

Responsiveness of U.S. Exports to Real Exchange Rate: Evidence from Top 10 U.S Trading Partners

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Abstract

This study investigates the impact of changes in the value of the US dollar on U.S exports to major trading partners of the US. The findings indicate that major trading partners are more likely to demand more US products when the value of the US dollar depreciates. Furthermore, a ten percent decrease in the US real effective exchange rate will cause an approximate increase of 3% of total US exports. In addition, the fluctuations in national income levels for top trading partners of the US can determine the amount of their demand of US products as well. In other words, an increase in national income for most of the trading partners will lead to an increased demand for U.S goods.

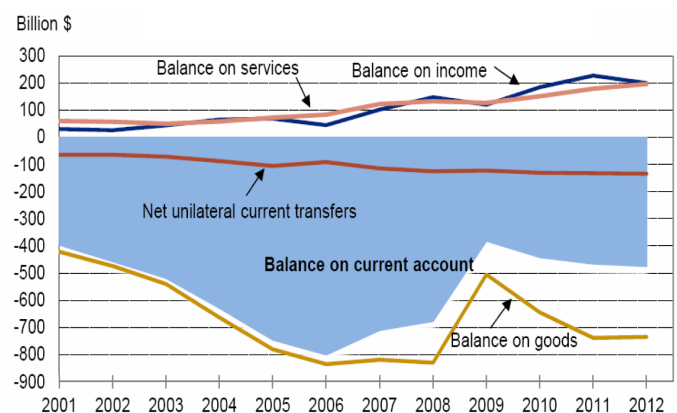
The author studies the impact of fluctuations between the value of the US dollar to U.S exports to major trading partners. The conclusion reveals that top trading partners demand more of the U.S goods when the US dollar depreciates. Furthermore, a ten percent decrease in the US real effective exchange rate leads to an increase of almost 3 % of total US exports. Changes in income level for top trading partners can determine the amount of exports as well. Moreover, a rise in income for trading partners leads to an increase demand for U.S goods.

Keywords: Currency Manipulation, Exports, Imports, Dollar, Renminbi, Trade

1. Introduction

Starting from the very basic idea of economics and GDP components, trade can play a substantial role in determining the growth of one country's GDP. Ram²¹ stated that there is a substantial positive impact of exports and trade on economic growth. Therefore, bolstering the size of exports in favor of the size of imports can be a plausible and rational idea for many countries. However, much of the fluctuations in trade are determined by many exogenous factors. We can think of the value of the domestic currency as a primary reason for enhancing or curtailing the size of exports. Sukar¹ has suggested that changes in the exchange rates explain much of the fluctuation in trade between two countries. Assuming that each country in the world has its unique trading system, government, region, language, and etc., we are going to focus on the U.S as our treatment country in this paper because of the large size the U.S has in the world economy. Obstfeld and Kenneth² confirmed that US has a very large size in the global economy. So, enhancing exports is a very good instrument that can stimulate the staggered U.S economic growth. In addition, increasing the size of exports will adjust the unsustainable current account deficit by combating the increasing size of imports. By looking at table 1 we see that U.S current account has experienced an increasing trade deficit after the year 2000. The downward trend has never been like this for the U.S before. Obstfeld and Kenneth³ agreed that US has never exceeded 4% of

Table 1. U.S. Current-account balance and its components [Annual]¹⁸



gross domestic product even when the U.S was an emerging economy in the 19th century. Trade deficit can directly influence the free adjustment of the overall U.S economy. Krugman³ indicated that U.S in the past was able to achieve full employment with saving rates higher than today's because U.S used to run a much smaller trade deficit. In order to find how US exports are influenced, we get data of total US exports, US exports to the top 10 trading partners, Real effective exchange rate, and the GDP of the top 10 trading partners. Top trading partners are Canada, China, Mexico, Japan, UK, Saudi Arabia, Germany, France, India, and South Korea. The goal is to see the responsiveness of US exports

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after depreciating or appreciating the dollar. Cheung and Fujii⁴ any ordinary country engaged in multilateral flows do respond to relative prices presented by a trade weighted exchange rate. U.S. real effective exchange rate has been really effective in bolstering exports to these countries when its value depreciates. In addition, the Income of these countries is positively related with the demand of U.S. exports.

