

How Trade Affects the Unemployment Rate: A Structural VAR Approach

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Abstract

Does an increase in imports reduce jobs in the United States? Or does an increase in imports make domestic firms less competitive? These questions were important political issues in the last two presidential elections. Therefore, this study examines whether changes in the amount of imports have a significant impact on the number of jobs and the economic growth in the United States. First, we use the SVAR for analysis to see if these political claims are acceptable or not. This paper also analyzed the impact of import shocks on GDP and the unemployment rate through the IRF using the GMM method. As a result, The political claim that import shock on GDP and unemployment rate is not economically significant. Also, we found that 1% GDP shock decreases unemployment rate and increases import for a short-term.

Keywords: Import, GDP, Unemployment rate

1 Introduction

In the last two US presidential elections, the impact of trade(import) on unemployment has been one of the important political and economic issues. The Republicans' position was that increased imports from abroad would hurt domestic firms, resulting in fewer jobs in the U.S. In addition they claim that increase in imports harms the competitiveness of domestic companies. This claim has gained much support from voters in the 2016 presidential election. As a result, the elected republican candidate passed laws directly affecting imports in the U.S.

Under this background this study analyzes the effect of imports on the unemployment rate and GDP through the SVAR approach. Using the SVAR model, we will examine the effects of import shock on the unemployment rate change and GDP growth. We will also examine whether political claims are economically relevant.

First of all, we check whether the political argument is meaningful through signature restriction. Next, GMM is used to find the IRFs and we analyze its economic meaning.

2 Review of Literature

Previous studies on the relationship between changes in trade and the unemployment rate show that there is no significant relationship or very little effects. For example, Felbermayr(2011) paper shows that a 10 percentage point increase in total trade openness reduces aggregate unemployment by about three quarters of one percentage point. And Kim(2011) results show an increase in trade has no significant effect on unemployment. Both studies used OECD countries as samples.

Also, Farsio (2003) paper shows empirical evidence that increase in GDP reduces the unemployment rate. These research results provided basic assumptions of the SVAR model.

3 Data

U.S. import GDP and unemployment rates using data provided by FRED. Each data is quarterly data from 1950 to 2020. And we converted data to a percentage change form rather than a level form for easy analysis. And Figure.1,2 and 3 shows that U.S. import GDP and

unemployment rates are all stationary.

4 SVAR approach

First, the SVAR model examines whether political claims are economically acceptable. And we started building the SVAR model with the following assumptions. We assume there are only 3 shocks, the unemployment shock, GDP shock and Import shock. Those three shocks represent exogenous movements in the respective variables.

$$U_T = \alpha_0 + \alpha_1 * U_{t-1} + \alpha_2 * G_{t-1} + \alpha_3 * I_{t-1} + E_{ut} \quad (1)$$

$$G_T = \beta_0 + \beta_1 * U_{t-1} + \beta_2 * G_{t-1} + \beta_3 * I_{t-1} + E_{gt} \quad (2)$$

$$I_T = \gamma_0 + \gamma_1 * U_{t-1} + \gamma_2 * G_{t-1} + \gamma_3 * I_{t-1} + E_{it} \quad (3)$$

Each U_T (Unemployment rate), G_T (GDP) and I_T (Imports) can be forecasted by following equation (1), (2) and (3). Also, the α , β and γ coefficients can be estimated by OLS. The residuals for the equation are equal to (4), (5) and (6).

$$E_{ut} = a\varepsilon_{ut} + b\varepsilon_{gt} + c\varepsilon_{it} \quad (4)$$

$$E_{gt} = d\varepsilon_{ut} + f\varepsilon_{gt} + g\varepsilon_{it} \quad (5)$$

$$E_{it} = h\varepsilon_{ut} + i\varepsilon_{gt} + j\varepsilon_{it} \quad (6)$$

In order to calculate the impulse response function, we need to know all the coefficients a, b, ..., j. Therefore, we use the covariance matrix of residuals to find moment conditions to use for estimation. And we also normalize $a = f = j = 1$. Which means a one unit ε_u will cause the unemployment rate to rise by one unit and similarly for both ε_g and ε_i .

$$\text{cov}([e_{1t}, e_{2t}, e_{3t}]) = [\sigma_1^2 \sigma_{12} \sigma_{13}, \sigma_{12} \sigma_2^2 \sigma_{23}, \sigma_{13} \sigma_{23} \sigma_3^2] \quad (7)$$

Then those quantities can be computed by the simple operation of calculating the reduced residual covariance matrix. Then we have six unique moment conditions.

