Empirical Analysis of the Influence on the Adjustment of Export Tax Rebate Rates on Product Exports

Yiwen Zhang[1, a] *and Bin Guo[2, b]

[1]School of Economics, Sichuan University, Chengdu City, Sichuan Province, China

[2]China Railway Trust Co., Ltd, Chengdu City, Sichuan Province, China

[a]fabulouseve@qq.com [b]gb@crtrust.com

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Abstract: Taking the adjustment policy of export tax rebate rates on September 5, 2018 as an example, this article studies the influence on the adjustment of export tax rebate rates on the quantity of products exported. The empirical results using Difference-in-Difference prove that the increase in the export tax rebate rates has significantly promoted the increase in year-on-year index of export volume, and the policy effect is obvious. In the robustness test, the results of basic regression are verified by adjusting the time window range and counterfactual analysis.

Introduction

Since the forty years of reform and opening, China's economy has experienced a period of rapid growth and has now entered a period of steady development. The average annual GDP growth has remained above 6%. As one of three carriages driving the economy, the contribution of exports to China's economic growth is very prominent. Fig. 1 shows China's GDP, exports, and export dependence from 1978 to 2018. Since 1986, China's export dependence has reached more than 10%, and it has remained at more than 17% since 1994. Especially in 2006 it was as high as 35.4%. For a long time, China's export dependence has remained at a high level. On the one hand, the expansion of the trade surplus has made China's foreign exchange reserves abundant and basically stable, which is conducive to the creation of more employment opportunities during the period of demographic dividends and enables the full use of China's labor resources. On the other hand, due to the complex and volatile international trade situation, a high degree of export dependence has also caused certain risks to China's economic growth, and higher requirements were put forward for China's trade policy.
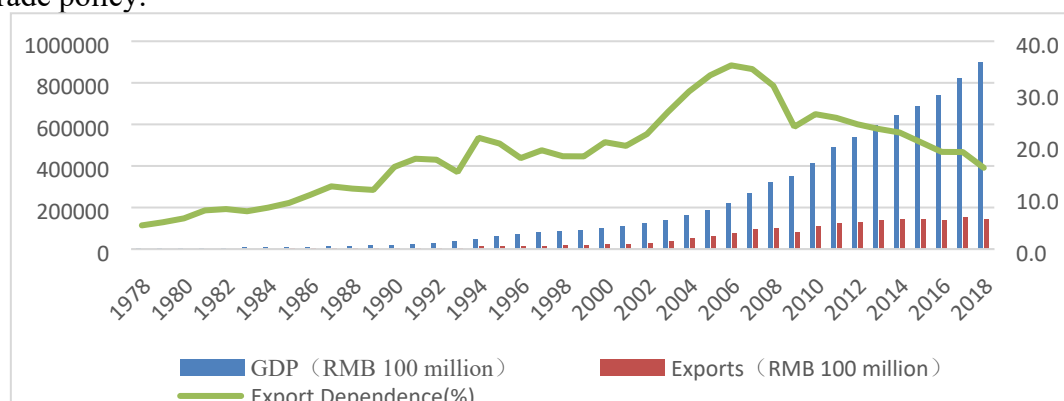

Figure 1. GDP, exports, and export dependence from 1978 to 2018

As an international practice to promote a country's exports, export tax rebates are not only recognized by the World Trade Organization, but also adopted by most countries in the world that implement indirect taxes. On the one hand, as a fiscal policy tool, the export tax rebate policy can achieve the goals of regulating trade and the macro economy through government adjustments. On the other hand, as a trade policy tool, it plays a pivotal role in adjusting the product structure,

optimizing the industrial structure, and rationally allocating resources, mainly through setting different export tax rebate rates.

Literature References

Scholars mainly study the influence on the adjustment of export tax rebate rates on product exports from the following aspects.

Some scholars have studied the impact of export tax rebate adjustments on export volume. Domestic and foreign literatures often use the total export volume or export growth rates as the measure of export volume. Most literature believes that the adjustment of export tax rebate rates is positively correlated with export volume[1,2,3,4,5,6,7,8]. However, some scholars believe that the influence on the adjustment of the export tax rebate rates on product exports only affects some industries[9,10,11].

Some scholars have studied the impact of export tax rebate adjustments on the structure of export products. Most literatures believe that the adjustment of export tax rebate rates has different effects on different products exported, which is conducive to optimizing the structure of export products[12,13]. However, some scholars believe that the adjustment of the export tax rebate rate has little effect on optimizing the structure of export products as well as promoting the transformation and upgrading of foreign trade[14].

