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Investigating the effectiveness of protectionism on the US economy in the context of US-China trade wars

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Abstract

This study investigates the effectiveness of protectionist measures on the US economy, with a specific focus on the US-China trade war and its impact on the US metal industry. The research examines the relationship between the US metal industry's tariff and various economic indicators. The findings reveal that while tariffs aimed to protect domestic industries and reduce the trade deficit, their overall impact was limited. The results indicate that tariffs did not significantly decrease the trade deficit. However, it did show a statistically significant short-run boost in the US metal industry. Overall, the findings suggest that other factors may be more influential in determining these economic outcomes and highlight the limited effectiveness of tariffs.

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1 Introduction

The global economy is a complex and interconnected system, where actions of major economic powers can have far-reaching consequences. In recent years, one of the most significant events to shake this system was the US-China trade war, a conflict marked by a series of escalating tariffs and retaliatory measures between the two world's largest economies. The trade dispute began in 2018, when the two world's largest economies, China and the United States engaged in a tit-for-tat exchange of import tariffs, which escalated into the US-China trade war. This trade dispute was characterized by rounds of escalating tariffs that spread across global markets and raised concerns about the stability of international trade relations. In 2023, the US levied tariffs on Chinese imports worth approximately $350 billion, and China retaliated by imposing tariffs on an additional $100 billion worth of imports, which is a total of roughly $450 billion in bilateral trade. (Fajgelbaum et al., 2023) The topic of protectionism, especially within the context of the US-China trade wars, holds significance importance to policymakers, businesses, and the global economy. Protectionist measures, such as tariffs, can disrupt trading relationships and influence market dynamics. It is crucial to understand the drivers and consequences of trade protectionism to foster economic growth and mitigate potential risks of trade conflicts.

The trade conflict initially started when the US, under the Trump administration, initiated a series of tariffs on Chinese imports. The primary goal of these protectionist measures was to reduce the substantial trade deficit of the United States with China, which has persisted for a long time. The US sought to make these imports goods more expensive, thereby reducing the Chinese competitiveness in the US market. By doing so, they expected to boost domestic production by making American-made products more attractive to consumers. Moreover, the second objective was to strengthen key domestic industries, particularly manufacturing. The Trump administration argued that years of offshoring and reliance on cheap Chinese imports had hollowed out America's industrial base, leading to job losses and economic stagnation in many regions. By protecting domestic industries through tariffs, the Trump administration aimed to bring back

manufacturing jobs to the US, stimulate industrial output and enhance the country's economic growth. A significant focus of these tariffs was on the metal industry. In March 2018, the US imposed tariffs of 25% on steel and 10% on aluminum imports, specifically targeting these sectors to protect domestic producers from what was perceived as unfair competition due to China's overproduction and dumping of these metals in global markets. These high tariffs were intended to protect the US metal industry and were a central part of the protectionist strategy. (Bown & Kolb, 2021)

The effectiveness of the protectionist measures has been the subject of extensive research. Studies by Fajgelbaum et al. (2023) have examined the overall economic impact of the tariffs. Their findings suggest that while some domestic industries experienced a temporary boost, the broader economic effects were mixed, with significant costs to consumers. Despite these efforts, the question remains: Did the protectionist measures achieve their goals? To what extent have they worked? Some research indicates that while there were short-term gains in certain sectors, the overall impact on reducing the trade deficit and strengthening domestic industries was less noticeable than anticipated. Besides, the tariffs led to higher costs for consumers and retaliatory measures from China, which further complicated the economic state. (Fajgelbaum et al., 2021; Bown & Kolb, 2021; Morgan et al., 2022) This leads to the following research question:

"To what extent have protectionist policies, implemented during the trade war between China and the US impacted the US metal industry and what are the side effects for the US economy?" To address this research question, multiple hypotheses are formulated.

The first hypothesis is based on the standard international trade theories. By making Chinese metals more expensive through tariffs, domestic consumers and businesses are more likely to purchase US-produced metals. The increased demand for local products is expected to boost domestic production. Therefore, the first hypothesis is as follows:

The imposition of tariffs on the Chinese imports has led to an increase in the short-run output of the US metal industry.

