The Impact of the Appreciation of the Chinese Yuan on the US Manufacturing Sector

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Abstract

Since 1985, the United States has incurred its largest bilateral trade deficit with China. Many associate this current account deficit and loss of American jobs in industries competing with rapidly rising imports from China. China's reserve of the US dollar is now in excess of $2.45 trillion. This paper examines the impact of the appreciation of the Chinese Yuan on the US manufacturing sector.

The Problem

As China's economic power and accumulation of wealth continue to grow, other countries including the Unites States worry about the economic and financial consequences. The United States has lost many manufacturing jobs even in the capital intensive industries, as imports from the People Republic of China (PRC) have surged in recent years. Since 1985, the United States has incurred its largest bilateral trade deficit with China. US trade deficit with China increased from a balance trade in 1986 to $227 billion in 2009. Today, China is the largest exporter to the United States. In 2009, the US imported approximately $297 billion, exceeding the import from the EU of $281 billion. Many associate this deficit with the loss of American jobs in industries competing with rapidly rising imports from China, and other Southeast Asian countries. China's exports to the US have been unprecedented, increasing from $4 billion in 1985 to approximately $297 billion in 2009. At the mean time, the US exports to China also increased, but at a significantly lower rate from approximately $4 billion in 1985 to approximately $70 billion in 2009. As we observe, the trade situation with China has deteriorated from a relative balance trade in 1985 to a huge imbalance in favor of China in 2009.

Although bilateral trade is good for both countries and allows for more efficient utilization of resources in addition to access to a very large Chinese market, many US industries are unable to compete and/or access the Chinese market. The imbalance of trade is partly attributed by the Chinese authorities' successful manipulation of the RMB to maintain global competitiveness. The Chinese Yuan was devalued in the early 1980s as part of government's policies to increase exports to the US. Following a significant pressure from the United States, in July 2005, China revalued its currency by 2.1% against the US dollar and moved to an exchange rate system that references a basket of currencies. Cumulative appreciation of the renminbi against the US dollar since the end of the dollar peg was more than 20% by late 2008, but the exchange rate has remained virtually pegged since the onset of the global financial crisis. Since, the RMB is pegged to the US dollar, the

devaluation of the dollar benefits the Chinese exports, since the dollar is a major international currency.

Recent reports indicate more willingness by the Chinese authorities to appreciate the Yuan against the dollar. However, many do not believe that the Chinese authorities will deviate too much from past practices, because China continues to focus on exports.   China's focus on exports is attributed to excessively weak domestic consumption. Adil Mohommad, Papa N'Diaye and Olaf Unteroberdoerster (2010) contributed the huge Chinese current account surpluses to a weak domestic consumption. Guo and N'Diaye (2009) concluded that weak consumption in China is largely due to low and declining share of household disposable income and a rising saving rate.

China's exposure to external demand from outside Asia has increased from 15% during 1995-2000 to over 19% during the 2001-2005 period. This trend mainly reflects China's growth of exports to advanced economies as it has become a hub of the region's supply chain network for advanced economies. While China's exposure to external demand continues, international businesses find it very difficult to compete effectively with domestic entities in China. The Chinese government vowed to continue reforming the economy and emphasized the need to increase domestic consumption in order to make China less dependent on foreign exports for GDP growth in the future.

Objectives

Global corporations such as Coca Cola have made more money in East Asia and Western Europe than in the United States in recent years. Currency fluctuations have more pronounced effect on the US businesses button line and the US economy in general than any other time in the US history. Profits earned in foreign currencies are worth more when the US dollar declines in value. SMS Elotherm, a small German manufacturer of machine tools signed a deal with DaimlerChrysler with $1.5 million worth of machines.   The machines would be manufactured in Germany and exported to the United States.   When the deal was signed, the profit per machine was calculated at €30,000 each. Within three days that profit had declined to €8000 as a result of the steep decline in the dollar against the euro, since EMS would be paid in dollars, while its cost is in euro. Another small German company was more successful. Keiper is a small German supplier to US automobile companies fared relatively well during the same period because they built a plant in Ontario Canada, and the dollar remained stable relative to the Canadian dollar.

