# Quantitative analysis of the economic impact of American presidential candidates on China and the United States based on multiple regression model

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**Abstract:** *From the perspective of taxation, under the premise of whether to continue to implement the Tax Reduction and Employment Law, this paper discusses the impact of different tax policies on the economy of the United States and China after the two candidates are elected as the President of the United States. From the perspective of taxation, a multiple regression model is established to quantitatively analyze the influence of the two presidential candidates. Finally, the regression model is tested by significance test, heteroscedasticity test and multicollinearity test. Facts have proved that the model is highly rigorous and reasonable.*

*Keywords: Trump tax reform plan, Multiple regression, Economic impact*

## 1. Introduction

2020 is the US presidential election year, in which Republican candidate Donald Trump and Democratic candidate Joe Biden run for president. The candidates of the two parties have different political positions and administrative plans in finance and trade, economic and financial governance and other key development areas (such as fighting measures for new crown pneumonia, infrastructure, taxation, environmental protection, medical insurance, employment, trade, immigration, education, etc.). The election of different candidates will shape different strategic patterns of global economic and financial development, and have a greater impact on the US economy and the global economy (including China's economy).

This paper makes a quantitative analysis of the impact of candidates on American economy from the perspective of taxation. On the one hand, if Donald Trump is re-elected, he will continue to push forward the tax reduction and employment bill. Biden, on the other hand, wants to abolish the tax cuts and employment bills. According to American data from 2018 to 2020, this paper estimates the impact of Trump's re-election on American economy. Since Trump began to implement the Tax Reduction and Employment Act in 2018, and Trump will continue to implement this policy after his re-election, we believe that the data of the United States from 2018 to 2020 well illustrate the impact of Trump's re-election on the American economy.

In addition, we believe that this policy will affect some important variables, and then have an impact on the economy. Therefore, we have established a multiple regression model. Select several important variables that may be affected by policies as explanatory variables, and quarterly GDP as explanatory variables. Quantitative discussion on the relationship between explanatory variables and interpreted variables. As for Biden, we estimated his impact on the US economy based on the US data from 2014 to 2017. Because Trump began to implement the tax reduction and employment bill in 2018, the data before 2018 are data without policies, and Biden will not implement policies after being elected.

Therefore, we think that the data before 2018 is a good indicator of how the Biden election will affect the American economy. In order to explore this effect, we established the same multiple regression model as above to discuss this problem.

## 2. Data preprocessing

All data sources are based on CEIE database. By selecting the data of explanatory variables related to the model from the global database and the Chinese economic database, a total of 27 quarterly data

were obtained from 2014 to 2020. After obtaining the data, we find that China and the United States have different ways of measuring and counting their macroeconomic indicators. Most of the data in the United States are seasonally adjusted by year to eliminate the pure seasonal abnormal fluctuations of macroeconomic indicators to the maximum extent, while the annual data estimated by year is processed on the basis of quarterly data of indicators, so the data obtained in the database needs to be processed. China's current data is easier to obtain directly, which is highly volatile. The data we need to model is the quarterly frequency data of each variable.

For US data, we use seasonally adjusted quarterly GDP (in millions of dollars) calculated at current prices and expenditures. Select the quarterly data of annualized seasonally adjusted disposable personal income and after-tax profit, and then divide the obtained value by 4 to obtain the quarterly data of current disposable personal income and after-tax profit. At the same time, the seasonally adjusted quarterly data of M1 and M2 are selected. The above indicators are in millions of dollars. For China's data, we can directly select the quarterly data of China's gross domestic product, import and export, and tax revenue, in billions.

Since this paper uses multiple regression model to solve and analyze the problem, we will deal with the logarithm of the data value of each explanatory variable, so as to better discuss the elasticity of the explained variable to the explanatory variable in the model.

### 2.1 Explanatory variables in the US economic model

### 2.1.1 Personal disposable income (DPI)_SA_MUSD)

In the case of relatively stable income, the level and intensity of tax levied by the state on residents will affect their personal disposable income. We should know that there is a positive correlation between personal disposable income and consumption. Consumption is determined by the important macroeconomic indicators of GDP calculated by the expenditure method. In the model, the economic situation of the United States is measured by GDP, so it is reasonable to believe that the change of personal disposable income caused by the change of tax will affect the economic situation of the United States to a certain extent. Therefore, it is reasonable to choose personal disposable income as the explanatory variable of the model.

