The Park Place Economist

Volume 20 | Issue 1 Article 11

2012

The Impacts of U.S. - China Trade on U.S. Manufacturing Unemployment

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Abstract

The U.S.-China economic ties have expanded over the past three decades with a substantial growth in both imports and exports. The total trade amount rose from only 2 billion in 1979 to over 457 billion in 2011. Although total trade increased over time, U.S. imports from China rose at a much higher rate than U.S. exports, and thus have caused a trade deficit since 1974, making China the U.S.'s biggest source of imports and second largest U.S. trading partner.

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Tung Hoang

I. INTRODUCTION

The U.S.-China economic ties have expanded over the past three decades with a substantial growth in both imports and exports. The total trade amount rose from only 2 billion in 1979 to over 457 billion in 2011. Although total trade increased over time, U.S. imports from China rose at a much higher rate than U.S. exports, and thus have caused a trade deficit since 1974, making China the U.S.'s biggest source of imports and second largest U.S. trading partner.

The impacts of trade on the U.S economy are yet to be thoroughly examined and many economists have debated the consequences that it has on the employment situation over the years. One thing is certain, the U.S.'s openness with the world in terms of trade will benefit U.S. individuals, corporations, and the U.S. economy as a whole. However, there are many negative aspects of the growing trade deficits; one of those suggested by many leading economists is the rise in unemployment. The U.S. labor market has been up and down many times in the past and these fluctuations can be attributed to many factors. Most of the time, it is thought that the macro-economic situation is the main cause. However, the changes in the labor market can be attributed to a major production shift which can be caused by opening trade with a labor-intensive country, such as China. Understanding the U.S's trade situation will yield a greater knowledge of the effect that the trade balance has on the U.S. employment situation, especially in those industries that mainly employ low-skilled workers.

The current unemployment situation in the U.S has attracted much attention from policy makers and economists as there have not been a clear solution to resolve the problem. The unemployment rate has remained relatively high over the past few years and differed across industries. For the manufacturing sector, the rate has stayed relatively high at about 10% on average (2001 – 2011). Therefore, if the trade imbalance of the U.S. with China contributes to U.S. manufacturing sector job losses, it would have significant policy implications and help the U.S. government provide necessary protection to its workers. In this paper, I examine the impacts of trade on unemployment while controlling other economic factors such as GDP, U.S. foreign direct investment to China, labor costs and productivity. Upon doing this research, I hope to find what affects unemployment in the U.S manufacturing sector the most and determine whether trade imbalance is an actual cause of millions of lost jobs in this sector.

The main theoretical framework used in this paper is the classic Heckscher-Ohlin theorem with two goods, two countries and two factors of production. Under this theorem, the U.S. is considered to be the capital abundant country and China the labor abundant country. According to the theory, as the two countries open to trade, each one would specialize in the goods that use intensively its abundant factor of production. Therefore, China, with its advantage in low-wage workers, is expected to utilize its production in industries that are labor intensive. As the U.S is more focused on producing goods that are capital intensive, there is a production shift from U.S. to China for those goods which primary factor of production is labor. This shift is an indication of job losses in industries that traditionally use workers as its main factor of production.

Despite the logical implication of the Heckscher-Ohlin theorem, the employment situation of the U.S. manufacturing sector may be influenced by factors other than trade. Therefore, I take into account other economic models and theories of leading economists that have different views concerning the impacts of trade on employment. By reviewing different opinions, I look forward to constructing a reliable model that can help answer the question of whether the growing trade with China causes job losses in the U.S. manufacturing sector. My hypothesis, which is based on the Heckscher-Ohlin theorem, is that factors favoring U.S-China trade (increased imports from China and more U.S. direct investment to main-

land China) contribute significantly to the rise in unemployment of U.S. manufacturing sector.