During the past 20 years, a new and different form of international business has developed that has greatly increased worldwide economic and political interdependence.   Global corporations are now making direct investment in fully integrated operations worldwide. Brigham and Houston (2009) listed seven reasons for global corporations to operate worldwide - to seek production efficiency; to avoid political, trade, and regulatory hurdles; to broaden their markets; to seek new raw materials and new technology; to protect processes and products; to diversify; and to retain customers. United States Direct Investment in foreign countries increased from $222 billion in 1976 to approximately $3.7 trillion in 2008, and the total US assets abroad increased from less than half trillion dollars in 1976 to approximately $19 trillion. Foreign Direct Investment in the United States increased from $47.5 billion in 1976 to more than $2.6 trillion in 2008. Since, our main goal is to increase manufacturing jobs in the US, we can do this by either increase exports or by attracting foreign investment in manufacturing or a combination of the two. Although, significant attention has been paid to the impact of exchange rate fluctuation at the macroeconomic level, more attention needs to be paid to its impact on the US manufacturing sector and creation of jobs at home.

Literature Review

Since the collapse of the Bretton Woods system in the 1970s until now, the US dollar has inherited the role of reserve currency in the international monetary regime. The system based on the Jamaica Accord is also referred to as the Dollar Standard. Since the beginning of the 21st century, the most serious problem of the dollar standard has been global imbalance. It is evident in the consistent current account deficit of the USA as well as in the continued current account surplus of East Asian countries and resource-exporting economies. A consistent current account deficit will lead to rising net external debt owed by the US and once the net external debt exceeds a limit, the currency of that country will face significant depreciation pressure. Hence, an international monetary system based on the US dollar will become unsustainable.

Faced with the challenge of persistent trade deficit and depreciation of the dollar, the Obama Administration adopted export growth as a critical part of its economic recovery plan. Export growth in manufacturing sector should be the number one priority for the Administration. America is the world's largest manufacturer, and exports are an important part of our manufacturing strength. The administration strategy to increase exports may not be easy given the rising role of China in the world manufacturing.

Huw McKay and Ligang Song (2010) explained that China's emergence as a manufacturing powerhouse has altered the distribution of power in the world economy in an irreversible fashion. The first half of the twenty-first century will be shaped substantially by the nature of China's continuing engagement with a strategy of manufacturing-led development. It seems that the attention of many developed world observers tends to be fixated on the role of exchange rate adjustment, particularly the appreciation of the Chinese yuan.

Although it is now widely agreed that China needs to rebalance its economy, to reduce its reliance on export demand and to stimulate domestic demand, especially personal consumption, the United States Manufacturing sector cannot rely on the appreciation of the Yuan to increase exports. In addition, the appreciation of the Chinese Yuan against the US dollar may not be in the long-term interest of the US, as China moves away from using the dollar in international transactions. According to Ming Zhang (2009) the Chinese Government has stepped up its drive to reconstruct its international financial strategy after the sub-prime crisis developed into a global financial crisis in 2008. The main aim of the strategy is to reduce the country's dependence on the US dollar in foreign trade, cross-border capital flows and foreign exchange reserve management.

In order to achieve the goal of moving away from the dollar, according to Ming Zhang (2009) the Chinese Government has taken a series of actions on the international financial stage, which can be divided into three tiers, moving from the near term to long term: renminbi (RMB) internationalization, regional monetary cooperation and reconstruction of the international monetary regime. The three-tier steps reflect the Chinese Government's ambition to reshape its international financial strategy, the aim of which is to comprehensively enhance the role of the RMB and some other currencies on the international market, and to reduce the dependence of China and East Asia in particular on the US dollar.

Methodology and Research Design

The debate on Sino-U.S. currency exchange rate becomes more popular in last few years, due to impact from recent financial crisis. One problematic issue is that there is no conclusive statement in extant literature for influential factors for loss in the U.S. manufacturing jobs. Some researchers and media accuse China's pegging Yuan with U.S. Dollar to be responsible for the job losses, while others argue that the policy helped the U.S. to maintain low level of inflation, and at the same time "export" inflation (for example, through Quantitative Easing) to China and other countries. Besides, as Sachs *et al.* (1994) point out, the contraction in U.S. manufacturing are considered by some researchers as mainly the result of technological development rather than competition from overseas. Statistics (U.S. Bureau of Labor Statistics) show that the employment in the U.S. manufacturing industries has declined consistently since 1940s.