$$\sigma_1^2 = \sigma_1^2 + b^2 \sigma_2^2 + c^2 \sigma_3^2 \quad (8)$$

$$\sigma_{12} = d \sigma_1^2 + b \sigma_2^2 + cf \sigma_3^2 \quad (9)$$

$$\sigma_{13} = g \sigma_1^2 + bh \sigma_2^2 + c^2 \sigma_3^2 \quad (10)$$

$$\sigma_2^2 = d^2 \sigma_1^2 + \sigma_2^2 + f^2 \sigma_3^2 \quad (11)$$

$$\sigma_{23} = dg \sigma_1^2 + h \sigma_2^2 + f \sigma_3^2 \quad (12)$$

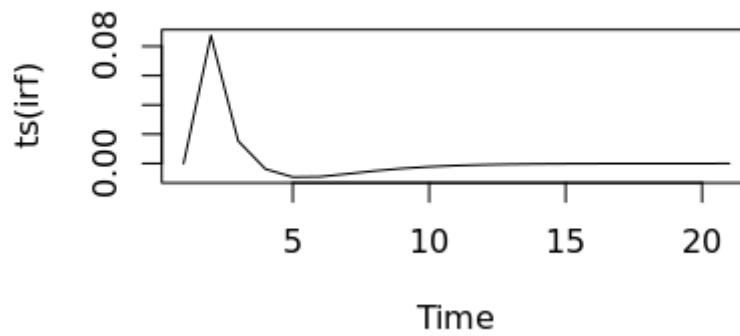
$$\sigma_3^2 = g^2 \sigma_1^2 + h^2 \sigma_2^2 + \sigma_3^2 \quad (13)$$

The left hand of each equation is reduced from the residual covariance matrix. Now we can solve coefficients and compute IRFs by imposing assumptions.

4.1 Using recursiveness assumption.

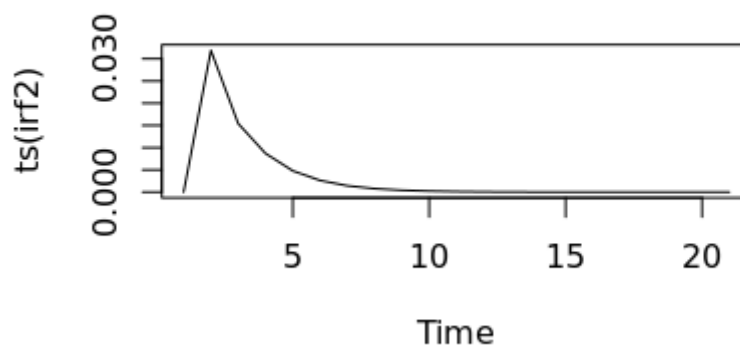
For the recursiveness we assume that the coefficients $b = c = f = 0$ to solve IRFs. And Figure.4 shows that a 1% point import shock has a positive effect on the unemployment rate. Which is an acceptable result based on political arguments. According to political claims, imports should have a negative impact on the domestic labor market and reduce the number of jobs in the U.S.

Figure.4 (IRF Import shock 1% point on Unemployment)



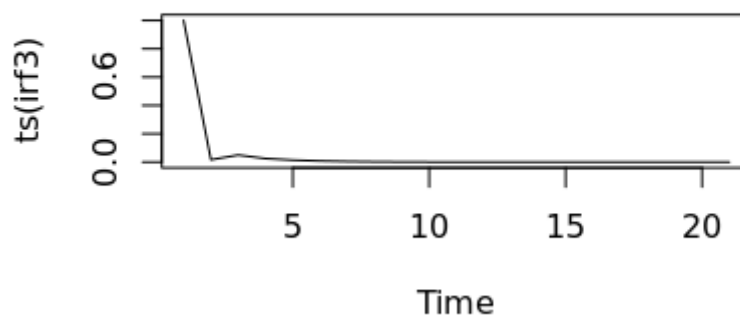
Then, we tested the impact of import shock on GDP. Figure 5 shows the impact of import shocks on U.S. GDP. When imports increase by 1%, GDP growth increases by 0.03% for about one year, and the effect disappears after one year. Although import shocks do not have a large impact, they do have a positive effect on GDP. Therefore, it is contrary to the assertion that an increase in imports adversely affects the domestic economy.

Figure. 5 (IRF Import shock 1% point on GDP)



Finally, the effect of the increase in import volume on the change in import volume can be confirmed through Figure. 6. Import shock increases import volume in the short term, but the effect disappears in the short term.