II. LITERATURE REVIEW

In reviewing the recent works on the impacts of U.S.-China trade on unemployment, I found a variety of articles and papers that express different viewpoints on the matter. In general, many of them suggest a direct causal relationship between trade deficits and unemployment and provide empirical models using different data sets that span from the 1970s to 2009. There are also several papers that propose the contrary viewpoint that trade impacts have negligible effect on the unemployment situation. The following summary will capture the most notable works done in the field in order to provide a broad picture of the background for this research.

In his research paper, Sucharita Ghosh (2002) investigates the relationship between international trade and employment in the manufacturing sector of the U.S for the period of 1961-1995. The author proposes that changes in trade of manufactured goods affect employment in the manufacturing sector of the U.S. Using the time series analysis method, the author confirms a long-run relationship between net imports and employment. Then, using the test of Granger causality, the author finds that changes in employment do not Granger-cause changes in net imports. In reverse, changes in net imports do cause Granger-cause changes in employment in the two major industries: industrial machinery and chemicals. However, the primary metals industry is an exception to this general finding, and Ghosh (2002) concludes that changes in net import in this industry do not Granger-cause changes in employment.
The Ghosh paper (2002) therefore provides insight into the relationship between employment and net imports in a bivariate context over the period 1961-1995 for the United States. The results in this paper set a groundwork to examine further the relationship between trade surplus and unemployment. In addition, it also suggests using time series analysis as an alternative way to test any hypothesis about the causality between variables.

Similarly to the work done by Sucharita Ghosh (2002), Jefferey D. Sachs and Howard J. Shatz's (1994) paper analyzes the impact of trade using theories and simulation models. The paper predicts the trends in the U.S labor market using a new database that allows the authors to trace the patterns of U.S. foreign trade. The main focus is on the period 1978 – 1990, during which time U.S. trade with developing countries expanded significantly. One of the main conclusions the authors found is that internationalization contributes to the decline of manufacturing employment, particularly of low-skilled workers. Nonetheless, the authors agree that increased internationalization by itself, however, cannot account for most of the observed labor market trends. The end of the paper makes some rough estimates of future trade flows with some of the key low-wage regions that include China, India and Mexico.

The Sacks and Shatz (1994) paper contributes significantly to the arguments and theoretical framework in my research paper with its comprehensive analysis and extensive use of theories. Also, this paper examines a period in the past during which U.S. expanded its trade internationally, which extended the scope of my research topic to a longer timeline. The suggested data sources in this paper are also useful, especially in the case when I want to analyze past patterns of labor markets.

Kate Bronfenbrenner's pilot study (2002) lays the groundwork for more comprehensive research to monitor and analyze the impact of the U.S.– China trade relations on workers, wages and employment in the U.S. Because of the lack of government data, the author first designs a media-tracking system to create a new database on production shifting out of the U.S. Then she analyzes macro data on imports, exports, and foreign investments to draw a conclusion that U.S. – China trade and investment policies have a significant impact on employment and wages for U.S. workers.

Bronfenbrenner's paper (2002) is relevant because it provides an important view on the impact of foreign investment on employment and wages. In addition, the paper provides a rich source of data for employment, wages and many other relevant variables by introducing the use of its media-tracking system. The production shift is also explained very carefully in this paper and is useful in establishing strong arguments.

On the contrary, Krugman's paper on World Trade (1994) provides a different view in the debate of trade impacts on labor markets. The

main focus of the paper is the discussion on the consequences of international trade with a focus on employment and wages. The author introduces a stylized model of global trade, employment and wages to examine the effects of growing trade. Krugman proposes that the rapid growth of Newly Industrialized Economies' (NIE) exports has something to do with the trends in OECD labor markets, including the rise in wage inequality and unemployment. However, the author concludes that NIE trade is not the principle cause of these labor market problems.

Krugman's (1994) paper provides a different view on the impact of NIE trade on employment by not suggesting a strong relationship between the two. Therefore, other economic factors besides trends in trade should be taken into account in explaining changes in employment. The articles reviewed in this section focused on the employment situation from 1960s to 1990s. Each paper has a different approach and model to examine the relationship between trade and the labor market, and only a few focused specifically on the manufacturing sector. Both sides of the debate propose very comprehensive models and strong arguments supported by advanced economic theories, yet there are more recent works that support the theory of negative trade impact on employment. However, not many of them are reviewing the period from 2000 – 2010 when U.S. trade with China experienced a substantial growth, mostly due to China joining the WTO in 2001. My research paper will help fill in this gap of literature by examining the most recent 10 years of trade between U.S. and China, specifically focusing on the impacts it has on U.S. manufacturing employment.