From Figure 1, Number of Employees in U.S. industries, we note that the loss in manufacturing sectors were compensated by increase of employment in service industries, which is consistent to economic development theories in regarding to economic structures of developed and developing economies.
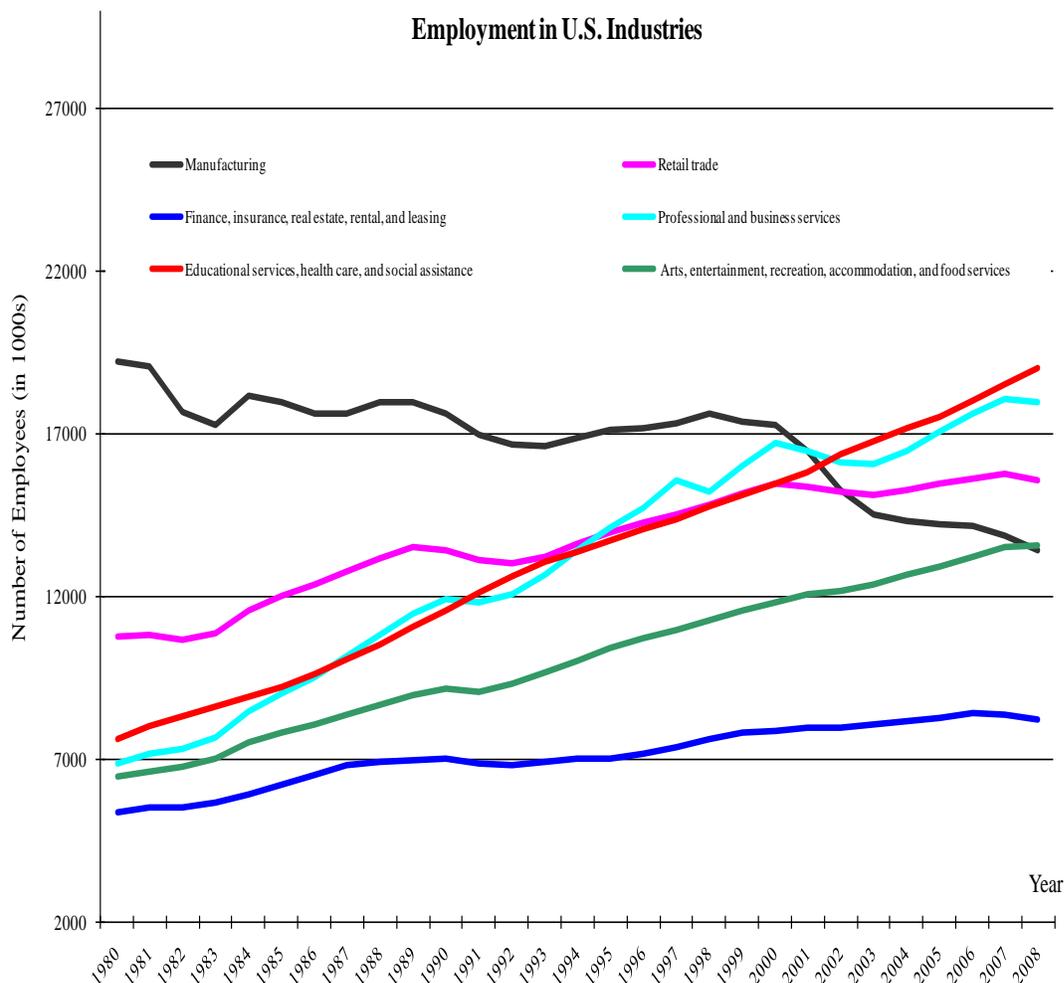

Figure 1: Number of Employees in U.S. industries
Source: U.S. Bureau of Economic Analysis