2. Objectives

A substantial number of countries who have enjoyed large surpluses have undervalued their currencies. Chen, and Chin⁵ Japan and China are major U.S. trading partners that enjoy surpluses, however, U.S. suffers from a large trading deficit with them. Also, U.S. is running a current account deficit of more than \$400 billion since the year 2000². In other words, allowing the market to determine the value of the dollar is not a better idea if the objective is to expand growth through the exports channel. So, by taking the measure of real effective exchange rate of the dollar, average trade-weighted by all U.S. trading partners, into account and implementing this study, the focus relies on how do the value of U.S. exports respond to the changes in \$ real exchange rate. Furthermore, we want to figure out the responsiveness of US exports to the most influential trading partners with the US and extending that strategy to measure similar consequence on the top 3 trading partners. In fact, top 10 trading partners are our concern in this study because they represent the larger share of U.S. exports and any change in the value of exports to these countries can significantly impact our decision. Moreover, getting data for all US trading partners is never an easy task due to either missing data or because the lack of transparency. Therefore, data of the top 10 trading partners is more efficient in interpreting our concerns. How much of an income each country has is another important factor in determining the demand for U.S. goods. So, the objective is to justify the effects of increasing income on the demand of U.S. goods.

3. Literature Review

The increasing size of U.S. current account deficit has inspired a substantial number of economists to implement studies on how real exchange rate directly influences trade. Sukar¹ initially believed that U.S. policy makers should acknowledge that a lower U.S. dollar value could be a major instrument in correcting the imbalance. Krugman³ has also stated that policy makers in Israel and Switzerland have always known that sometimes a weaker currency means a stronger economy and responded by devaluing their currencies. If the US dollar depreciates, U.S. products will be more competitive in the world market and this will help in correcting the imbalance. Evidence of depreciating the exchange

rate could promote exports is often being referred to China in most cases. Chen and Rau⁵ have suggested that China has followed a tight and strict exchange rate policy that caused China to become a leading world exporter. Staiger and Sykes⁶ mentioned governments that have adopted a fixed exchange rate regime have intervened systematically in the exchange market by soaking an excess supply or relieving an excess demand, which have resulted in a higher volume of Chinese exports to the world markets. Carrying out the same assumptions, evidence comes from the Eurozone. Williamson and Cline have found that the depreciation of the Euro has strongly influenced and strengthened the European trade prospects. However, it hasn't become as extreme as to push the Euro area into the prospect of larger surpluses¹⁷.

In fact, a rich literature is suggesting that movement of the dollar value can explain much of exports amount. Blanchard, Giavazzi and Sa⁷ have identified an increase in the U.S. demand for foreign goods and an increase in foreign demand for U.S. assets which have caused an appreciation of the value of the dollar, and those are the roots of the forces that are behind large U.S. current deficit. However, Kraay and Ventura⁸ have claimed that the dot com bubble was the primary root of the increase in the current account deficit.

Different opinions have appeared on how to deal with correcting for the imbalance. Furthermore, Sukar¹ and Cavallo and Tille⁹ suggested that a depreciation of the \$ would make U.S. goods more competitive in the world market thus, help to restore the trade deficit. On the other hand, some economists have viewed the magnitude that real exchange rate has on US exports less heavily. Fratzcher, Juvenal and Sarno¹⁰ have agreed that adjusting for the U.S. real exchange rate isn't a primary element in correcting for U.S. imbalance. Although Real exchange rates of the dollar seem to be an important driving force in determining the magnitude of exports, equity market shocks and housing price shocks have been major determinants of the U.S. current account. Housing and equity market shocks accounts for more than 30% of the movement in the U.S. trade balance while only 9% is the movement caused by real exchange rate. Also, some economists have totally neglected the role of government in adjusting real exchange rate to correct for any imbalance. Mountford and Uhlig¹¹ found that expansionary/contractionary fiscal policies have no clear effect on the real GDP. Some economists have looked at the issue from another direction; trade deficits cause a movement in the real exchange rate. Bergins and Sheffrin¹² considered that account deficit is caused after a fall in the output level in an economy that lead that country to borrow in the world market and therefore, influence the movement of real exchange rates in neighboring countries.