III. DATA

As suggested by the theoretical framework and the list of papers I reviewed, I constructed an empirical model with unemployment in U.S. manufacturing sector as the dependent variable. The independent variables are U.S imports and exports to China, productivity of U.S. manufacturing labor, the amount of U.S. direct investment to China, and the manufacturing production index. Due to the limit in data available, I am using the 'panel' method to run the regression in order to have a more accurate measurement. I broke down the manufacturing sector into five major industries: Food, Chemicals, Chemical Related Products, Machinery & Transportation, and Miscellaneous Manufacturing. Data for each of the independent variables will be collected on an annual basis and separately for each industry. Sources of data are U.S. government websites.

I use the U.S. employment index for the manufacturing sector, using 2002 as a base and available from 1930 to 2011. Therefore, value for the employment index in 2002 will be equal to 100 and other years' index will be constructed base on its relative employment value to 2002. For example, employment data in 2002 is 1 million and employment for 2003 is 1.2 million, then the index value of employment in 2003 is 120.

The variables that measure U.S trade with China are U.S. imports and U.S exports, measured by the actual dollar value. Both variables are obtained from the United States International Trade Commission (USITC) website on an annual basis, measured in billions of dollars. The data are available on this website from 1986-2011.

For U.S. manufacturing productivity, I obtained the data from the Bureau of Labor statistics website. Productivity is measured by output per hour and in percentage change from previous year. The data is obtained on an annual basis and are available from 1987-2011.

I acquired the data from the Bureau of Economic Analysis website for the U.S. direct investment in China. The data is available separately for each industry, and has the range of 1989-2009.

The same source is used to obtain Industrial Production Index data. I used Industrial Production Index instead of real GDP because it is a better measurement of the growth of manufacturing industries. GDP covers a broader range of the economy and may not accurately reflect changes in the manufacturing sector. The range for this data is from 1998-2010.

IV. EMPIRICAL MODEL

In this research, only one OLS regression is used to analyze the effect of trade on employment in the U.S. Manufacturing sector. The dependent variable is the employment data of the U.S. Manufacturing sector, measured in index value with base year of 2002. The independent

variables are Industrial Production Index (INDUSTRIAL_PROD), Productivity for Manufacturing Sector (P), U.S. Direct Investment to China (US_INVEST) and dummy variables for Chemicals, Chemical related products, Machinery and Miscellaneous manufacturing industry.

Regression Model:

$$EMP=a + a_1EXPORT + a_2IMPORT + a_3P + a_4US\_INVEST + a_5INDUSTRIALPROD + a_6 CHEMICAL + a_7CHEM\_RELATED + a_8MACHINARY + a_9MISC$$

All the data iare from 1989-2009 and are obtained annually. The empirical model not only controls for trade effects but also economic factors that may have an impact on employment. For the trade variables, I hypothesize that increasing imports from China will result in lower employment levels. Likewise, increasing exports to China will increase the number of jobs in the U.S, which follows directly from the Heckscher-Ohlin theory. The theory states that a capital-abundant country will export the capital-intensive good, while the labor-abundant country will export the labor-intensive good (Salvatore 2009). Under this theory, I consider the United States as the capital abundant country and China as the labor abundant one. Provided that, the United States would be focused on manufacturing the capital-intensive goods and leaves most of its production process of labor-intensive goods to China. Therefore, the manufacturing sector would mostly be affected because it employs labor heavily.