### 2.1.2 Profit after tax (PAT_SA_MUSD)

The state levies taxes on the business income of enterprises. The level and intensity of enterprise income tax will affect the intensity of enterprise burden and after tax profit of enterprise, and then affect enterprise's investment enthusiasm and various business decisions. All of these will affect the development of enterprises, and investment is another important macroeconomic indicator to determine GDP calculated by expenditure method. Therefore, it is reasonable to take the after tax profit as the explanatory variable of the model.

### 2.1.3 M1 and M2

Xiao Wei (2019) [1] believes that tax intensity will have an impact on the efficiency of money supply and monetary policy. Through empirical analysis, he found that increasing tax intensity will inhibit the efficiency of money supply and monetary policy. Monetary policy is an important means for a country to regulate and control its economic situation, thus affecting its economic trend and development. Therefore, it is reasonable to choose M1 and M2 as explanatory variables of the model.

### 2.2 Explanatory variables in China's economic model

### 2.2.1 Import (CIF BRMB) and export (FOB BRMB)

Li Daokui [2] (2019) believes that Trump's tax reform policy has strengthened bilateral trade friction between China and the United States in the short term, and China will be an important object of influence on the effect of the tax reform policy of the United States. Through empirical analysis, Cao Jing [3] (2019) quantified that the change of US tax rate will affect China's import and export. Foreign trade is another important macroeconomic index to determine GDP calculated by expenditure method, so it is reasonable to choose Import and export as the explanatory variable of the model.

### 2.2.2 Tax (TR_BRMB)

Cao Jing [3] (2019) quantified the spillover effect of US tax rate changes through empirical analysis, believing that the US tax system reform will have a serious impact on China's tax rate, and will also have

a certain impact on China's tax policy.As an important part of government revenue and an important means of government procurement and fiscal policy, the change of tax revenue will affect China's economic situation. Therefore, it is reasonable to choose tax as the explanatory variable of the model.

## 3. Establishment of model

### 3.1 Establishment of American regression model

According to the problem analysis, the regression equation is established, and the data from 2014 to 2017 are used for regression analysis. The logarithm of the explained variable and the explained variable is to facilitate us to observe the elastic relationship between them.

$$lnY = \beta_0 + \beta_1 x_1 + \beta_2 lnx_2 + \beta_3 lnx_3 + \beta_4 lnx_4 \tag{1}$$

The results obtained by Stata software are as follows:

| Source | SS | df | MS | | | |
|--------|-----|----|-----|---|---|---|
| | | | | Number of obs | = | 16 |
| | | | | F(4, 11) | = | 720.89 |
| Model | .027681431 | 4 | .006920358 | Prob > F | = | 0.0000 |
| Residual | .000105597 | 11 | 9.5997e-06 | R-squared | = | 0.9962 |
| | | | | Adj R-squared | = | 0.9948 |
| Total | .027787028 | 15 | .001852469 | Root MSE | = | .0031 |

*Figure 1: Equation (1) regression result 1n (1) regression results1*

| GDP_CPE_SA~D | Coef. | Std. Err. | t | P>|t| | [95% Conf. Interval] | |
|--------------|-------|-----------|---|-------|------|---|
| DPI_SA_MUSD | .8988074 | .1660486 | 5.41 | 0.000 | .5333368 | 1.264278 |
| PAT_SA_MUSD | .0053796 | .0260358 | 0.21 | 0.840 | -.0519249 | .0626841 |
| M1_SA_MUSD | -.0015064 | .1594357 | -0.01 | 0.993 | -.3524221 | .3494092 |
| M2_SA_MUSD | .0074932 | .1863129 | 0.04 | 0.969 | -.4025786 | .417565 |
| _cons | 1.626583 | 1.310126 | 1.24 | 0.240 | -1.256985 | 4.510151 |

*Figure 2: Equation (1) regression result 2n (1) regression results2*

For the regression result of equation (1), we have made an analysis of variance. In order to avoid multiple collinearity among variables, the variance expansion factor of variables was detected.

| Variable | VIF | 1/VIF |
|----------|-----|-------|
| M1_SA_MUSD | 313.23 | 0.003193 |
| M2_SA_MUSD | 271.70 | 0.003680 |
| DPI_SA_MUSD | 96.05 | 0.010411 |
| PAT_SA_MUSD | 2.67 | 0.374652 |
| Mean VIF | 170.91 | |

*Figure 3: Detection of variance expansion factor*

According to the definition of variance expansion factor, we find that the model has serious multicollinearity, which is caused by the common trend of some variables and other economic variables.The regression equation was established again.