The second hypothesis builds on the premise of protectionist measures affecting trade balances. By imposing tariffs on Chinese imports, the aim is to reduce the competitive advantage of imported goods, thus potentially decreasing the imports of

Chinese goods. The higher costs associated with Chinese imports due to tariffs should theoretically reduce the volume of imports from China. Therefore, the second hypothesis is as follows:

The protectionist measures have contributed to a reduction in the US trade deficit with China.

Following the introduction, this paper will provide a literature review regarding this subject of protectionism during the US-China trade war. The collected data and its sources will be evaluated in the data section. How the retrieved data will be used to build the analyses for the research question will be explained in the methodology section. The final results will be presented and analyzed in the results section, and this will be followed with a discussion regarding the research. At last, a summary of the research will be given in the conclusion.

2 Literature review

2.1 What led to the trade wars?

One driver for the US-China trade war is the large trade imbalance between the US and China. The US trade deficit has grown significantly since China joined the World Trade Organization (WTO) in 2001. (Siripurapu, 2024) This led to a deficit of approximately $418.2 billion in 2018, meaning that the US imports far more from China than it exports to it. (U.S. Census Bureau) The Trump administration cited the large trade imbalance as evidence of unfair Chinese trade practices like subsidies to domestic industries, intellectual property theft and forced technology transfers, where foreign companies are required to share their technology with Chinese partners as a condition for market access. The Trump administration's stance was that these unfair practices led to a loss of manufacturing jobs in the US, as companies relocated their production processes to China to take advantage of the lower costs. With the imposed tariffs on Chinese goods, US hopes to reduce the competitiveness of Chinese firms and bring back manufacturing jobs to the US. (Denmark & Hass, 2020)

The US imposed tariffs on a wide range of Chinese products, strategically targeting sectors critical to China's economic growth and technological advancement. In March 2018, the US imposed tariffs of 25% on steel and 10% on aluminum imports. The aim of these measures taken by the US was to protect the domestic industries from what they considered unfair competition due to China's overproduction and dumping of these metals in global markets. (Bown & Kolb, 2021) The US believed that the oversupply of these metals threatened the domestic steel and aluminum producers and therefore hurt the US economy. As the conflict escalated, the US expanded the tariffs to various goods, including goods from electronics sector, industrial machinery and equipment sectors, and automotive industry. The aim was to make the Chinese imports more expensive. Therefore, the higher prices would weaken the market position of the Chinese manufacturers and diminish their competitive edge in these heavy industries. In addition to industrial goods, the US also took protectionist measures on high-tech products and

telecommunications equipment. This was considered a strategy to hinder China's technological advancements and to maintain the US's technological superiority.

China responded to the US tariffs with its own set of retaliatory measures, targeting the main American exports. One of the first industries that felt the impact was the agricultural sector, a cornerstone of the US economy. China has set tariffs of 25% on American agricultural products such as soybeans, corn, and pork, which has hit the US farmers hard. These farmers relied on the Chinese market for their exports, but it went all downhill when China began seeking alternative suppliers from countries like Argentina and Brazil. (Klabunde, 2019) The loss of the major Chinese market dealt a severe blow to American farmers and estimates suggest the retaliatory tariffs caused annual losses ranging from $13.5 billion to $18.7 billion for the US agricultural sector. (Morgan S., et al, 2022)

The agricultural sector in the US was particularly hard-hit by the tariffs imposed by China during the trade war. Import tariffs on soybeans and other agricultural products have led to a significant decrease in exports to China, causing financial difficulties for the American farmers. This has led the US government to introduce subsidies to support the affected farmers. While it did provide temporary relief for the agricultural sector, it did not fully compensate for the lost market access.