Industrial Production Index (INDUSTRIAL_PROD) is a measurement for the growth of manufacturing industries and I use the percentage change in value from the previous year. The productivity variable (P) measures output per hour and is hypothesized to have a positive correlation with the employment level. U.S. direct investment to China (US_INVEST) accounts for the dollar amount that U.S. firms spend each year investing in China. The more U.S. investments made in China, the higher the possibility of production shifts from U.S. to China, thus leading to lower employment in the U.S. manufacturing sector.

A problem when building the empirical model is that the range of data is limited to only 19 observations. As stated previously, in order to increase the reliability of the empirical model, the manufacturing sector is broken down into five smaller industries, each represented by a dummy variable: Food (FOOD), Chemicals (CHEMICAL), Chemical related products (CHEM_RELATED), Machinery & Transportation (MACHINERY), and Miscellaneous manufacturing (MISC). The data for each industry is presented using a 'panel' method to increase the number of observation to 99 observations.

The regression model will yield knowledge on which factor has a significant impact on employment and whether changes in employment can be attributed to changes in trade with China (increasing imports to the U.S. and more direct investment to China).

V. EMPIRICAL RESULTS

A. Impact of Exports and Imports

The results for the OLS regression are reported in Table 1 along with some descriptive statistics. Table 1 shows the extent to which trading has an impact on manufacturing employment. Because manufacturing employment is measured by an index, change in the value of the coefficient shows how much the employment index will change for a one unit change in the independent variable. In general, all of the independent variables have the predicted sign of coefficients, except for the US_INVEST variable, and are significant at the 5% level (p-value = 0.000). The regression also has an adjusted R-Square of 0.85. To get started, the results show that a 1% increase in productivity level (P) will decrease the employment level (EMP) by 0.7%, which supports the proposed hypothesis. As U.S manufacturing workers become more productive, fewer workers are needed for the production process.

US_INVEST has a positive sign for its estimated regression coefficient, indicating that increasing the amount of investment overseas actually helps boost the domestic employment by a small amount of 0.002% for every million dollars invested. This result contradicts the hypothesis that increasing U.S. investment in China will lead to a production shift in the manufacturing sector, which may decrease the number of manufacturing jobs in the United States. The amount of U.S. investment to China over the past 20 years averages 284 million dollars and surged from a few hundred millions to billions of dollars in recent years.

An important factor that has substantial impact on manufacturing employment is the Industrial Production Index (INDUSTRIAL_PROD). The index reflects how well the manufacturing industry is doing each year and is a better measurement than GDP. The regression results show that a 1% increase in the industrial production index from the previous year generates a 1.5% increase in manufacturing employment. The relationship between the two variables is positive and is well supported by the fact that the better the manufacturing sector is doing, the lower the rates of unemployment it has.

With regards to exports and imports, the descriptive statistics show that average imports value exceeds the average exports value by an amount of 4.5 billion dollars. Both values of imports and exports have increased significantly over the years. The regression results support the hypothesis that increasing exports creates more domestic jobs while increasing imports reduces the number of jobs in the manufacturing sector. One billion dollars in exports could raise employment by approximately 2.48 percent while the same amount of increase in imports reduces the manufacturing employment by approximately 0.48 percent. This result shows that imports have a lesser impact on employment than exports have.

B. Comparing between manufacturing industries

Using the food industry as a reference, the dummy variable for this industry is omitted in the empirical model. The regression results show that holding other controlled variables equal, the Chemicals and Machinery industry both generate less jobs than the Food industry by approximately 12% compared to food industry employment. In contrast, the Chemical related products industry creates more jobs than the Food industry by 10% , and miscellaneous manufacturing industry increased employment by 29% in reference to the food industry.

VI. CONCLUSION

The topic about the U.S.-China trade impact on unemployment is fiercely debated among intellectuals and policy makers. There has not been a unified view due to the unique characteristics of China and its exponential economic growth over the past years. The findings of this paper support the idea that increasing imports from China will lead to a higher unemployment situation in the Manufacturing sector, reflected in a negative correlation between employment and imports. It is also interesting to see that exports have a much larger impact on employment than imports. Therefore, the unemployment situation can be improved by increasing the amount of U.S. exports to China. However, given the fact that U.S. is an industrialized country and allocates most of its resources on heavy industries and high-end products where it can utilize its competitive advantage in technology, the trade imbalance in the manufacturing sector is not going to change any time soon. Therefore, the unemployment situation in manufacturing will continue to occur in the near future unless manufacturing workers can improve their skills and move to different sectors that require more advanced expertise.