Figure. 6 (IRF Import shock 1% point on import)



As a result of creating the SVAR model and analyzing the IRFs, it was confirmed that there were parts that were consistent with the assertion and parts that were not. The claim that an increase in imports raises the unemployment rate is true to some extent, but the figures are insignificant and temporary. And we found no evidence that an increase in imports has a negative impact on domestic economic growth. Rather, the increase in import raising GDP in the short term.

4.2 Sign Restriction

In Section 4.1, IRF was calculated under assumption assuming $b = c = f = 0$. In this section, we will change b, c, f equals to 1, 2, 3, etc. and check the result of IRF is maintained. As a result, signs of IRFs were consistent while changing the assumption of coefficients. The import shock has a positive relationship with the unemployment rate and the GDP growth rate.

4.3 GMM Method

The previous analysis made assumptions based on political claims. However, their arguments are economically meaningless or weak. Therefore, in this section we will calculate and analyze IRFs based on the GMM method and more realistic assumptions. And the impact of GDP shock on other variables will be analyzed. Also, we used $(b=d=h=0)$ as an assumption when calculating the GMM. Since the previous analysis confirmed that an increase in imports affects GDP and unemployment in the short run, $c = f \neq 0$ is assumed.

Figure. 7 shows 1% import shock on unemployment rate change. Unlike the section 4.1 IRF result, it reduces the unemployment rate in the short term and the effect disappears after the 6th quarter. In other words, import shocks help reduce unemployment rate in the short run.

Empirical inference could be an increase in imports helps the unemployment rate because not all imports are finished goods for consumption. If imports of raw materials needed for the production of final goods increase, domestic labor supply may increase, which may have a positive effect on reducing the unemployment rate. Following Figure. 8 shows a pattern that is similar to the previous IRF for section 4.1. An increase in imports has the effect of increasing GDP in the short run.

Now we are going to calculate IRF for GDP shock. The hypotheses used to calculate the GDP shock are: Since an increase in GDP has the effect of boosting investment and consumption, both imports and the employment rate will rise. As a result Figure 9 and 10 shows 1% GDP shock effect unemployment rate change and GDP growth. And the sign of IRFs is consistent with our assumptions. Which means GDP shocks decrease unemployment rate and increase imports in the US.

5 Conclusion

The main motivation for this paper was to examine whether the political claim is true or not. Therefore, the claim that an increase in imports reduces the number of jobs and suppresses economic growth was confirmed through the SVAR model. Analysis of IRFs revealed that most claims lack evidence or were only true for a short period of time. In fact, an increase in imports had a positive effect on GDP growth.

Furthermore, we found more significant IRFs with optimal coefficients using GMM. And we analyzed how import volume and GDP shock affect the economy through IRFs. As a result, the import shock reduced unemployment and increased GDP in the short run. Also, GDP shocks have also shown the result of reducing unemployment and increasing income.

6 Further Research

To further increase the accuracy of the study, future studies may analyze the unemployment rate by industry. In addition, if inflation and exchange rates that affect trade are included in the model, more accurate results will be obtained.

References

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Figures

Figure.1 GDP Change(Quarterly Data)

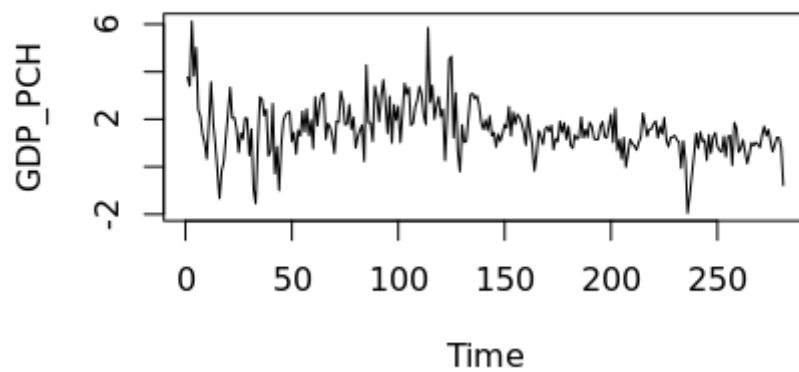


Figure.2 GDP Change(Quarterly Data)