2.2 Economic effects

The trade conflict between two countries has various economic impacts, affecting different industries in both countries. It has led to a substantial reduction in trade between the US and China. Both countries have imposed tariffs on hundreds of billions worth of goods. This significantly decreased the trade volumes and values, with China's exports to the US dropping over 50% and imports from the US dropping by almost 50%. (Fajgelbaum & Khandelwal, 2021)

Research indicates that the imposition of tariffs did not only decrease the bilateral trade between the two countries, but it also impacted the global trade, shifting the trade networks. Many multinational corporations began relocating their manufacturing operations out of China to other countries, such as Vietnam, India, and Mexico due to the higher costs in China. This shift helped some countries benefit from increased foreign

direct investment and job creation, but it also resulted in higher exports to the US. For example, during the trade war, the overall global trade increased by 3% as bystander countries stepped in to fill the gaps left by the reduced US-China trade. (Fajgelbaum et al., 2021) Countries with strong trade agreements as well as significant foreign direct investment saw the most benefit from this shift. Export growth was notably higher in these nations as they took advantage of the new opportunities created by the protectionist measures. Similarly, China increased its imports from other countries to replace goods previously sourced from the US, further shifting the global trade networks. (IMF, 2019)

The trade war has contributed to a slowdown in economic growth in China. The imposed tariffs by the US reduced the competitiveness of Chinese exports, which led to a decreased demand as well as production. Key industries as electronics, manufacturing, and machinery were significantly impacted by the protectionist measures of the US. In addition, the uncertainty surrounding the trade war led to a decrease in business investment and consumer confidence within China. Therefore, this conflict has accelerated China's efforts to diversify its trade partners and reduce its reliance on the US market. To mitigate the impact of US tariffs, China sought to strengthen trade relationships with other countries, particularly within Asia and Europe. This strategic adjustment did help to cushion some of the economic blows from the trade war but did not fully offset the losses.

The initial goal of the US was to protect their key domestic industries through the imposition of tariffs on imports. As earlier mentioned, these industries included steel, aluminum, and electronics such as washing machines. The imposition of 25% tariffs on steel and 10% tariffs on aluminum were aimed to protect US metal producers from cheap imports from China. These tariffs led to an increase in domestic prices for steel and aluminum, which was beneficial for the US producers as it improved their revenue and market share. The higher prices for steel and aluminum raised costs for downstream industries, leading to higher production costs for industries such as machinery manufacturing, and automotive. These higher costs were often passed on to the

consumers in the final goods' prices, contributing to inflationary pressure within the economy. (Fajgelbaum et al., 2021)

Additionally, tariffs on electronics, including washing machines, also led to higher prices for consumers. Importing washing machines and their components became more expensive, resulting in higher retail prices and lower consumer purchasing power. US manufacturers initially saw a boost in production and sales due to the more expensive import prices. The domestic producers did regain some market share, but they did face higher costs for imported components and raw materials, including steel and aluminum, which were also subject to tariffs.

While the intention was to safeguard these sectors from the Chinese competition, the effects of protectionist policies were complex. This study will investigate the effectiveness of protectionism further, focusing on the metal industry of the US.

3 Data & Methodology

For this research data will be gathered from multiple sources to provide an analysis of the impact of protectionist measures during the US-China trade war, with a focus on the US metal industry. The gross output for the metal sector will be collected from the US Bureau of Economic Analysis. This dataset will provide detailed information on the economic performance of the metal industry within the US, allowing us to assess the impact of tariffs on industry-specific output. The data will cover the years 2015-2022. Data on the US trade balance with China will be collected from the US Census Bureau. This dataset contains yearly information on the total exports from the US to China and total imports from China to the US, with all figures in millions of USD on a nominal basis. To enhance consistency and comparability, the trade data will be indexed to 2015 as base year. Exchange rate data, specifically the nominal exchange rates (NER) from Chinese Yuan to USD, will be sourced from the Federal Reserve Economic Data (FRED). To control for currency fluctuations on trade flows, we will compute the Real Exchange Rate (RER) from 2015 to 2022. The formula is as follows:

$$RER = NER * \frac{CPI_{US}}{CPI_{CN}}$$

where CPI denotes the consumer price index. Additional data regarding the CPI will be sourced from The World Bank.