Surprisingly, as suggested by the results, the employment situation in manufacturing can also be slightly improved by increasing the amount of investment overseas. However, this implication may not hold true in the long term and needs to be tested more in different models. The performance of the manufacturing sector is a good indicator of the employment situation, yet it is highly correlated with the productivity of workers, which has a negative relationship with employment. Therefore, the regression result of this variable does not open much room for suggestion on the employment situation.

In terms of industries within the manufacturing sector, there is a substantial difference in terms of employment and trade amount within each industry. Due to the limitation of data availability, using 'panel' methods in analyzing the empirical model assumes that this difference does not play an important role in yielding the regression results. This assumption may not hold true and further research needs to be conducted to separate the impact of each industry on employment from the manufacturing sector as a whole. One way to do this is to generate a data set that contains more observations for each variable than the one used in this research paper, which mostly depend on the availability of trade data (both exports & imports). Better data will yield a better understanding of trade on manufacturing unemployment.

This study on how trade impacts unemployment can be further expanded by taking into account the possible impact of each industry on

the others within the manufacturing sector. In addition, being able to compare the regression results of the U.S. manufacturing sector with Chinese manufacturing sector using the same model can also yield substantial knowledge on the impact of trade on unemployment. Nevertheless, this seems to be very difficult to implement in the near future because of the data limitation and reliability issue from sources provided by the Chinese government.

The main theoretical framework and many articles and papers in the field of economics have strongly suggested that U.S.-China trade has a great impact on U.S. manufacturing unemployment, which provides good support for my paper. However, there are also strong arguments from the opposite side of the debate made by leading economists that need to be taken into account for any further expansion of this research. More controlling variables such as labor compensation, technology advancement and employment changes in other industry sectors are also very important to analyze in future models. Overall, this is a very controversial topic and through research such as this, the government can have a better approach to reduce the unemployment situation not only in manufacturing sector but for the economy as a whole.

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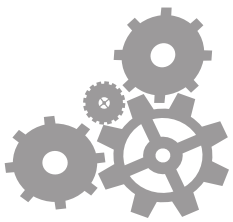

APPENDIX

Table 1: Descriptive Statistics

		Measurement	Mean	Std. Deviation
Dependent Variables	Manufacturing Employment Index	Index, Base = 2002	102.146	16.63090237
	Productivity Index	Index, Base = 2002	97.7745	15.98379504
	US Direct Investment to China	Millions of dollar	284	2311.94814
	Import	Actual Dollar value	6,256,698,101	37,017,026,986
	Export	Actual Dollar value	1,756,317,714	5,734,269,429
Independent Variables	Manufacturing Industry Production Index	Percentage change from previous year	2.723591148	4.096050092
	Chemicals	0 or 1	0	0.4
	Chemicals related products	0 or 1	0	0.4
	Machinery & Transportation	0 or 1	0	0.4
	Miscellaneous manufacturing	0 or 1	0	0.4

Table 2: Resgression Results

		Coefficient	t-Statistic	P-value
Dependent Variables	Manufacturing Employment Index			
	Productivity Index	-0.727	-8.367	0.000
	US Direct Investment to China	0.002	2.708	0.006
	Import	-4.822E-10	-10.026	0.000
	Export	2.483E-9	4.766	0.000
Independent Variables	Manufacturing Industry Production Index	1.519	8.156	0.000
	Chemicals	-12.223	-4.476	0.000
	Chemicals related products	10.182	4.399	0.000
	Machinery & Transportation	-12.065	-2.516	0.000
	Miscellaneous manufacturing	29.415	8.420	0.000

Sample Size: 99
R-Square: 0.850
Adjusted R-Square: 0.853