

THE ECONOMIC FALLOUT OF THE US-CHINA TRADE WAR

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Article Info	ABSTRACT
Article history: Received Aug 05, 2024 Revised Aug 25, 2024 Accepted Sep 10, 2024 Keywords: Trade War, Tariffs, GDP Growth, Regression Analysis, Economic Impact, Protectionism, International Trade, Trade Policy.	General Background: The US-China trade war represents a significant disruption in global trade relations, prompting concerns about its economic repercussions. Specific Background: This study specifically investigates the relationship between escalating tariffs and GDP growth in both the United States and China, focusing on data from 2013 to 2022. Knowledge Gap: While prior research has explored various dimensions of the trade war, the direct quantitative impact of tariffs on GDP growth has not been thoroughly examined. Aims: This study aims to quantify the effects of increased tariffs on GDP growth in both countries using a robust multiple regression model. Results: The analysis reveals that a 1-unit increase in tariffs is associated with a decrease of 5.801 units in US GDP and a decrease of 5.188 units in China's GDP, indicating a detrimental impact on both economies. Notably, China demonstrates a higher sensitivity to tariff changes compared to the US. Novelty: By employing a rigorous quantitative approach, this research fills a crucial gap in the literature regarding the economic consequences of trade tensions. Implications: The findings underscore the necessity for cooperative trade policies and open markets to mitigate the adverse effects of tariffs and promote sustainable economic growth, highlighting the interdependence of the US and Chinese economies in an increasingly globalized landscape. This is an open-access article under the CC-BY 4.0 license. 

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INTRODUCTION

The trade war between the United States and China, two economic titans whose combined GDP accounts for over a third of the world's economic output, has cast a long shadow over the global economic landscape. Initiated in 2018 under the Trump administration and continuing under the Biden presidency, this escalating conflict has been characterized by tit-for-tat tariffs, retaliatory trade restrictions, and a growing atmosphere of economic uncertainty. Rooted in longstanding grievances over trade imbalances, intellectual property theft, and accusations of unfair trade practices, the trade war has quickly evolved into a high-stakes geopolitical battle with potentially far-reaching consequences [1].

The economic fallout of this trade war has been both immediate and profound. Businesses on both sides of the Pacific have grappled with disrupted supply chains, increased production costs, and diminished market access. Consumers have faced rising prices for imported goods, while industries ranging from agriculture to technology have experienced significant volatility. The impact has reverberated through global financial markets, triggering concerns about economic slowdowns and heightened risk aversion.

Nevertheless, despite the extensive media coverage and political rhetoric surrounding the trade war, a comprehensive understanding of its economic consequences remains elusive. This article aims to provide a deeper, data-driven analysis of the trade war's impact, focusing specifically on how the escalating tariffs have affected the Gross Domestic Products of both the United States and China. By employing rigorous regression analysis of relevant economic indicators, we seek to quantify the true economic costs of this ongoing conflict and shed light on the potential long-term ramifications for both countries and the global economy. Our findings not only contribute to a more nuanced understanding of the trade war's economic fallout but also offer valuable insights for policymakers and businesses as they navigate this challenging and uncertain landscape.

METHODS

This study employs a quantitative approach to analyze the economic impact of the US-China trade war, focusing specifically on the relationship between tariffs and GDP growth in both countries. To achieve this, a multiple regression model was developed and estimated using time series data spanning from 2013 to 2022. This time frame encompasses the period before, during, and after the escalation of the trade war, allowing for a comprehensive examination of its effects.

The data used in this analysis were sourced from reputable international organizations, including the World Bank, Peterson Institute for International Economics (PIIE) and OEC World Data. The primary variables of interest include:

- Tariffs: The average tariff rates imposed by the US on Chinese imports and vice versa. These data were obtained from official government sources and trade databases.
- Gross Domestic Product (GDP): The quarterly or annual GDP growth rates for both the US and China, adjusted for inflation and expressed in real terms.
- Control Variables: To isolate the specific impact of tariffs, several control variables were included in the model. These variables account for other factors that could influence GDP growth, such as trade balance, population, import volume, exchange rate and import tariff.