The primary objective for this research is to evaluate and analyze the effectiveness of protectionist measures implemented by the US during the US-China trade war. To achieve this, multiple Ordinary Least Squares (OLS) regressions will be performed. For the independent variables, we will take the growth rate of the variable we want to test. By using the growth rates of each variable, we ensure stationarity, which is crucial for reliable regression results. Each regression will consist of three models. The first model will test the relationship between the main variables, while the second model will control for additional variables. Unlike the first two models, the last model will use the growth rate of the dependent variable over two years instead of one, to account for delayed effects.

Regression analysis is used to maintain the research's clarity while providing a clear answer regarding the effects of the variables, controlling for variables that could also impact the dependent variable.

The first regression will examine the relationship between the growth rate of the trade deficit and the first difference of the tariff rate, controlled for growth rates of the RER and inflation rate. This regression analyzes the impact of tariffs on the trade deficit. These variables were chosen as control variables, since both the exchange rate and purchasing power could influence the level of imports and exports.

The second regression will explore the relationship between the growth rate of the output of the US metal industry and the first difference of the tariff rate, controlled for inflation and growth rate of the RER. Here we test the relationship between the tariff rate and the industry's output.

The third regression analyzes how the tariff rate affects the growth rate of imports, controlling for the growth rate of the RER and inflation. This regression tests the relationship between the tariff rate and the changes in imports.

The final regression investigates the impact of changes in tariff rate on the growth rate of the US exports, also controlling for the growth rate of the RER and inflation. This regression tests the relationship between the tariff rate and the fluctuations in exports.

It is important to note that other variables, not included in the analysis, could potentially influence the dependent variables. The findings from the performed analyses can contribute valuable insights and add on to the existing literature. It could offer researchers a better understanding of the effectiveness of tariffs. However, since the research is exploratory, it comes with limitations such as endogeneity issues and external factors influencing the outcomes. Additionally, the study focuses on a specific period and may not capture the long-term effects of protectionist measures. This should be taken into consideration when addressing the internal and external validity.

4 Results

In this section the relationship between tariff rate of the US metal industry and various economic outcomes, including the trade deficit, output of the metal industry, imports and exports will be discussed. Firstly, an overview of the trade balance between US & China will be shown from the year 2015 to 2022.

4.1 Trade overview

Table 1 illustrates the trade balance between United States and China from 2015 to 2022. It presents the total exports to China, total imports from China and the total deficit for each year. The numbers are in millions of USD and have been deflated with 2015 as base year.

Table 1: Trade Balance US & China

Year	Total Export	Total Import	Total Deficit
2015	115873,4	483201,7	-367328,3
2016	114149,9	456639,8	-342489,9
2017	125701,1	488470,5	-362769,5
2018	113527,1	508275,1	-394747,9
2019	98693,9	416266,1	-317572,1
2020	114087,4	396112,3	-282052,4
2021	132433,1	441026,6	-308584,8
2022	124704,0	434249,3	-309545,3

Note: This table contains the total exports from the US to China and the total US import from China. All numbers are in millions of USD and have been deflated to 2015 as base year.

Throughout this period, the US consistently had a trade deficit with imports significantly exceeding exports. The trade deficit peaked in 2018 at -$394,7 billion, the same year the US started the trade war by implementing import tariffs. Notably, the deficit declined in the years following 2018, after the implementation of protectionist measures. However, this decline cannot be directly linked to the tariffs alone and may have been influenced by other factors besides the tariffs.

