrial chain. Therefore, this paper incorporates the above indicators into the control variables. Industry scale (SIZE) is characterized by the main business income of the industry. Technological level (R&D) is characterized by R&D investment intensity, which is calculated by the proportion of the internal expenditure of R&D funds in each industry to the main business income. Capital density (Fixed) is characterized by the net fixed assets of each industry and the total number of employees in the industry.

3.3 Data description

This paper takes 2008 as the starting point of the research to analyze the impact of the anti-globalization shock on the restructuring of China's industrial chain during the more than ten years from 2008 to 2018. The descriptive statistics of the variables are shown in Table 1.

Table 1: Descriptive Statistics of Variables

Variable Name	Number of Samples	Mean	Standard Deviation	Minimum Value	Maximum Value
ICC	154	0.133	0.050	0.040	0.252
ICS	154	0.299	0.110	0.100	0.533
Anti_global	154	0.022	0.001	0.021	0.023
Tech	154	-1.253	1.349	-5.684	2.556
Infina	154	-1.324	0.420	-3.131	-0.563
Human	154	11.088	1.421	7.261	13.742
Size	154	10.626	0.922	8.444	12.369
R&D	154	-5.331	0.796	-7.149	-3.843
Fixed	154	2.842	0.747	1.042	4.721

Source of data: Compiled by the author based on the data from WIOD and the Organization for Economic Cooperation and Development (OECD).

4 Empirical Results and Analysis

4.1 Benchmark Regression Results

Table 2 reports the benchmark regression results of the impact of the anti-globalization shock on the connections and status of the industrial chain of China's manufacturing industry respectively.

The estimation results show that: (1) The estimated coefficients of the core explanatory variable, the anti-globalization index, are consistently negative and have all passed the significance test at the 1% level. This indicates that the anti-globalization shock has a significantly negative impact on the connections of the industrial chain of China's manufacturing industry and the restructuring of its status, thus validating Hypothesis 1. (2) Judging from the estimated coefficients of the core explained variables, compared with the degree of industrial association with other countries, the anti-globalization shock has a greater impact on the profitability of China's manufacturing industry in the global industrial chain. The possible reason is that as the world's factory, China has been deeply integrated into the division of labor system of the Global Value Chain and has established close connections with upstream and downstream economies. Even if some developed countries led by the United States attempt to squeeze China out of the global industrial chain by taking advantage of this round of anti-globalization, it is difficult to find substitutes in a short period of time to fill the gaps in the global industrial chain after China is squeezed out. However, in terms of the status of the industrial chain, China has been integrated into the global division of labor system by virtue of its factor cost advantages and is located in the middle and lower reaches of the value chain. Although China has been vigorously advocating that the manufacturing industry should move towards the upper and middle reaches of the global industrial chain, due to the still large gap in its own technological accumulation and other aspects compared with the upstream developed economies, the actual effect of the upgrading of the industrial chain of China's manufacturing industry is not very satisfactory. Moreover, the technological blockade by developed countries under the anti-globalization shock has made the process of China's upward climb even more difficult. Therefore, although the anti-globalization has brought significant negative impacts on both the connections of the industrial chain of China's manufacturing industry and the restructuring of its status, its impact on the status of the industrial chain is even greater. (3) In terms of control variables, both the industrial structure and the technological level have a significant positive impact on the connections of the industrial chain of China's manufacturing industry and the restructuring of its status.Capital density has a negative impact on both the connections of the industrial chain and the restructuring of its status.

4.2 Robustness Test

This paper examines the robustness issue by using the method of lagging the core explanatory variable by one period. The regression results are consistent with the benchmark regression results, which indicates that the research findings of this paper are reliable.

4.3 Mechanism Test

$$\mathrm{Tech}_{it} = \alpha_1 + \beta_1 \mathrm{Anti}_{\mathrm{global}\,it} + \gamma_1 \mathrm{Z}_{it} + \varphi_i + \varphi_t + \varepsilon_{it} \quad (5)$$

$$\mathrm{Infina}_{it} = \alpha_1 + \beta_1 \mathrm{Anti\_global}_{it} + \gamma_1 \mathrm{Z}_{it} + \varphi_i + \varphi_t + \varepsilon_{it} \quad (6)$$

$$\mathrm{Human}_{it} = \alpha_1 + \beta_1 \mathrm{Anti\_global}_{it} + \gamma_1 \mathrm{Z}_{it} + \varphi_i + \varphi_t + \varepsilon_{it} \quad (7)$$

