Analysis of the Impact of the United States' Decoupling of Trade with China on the Global Value Chain Division of China's Mechanical and Electrical Industry

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Abstract. This article matches the cases of China US trade frictions to various sub sectors of the electromechanical industry, considers the comparative advantage index of heterogeneous product quality, and uses regression analysis to simulate different scenarios of tariffs. It directly affects the participation of Chinese electromechanical products in the global value chain division of labor, and provides reasonable suggestions for maintaining the comparative advantage position of the electromechanical industry in the global division of labor. The conclusion of this article is as follows: 1. The decoupling and chain breaking measures taken by the United States towards China have had an impact on China's global value chain division of labor in the electromechanical industry, and overall have suppressed its comparative advantage position; 2. The decoupling and chain breaking measures have a more significant impact on the global value chain division of labor in the electromechanical industry in recent times; 3. It is suggested to timely promote measures to extend, strengthen, and supplement the supply chain, and build a unified national factor market to mitigate the negative impact of the United States' decoupling and block chain measures.

Keywords: Global value, chain decoupling, broken chain market.

1. Introduction

Since the beginning of this century, the proliferation of neoliberalism has led to an economic and financial crisis in the world, and the process of globalization has encountered a backlash. Economic globalization has promoted the full flow of global wealth, facilitated the construction of global value chains, optimized resource allocation efficiency, and also accompanied urgent global problems such as development deficits, fairness deficits, governance deficits, and great power games. Against this background, the trend of "anti globalization" has risen, interwoven with the COVID-19 and the Russia-Ukraine conflict, further intensifying this trend. As the world's largest developed country, the United States generally has a comparative advantage in technology intensive industries, often engaged in high-value production activities, and is at the high-end of the value chain. However, the working class is at a disadvantage in distribution under the globalization model, and the wealth of the middle class and the bottom of society has sharply decreased, resulting in a continuous increase in the Gini coefficient. China has deeply integrated into the process of globalization, relying on its advantages in resources, labor, and other aspects to penetrate deeper into the global value chain and continuously climb towards the high-end of the global value chain. Its relationship with the United States in the value chain has also evolved from "complementarity" to "competition". In order to maintain the dominant position of the United States in the high-end technology field, China was locked in at the low end, and the interests of the American working class were safeguarded. The United States provoked trade disputes, used tariff and non-tariff measures to suppress China, and gradually evolved into "de risk" and "de sinicization" of goods. The essence of the trade dispute between China and the United States is the dispute over the dominance and discourse power of the global industrial and supply chains, the distribution of industrial profits, and the restriction of China's high-tech product exports by the United States through trade frictions between China and the United States, thereby hindering China's introduction, application, and research and development of high-tech products [1]. The trade friction between China and the United States, along with geopolitical

tensions, ideological conflicts, and other multiple factors, have led to a trend towards short chain and localized global supply chains. The traditional economic and trade system is facing severe challenges, and the global value chain has entered a period of reshaping and deep adjustment.

As the world's second-largest economy, largest consumer market, and largest manufacturing country, China holds a pivotal position in the global industrial chain. With the deepening of opening up to the outside world, China has integrated into the world's industrial and value chain systems, especially the industrial cooperation between China and the United States has become more prominent. From the perspective of the "smile curve" of the industry, the United States occupies the upstream of the industrial chain, namely the research and development and design stage, while China occupies the production stage. If the trade between China and the United States is decoupled, and China's research and development and design capabilities are still insufficient, it will cause production stagnation in China, endanger the safety of the industrial chain, and thus restrict the development of the industry and economy [2].

Mechanical and electrical products are a beautiful business card for China's export products, and the United States is an important market for China's mechanical and electrical product exports. The total export value of electromechanical products showed an overall growth trend from 2001 to 2021, increasing from 118.787 billion US dollars in 2001 to 1985.089 billion US dollars in 2021, maintaining a continuous growth momentum. However, due to the introduction of a series of tariff lists by the United States on China's electromechanical products and the impact of the COVID-19 in 2019, China's total exports of electromechanical products and exports to the United States declined in 2019. The imposition of tariff and non-tariff barriers by the United States on Chinese electromechanical products will seriously undermine the security of China's electromechanical product industry and supply chain.

Previous studies have focused on the impact of the decoupling of US trade with China on the global value chain division of labor in Chinese related industries, and how to effectively avoid and prevent potential risks. However, there is still room for further exploration in terms of focusing on specific fields and analyzing influencing factors. This article will focus on electromechanical products, quantify and visualize the impact of decoupling on the global value chain division of labor in China's electromechanical industry, and explore various influencing factors.

