# The Impact of Export Control on China's Semiconductor Import Trade from Regional Comprehensive Economic Partnership Partners

## ---mediating effect from American Foreign Direct Investment

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**Abstract.** This paper uses the PSM-DID (Propensity Score Matching - Differences-in-Differences) approach to examine the impact of US export control on trade in key semiconductor products between China and RCEP(Regional Comprehensive Economic Partnership) members. The results show that U.S. export control promotes China's import of semiconductors from RCEP partner countries, showing a significant trade transfer effect, and U.S. FDI(Foreign Direct Investment) in RCEP member countries boosts the influence of export control on China's import of semiconductors from RCEP member countries. The quantification of the trade transfer effect of export control provides a "China story" for relevant research and provides useful policy suggestions for China on how to evade U.S. export control.

**Keywords:** RCEP; Trade; FDI; Export Control; PSM-DID

## 1 INTRODUCTION

In 2018, the United States enacted the ECRA(Export Control Reform Act), and at the same time, China's export controls in the United States are increasingly stringent. In this context, Yang Ce and Zheng Jianming [1] measured the list of entities with dummy variables to capture the broad marginal impact of limiting technical output. Ji Jianyue and Liu Luping[2] empirically studied the influence and mechanism of US export control on technological innovation investment of Chinese regulated enterprises by using a multi-period DID(difference-in-differences) model. Most existing studies have measured the influence of the control on the trade of micro-products. Layton[6] believed that the future trend of U.S. semiconductor export control policy is ineffective, and the U.S. should implement small-scale export control. Saif M. Khan[7] believes that the final impact of the control strategy depends on successful joint control. Japan IDC Site Hayakawa et al. [8] take the foreign FDI of Japanese semiconductor manufacturers as an


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important mechanism variable and discuss the transfer effect of regulated product trade caused by semiconductor disputes between Japan and Korea from the time and product dual dimensions.

Most scholars pay close attention to the formulation of export control strategy and the legal principle of export control in the United States but have little influence on the economic impact of export control. Among them, domestic scholars have studied research on the impact of export control on technological innovation. However, few scholars applied free trade theory to study the impact of export controls on trade transfer between China and RCEP member countries.

By establishing the DID model, the export control is quantified and the influence of export control policy is analyzed on semiconductor products between China and its trade partners, i.e. the effect of trade transfer, by investing in RCEP countries by the U.S.A. and provide useful policy suggestions for China to circumvent US export control and realize the development of China's semiconductor trade.

## 2 THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

The economic and technical attributes of the semiconductor industry are endowed with the characteristics of globalization of the value chain. Export control is a policy tool. Free trade theory holds that export regulation influences trade inhibition and trade transfer.

The Foreign Direct Products rule (FDP rule), which controls U.S. exports, could discourage Chinese imports from other regions. For example, when a Japanese company buys components from the United States and assembles finished products in a Japanese factory for export to China if the product meets the requirements of the FDP rule, it may need to submit an export license application to the United States BIS and get approval, so Japanese exporters will reduce exports to China. This is a restraining influence induced by extraterritorial jurisdiction.

Based on this, hypothesis 1 is proposed: US export control hurts China's import of semiconductors from RCEP trading partners, that is, the inhibitory impact caused by extraterritorial jurisdiction is stronger than the transfer effect of export control on China's trade with RCEP member countries.

The implementation of US export control may increase China's imports from RCEP regions, so Chinese enterprises choose to import alternative products from other regions, that is, the trade transfer effect. If RCEP member countries can provide semiconductor alternatives similar to the United States and have good trade partnerships with China, then China's import trade from RCEP trading partners will rise.

Based on this, hypothesis 2 is proposed: US export control has a positive influence on China's import of semiconductors from RCEP trading partners, the transfer effect of export control on China's trade with RCEP member countries is stronger than the inhibiting impact caused by extraterritorial jurisdiction.

To further promote the good development of US semiconductor enterprises and encourage domestic enterprises to conduct export platform FDI to RCEP trading partners

[4] , US semiconductor enterprises are faced with increasingly stringent export control, and are motivated to cross trade barriers[3] . FDI in RCEP member countries circumvents the impact of export controls to produce semiconductor products for exporting to China. As recipient countries of FDI from the United States, member countries of RCEP have a certain buffer impact on the adverse effects of US export controls on China. thus increasing the trade transfer effect.

Based on this, hypothesis 3 is proposed: US FDI in RCEP member countries amplifies the trade transfer effect of export control on China's import of semiconductors from RCEP trading partners.

# 3 STUDY DESIGN

## 3.1 Sample selection and data source

This text uses the DID approach to examine the influence of U.S. Export Regulation on the trade of 100 semiconductor products between China and RCEP partners from January 2017 to December 2021. Trade data comes from UN Comtrade and ITC databases. GDP data comes from the United Nations database and the International Monetary Fund (IMF), and China's distance from other countries comes from the CEPII database. Whether semiconductors are subject to export control or not is judged according to Export Control Regulations issued by the U.S. Bureau of Industrial Security.

## 3.2 Model setting and variables

This paper imitates Hayakawa et al.[8] to discuss the trade gravity model of Japan's semiconductor export control on its export structure change. By adding the country fixed impact and product fixed impact, the consistency of estimation results is avoided due to the omission of variables.