$$lnY = \beta_0 + \beta_1 x_1 + \beta_2 lnx_2 \tag{2}$$

The regression results of Stata software are as follows:

| Source | SS | df | MS | | | |
|--------|-----|----|-----|---|---|---|
| | | | | Number of obs | = | 11 |
| | | | | F(2, 8) | = | 2.28 |
| Model | .003675748 | 2 | .001837874 | Prob > F | = | 0.1644 |
| Residual | .006444205 | 8 | .000805526 | R-squared | = | 0.3632 |
| | | | | Adj R-squared | = | 0.2040 |
| Total | .010119954 | 10 | .001011995 | Root MSE | = | .02838 |

*Figure 4: Equation (2) regression result 1n (2) regression results1*

| GDP_CPE_SA~D | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| DPI_SA_MUSD | .122593 | .2145543 | 0.57 | 0.583 | -.37217 | .6173561 |
| PAT_SA_MUSD | .317036 | .157922 | 2.01 | 0.080 | -.0471328 | .6812048 |
| _cons | 9.458173 | 4.772628 | 1.98 | 0.083 | -1.547527 | 20.46387 |

*Figure 5: Equation (2) regression result 2n (2) regression results2*

The p value of the model is less than 0.05, indicating that the coefficient of regression variable is not significantly 0.According to the definition of variance expansion factor, there is no serious multicollinearity in the regression equation, which improves the accuracy of the model. At the same time, the test shows that there is no Heteroscedasticity in the regression equation, the standard error of the regression equation is valid, and the hypothesis test is also valid.

In short, we know that the regression model of equation (2) is reasonable and effective. From 2014 to 2017, there is a significant correlation between GDP and DPI in the United States. In addition, for every 1% increase in disposable income, the GDP of the United States will increase by 0.908%.This shows that if Biden is elected, repealing the tax cuts and jobs act will lead to a decline in personal disposable income. For every 1% increase in disposable income, the GDP of the United States will drop by 0.908%

### 3.2 Establishment of China regression model

On the basis of the problem analysis, the regression equation is established, and the data of China from 2014 to 2017 are used for regression analysis. The logarithm of the explained variable and the explained variable is to facilitate us to observe the elastic relationship between them.

$$lnY = \beta_0 + \beta_1 x_1 + \beta_2 lnx_2 + \beta_3 lnx_3 \tag{3}$$

The results obtained by Stata software are as follows:

| Source | SS | df | MS | | | |
|---|---|---|---|---|---|---|
| | | | | Number of obs | = | 16 |
| | | | | F(3, 12) | = | 11.42 |
| Model | .207784016 | 3 | .069261339 | Prob > F | = | 0.0008 |
| Residual | .072780929 | 12 | .006065077 | R-squared | = | 0.7406 |
| | | | | Adj R-squared | = | 0.6757 |
| Total | .280564946 | 15 | .01870433 | Root MSE | = | .07788 |

*Figure 6: Equation (5) regression result 1n (5) regression result 1*

| GDP_CHINA_~B | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| CIF_BRMB | -.2061925 | .270249 | -0.76 | 0.460 | -.7950144 | .3826294 |
| FOB_BRMB | 1.281464 | .2894499 | 4.43 | 0.001 | .650807 | 1.912121 |
| TR_BRMB | .2911076 | .1551076 | 1.88 | 0.085 | -.0468427 | .629058 |
| _cons | -1.410591 | 2.235598 | -0.63 | 0.540 | -6.281542 | 3.460359 |

*Figure 7: Equation (5) regression result 2n (5) regression result 2*

For the regression result of equation (5), we have made an analysis of variance. In order to avoid multiple collinearity among variables, the variance expansion factor of variables was detected. According to the definition of variance expansion factor, there is no serious multicollinearity in the regression equation, which improves the accuracy of the model.

In conclusion, we know that the regression model of equation (5) is reasonable and effective. As can be seen from table 3, from 2014 to 2017, China's GDP and exports (95% confidence level) are significantly correlated with tax (90% confidence level). If Biden is re elected, the tax reduction and Employment Act will be abolished, which will affect China's exports and taxes [2].In addition, every 1% increase in exports corresponds to a 1.281% increase in China's GDP, and a 1% increase in tax revenue corresponds to a 0.291% increase in China's GDP.