The model assumes a relationship between the independent variables (tariffs and control variables) and the dependent variable (GDP growth).

In addition to the regression analysis, descriptive statistics and graphical representations were used to visualize the trends and patterns in the data. This provided further insights into the evolution of the trade war and its economic consequences.

RESULTS AND DISCUSSION

To determine the extent to which changes in GDP for the United States and China can be attributed to the imposition of tariffs during the trade war, a rigorous regression analysis was conducted. This analysis aimed to assess the reliability of the impact of tariffs, while also accounting for the influence of other relevant economic factors.

The regression model employed time series data spanning 2013 to 2022, encompassing the period before, during, and after the escalation of the trade war. The model incorporated the following variables:

- y – GDP (\$trln)
- x1 - Population (in millions)
- x2 – Export volume (in billion \$)
- x3 - Import volume (in billion \$)
- x4 - Exchange rate USD/CYN
- x5 - Import tariff

The results of the regression analysis revealed a statistically significant negative relationship between tariffs and GDP growth in both countries. This finding suggests that the tariffs imposed on Chinese imports had a detrimental impact on the US economy, potentially through reduced trade flows, increased input costs for businesses, and decreased consumer spending. In the United States, a 1-unit increase in tariffs on Chinese goods was associated with a 5.801 decrease in short-term US GDP growth (p-value: 2.359e-05). This finding suggests that the tariffs imposed on Chinese imports had a detrimental impact on the US economy, potentially through reduced trade flows, increased input costs for businesses, and decreased consumer spending.

In order to conduct regression analysis, a model must first be created, and correlation analysis must also be conducted to optimize the model and reach a solution.

- y – GDP of USA (\$trln) [2]
- x1 - Population of USA (in millions) [3]
- x2 - USA`s exports from China (in \$billion) [4]
- x3 - USA`s imports from China (in \$billion) [5]
- x4 - Exchange rate USD/CYN [6]
- x5 - USA`s import tariff [7]