For the sake of exchange rate of Yuan, in fact China encountered trade deficits with most developed countries except the U.S. [see Mankiw (2003) for example]. Considering the difference in economic structure (China and other emerging economies are abundant in inexpensive labor recourses) and the U.S. restrictions on exports of high-tech products (especially to China), the comparative advantage theory would suggest increase of importing labor-intensive products from China and other developing countries, a phenomenon which has being observed in last three decades, especially following the rapid growth of multinational corporations and the globalization trend. As now it's more cost (specifically the labor cost) effective to import from overseas or relocate the production facilities in other countries, even if Washington's request for sharp appreciation of the Yuan gets satisfied, it is very likely to see increase of imports from other developing countries such as India, Vietnam and Mexico, etc.

One argument raised in regarding to Chinese Yuan exchange rate, is that the nominal Yuan appreciated by more than 20% since 2005, while during the same time period, the employment in U.S. manufacturing industries deteriorated. To check the real change in exchange rate of the Yuan, the different inflation levels of both countries need to be taken into account.   Using CPI indices of urban areas in China and U.S. and 1982 as the base year, we calculate real exchange rate of Yuan as,

(1)
$$REXR = EXR \times \frac{CPI_{CHINA}}{CPI_{U.S.}}$$

where *REXR* is the real exchange rate, and *EXR* is the nominal exchange rate, measured as value of Chinese Yuan per U.S. dollar. Overall, the real exchange rate calculated as stated, reveals that the Yuan appreciated in the last two decades (see Figure 2). And some analysis [see for example, Economist (Nov. 6th, 2010)] argues that the real Yuan appreciated much faster, about 50% since 2005. Thus, people opposing U.S. Congress's voice of pushing Chinese government for appreciating Yuan conclude that the exchange rate should not be accused for job losses in the U.S.

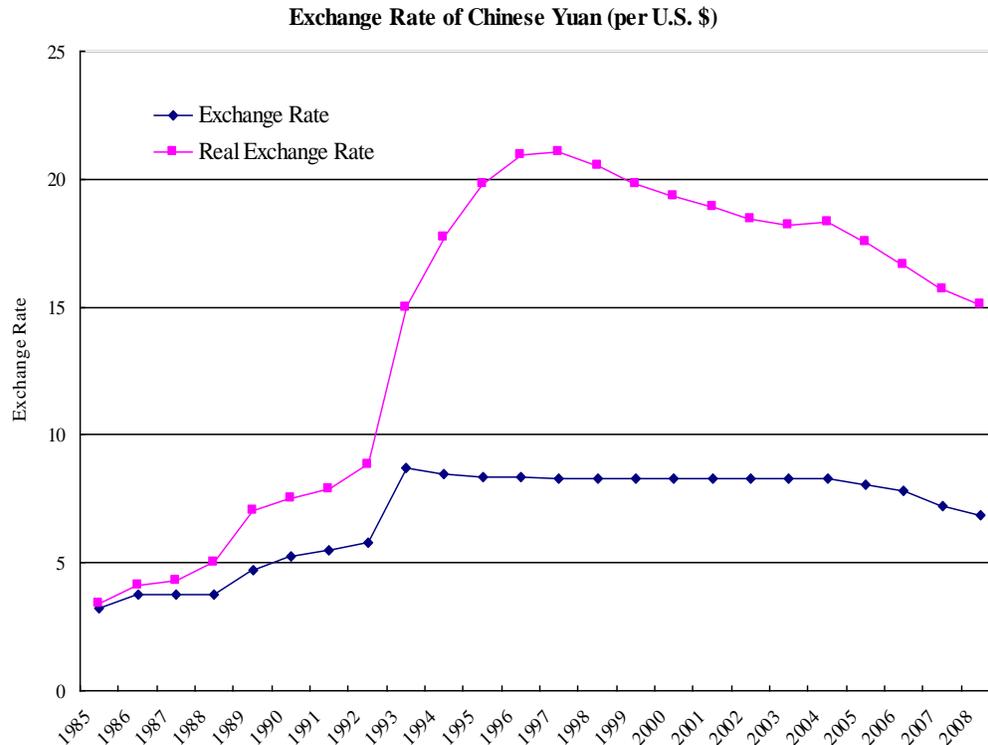**Exchange Rate of Chinese Yuan (per U.S. $)**

Figure 2: Exchange Rate of Chinese Currency
Source: U.S. Federal Reserve Bank of New York, National Bureau of Statistics of China

Given aforementioned debates, in what follows we focus on testing whether there exists significant relationship between the Sino-U.S. currency exchange rate and employment in U.S. manufacturing industries. As one fundamental point of debates on the exchange rate issue is whether the rate does impact the employment negatively, statistical study of the issue although simple but not naïve, can bring some insights in understanding the currency appreciation/depreciation topic more thoroughly.