In addition, scholars have also studied the effects of export tax rebate on the prices of export products[15], the re-allocation of resources[16], the quality of export products[17], the cost premium of enterprises[18], the productivity of export enterprises and industries[19], the competitiveness of export products[20] and the soundness of export tax rebate policies[21].

Policy background

In theory, the export tax rebates should follow the principle of zero tax rate to avoid reducing the international competitiveness of export products due to repeated taxation. But from a practical point of view, on the one hand, export tax rebates often bring greater financial pressure on the government. On the other hand, the government needs to guide the adjustment of export product types and the upgrading of industrial structure. Therefore, in practice, the export tax rebate rates are often lower than the tax rates, and they are adjusted frequently according to the needs of government macro-control, which reflects the characteristics of the combination of zero tax rate principle and national macro-control.

China's export tax rebate system was formally established in 1985, and the reform of the export tax rebate mechanism began at the end of 2003. According to the taxation policy documents of the State Administration of Taxation, since the reform of the export tax rebate mechanism, China has carried out no fewer than 28 adjustments to the export tax rebate rates. In the years after the start of the reform, although the adjustment of China's export tax rebate rates was mainly concentrated on cancellation and reduction, the export tax rebate rates for some encouraged and supported products are still being raised. After the international financial crisis in 2008, China 's export tax rebate rate has undergone relatively intensive adjustments, almost all of which are increasing, in response to the international financial crisis's interference in export trade. After that, the frequency of adjustment was reduced, mainly focusing on cancellation and improvement. The last adjustment was to matches the reduced VAT rates on March 20, 2019, according to the principle that the export tax rebate rates must not exceed the tax rates.

Research Design

On September 5, 2018, the Ministry of Finance and the State Administration of Taxation jointly issued the "Notice on Increasing the Export Tax Rebate Rates for Mechanical and Electrical Products and Cultural Products". Since this adjustment involves only some products, it provides a natural experimental opportunity for the DID analysis of the impact of export tax rebate rate

adjustments on product exports. As can be seen from Table 1, there are 397 products involved in this adjustment, with an average increase of 3.531 and a maximum increase of 13.

Table 1. Adjustment of export tax rebate rates on September 15, 2018

	Number of samples	average value	Standard deviation	Minimum value	Maximum value
Before improving	397	8.882	4.966	0	15
After improving	397	12.413	3.243	9	16
Increase	397	3.531	2.638	1	13

Note: According to the CMCODE2018C version of the export tax rebate rate library

Model Construction. This paper uses DID to identify the influence on the adjustment of export tax rebate rates on the quantity of products exported. The basic regression equation is constructed as follows:

$$Y_{it} = \beta_0 + \beta_1 G_i + \beta_2 T_t + \beta_3 (G_i \times T_t) + \beta_4 X_{it} + \varepsilon_{it} \qquad （1）$$

In the formula, i is the product type and t is the time. The explained variable Y_{it} represents the export quantity of product i at time t, and the explanatory variables G_i and T_t are dummy variables for product grouping and time grouping, respectively. X_{it} is the other control variable. ε_{it} is the residual term.

From the regression Eq. 1, it can be concluded that the net effect of the change in the number of exports due to the increase in the export tax rebate rates of the treatment group can be expressed as β_3, which is the coefficient most concerned in this paper. Intuitively, it can be assumed that if the increase in export tax rebates encourages exports, the β_3 value should be significantly positive.

Data sources. This article uses the year-on-year index of export volume to reflect changes in the export quantity of products, and uses the year-on-year index of export volume of 4-digit HS classified export products from September 2017 to September 2019 published by China Customs as the explained variable Y_{it}.Because the outliers in individual months have an impact on the results, so we remove the highest and lowest 5% outliers.

According to the "Product List for Increasing the Export Tax Rebate Rates" given in the annex to the Notice above, the export tax rebate rates for a total of 158 headings of products were increased. They are defined as treatment groups, with a G_i value of 1. The remaining 1070 headings of products are defined as the control group, and the G_i value is taken as 0.

The policy implementation date is September 15, 2018, and the time period studied in this article is 12 months before and after the adjustment policy. Therefore, before the export tax rebate rates increase, that is, from September 2017 to August 2018, the time grouping variable T_t value is 0; after the export tax rebate rates increased, that is, from September 2018 to September 2019, the time grouping variable T_t value was taken to be 1.