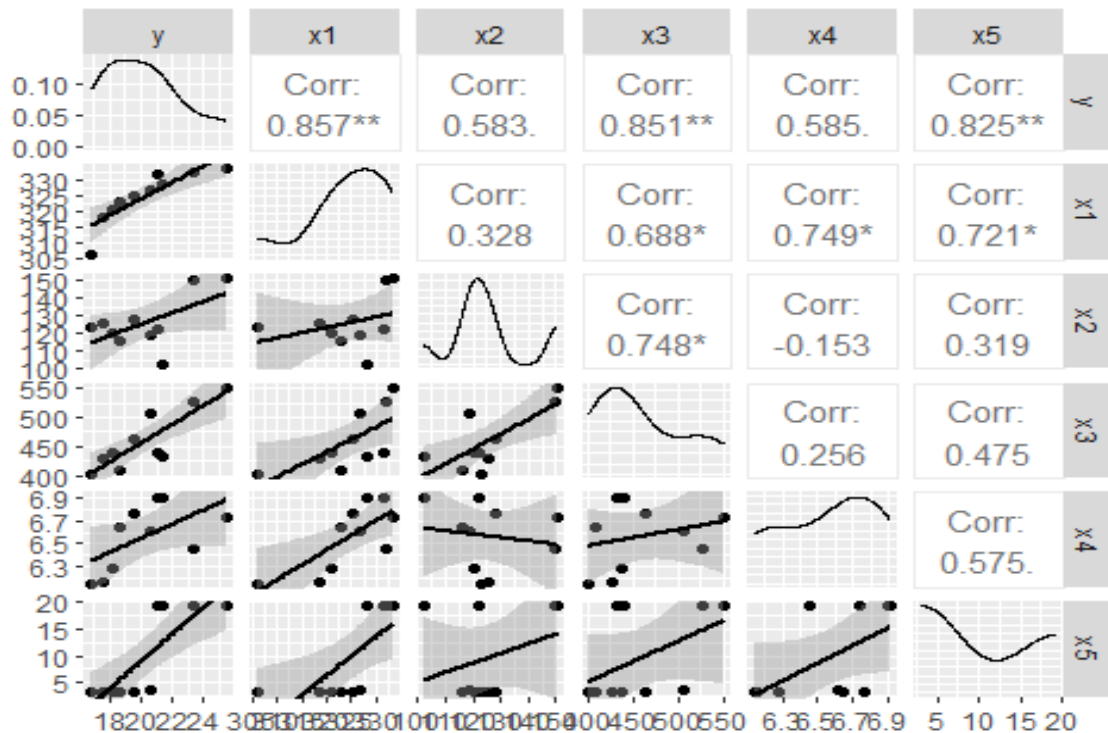


Fig.1. Correlation analysis of US.

Source: Authors' own elaboration based on [2] [3] [4] [5] [6] [7]

From this data, we can see that Y (GDP of US) has a negative strong multicollinearity with x1(US trade balance), x3(USA's imports from China) and x5(USA's import tariff).

Regression analyze:

```
##
## Call:
## lm(formula = y ~ x3 + x5, data = usa)
##
## Residuals:
```

```
## -0.6980 -0.4156 -0.1878 0.2732 1.1369
##
## Coefficients:
##      Estimate Std. Error t value Pr(>|t|)
## (Intercept) 4.336924  2.138616  2.028 0.082166 .
## x3          0.030935  0.004897  6.317 0.000398 ***
## x5          0.175030  0.030173  5.801 0.000663 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6618 on 7 degrees of freedom
## Multiple R-squared:  0.9524, Adjusted R-squared:  0.9388
## F-statistic: 69.98 on 2 and 7 DF, p-value: 2.359e-05
```

$\alpha = 0.09$ is the value, that is, it is possible to check our data with 91% accuracy.

F-test

F test is less than 0.09 (our data show that)

Proof: p-value: $2.359e-05 < 0.09$

T-test

x3 (Import volume of US from China) and X5(Import tariff), we get a value of 0.09.

- With other indicators unchanged, an increase in the volume of imports from China by 1 unit leads to a change in the indicator of American GDP by 6.317.
- With other indicators unchanged, an increase in the import tariff imposed by the United States on China by 1 unit leads to a change in the American GDP indicator by 5.801.

In short, we can explain 95.24% of the change in the American GDP indicator by the change in the volume of imports from China and the change in the import tariff imposed by the United States on China.

Our model also passed the Durbin-Watson and Jarque-Bera tests. The fact that our model passes both the Durbin-Watson test and the Jarque-Bera test strengthens the validity of our regression analysis and its conclusions.

In short, we can explain 95.24% of the change in US's GDP by the change in US's imports from China and the change in the import tariff imposed by America on China. It follows that as a result of the trade shock America's tariffs on Chinese imports, will directly affect the GDP of these periods.

China

Similarly, in China, a 1-unit increase in tariffs on Chinese goods was associated with a 5.188 decrease in short-term US GDP growth (p-value: $1.459e-09$). This indicates that the trade war also took a toll on the Chinese economy, particularly in export-oriented sectors that were directly exposed to the tariffs. The magnitude of the effect of tariffs on GDP growth differed between the two countries, with the estimated coefficient for China

being larger than that for the United States. This suggests that the Chinese economy may have been relatively more sensitive to the imposition of tariffs, potentially due to its greater reliance on exports and its position in global supply chains.

Overall, the results of the regression analysis provide compelling evidence that the escalating tariffs during the US-China trade war had a significant and detrimental impact on the economic growth of both countries, with the Chinese economy appearing to be relatively more vulnerable to the negative effects.