As Figure 3 points out, the contraction in manufacturing jobs, if it's impacted by the trade imbalance with China, can be mainly concluded as the results from dramatic increase in imports. This trend started from late 1980s, after Chinese government started opening up its economy to the world, with its speed got accelerated after China's participating the WTO at the end of 2001.
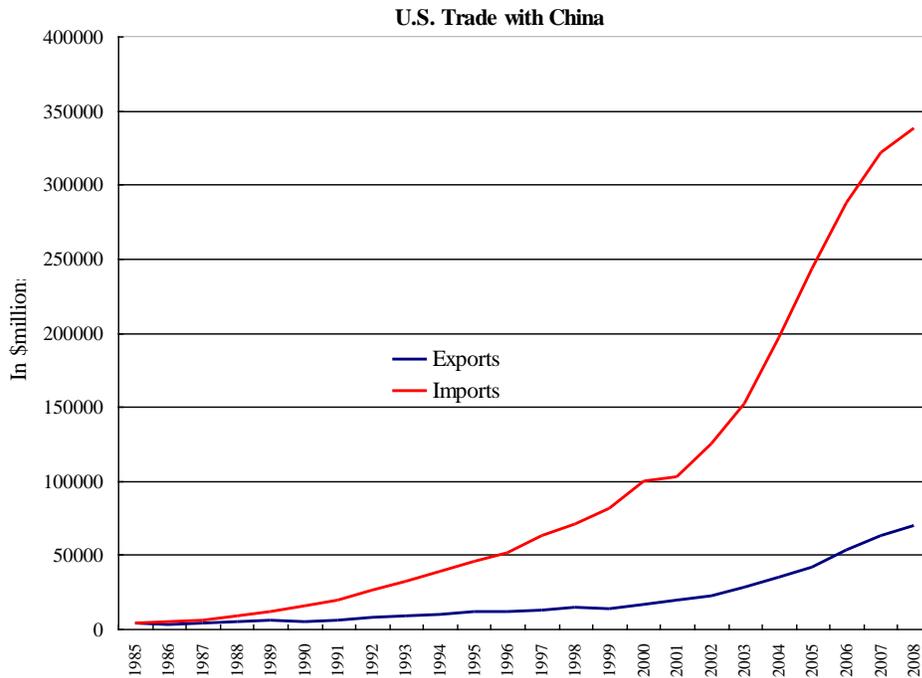
Figure 3: Sino-U.S. Trade
Source: U.S. Census

Thus, initially a simple log linear regression can be established as,

(2) $$\ln(\text{Employment}) = \beta_0 + \beta_1 \times \ln(\text{Imports}) + \varepsilon$$

in which imports is mediator variable [see Pearl (2000) for details] and is assumed to be influenced by exchange rate of Yuan and other covariates. According to Wooldridge (2008), to obtain unbiased estimates for parameters, we can conduct a two-stage least squares (2SLS) model and use exchange rate and other covariates as instrumental variables for analyzing the variability in logarithm of imports from China,

(3) $$\ln(\text{Imports}) = \theta_0 + \theta_1 \times \ln(\text{REXR}) + \theta_2 \times \ln(x_2) + ... + \theta_k \times \ln(x_k) + \omega$$

where $x_2, ..., x_k$ are additional instrumental variables.

Equations (3) and (2) can be combined to investigate the impact from exchange rate of Yuan upon employment in U.S. manufacturing industries.