Equations (5), (6), and (7) respectively test the technology spillover channel, financing constraint channel, and human capital channel through which anti-globalization affects the restructuring of the industrial chain. The specific regression results are shown in Table 4. It can be observed that: (1) The estimated coefficient of the technology spillover channel is significantly negative, indicating that the anti-globalization shock has hindered the improvement of China's independent innovation ability, restricted the technology spillover effect, and is unfavorable to the restructuring of the manufacturing industry's industrial chain. (2) The estimated coefficient of the financing channel is significantly negative, indicating that under the anti-globalization shock, the financing constraints on Chinese enterprises have been significantly strengthened, thereby affecting the connections and status of the industrial chain of China's manufacturing industry. (3) The estimated coefficient of the human capital channel is significantly negative, indicating that anti-globalization has hindered the free flow of human capital and is unfavorable to the effect of enhancing human capital. According to the analysis results in the previous text, anti-globalization can affect the

Table 2: Benchmark Regression Results

	ICC	ICS
Anti-global	-93.98***	-185.070***
	(-8.81)	(-11.05)
SIZE	0.025***	0.034***
	(4.27)	(3.75)
R&D	0.021***	0.026***
	(4.15)	(3.23)
K/L	-0.007*	-0.003
	(-1.85)	(-0.55)
con.	2.049***	4.128***
	(2.69)	(12.42)
Industry fixed effects	YES	YES
Time fixed effects	YES	YES
Observations	154	154
R^2	0.620	0.843

Table 3: Robustness Test

	ICC	ICS
Anti-global	-92.498 ***	-179.857***
	(-8.84)	(-10.63)
SIZE	0.024***	0.033***
	(4.33)	(3.55)
R&D	0.021***	0.024***
	(4.25)	(3.02)
K/L	-0.007*	-0.003
	(-1.90)	(-0.51)
con.	2.018***	4.021***
	(9.72)	(11.97)
Industry fixed effects	YES	YES
Time fixed effects	YES	YES
Observations	154	154
R^2	0.619	0.836

connections and status of the industrial chain of China's manufacturing industry through the above three channels, thus validating Hypotheses 2, 3, and 4.

5 Conclusions and Countermeasure Suggestions

Based on the ADB-MRIO 2019 database and the UIBE database of the Institute of Global Value Chains at the University of International Business and Economics, this paper calculates the level of restructuring of the connections and status of the industrial chain of China's manufacturing industry. It also examines the impact of the anti-globalization shock on the restructuring of the industrial chain of China's manufacturing industry and its mechanism of action by using relevant data from the Economic Research of ETH Zurich and the National Bureau of Statistics of China. The research findings of this paper indicate that: First, the anti-globalization shock has a significant inhibitory effect on the restructuring of the industrial chain of China's manufacturing industry, and this conclusion still holds after the robustness test. Second, anti-globalization can inhibit the restructuring of the industrial chain of China's manufacturing industry through measures such as technological blockades, investment restrictions, and controls on the flow of human capital.

Based on the above conclusions, this paper puts forward the following policy suggestions: First, adhere to the implementation of opening - up in a broader scope, wider fields, and at a deeper level, and strengthen the connection between China and the global industrial chain. Second, strengthen the construction of independent innovation capabilities and make up for the short - comings of the industrial chain. Third, accelerate the construction of a developed financial market with breadth and depth to provide capital guarantee for the restructuring of the manufacturing industry's industrial chain.

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Table 4: Mechanism Test

	Technology Spillover Channel	Financing Constraint Channel	Human Capital Channel
Anti-global	-3083.27***	-972.995***	-236.436*
	(-2.82)	(-11.66)	(-1.86)
SIZE	-1.425**	-0.083*	0.876***
	(-2.36)	(-1.82)	(12.48)
R&D	-1.305**	-0.042	0.873***
	(-2.48)	(-1.07)	(14.26)
K/L	0.152	0.988***	0.023
	(0.36)	(30.27)	(0.48)
con.	77.357***	17.713***	11.546***
	(3.56)	(10.69)	(-2.46)
Industry fixed effects	YES	YES	YES
Time fixed effects	YES	YES	YES
Observations	154	154	154
R^2	0.713	0.962	0.914

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