While there was a substantial amount of literature suggesting a low value of U.S. dollar, there was a few estimating the actual number of rise or fall in U.S. exports or movement of US

current account if the dollar value deviates. Blanchard, Giavazzi and Sa⁷ estimated a reduction of 1% in the US current account if the dollar depreciates by 15%. Kara indicated, although a decrease in the domestic currency is expected to have reduced imports volume and an increase exchange rate is expected to increase import volume, US exports and demand functions are strongly correlated with the fluctuation of the value of the Renminbi. In other words, for every 1% appreciation in the value of the RMB, the US will enjoy an increase of 2% in the value of their exports to China¹³. Chiu, Lee, and Sun¹⁴ conducted a heterogeneous panel co-integration causality analysis to examine the relationship between real exchange rate and the volume trade between the US and its major trading partners. Their findings indicate that a fall in the US dollar will reduce the amount of US exports to 13 trading partners and increase it with 37 partners, including China. Cavallo and Tille⁹ predicted that the US dollar must depreciate by 30-35% against major world currencies in order to return to a balanced current account. They indicated that depreciating the dollar will entail competitiveness of U.S goods in world market.

Because Corsetti¹⁵ believes in twin deficit, trade deficit could be solved by fiscal policies. However, any expansionary policy could be ineffective if the country isn't open to trade or, if fiscal shocks are not persistence. In addition, Kim and Roubini¹⁶ have disagreed with many authors that neglected the idea of resolving current account deficit with fiscal policies and found that expansionary fiscal policies could indeed improve current account if they were accompanied with a depreciation in the real exchange rate; increase in private savings and drops in investment cause current account improvement while nominal exchange rate declines.

4. Data Discussion and Methodology

Gathering of data comes from the World Bank. We have picked on all of the US top trading partners GDP. World Bank also provided us with data on real effective exchange rate that we chose to use on the variable REER. We also gathered data on US exports to the top 10 trading partners from United States Census Bureau. The time series data goes from year 1982 until 2012 for every variable we have. Choosing the year 1982 as a benchmark wasn't a coincidence, however, it was for a reason. Some of the most influential US trading partners today like China, have started trading with US after 1982, so, it will make no sense if we go back in the data and include older years. Therefore, our study depends on a time series data because our main concern is the US exports function. By including a descent amount of years that goes from 1982 until 2012, we could explain much of the variation overtime because U.S is a huge economy in the world market. Therefore, results to the U.S illustrate a smaller image of the results if we are to measure the world wide fluctuations in

exports. So, we summed the total exports of the US to the top 10 trading partners in one variable, US exports. We also summed up all the GDPs for the top 10 trading partners and included them in one variable, top 10 trading partners GDP as shown in table 2. We also summed all US exports to the top 10 trading partners as well and included them in the variable, US exports. Motivation behind that method is that we want to see the overall effect of income on the overall US exports. We consider real terms for all GDPs and exports. After that, we estimate US exports to each of the top 3 trading partners independently.

5. Estimation Strategy

To determine how real effective exchange rate influence the amount of U.S exports to top 10 trading partners we develop one equation and then extend that equation to determine the impact on the top 3 trading partners independently. US export function that is applied to the data comes from U.S exports to the top 10 trading partners. The exports function used is conventional because it was used by previous studies. In formulating the US