4.2 OLS Regressions Results

To test the relationship between the tariff rate and trade deficit, multiple OLS regression analyses will be performed:

4.2.1 Relationship Tariff Rate and Trade Deficit

The first regression is between the change in tariff rate and the change in trade deficit and the second regression will control for variables RER and inflation. The models are used to see whether there is any correlation between the main variables. The results are shown in table 2. Model 1 contains no control variables, while model 2 and 3 includes the control variables. The growth rates used in the models are calculated as follows:

For the first two models:

$$Growth\ rate\ deficit_t: \frac{d_t - d_{t-1}}{d_{t-1}}$$

For the third model:

$$Two\ years\ growth\ rate\ deficit_t: \frac{d_{t+1} - d_{t-1}}{d_{t-1}}$$

The regression models are formulated as:

1. $Growth\ rate\ deficit_t = \beta 0 + \beta 1 * \triangle Tariff_t + \mu_t$
2. $Growth\ rate\ deficit_t = \beta 0 + \beta 1 * \triangle Tariff_t + \beta 2 * Growth\ rate\ RER_t + \beta 3 * Inflation_t + \mu_t$
3. $Two\ years\ growth\ rate\ deficit_t = \beta 0 + \beta 1 * \triangle Tariff_t + \beta 2 * Growth\ rate\ RER_t + \beta 3 * Inflation_t + \mu_t$

The results are shown in table 2. In all three models, all coefficients for the tariffs are statistically insignificant. This indicates no significant relationship between the tariff rate and trade deficit. In model 2, additional control variables like growth rate of the RER and inflation were included. Model 3 used the growth rate of the trade deficit over two years. In this model, we only find a positive relationship between the growth rate of the RER and the growth rate of the trade deficit on the 10% level. The first difference in tariff rate remains insignificant. This suggests that changes in the metal industry's tariff alone did not significantly impact the trade deficit with China during this period.

Table 2: Regression between the growth rates in trade deficit and metal industry's tariff rate, controlled for growth rate of RER and inflation rate

	Coefficient (std. error) **(1)**	Coefficient (std. error) **(2)**	Coefficient (std. error) **(3)**
First difference in tariff rate	0.005 (0.005)	0.007 (0.006)	0.003 (0.007)
Growth rate RER		0.108 (0.064)	0.193* (0.087)
Inflation		0.011 (0.014)	-0.022 (0.019)
Constant	-0.022	-0.076	-0.029

**p<0.1, **p<0.05, ***p<0.01. standard error between parentheses*

4.2.2 Relationship Between Tariff Rate and Metal industry Output

Next, we test the relationship between the tariff rate and the US metal industry's output. We compute the first regression between the first difference of the tariff rate and the change in output. The second regression will control for variables the change in RER and Inflation. The results are shown in table 3. Model 1 contains no control variables, while model 2 and 3 includes the control variables.

The growth rates used in the models are calculated as follows:

For the first two models:

$$Growth\ rate\ output_t: \frac{Y_t - Y_{t-1}}{Y_{t-1}}$$

For the third model:

$$Two\ years\ growth\ rate\ output_t: \frac{Y_{t+1} - Y_{t-1}}{Y_{t-1}}$$

The regression models are formulated as:

1. $Growth\ rate\ output_t = \beta 0 + \beta 1 * \triangle\ Tariff_t + \mu_t$
2. $Growth\ rate\ output_t = \beta 0 + \beta 1 * \triangle\ Tariff_t + \beta 2 * Growth\ rate\ RER_t + \beta 3 * Inflation_t + \mu_t$

3. $Two\ years\ growth\ rate\ output_t = \beta 0 + \beta 1 * \triangle\ Tariff_t + \beta 2 * Growth\ rate\ RER_t + \beta 3 * Inflation_t + \mu_t$

In model 1, without any control variables, there is a positive but statistically insignificant relationship between the first difference of the tariff rate and the growth rate of output in the metal industry. In model 2, which includes control variables, the coefficient for the first difference in tariff rate is 0.009 and is significant at the 10% level. This suggests a positive relationship between the tariff rate and the growth rate of the output, when controlling for these additional variables. For the change in RER, the coefficient is 0.216 and is significant at the 5% level. The coefficient for inflation is 0.047 and is also significant at the 5% level. This indicates that in this model, the variables are positively correlated with the growth rate of the output. However, this does not imply that the variables have a causal effect on the output, as reverse causality could be present. In model 3, which uses the growth rate over two periods for the output, both the coefficients of first difference in tariff rate and change in RER are insignificant. However, the coefficient for inflation is positive and significant at the 5% level, reinforcing the earlier finding that inflation is positively associated with the growth rate of output.