2. Literature review

Trade frictions among major powers have always been a hot topic in international trade and economics research. In recent years, scholars have conducted in-depth research on the evolution and consequences of the decoupling of US trade with China. There are several main dimensions: one is to simulate the impact of policy evolution decoupling on various aspects of the economies of the two countries, such as using models such as CGE and GTAP to simulate different scenarios of tariff increases. It is found that in the short term, the employment rates of certain industries have improved, but all at the cost of welfare losses in both countries [3], or to construct a DSGE model for parameter calibration and estimation. The simulation results show that increasing tariffs The policy of increasing subsidies has had a significant impact on bilateral trade in the short term, followed by a gradual weakening of the policy's impact on trade itself, and a gradual emergence of negative effects on economic growth, inflation, and employment [4]. The second is to simulate the impact of decoupling on the global economy through policy evolution, such as decomposing the input-output model to prove that in the absence of substitution effects, the global economy is most affected, and global GDP will decrease by 0.5% - 0.8%, making China's traditional trade and value creation model unsustainable [5]. The third is to simulate the impact on different industries through policy simulation, Based on the gravity model of trade data from 20 countries, it can be demonstrated that the main factors affecting the import and export of Chinese high-tech products under the background of the United States imposing tariffs on Chinese high-tech products [1], or through theoretical and empirical analysis, it can be proved that the overall trade friction between China and the United States has a

significant negative impact on the forward participation, backward participation, and status index of China's manufacturing global value chain [6].

Currently, industries in various countries around the world are deeply embedded in the global value chain system. Enhancing the comparative advantage of domestic industries in the global value chain is a major issue with global and long-term significance. The decoupling of US trade with China has also put forward new requirements for China to strengthen, extend, and supplement its supply chain. Scholars have conducted in-depth research on the impact of decoupling on the comparative advantage position of the value chain. One is to provide a quantitative method for measuring the division of labor status of GVCs, such as GVC length index, GVC upstream degree index, vertical specialization index, GVC status index, etc., to comprehensively and objectively understand the comparative advantage status of value chains in various countries around the world [7]. The second is to analyze the impact of the United States' strategic containment of China on the comparative advantage status of China's industrial value chain and its specific action path based on global value chain theory [8].

The above research provides a systematic explanation of the measurement indicators and theoretical basis of GVC division of labor to measure the degree of impact, consequences, and response measures of the United States decoupling from China's trade. It provides a basic framework for studying the advantageous position of China's industrial value chain in terms of the impact of the United States decoupling from China, but there are still shortcomings. Firstly, the current impact of decoupling between China and the United States is mainly at the qualitative level, with relatively little research on the quantitative level; Secondly, there is a lack of research on industry heterogeneity at both international and national levels; Thirdly, in terms of research methods, most studies on the impact of trade frictions between China and the United States are conducted through scenario simulations, limited to a more general measurement and without in-depth investigation. This article matches the cases of trade frictions between China and the United States to various sub sectors of the electromechanical industry, considers the comparative advantage index of heterogeneous product quality, and uses regression analysis to simulate different scenarios of tariffs. It directly affects the participation of Chinese electromechanical products in the global value chain division of labor, and provides reasonable suggestions for maintaining the comparative advantage position of the electromechanical industry in the global division of labor.

3. Measurement and Analysis of the Division of Labor in the Value Chain of China's Electromechanical Industry by the "Decoupling and Chain Breaking" Policy in the United States

3.1. Construction of Comparative Advantage Index Considering Heterogeneous Product Quality

Based on the approach of Li Hong et al. (2020), this article believes that the comparative advantage index of a certain industry in a country's global value chain division of labor can be defined as [8]:

$$Q_{ik} = \sum^{M}{}_{j} Y_i/Y_j * P^E{}_{ijk}/P^I{}_{ijk}/M \quad (1)$$

Among them, $P^E{}_{ijk}$ is the unit value of products exported from country i and industry k to country j, and $P^I{}_{ijk}$ is the unit value of products imported from country i and industry k to country j [8]. According to the unit value method of import and export commodities, the larger the ratio of the unit value of exported products to the unit value of imported products in country j, the more significant the comparative advantage of country i's k industry in the global value chain division of labor [8]. Therefore, this indicator measures China's average comparative advantage index (M=1) relative to the United States in the K-industry in this article. Considering the heterogeneity of product quality, this formula also includes adjustment coefficients Yi/Yj, where Yi and Yj represent the per capita GDP levels of country i and country j, respectively [8]. This adjustment is similar to Hausmann's assumption that the higher a country's income level, the better the quality of its exported products [8].