## 4. Policy analysis

### 4.1 Donald Trump elected president of the United States

After trump is elected, he will continue to promote tax reform and adhere to the tax reduction policy. Based on the above model and the model established by Cao Jing [3] (2019), it can be seen that Trump's re-election and his policy propositions in the tax field will produce tax competition effect and have a serious impact on bilateral trade. It can be seen from the model that it will have a significant negative impact on China's export volume, thus reducing the export volume, and then affecting the development of China's economy. We will make the following suggestions based on the established model.

1) Adapt to the complex situation, adhere to the road with Chinese characteristics, and calmly deal with the impact

Economic globalization has become an inevitable trend. The world economic structure under the multilateral trading system is becoming increasingly complex, and the beneficiaries are no longer limited to developed countries such as the United States. China should continue to promote the sustainable development of the multilateral trading system based on equality and mutual benefit, actively adapt to the complex economic structure, and calmly cope with the tax impact and trade friction brought by the US tax reform. Due to the huge differences in tax structure between China and the United States, China should not overreact because of the tax competition effect. It should continue to adhere to the current tax policy in line with China's national conditions, and continue to implement structural tax reform, so as to reduce institutional costs, improve the competitiveness of Chinese enterprises, provide a good management environment for the development of enterprises, and firmly follow the road with Chinese characteristics. China should show enough confidence, not be afraid of challenges, and take measures such as optimizing industrial structure and adjusting industrial chain to face the impact brought by the United States.

2) Comprehensively deepen reform and accelerate the pace of transformation

At present, China is in an important stage of comprehensively deepening reform. According to this model, we suggest that China can appropriately accelerate the reform process in the field of foreign trade, accelerate the transformation of trade growth mode and optimize China's economic structure. Strengthen the reform and actively guide the transformation and upgrading of foreign trade enterprises, so as to effectively improve the international competitiveness of foreign trade enterprises and make China better and faster change from a big trading country to a powerful trading country. In addition to hedging the impact of export reduction brought by the US tax reform to a certain extent, it can also continue to promote the healthy development of China's economy. At the same time, we should comprehensively deepen the reform of changing business tax to value-added tax, and improve the competitiveness of China's tax system.

3) Develop science and technology, pay close attention to technology, and become a powerful country

The impact of US tax reform on China is not limited to short-term. To fundamentally reduce the impact of Trump's re-election to China, China should speed up the implementation of innovation-driven strategy, increase investment in scientific and technological development, vigorously promote the development of core technologies belonging to China, strengthen the awareness of innovation and scientific and technological strength, continuously improve China's scientific and technological level, lead economic development through core technologies, enhance the position of China and the United States in chip and bilateral trade, and weaken the influence of the United States on China's economic development prospects, which can become stronger.

### 4.2 Joe Biden was elected President of the United States

Biden eliminated the established model of tax reform and tax reduction and the established model of Cao Jing [3] (2019) in the field of tax politics. After Biden was elected president of the United States, the tax rate in the United States increased, which promoted China's economic development to a certain extent compared with Trump's election. However, as the president of the United States, Biden's attitude towards China's economic development still persisted. Combining the model with the actual situation, we give the following specific suggestions.

1) Recognize the economic development situation and make full preparations

Biden's election means that China's economic development will face more uncertainties.

Through the analysis of the established model, Biden's election can alleviate bilateral trade friction, promote the growth of China's exports and promote the development of China's economy to a certain extent. Since most American politicians regard China as a competitor and hold a common tough attitude towards China, the easing policy after Biden's election has not made China ignore the uncertainty of the future. Our suggestion is that China should realize that the economic development situation and conflict between the United States and China in trade are inevitable and long-term, so it should be prepared for cover.

2) Maintain high sensitivity, effectively prevent risks, and enhance their own economic strength

Biden's suggestions in the field of tax policy after his election are different from Trump's. The uncertainty of American policy should require China to be highly sensitive to the development direction and trend of the US and even the world economy, keenly capture the changes that may affect China's economy, pay attention to the changes of leading indicators in trade and other fields, and make plans in advance to ensure effective response. Consistent with Donald Trump's election as President of the United States, the most important thing is to enhance China's economic strength in many ways. Only with strong economic strength can we better promote the sustained and upward development of China's economy.

## 5. Conclusion

This paper discusses the possible impact of these two candidates on the economies of the two countries from the perspective of the financial sector. Through the establishment of multiple regression model, this paper quantitatively analyzes the impact, draws relevant conclusions, and puts forward countermeasures according to different situations in China. In addition, it also explains the selection of multivariate variables, the selection and processing of data, related knowledge and symbols. Finally, some policy suggestions are given.

## References

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