This paper selects the semiconductor products not subject to US export control and uses the PPML(Poisson Pseudo Maximum Likelihood) trade gravity model to measure the effect of US semiconductor export control on China's semiconductor product trade. Based on the DID method, the following multi-period DID model is constructed:

$$TRADEijpt = \beta_0 + \beta_1 Treat_P * Post_t + \beta_2 LnPGDP_{jt} + \beta_3 LnDistw_{ij} + \beta_4 \lambda i + \beta_5 \lambda r + \beta_6 \lambda t + \beta_7 \varepsilon ijpt \quad (1)$$

The definitions and data sources of each variable in the model are described before, and i for China, j for RCEP trading partners, p for semiconductor products, and t for time.

# 4 EMPIRICAL TEST AND RESULT ANALYSIS

## 4.1 Benchmark regression results

Table 1 reports the test results of these hypotheses. The results show that the export control of the U.S. has a significant promotion impact on China's import of semiconductor products from the RCEP trading partner countries, i.e. there is a trade transfer effect. When the U.S. controls the export of specific semiconductor products from China, it increases the import of semiconductor-controlled products from RCEP member countries. Hypothesis 2 studied in this article passes the test.

**Table 1.** Regression Analysis Table

| | Baseline Regression | DID | PSM-DID | Adjustment Effect |
|---|---|---|---|---|
| VARIABLES | TRADE | TRADE | TRADE | TRADE |
| TreatXpost | 0.102* | 0.122* | 0.076 | -10.174*** |
| | (1.73) | (1.85) | (0.28) | (-5.76) |
| TreatXpostXlntrfdi | | | | 1.297*** |
| | | | | (6.32) |
| lndis_int | -0.406*** | -0.788*** | -0.626*** | -0.230*** |
| | (-3.51) | (-6.02) | (-4.25) | (-7.36) |
| lnPGDP | 0.411 | 0.429 | 0.527 | -0.058 |
| | (1.07) | (0.95) | (1.06) | (-1.58) |
| Constant | 42.091*** | -10.925 | 12.440 | 8.394*** |
| | (2.66) | (-0.63) | (0.64) | (24.76) |
| Observations | 20,821 | 15,630 | 12,075 | 9,878 |
| adj_R2 | 0.799 | 0.791 | 0.796 | 0.467 |
| Individual Effects | YES | YES | YES | YES |
| Time Effect | YES | YES | YES | YES |

* p<0.1, ** p<0.05, *** p<0.01

This text adopts PSM-DID to test the robustness of the conclusion. The kernel matching method is used to estimate the feature vectors such as the product category and the trade scale of semiconductor products.

Table 1 shows the results of the different tests. Further differential analysis was performed on the treatment group and the control group. After the PSM-DID test, there was no substantial difference between the results and the benchmark regression results, so the research conclusion in this text is robust.

## 4.2 Mediating effect

The adjustment effect model is as follows:

$$TRADEijpt = \beta_0 + \beta_1 Treat_P * Post_t + \beta_2 LnPGDP_{jt} + \beta_3 LnDistw_{ij} + \beta_4 lntrfdi_{jt} + \beta_5 Treat_P * Post_t * lntrfdi_{jt} + \beta_6 \lambda i + \beta_7 \lambda r + \beta_8 \lambda t + \beta_9 \varepsilon ijpt \quad (2)$$

It can be seen from Table 1 that US FDI in RCEP trading partner countries promotes the influence of export control on the transfer of semiconductor trade between China and RCEP trading partners. When the U.S. imposes strict export control on China, the U.S. enterprises try to make up for the adverse impact of the export control on trade from the aspect of FDI, divert the FDI to the RCEP member countries, and make platform-type investments. This FDI will promote the semiconductor production capacity of the RCEP member countries, thus amplifying the trade transfer effect of semiconductors between China and the RCEP trading partner countries. Therefore, assumption 3 holds.

## 5 CONCLUSION AND COUNTERMEASURES

Within the background of increasingly strict U.S. export control to China, this article uses the DID model to measure the impact of export controls on trade transfers. The results indicate that U.S. export control promotes China's semiconductor trade with RCEP trading partner countries, and the US FDI in RCEP member countries amplifies the impact of U.S. export control on China's semiconductor trade transfer from RCEP trading partner countries. The research provides a "China story" for relevant research and provides some useful policy suggestions for China to circumvent U.S. export control and achieve the development of China's semiconductor industry.

First, by importing semiconductor products from RCEP countries, Chinese semiconductor enterprises will convert the direct trade inhibition influence of export control into the trade transfer effect of China on RCEP member countries, which will partially weaken the protective influence of the US semiconductor export control on China. Second, China can offset the negative impact of export control on China by magnifying the trade transfer effect of US export control on China by RCEP member countries. Deepening economic and trade relations between China and RCEP is conducive to China taking the initiative in the US semiconductor export control against China[5]. Third, China should pay more attention to the US FDI in RCEP countries, such export platform FDI will make RCEP trading partner countries produce technology spillover, improve the development level of the host country's semiconductor industry, and then export more high-quality semiconductor products to China to solve the current semiconductor product supply difficulties in China.

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