This paper uses year, month and category fixed effects as other control variables to control the impact of international market demand changes, seasonal demand changes, and product category differences on the number of product exports.

The effectiveness of DID is closely related to the similarity of the change trend of the treatment group and the control group before the policy shock. Fig. 2 reflects the changes in the average year-on-year export volume of the treatment group and control group from September 2017 to September 2019.It can be seen that, the changes in the two groups were similar before September 2018,and the treatment group was significantly higher than the control group after September 2018.This shows that the treatment group is likely to be affected by the increase in export tax rebate

rates. This provides a reliable basis for using DID to identify the impact of the increased export tax rebate rates on the export volume .
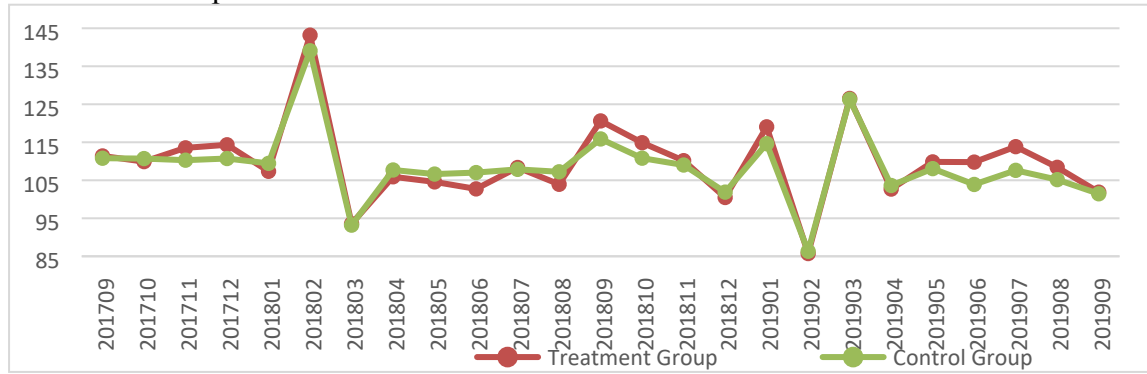

Figure 2. Changes in the average year-on-year export volume from Sept. 2017 to Sept. 2019

Empirical results and robustness tests

Analysis of Basic Regression Results. Table 2 shows the empirical results of basic regression. This article focuses on the regression coefficient β_3 of the cross term $G_i \times T_t$ .Regression (1) did not control other variables, and regressions (2), (3), and (4) increased the control over year, month and category fixed effects, respectively. It can be seen from the regression results that β_3 is a significantly positive value at a significance level of 5%.This result is consistent with the previous assumptions of this article, and is also the same as most existing research results, indicating that an increase in the export tax rebate rates will significantly increase the product export volume index.

Table 2. Basic regression results

Independent variable	Dependent variable Y_{it}			
	（1）	（2）	（3）	（4）
G_i	-0.2090（0.7620）	-0.2034（0.7614）	-0.2562（0.7578）	-1.1954（0.8381）
T_t	-2.3130***（0.4023）	0.23624（0.5886）	9.8126***（1.3848）	9.7821***（1.2378）
$G_i \times T_t$	2.4239**（1.0491）	2.4342**（1.0484）	2.4803**（1.0434）	2.6061**（1.0361）
Constant term	109.8006***（0.2926）	110.9061***（0.4819）	124.3911***（1.3452）	122.7726***（3.1447）
Year fixed effect	no	yes	yes	yes
Month fixed effect	no	no	yes	yes
Category fixed effect	no	no	no	yes
Number of samples	23769	23769	23769	23769
R²	0.0016	0.0030	0.0131	0.0314
Adjustment R²	0.0014	0.0028	0.0124	0.0268
F value	12.42	14.51	19.67	6.90
	0.0000	0.0000	0.0000	0.0000

Note: ***, **, * are significance levels of 1%, 5%, and 10% respectively; standard errors are in parentheses. And the following tables are the same.

Robustness test Ⅰ - adjusting the time window range. In the basic regression results, we used data 12 months before and after the policy to analyze. But in fact, the response of each product to

the policy may have varying degrees of time lag, and may have different responses at different time. Therefore, we will adjust the time window range and observe the results of setting the window range to 1 month, 3 months, 6 months, 9 months and 11 months.