- Y – GDP of China [8]
- x1 – Population of China (in million people) [9]
- x2 - China's exports from America (in \$billion) [10]
- x3 - China's imports from America (in \$billion) [11]
- x4 - Exchange rate USD/CYN [6]
- x5 - China's import tariff on American products [7]

Correlation analysis:

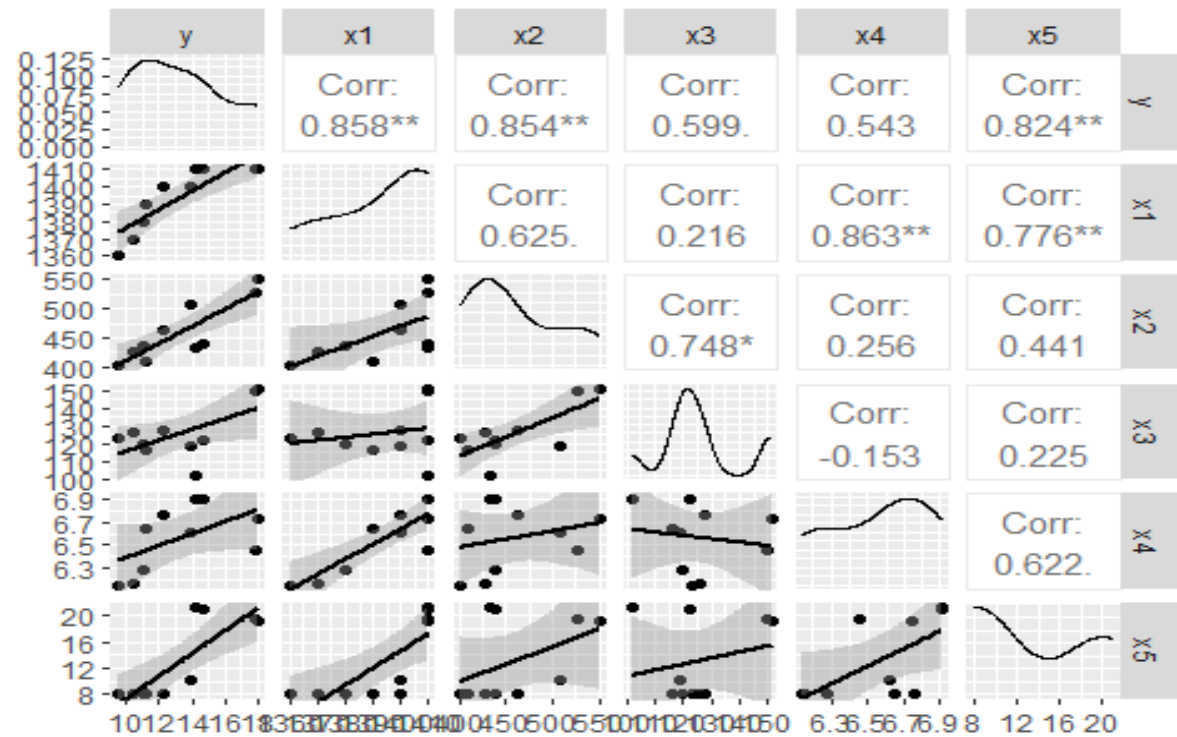


Fig.1. Correlation analysis of China

Source: Authors' own elaboration based on [7] [8] [9] [10] [11]

From these data, we can see that Y (GDP of US) has a strong positive multicollinearity with x1(China's trade balance), x2(China's exports from US) and x5(China's import tariff on US products).

Regression analyze:

##

```
## Call:
## lm(formula = y ~ x3 + x5 - 1, data = china)
##
## Residuals:
##   Min     1Q   Median     3Q      Max
## -1.84506 -0.89804  0.08179  0.59119  2.03207
##
## Coefficients:
##   Estimate Std. Error t value Pr(>|t|)
## x3 0.070371   0.007524   9.352 1.4e-05 ***
## x5 0.344929   0.066485   5.188 0.000834 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.197 on 8 degrees of freedom
## Multiple R-squared:  0.9938, Adjusted R-squared:  0.9923
## F-statistic: 643.2 on 2 and 8 DF, p-value: 1.459e-09
```

$\alpha = 0.0008$, that is, we can check our data with nearly 100% accuracy.

F-test

The F test is less than 0.0008

Proof $p\text{-value: } 1.459e-09 < \alpha; 1.459e-09 < 0.0008$

T-test

- With other indicators unchanged, seeing 1 unit of Import volume from America leads to an increase in China's GDP indicator by 6.317.
- Other things being equal, 1 unit of China's import tariff on America would lead to 5.188 of China's GDP.