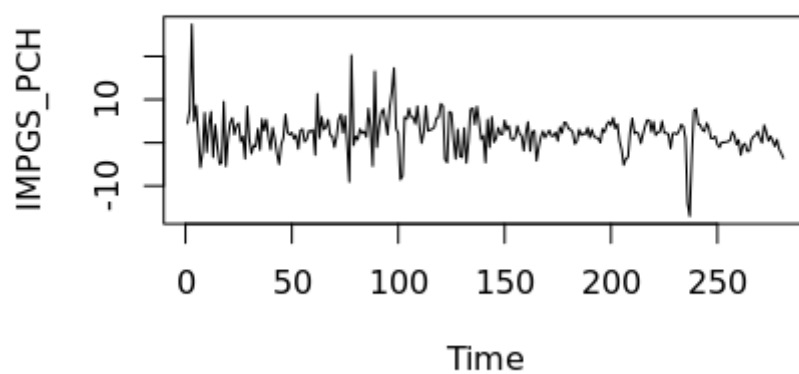


Figure.3 Import Change(Quarterly Data)

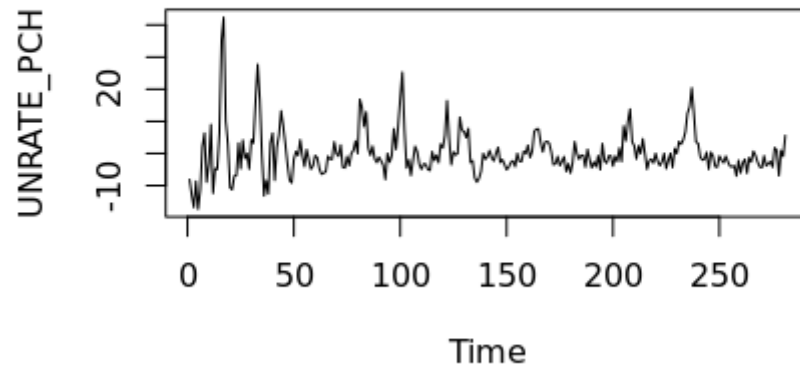


Figure. 7 (IRF Import shock 1% point on Unemployment, GMM)

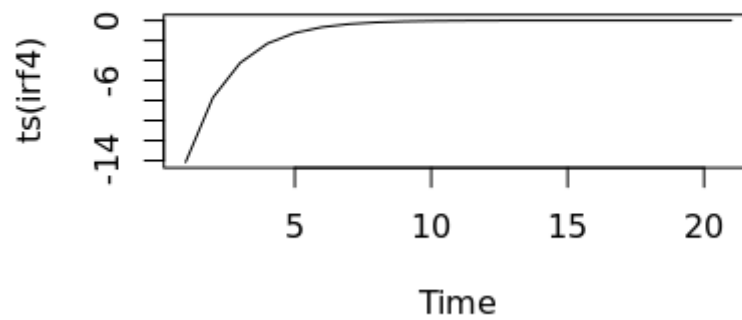


Figure. 8 (IRF Import shock 1% point on GDP, GMM)

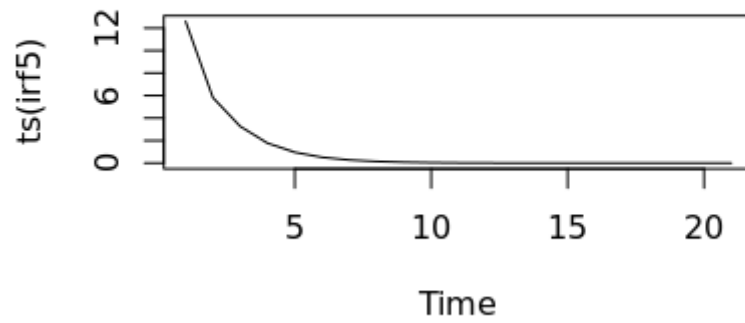


Figure. 9 (IRF GDP shock 1% point on UMP, GMM)

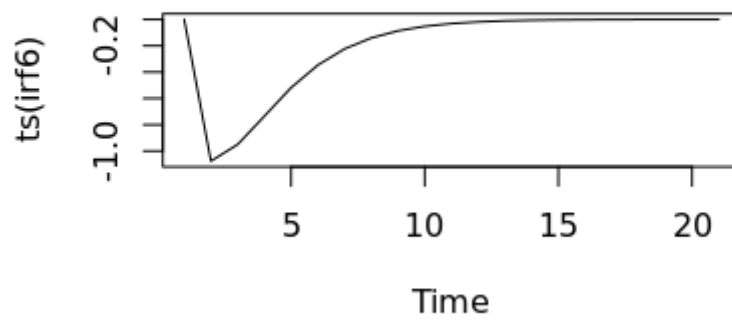


Figure. 10 (IRF GDP shock 1% point on IMP, GMM)