Table 3. Regression Results for Adjusting the Time Window Range

Independent variable	Dependent variable Y_{it}				
	1 month	3 month	6 month	9 month	11 month
G_i	-6.5695**	-4.6543***	-3.3670***	-2.0840*	-1.5544*
	（2.6069）	（1.5161）	（.0873）	（0.9748）	（0.8783）
T_t	3.5596***	4.3642***	18.9759***	-6.2709***	-3.0094***
	（1.2842）	（1.2196）	（1.7071）	（0.7339）	（0.4704）
$G_i \times T_t$	7.8096***	4.5817**	3.6673***	2.6667**	2.8044**
	（2.9568）	（1.8190）	（1.3370）	（1.2065）	（1.0857）
Constant term	108.6914	108.0118***	83.2418***	116.4911***	112.3775***
	（7.3294）	（4.6361）	（3.8782）	（3.3671）	（3.0429）
Year fixed effect	yes	yes	yes	yes	yes
Month fixed effect	yes	yes	yes	yes	yes
Category fixed effect	yes	yes	yes	yes	yes
Number of samples	2887	6664	12334	18013	21819
R²	0.0819	0.0642	0.1434	0.0333	0.0312
Adjustment R²	0.0492	0.0495	0.1357	0.0274	0.0262
F value	2.51	4.37	18.77	5.61	6.35
	0.0000	0.0000	0.0000	0.0000	0.0000

It can be seen from the regression results in Table 3 that β_3 is a significantly positive value at least at a significance level of 5%, which proves that the results of the basic regression are robust.

Robustness Test Ⅱ - Counterfactual Analysis. This article sets the time of two counterfactual analyses as June 2018 before adjustment and March 2019 after adjustment. Limited by the availability of data, we set the time window range from 1 month to 6 months before and after.

From the regression results in Table 4, it can be seen that the β_3 of 1 month, 3 months, and 6 months before and after June 2018 and March 2019 are not significant, indicating that the virtual policy adjustment will not affect the year-on-year index of export volume. These results further prove the robustness of the results of the basic regression analysis above.[1]

Table 4. Regression results of counterfactual analysis

Independent variable	Dependent variable Y_{it}					
	June 2018			March 2019		
	1 month	3 months	6 months	1 month	3 months	6 months
G_i	-2.4626	-2.1659	-1.1668	-1.1234	-0.4009	0.7991
	（2.4174）	（1.4888）	（1.1225）	（2.7896）	（1.5286）	（1.0885）
T_t	0.1450	13.0780***	-9.667***	40.1609***	-10.5132***	-18.9339***
	（1.1940）	（1.2174）	（1.2596）	（1.3652）	（1.2170）	（1.6823）
$G_i \times T_t$	0.1352	0.6823	-0.0030	-0.04724	0.5596	0.1708
	（2.7506）	（1.7903）	（1.3817）	（3.1380）	（1.8274）	（1.3271）

[1] In the counterfactual analysis of this article, the results from 1 month to 6 months before and after are respectively verified, and all β_3 are not significant. Due to space limitations, not all regression results are reported here.

Constant term	113.447***	96.5915***	109.733***	77.1032***	97.7664***	106.3398***
	（6.6350）	（4.7523）	（3.7024）	（8.6910）	（5.0837）	（3.7914）
Year fixed effect	yes	yes	yes	yes	yes	yes
Month fixed effect	yes	yes	yes	yes	yes	yes
Category fixed effect	yes	yes	yes	yes	yes	yes
Number of samples	2876	6681	12253	2825	6697	12567
R^2	0.0813	0.1053	0.1363	0.2970	0.1852	0.1283
Adjustment R^2	0.0486	0.0912	0.1285	0.2715	0.1725	0.1206
F value	2.48	7.51	17.58	11.63	14.55	16.81
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conclusions

This article takes the policy on September 5, 2018 of increasing the export tax rebate rates of mechanical and electrical products and cultural products as an example to study the impact of the adjustment of export tax rebate rates on the number of product exports, using product export data from September 2017 to September 2019.The empirical results using DID prove that the increase in export tax rebate rates has significantly promoted the increase in the year-on-year index of export volume, and the policy effect is obvious. The robustness of the results above was tested by adjusting the time window range and counterfactual analysis.

Because this article uses data from September 2017 to September 2019 to study the policy in September 2018, the research has certain advantages in timeliness. However, there are still many aspects that can be further explored, such as whether the adjustment of the export tax rebate rates has an impact on upstream and downstream related products, whether the adjustment has different degrees of impact on different types of products, whether the adjustment of different magnitudes has different degrees of impact on products. If we can continue to explore the issues above, we can further improve the research on the impact of export tax rebate adjustments on product exports.

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