Empirical Analysis

We study the employment in U.S. manufacturing industries with application of the 2SLS model constructed above. The real employment data used here is the annual total employees hired in the industries, provided by the U.S. Census. Due to public availability of employment data in the U.S. and trade with China, only annual data from 1985 to 2008 are included in this study. For the first stage LS analysis on imports from China. Since the imports are influenced not only by the exchange rate of Yuan, but also by imports from other countries and the relative value of other currencies, we include these three Instrumental variables in the first stage. They are denoted as LnREXR for

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logarithm of real exchange rate of Chinese Yuan; LnTIMP for logarithm of total imports (in U.S. $millions) from other top five trading partners of the U.S. including Canada, Mexico, Japan, Germany and U.K; and LnMCINX for logarithm of the major currency index of the U.S. dollar which is constructed by the Federal Reserve and measures dollar value against the currencies of Europe Union countries, Canada, Japan as well as Australia [see Goldberg (2004) for details].

Applying 2SLS model with SAS SYSLIN procedure, we obtain the first and the second stage LS results as follows,

(4)

$$\ln(\text{Imports}) = -14.591 + 0.35485 \times \ln(\text{REXR}) + 2.33 \times \ln(\text{TIMP})$$
$$-1.253 \times \ln(\text{MCINX}) + \omega$$

(5)

$$\ln(\text{Employment}) = 10.30478 - 0.05587 \times \ln(\text{Imports}) + \varepsilon$$

More detailed statistics are listed in Table 1 below:

The 1st Stage LS Results

Variable	Coefficient Estimate	Standard Error	p-value
LnREXR	0.35485	0.09815	0.0017
LnTIMP	2.3305	0.128	<0.0001
LnMCINX	-1.253	0.3324	0.0012
R-square	98.70%		

The 2nd Stage LS Results

Variable	Coefficient Estimate	Standard Error	p-value
LnIMP	-0.05587	0.008576	<0.0001
R-square	65.86%		

Table 1: 2SLS Results

The 2SLS results reveal that, consistent to what have been expected, depreciation of the Yuan has statistically significant effect in promoting the imports from China, which in turn has significantly negative impact on employment in U.S. manufacturing industries. One interesting point here is that while the depreciation of major currencies results in decrease in imports from China, the increase of imports from these countries shows a positive relationship with that from China. This may be due to the reason that in the last two decades the demand for imported goods increased dramatically in the U.S. due to their low price level and increase of outsourcing of U.S. companies, as well as these goods are targeting at different U.S. market sectors.

Therefore, the appreciation of Chinese Yuan can help improve the employment in U.S. manufacturing industries. Albeit, given the reality that the Yuan appreciated against the U.S. dollar in the last decade, the deterioration in the employment in U.S. manufacturing industries is more

likely the result of structural change in the economy following the globalization, and due to other factors such as the financial crisis started in the U.S. residential mortgage market. Based on parameters' estimate in the table above, we note that other factors, such as the imports from other countries, have much stronger impact in the magnitude if compared to the exchange rate of Yuan.

Conclusions

In this paper, we study the impact of exchange rate of Chinese Yuan on employment in U.S. manufacturing industries. We construct a simple log linear 2SLS model, and based on the empirical analysis results, we conclude there exists a statistically significant relationship between the exchange rate and the employment. While appreciation in Chinese Yuan can improve the situation of losses in U.S. manufacturing jobs, the historical data and appreciation of the Yuan in last ten years reveal that the contraction of the employment have been influenced on larger degree by other factors instead of the exchange rate.

Thus, resorting to solely the appreciation of Chinese Yuan, as argued by some politicians in Capitol Hill may have limited effect in solving the employment problems faced by the U.S. manufacturing sectors. As majority of manufacturing jobs are labor-intensive, based on high labor cost in the U.S. workable solution for long run in job losses is to improve the productivity and relocate labor force effectively into high-skill positions, for example, by training current employees with new technologies and skills.

In addition, this research is carried out at an aggregate level, which does not take into account the differences in different U.S. manufacturing sectors. Further research can be conducted to provide a comparable study of the impact from the exchange rate. Besides, with more data available from proprietary sources, thorough studies can be carried out which can provide more reliable and detailed insights into the currency exchange rate and employment issues.

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Biographies

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