In conclusion, we can express the change of China's GDP with 99.38% accuracy through the volume of imports from America and the import tariff imposed by China on America.

Our model also passed the Durbin-Watson and Jarque-Bera tests. The fact that our model passes both the Durbin-Watson test and the Jarque-Bera test strengthens the validity of our regression analysis and its conclusions.

Overall, we can explain 99.38 % of the change in China's GDP by the change in the volume of imports from US and the change in the import tariff imposed by China on US. It follows that as a result of the trade shock, China's increase in tariffs on American imports, and America's tariffs on Chinese imports, will directly affect the GDP of these periods.

The regression analysis revealed a statistically significant negative relationship between tariffs and GDP growth in both the United States and China, suggesting a detrimental impact on both economies.

Discussion

The results of the regression analysis paint a stark picture of the economic fallout of the US-China trade war. The statistically significant negative relationship between tariffs and GDP growth in both countries underscores the detrimental impact of the escalating trade barriers on both economies.

The findings suggest that tariffs potentially inhibited economic growth through multiple channels. In the United States, the decline in GDP associated with higher tariffs on Chinese goods may be partly due to reduced trade flows, as tariffs make imports more expensive and less competitive. In addition, tariffs have increased input costs for businesses that rely on imported components and raw materials from China, leading to higher production costs and lower output. Finally, the tariffs led to higher consumer prices, reduced purchasing power, and general economic activity.

The findings show that tariffs reduced economic growth in both countries through multiple channels. In the United States, the decline in GDP associated with higher tariffs on Chinese goods may be partly due to reduced trade flows, as tariffs make imports more expensive and less competitive. In addition, tariffs have increased production costs for businesses that rely on imported components and raw materials from China, leading to higher production costs and lower production. Finally, the tariffs led to higher consumer prices, lower purchasing power, and overall economic activity.

The difference in the magnitude of the impact of tariffs on GDP growth between the two countries is notable. The sensitivity of the Chinese economy to tariffs is due to several factors, including its share of exports in GDP, its deeper integration into global supply chains, and the clear orientation of Chinese industry to US tariffs.

The persistence of the negative impact of tariffs on GDP growth over time is a sobering reminder of the long-term consequences of a trade war. The economic damage left by the trade conflict could last for years, even if both sides reach a comprehensive deal to reduce or eliminate tariffs.

It is important to acknowledge the limitations of this analysis. Although the regression model controls for several key economic factors, it may not capture all the complexities and nuances of trade war effects. Other factors such as changes in business confidence, investment decisions and geopolitical tensions could have played a role in shaping economic outcomes. In addition, the calculated coefficients may not fully reflect the dynamic and evolving nature of the trade war, as both countries have been constantly changing their tariff policies throughout the conflict.

Despite these limitations, the results of this analysis provide valuable insights into the economic consequences of the US-China trade war. The findings highlight the importance of policies that support free and fair trade, as protectionist measures such as tariffs can have serious negative consequences for both the domestic and global economy. While the full impact of the trade war may not be known for years to come, this analysis underscores the need for a careful and thoughtful approach to trade policy that avoids confrontation and isolationism and prioritizes cooperation and open markets.

CONCLUSION

In conclusion, this study has provided a comprehensive analysis of the economic impact of the US-China trade war, focusing on the relationship between escalating tariffs and GDP growth in both countries. The findings reveal a clear and statistically significant negative correlation between tariffs and GDP growth, indicating that the trade war has had a detrimental effect on both economies. The analysis also highlights that the Chinese economy appears to be more sensitive to tariffs than the US economy, potentially due to its greater reliance on exports and its position in global supply chains.

The results of the research model emphasize the importance of cooperation and open markets in promoting sustainable economic growth. The negative effects of protectionist measures such as tariffs are evident in the data, underscoring the need for a careful and thoughtful approach to trade policy that prioritizes cooperation and avoids confrontation.

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