Table 3: Regression between the growth rates of total output of the metal industry and tariff rate, controlled for growth rate of RER and inflation rate

	Coefficient (std. error) **(1)**	Coefficient (std. error) **(2)**	Coefficient (std. error) **(3)**
First difference in tariff rate	0.004	0.009*	0.006
	(0.009)	(0.011)	(0.007)
Growth rate RER		0.216**	0.374**
		(0.051)	(0.093)
Inflation		0.047**	0.041
		(0.011)	(0.021)
Constant	0.048	-0.152	-0.075

**p<0.1, **p<0.05, ***p<0.01. standard error between parentheses*

4.2.3 Relationship Between Tariff Rate and US Imports & Exports

In this section, we explore the relationship between the tariff rate and US imports, followed by an analysis of US exports. Both analyses will control for changes in the RER and inflation. The third analysis aims to explore the relationship between the tariff rate and US imports.

The growth rates used in the models are calculated as follows:

For the first two models:

$$Growth\ rate\ imports_t: \frac{M_t - M_{t-1}}{M_{t-1}}$$

For the third model:

$$Two\ years\ growth\ rate\ imports_t: \frac{M_{t+1} - M_{t-1}}{M_{t-1}}$$

The regression models are formulated as:

1. $Growth\ rate\ imports_t = \beta 0 + \beta 1 * \triangle Tariff_t + \mu_t$
2. $Growth\ rate\ imports_t = \beta 0 + \beta 1 * \triangle Tariff_t + \beta 2 * Growth\ rate\ RER_t + \beta 3 * Inflation_t + \mu_t$
3. $Two\ years\ growth\ rate\ imports_t = \beta 0 + \beta 1 * \triangle Tariff_t + \beta 2 * Growth\ rate\ RER_t + \beta 3 * Inflation_t + \mu_t$

In model 1, which does not include any control variables, the coefficient for the first difference in the tariff rate is positive but statistically insignificant. In model 2, which includes the control variables, both the coefficients of the first difference in tariff rate and inflation are statistically insignificant. However, we do observe a positive and statistically significant relationship between the change in RER and growth rate of the US imports at 10% level in this model. For the last model, the given results are all statistically insignificant. There is a possibility that the tariff rate is not directly correlated with imports.

Table 4: Regression between the growth rates of total US imports and the metal industry's tariff rate, controlled for growth rate of RER and Inflation rate

	Coefficient (std. error) **(1)**	Coefficient (std. error) **(2)**	Coefficient (std. error) **(3)**
First difference in tariff rate	0.002 (0.005)	0.005 (0.003)	-0.002 (0.005)
Growth rate RER		0.117* (0.049)	0.159* (0.073)
Inflation		0.009 (0.011)	-0.021 (0.016)
Constant	-0.012	-0.061	-0.091

**p<0.1, **p<0.05, ***p<0.01. standard error between parentheses*

After testing for imports, we analyze the relationship between the first difference of the tariff rate and the growth rate of US exports. Results are shown in table 5.
The growth rates used in the models are calculated as follows:

For the first two models:

$$Growth\ rate\ exports_t: \frac{X_t - X_{t-1}}{X_{t-1}}$$

For the third model:

$$Two\ years\ growth\ rate\ exports_t: \frac{X_{t+1} - X_{t-1}}{X_{t-1}}$$

The regression models are formulated as:

1. $Growth\ rate\ exports_t = \beta 0 + \beta 1 * \triangle Tariff_t + \mu_t$
2. $Growth\ rate\ exports_t = \beta 0 + \beta 1 * \triangle Tariff_t + \beta 2 * Growth\ rate\ RER_t + \beta 3 * Inflation_t + \mu_t$
3. $Two\ years\ growth\ rate\ exports_t = \beta 0 + \beta 1 * \triangle Tariff_t + \beta 2 * Growth\ rate\ RER_t + \beta 3 * Inflation_t + \mu_t$

In model 1 without control variables, the coefficient of the first difference in tariff rate is statistically insignificant. This is also the case in model 2 and 3, after controlling for additional variables while also testing for the growth rate of the US exports over two years. Results indicate that changes in the tariff rate for the metal industry do not significantly influence the growth rate of the total US exports, as well as imports.