Table 2. Summary statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Year	31	1997	9.09	1982	2012
Log (REER)	31	4.62	0.113	4.46	4.91
Log (China GDP)	31	27.7	0.867	26.23	29.1
Log (Mexico GDP)	31	27.23	0.242	26.89	27.6
Log (Canada GDP)	31	27.5	0.244	27.07	27.8
Log (top 10 trading partners GDP)	31	29.9	0.285	29.5	30.4
Log (US exports to China)	31	23.5	1.1	21.8	25.4
Log (US exports to Canada)	31	25.6	0.53	24.5	26.4
Log (US exports to Mexico)	31	24.8	0.83	23.2	26.09
Log (US exports to the rest of the world)	31	27.43	.54	26.49	28.2

exports function we follow Sukar¹ and Kara¹³ and use the following log linear formulation:

$$\ln US_{ex10} = \beta_0 + \beta_1 \ln GDP_{10} + \beta_2 \ln REER \quad (1)$$

where US_{ex10} is demand of the 10 top trading partners for US goods, GDP_{10} is the total real GDP for all top 10 US trading partners, $REER$ is the real effective exchange rate of the US dollar. $REER$ is measured against the weight of all other trading partners currencies. An expected estimate of the $REER$ coefficient to be positive. The prediction stems from the idea that at higher levels of income, trading partners demand more of US products.

Because we care more about the top 3 trading partners, Canada, China, and Mexico, we will estimate 3 more equations that are extended from the original model. We will begin with Canada. The export demand function is the same but instead it measures US exports to Canada only, GDP measures Canada GDP only, and $REER$ is the same.

$$\ln US_{ex_{ca}} = \beta_0 + \beta_1 \ln GDP_{Ca} + \beta_2 \ln REER \quad (2)$$

where $US_{ex_{ca}}$ is US exports to Canada, GDP_{Ca} is Canada GDP, and $REER$ is US \$ real effective exchange rate in terms of all

trading partners. Our expectation will still hold where we would predict a positive estimate for β_1 and a negative estimate for β_2 . Then, we will determine the effect on US exports to China by the following equation:

$$\ln US_{ex_{Ch}} = \beta_0 + \beta_1 \ln GDP_{Ch} + \beta_2 \ln REER \quad (3)$$

where $US_{ex_{ch}}$ is demand of China for US goods, GDP_{Ch} is China GDP, and $REER$ is the same as before. The same thing holds for our expectation on beta estimates. Finally, we will determine the effect on US exports to Mexico by the following equation:

$$\ln US_{ex_{me}} = \beta_0 + \beta_1 \ln GDP_{me} + \beta_2 \ln REER \quad (4)$$

where $US_{ex_{me}}$ is demand of Mexico for US goods, GDP_{Me} is Mexico GDP, and $REER$ is the same as before. Same assumptions hold here as well where Mexico GDP has a positive impact on US exports, $REER$ has a negative impact on US exports.

6. Results and Discussion

The results are shown in Table 3 and 4, where each column is the estimation of each model respectively. The first column is

Table 3. Results before robustness

US exports(%)	Top 10 trading partners(%) (1)	China(%) (2)	Canada(%) (3)	Mexico(%) (4)
Constant	-23.99 (-7.56)***	-13.7 (-6.7)	-64.5 (-0.8)	-65.7 (-13.9)***
GDP(%)	1.79 (21.15)***	1.39 (37.6)***	3.16 (1.27)	3.45 (22.56)***
REER(%)	-.522 (-2.52)***	-0.31 (-1.04)	0.557 (0.10)	-0.74 (-2.03)
R-square	0.96	0.98	0.064	0.95
P-value	0.00	0.00	0.4	0.00
B-p/c-w	0.42	0.12	0.21	0.39
Durbin Watson stat	0.142	0.90	2.14	0.22

Table 4. After robustness

US export(%)	Top 10 trading partners(%) (1)	China(%) (2)	Canada(%) (3)	Mexico(%) (4)
Constant	-27.21 (-4.83)	-17.3 (-5.33)	-63.8 (-.84)	-66.2 (-8.3)
GDP(%)	1.86 (10.3)***	1.41 (19.3)***	3.15 (1.35)	3.4 (12.37)***
REER(%)	-0.287 (-2.15)***	0.327 (0.403)	0.466 (0.09)	-0.64 (-2.3)**
R-square	0.99	0.99	0.09	0.99
p-value	0.00	0.00	0.27	0.00
Durbin Watson stat	1.16	1.98	2.0	1.21