When Qik>1, it indicates that China's electromechanical product related industries are in a comparative advantage position relative to the United States in the global value chain division of labor, and this industry is an advantageous industry; When Qik<1, the Chinese electromechanical product related industry is relatively non advantageous compared to the United States. This article also matches the six digit customs HS industry with the corresponding two digit sub industry of China's electromechanical products. The relevant data is extracted from the Trade Unit Value database in the CEPII database.

3.2. Model Settings

This article is based on industry level research to investigate the impact of China US trade frictions on the global value chain division of labor in China's manufacturing industry. Therefore, the following econometric model is set: $Qkt=\alpha+\beta\times Numberkt+\varepsilon$ Among them, k and t represent the manufacturing industry segment and year, respectively, and Qkt is the comparative advantage index of k industry in the global value chain division of labor in the t-th year [8]. Number is the number of decoupling and chain breaking measures taken by the United States against China's K-industry in the t-th year. This article excerpts policy cases of the United States attempting to decouple and break links with China published on the China Trade Remedies Information website, and conducts statistics based on the six digit HS industry of customs. Then, the relevant data is matched to the two digit sub industry of manufacturing.

3.3. Empirical Result Analysis

Table 1 reports the impact of the decoupling of US trade with China on the comparative advantage position of China's electromechanical industry in participating in the global value chain division of labor. From this, it can be seen that the number coefficient of the core explanatory variable trade friction is significantly negative, indicating that the decoupling of US trade with China will significantly weaken the comparative advantage of China's manufacturing industry in the global value chain division of labor. This is consistent with the research findings of many well-known scholars, namely that the decoupling of US trade with China has a negative impact on China's position in the global value chain division of the electromechanical industry.

Table 1. Benchmark Regression Results

Model	
number	-0.141**
	(0.030)
Constant term	6.63
Industry fixed effects	Control
Sample size	42
R^2	0.111

4. Conclusion

This article matches the 2012-2021 trade friction cases between China and the US to various sub sectors of the electromechanical industry, taking into account the comparative advantage index of heterogeneous product quality. Using regression analysis, it simulates different scenarios of tariffs and quantitatively tests the direct impact of decoupling measures on China's participation in the global value chain division of labor for electromechanical products. The following conclusion can be drawn: (1) Currently, the United States has taken measures to decouple and break the chain, which has had a significant negative impact on China's position in the global value chain division of mechanical and electrical products, and has exacerbated the fragility of the industrial chain of those industry. The impact of the US decoupling and chain breaking measures on China's global position and competitive advantage in the electromechanical industry cannot be ignored. The government should rationally understand the negative impact of the US decoupling measures, guide relevant enterprises to establish

correct expectations, and actively respond. Meanwhile, the government should take appropriate trade remedies for the relevant industries that are greatly affected by decoupling. The key to breaking free from the negative impact of the United States' decoupling and shaping new competitive advantages lies in seeking impetus from reform, seeking opportunities from openness, and promoting economic restructuring and upgrading in multiple aspects such as optimizing trade structure, promoting regional coordinated development, and adjusting national income distribution. The government should actively implement high-level economic and trade rules, implement higher levels, and deeper levels of opening up to the outside world, and find ways to stabilize foreign trade and foreign investment, especially exports to developed countries. Also, they need to guide export enterprises to explore new markets and expand exports to developing countries and ASEAN regional markets. Shaping new competitive advantages in the global industrial chain value chain with a high-level dual circulation new pattern. The government need to introduce policies and measures to extend, supplement, and strengthen the supply chain, accelerate the cultivation of "specialized, refined, unique, and new" type enterprises, build more supply chain "chain master" type enterprises, and open up a new track of enterprise competition. The government should promote "strong chain" through core technologies and breakthroughs in broken supply components, promote deep integration of industrial chain innovation chains, and reshape the initiative of the global value chain through industrial and technological breakthroughs. China need to build a factor circulation system with the theme of domestic circulation and the support of a unified domestic market, and take effective measures to ensure the smooth circulation of the industrial chain and supply chain, shaping domestic demand as a new fulcrum for the development of the domestic industrial chain value chain.

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