Dean&Francis
ISSN 2959-6130

The Impact of the United States' Tariffs on China on China's Machinery and Equipment Export Trade

Chenxi Qiao

Changsha University of Science and Technology, Changsha, Hunan(410114), China
E-mail: 2774786651@qq.com

Abstract:

This paper analyzes the impact of U.S. tariff impositions on China on the exports of China's key industries, particularly the mechanical equipment sector, amid escalating Sino-U. S. trade frictions. Employing the GTAP model, the study simulates and examines changes in China's mechanical equipment exports under varying tariff levels. The results indicate that as tariff rates increase, China's exports of mechanical equipment to the United States decline overall, with the electronic equipment and transportation equipment sub-sectors being the most severely affected. Concurrently, China's Gross Domestic Product (GDP) and social welfare decrease with rising tariffs, whereas the United States experiences slight growth in both GDP and welfare under certain scenarios. This research provides a quantitative basis for adjusting China's mechanical equipment export policies and offers strategic recommendations for navigating the high-tariff environment.

Keywords: Sino-U.S. trade frictions, tariffs, mechanical equipment exports, GTAP model, policy simulation

1. Introduction

1.1 Research Background

The escalation of Sino-U.S. trade frictions since 2018 has reshaped the bilateral trade landscape, with the U.S. imposing successive tariff measures on Chinese goods spanning key sectors including electronics and machinery. A notable development occurred in May 2024, when the U.S. announced a further tariff hike on select Chinese products, which further intensified the impact on China's export sector. As a critical component of China's export portfolio, the mechanical equipment industry accounts for a significant share of the country's total exports, and shifts in its trade patterns directly influence China's industrial upgrading trajectory and foreign trade policy orientation. Against this backdrop, investigating the effects of U.S. additional tariffs on China's mechanical equipment exports carries substantial practical significance and policy reference value.

1.2 Review of Domestic and International Research

In academic studies on Sino-U.S. trade and tariff issues, scholars worldwide commonly employ analytical models such as the Global Trade Analysis

Project (GTAP), World Input-Output Database (WIOD), and Almost Ideal Demand System (AIDS). From an international perspective, Susan Helper (2023) noted that U.S. additional tariffs on Chinese mechanical equipment have driven a 12%–15% increase in domestic U.S. prices, and that replacing Chinese production capacity through supply chain adjustments remains infeasible in the short term. Domestically, Chinese scholars Sheng Wenwen and Peng Hongbin (2023) utilized the Melitz model and spatial econometric analysis to find that China's market diversification strategy has reduced its export dependence on the U.S. from 19% to 14.7%. They further proposed tilting policy subsidies toward high-tech segments of the industry.

1.3 Research Objectives

This paper aims to apply the GTAP model to simulate the macroeconomic impacts of U.S. tariffs on China's mechanical equipment industry, focusing specifically on changes in output, trade flows, and social welfare within the sector. The analysis will cover different tariff scenarios to quantify the heterogeneous effects across sub-sectors of mechanical equipment. Ultimately, this study seeks to provide data-driven support for governments and enterprises in formulating response strategies, thereby mitigating the negative repercussions of tariff policies on China's mechanical equipment exports.

2. Research Methods

2.1 Research Theories and Models

This study employs the Global Trade Analysis Model (GTAP) for policy simulation. By collecting relevant data before and after the United States imposed additional tariffs on China and inputting them into the GTAP model for analysis, the impact of tariff changes on China's mechanical equipment exports was evaluated.

2.2 Experimental Scheme

Data collection: Obtain the basic database from the GTAP official website; Collect tariff data from USTR and WTO; Obtain detailed data on the machinery and equipment industry from China's customs and industry associations.
Data processing: Unify data formats, verify the rationality of numerical values, and align statistical criteria.
Database update and base period adjustment: Use the recursive method to update the GTAP base period data to make it closer to the economic environment at the time of policy implementation.
Industry and regional segmentation: Refine the original classification of GTAP to clearly define the research sub-departments and countries/regions.
Parameter calibration: Adjust the default parameters of GTAP according to the characteristics of the machinery and equipment industry.
Policy scenario setting: Set the base scenario, policy scenario and alternative scenario, and transform the tariff impact into a variable recognizable by the model.
Model operation and result output: Run the simulation using the RunGTAP software to obtain the percentage changes in variables such as export volume, price, and benefits.

3. Research Results

The following results were obtained through the GTAP model simulation:

Table 1 Changes in China's Exports and Output to the United States under Different Tariff Levels (%)

Export and Output Table

Product category	tariff: 1% : export fluctuation	output fluctuation	tariff: 5% : export fluctuation	output fluctuation	tariff: 10% : export fluctuation	output fluctuation
Car	+1.93	+0.10	-17.33	-0.65	-41.41	-1.60
Metal products	+11.70	+1.12	-8.56	-0.48	-33.89	-0.48
Electronic devices	-4.50	-1.03	-28.22	-4.48	-57.87	-8.90
Transportation equipment	-1.85	-0.05	-17.81	-0.26	-37.74	-0.51
Other mechanical products	+7.35	+0.51	-17.92	+0.46	-49.51	+1.67

In terms of macroeconomic impact:
A 1% tariff: China's GDP rises by 0.02%, and social welfare (EV) increases by 113.29 million US dollars. The US GDP declined by 0.01% and welfare decreased by 45.52 million US dollars.
A 5% tariff: China's GDP drops by 0.58%, and welfare

ISSN 2959-6130

benefits decrease by 4,357.53 million US dollars. The US GDP rose by 0.10% and welfare increased by 2,186.47 million US dollars.

A 10% tariff: China's GDP drops by 1.34%, and welfare benefits decrease by 9,971.05 million US dollars. The US GDP rose by 0.23% and welfare increased by 4,976.46 million US dollars.

4. Discussion

The research results show that the additional tariffs imposed by the United States have an overall inhibitory effect on China's mechanical equipment exports, especially under the scenario of high tariffs, the exports of electronic equipment and transportation equipment have decreased significantly. It is worth noting that some mechanical products still maintained output growth in the early stage of tariff hikes, reflecting that China has a certain degree of competitive resilience in certain niche fields. Furthermore, although the United States may enjoy short-term welfare growth in some scenarios, in the long run, tariff barriers may exacerbate its supply chain costs and inflationary pressures.

5. Conclusions and Suggestions

This paper simulates and analyzes the impact of the additional tariffs imposed by the United States on China's mechanical equipment exports through the GTAP model. Research has found that as tariff rates rise, China's exports to the United States generally decline, causing damage to GDP and social welfare. While the United States benefits in the short term, it faces supply chain and cost challenges in the long run.

For this purpose, the following suggestions are put forward:

1. Promote the diversification of the export market for mechanical equipment and reduce reliance on the United States;
2. Strengthen policy support and R&D investment in high-tech links;
3. Utilize mechanisms such as free trade agreements to expand emerging markets;
4. The government and enterprises should work together to address trade barriers and enhance industrial competitiveness.

References

[1] Helper, S. (2023). The Impact of Tariffs on U.S. Machinery Prices. Journal of International Economics, 115, 103–120.

[2] Sheng Wenwen, Peng Hongbin. (2023). Evolution of China's Machinery and Equipment Export Structure and Policy Response under Sino-US Trade Friction. International Trade Issues, 39(4), 45-58.

[3] Hertel, T. W. (Ed.). (1997). Global Trade Analysis: Modeling and Applications. Cambridge University Press.