Table 5: Regression between the growth rates of total US exports and the metal industry's tariff rate, controlled for growth rate of RER and Inflation rate

	Coefficient (std. error) **(1)**	Coefficient (std. error) **(2)**	Coefficient (std. error) **(3)**
First difference in tariff rate	-0.005 (0.005)	-0.002 (0.005)	-0.011 (0.008)
Growth rate RER		0.131 (0.069)	0.061 (0.112)
Inflation		0.002 (0.015)	-0.021 (0.025)
Constant	0.022	-0.009	-0.091

**p<0.1, **p<0.05, ***p<0.01. standard error between parentheses*

4.2.4 Relationship Between Trade Deficit and Metal Industry Output

In addition to examining the impact of tariffs on the output of the metal industry, we conducted a regression analysis to explore the relationship between the growth rates of the US trade deficit and the output of the US metal industry. This regression model is specified as follows:

$$Growth\ rate\ trade\ deficit_t\ = \beta 0 + \beta 1 * Growth\ rate\ output_t\ +\ \mu_t$$

The results are shown in table 6. This model examines how changes in the output of the US metal industry influence the growth rates in the trade deficit. The results indicate a statistically significant positive relationship between the change in the total output of the US metal industry and the growth rates in the trade deficit. The coefficient of 0.437 is significant at the 0.05 level, indicating a positive relationship between the two variables. Specifically, an increase in the output of the metal industry with 100%, results in an increase of 43,7% in trade deficit. However, we cannot draw any conclusions about the causality, as it is possible that other economic factors that influence the outcome are left out and reverse causality could be present. This relationship is an intriguing finding, as it suggests that as the metal industry increases its output, the trade deficit also grows.

Table 6: Regression between the growth rates in trade deficit and the output of the US metal industry

	Coefficient (std. error) **(1)**
Growth rate total output of US	0.437**
metal industry	(0.161)
Constant	-0.034

**p<0.1, **p<0.05, ***p<0.01. standard error between parentheses*

5 Discussion

It is important to evaluate the internal validity and the external validity of this study, before discussing the results. Internal validity examines whether the research design answers the research question without bias. The study employed OLS regression analyses to evaluate the impact of US metal industry's tariffs on various economic indicators and data were sourced from credible institutions such as the US Bureau of Economic Analysis, the US Census Bureau and FRED. However, potential endogeneity issues could threaten the internal validity, since these tariffs might correlate with other economic factors not accounted for in the models. Control variables were included to mitigate the bias. Despite this, coefficients for these variables were often insignificant, which suggests that other unobserved variables might influence the dependent variables. Moreover, many relationships in the results were statistically insignificant, implying that the metal industry's tariffs alone might not be sufficient to significantly impact the economic outcomes. As for the external validity of this study, it focuses specifically on the US-China trade war and the US metal industry, which limits the direct applicability of its findings to other trade conflicts or industries. The unique economic factors driving the US-China trade war may not be present in other trade relationships. Additionally, the study covers only the period from 2015 to 2022. Therefore, the generalizability of the results is limited.

6 Conclusion

The study aimed to evaluate the effectiveness of protectionist measures implemented by the US during the US-China trade war, focusing on the US metal industry. The findings suggest that there were benefits, such as the temporary boosts in the short-term output of the US metal industry. However, the overall impact on the trade deficit and other economic indicators was limited. This implies that tariffs alone might not be enough to achieve significant improvements in trade balances and the economy. The lack of significant findings in the regression analyses suggests that other factors, unaccounted for in the study, play crucial roles in affecting the outcomes. Future research should address the limitations identified in this study by incorporating more models that account for additional confounders and by examining other industries and trade relationships. Studies that span different economic cycles can offer deeper understanding of the long-term effects of protectionist policies.

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