the estimation of our first model, the second column is the second model, the third column represents the third model, and the fourth column represents the fourth model. After running a regression for our first model, we see that if the total GDP for the entire top 10 trading partners rise by 1%, US exports to the top 10 trading partners will go up by 1.86 and it's statistically significant at the 1% level. This result matches our earlier prediction about the positive impact that income has on demand for US goods. Second, we see that if real effective exchange rate rise by 1%, US exports to the top 10 trading partners will drop by 0.28 and it is statistically significant at the 1% level. This is exactly as what we've predicted in our assumptions. The model has an overall significance with a zero p-value. Also, adjusted R-sq is 0.99, which means that out of the total variation, we can explain .99. After running the second model, we see that when Canada's GDP increase by 1%, US exports to Canada increase by 0.88 and it is highly significant at the 1% level. If real effective exchange rate goes up by one %, US exports to Canada will drop by 0.01, however, it is insignificant. Again, this is almost the same as what we have predicted before. Running to the third model, If China's GDP increase by 1%, US exports to China will increase by 0.327 %, and it's significant at the 1% level. This is exactly as what we've predicted. However, when real effective exchange rate of the US \$ increases by one %, US exports to China rise by 0.327% and it is insignificant. This wasn't predicted once we've made our assumption. What can explain that is exports to China are necessity goods. Also, the Yuan is a fixed exchange rate that is pigged to the major currencies, mainly \$, and any rise in the dollar is actually associated with a rise in the Yuan, so that's why we have a positive coefficient for the value of REER. The model has an overall significance with an adjusted R-sq of 0.99; out of the total variation we explained 0.99. The reason why I get high R-squares is that because I'm dealing with time-series data.

7. Statistical Robustness

We haven't reported one controversial variable, Chinese exchange rate due to concerns of multicollinearity. We have omitted the Chinese exchange rate because the Yuan is pigged (fixed) to a number of major currencies, mainly the dollar, and including it in our model would raise concerns about high correlation between the two variables. In order to trust my t-stats we check for heteroskedasticity by using the B-P/C-W test with the following hypothesis:

H0: Constant variance (Homo)

Ha: fitted values of Y

our P-value is very high, (so we fail to reject the null, no heteroskedasticity). In order for us to trust our error term, we check

for autocorrelation. Auto correlation is a bigger of a concern especially with time series data. So, we run the Durbin Watson test with the following hypothesis:

H0: no auto correlation

HA: autocorrelation. (Reject the null)

After figuring out that we have an autocorrelation problem, we predict the residuals and generate a new variable for lagged residuals. After that, we run a regression on residuals and lagged residuals, and then we do the prais regression that will correct for our autocorrelation problem. After checking for correlation between my explanatory variables, I'm more confident that there is no multicollinearity in my model. Correlation between variables didn't exceed .56 for all variables.

8. Conclusion

A current account deficit ranging from 4-6% out of the total GDP is a big of concern for the U.S especially when it's associated with different budget deficit. Running a large trade deficit would prevent the whole wide U.S economy from adjusting smoothly to full employment. Therefore, enhancing exports is the best tool that allows for such a correction. In order to achieve the goal of influencing current account positively through exports, US should work that through the top 10 trading partners because they resemble a very big share in the U.S trade by increasing exports to them. Enhancing exports should be directly coming from the depreciating the value of the dollar. Our findings indicate that at lower dollar values, the volume of US exports to the major 10 trading partners increase. Although growth in the national income of the major trading partners could result in higher levels of US exports, US policy makers can't react to that because increasing the growth of other countries that is not at their disposal. Therefore, emphasizing the idea of lowering the value of the dollar to achieve a better economy by increasing exports.

By looking at our results we see that if US real effective exchange rate rises by one percent, US exports to China go up. Mainly this is because of the pigging the Yuan to the US \$, so any rise or fall in the value of the dollar would have a similar effect on the Chinese currency after China's central bank intervention. This particular result emphasizes various suggestions for us. The first one we could think of is that pigging a currency to another is not always a favor for the pigged (the dollar in this case). This indicates that the U.S can't benefit from depreciating their currency to increase exports to China. However, real effective exchange rate has shown a negative relationship with US exports to all of the top 10 trading partners that mostly adopt a floating exchange rate regime.

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