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GDP Elasticity in China's export to the U.S. and other countries

Bachelor Thesis within Economics

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Subject Terms: China to America export, GDP elasticity, price, distance, ordinary least square, panel data

Abstract

The purpose of this paper is to analyze the China's exports to the United States by examining the GDP elasticity of export demand. In order to do this, I will study the U.S. together with 33 other countries in a regression analysis to find out whether the United States is more or less GDP sensitive for China exports. The regression model estimates how China's exports to each country depend on the importing country's GDP, price index, and distance from China. China's 34 most important trade partners will be analyzed by examining their GDP elasticity of export demand by adding a slope country dummy of GDP in a function describing each country's demand for exports from China. Finally, the study compares their slope coefficients. The distance and price will also be examined in my regression model. The data set contains 34 countries with observations from 1992 to 2010, gathered from UN Comtrade and World Bank Database.

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1. Introduction

The most remarkable event in the Chinese-American relationship was the Sino-U.S. trade agreement that was settled by the governments of China and America in Peking on July 1, 1979, after the President Richard Nixon made his historic visit to China setting up the establishment of Sino-US relations in 1972 so that the Chinese-American trade could started which benefits both countries' economies. In 1979, the total trade value between China-U.S. increased from $2 billion in 1979 to $457 billion in 2010 (Morrison, 2011). In this thesis I particularly focus on examining whether the U.S. imports from China are the most important component of the China's exports.

1.2 How important are exports in Chinese economy?

Since China entered into the World Trade Organization (WTO) in 2000, China is considered as the main force in the global economy and trade and relies on the advantage of its abundance of labor. In 2005, China became the sixth largest economy in the world as well as the largest trading partner for America. (Hufbauer, Wong, Sheth, 2006). Why does China's economy grow so fast? Recent studies show that the most crucial reason for the growth of China's economy has the high increase in export value since the trade reform (Xia, Halyan and Peter 1997).

Following is a short historical summary of the impact of exports on China's economy. After the rural reform China's economy did not rely on its external economy, and therefore before 1960, the export share of GDP was approximately zero. However, from the mid-1980s, China's economic growth was subsitantially increased by the trade opportunity that the world economy offered. (Rodrik, 2006). Figure 1, indicates that from 1985 up to 2006, the export share of GDP increased from appoximately 9% to almost 40% which is the highest percentage in the whole period. In 2006, the percentage almost made up half of China's GDP. However, after 2006, the percentage decreased sharply back to 27% in 2009.

Figure 1 shows the evidence for the statement that export volume is indeed a significant contributer to GDP.

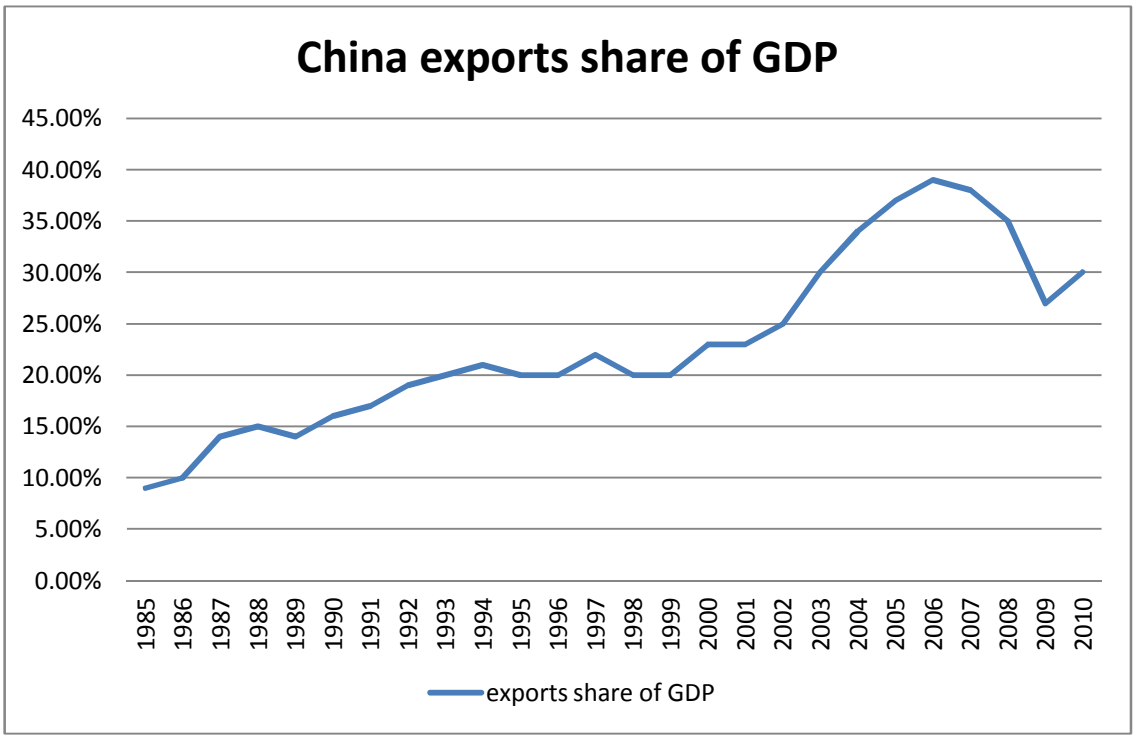

Figure 1: China exports share of GDP in 1985 to 2010
Source: World Development Indicators Database

1.3 The overview of China exports

Over the past few decades, China became the largest export source of America in 2010 (Morrison 2011). China's manufacturing goods with low prices greatly benefits the U.S. Most firms in U.S. are willing to purchase merchandise from China because the relatively lower price could greatly lower input costs in the firms and increase their competitiveness. Until 2010, U.S. imports from China rose to 23.1%, and 19.1% of U.S. imports come from China.

Figure 2 shows China's 34 most important trade partners that import from China. The U.S has a larger imports value from China than from any other important trade partner of China.

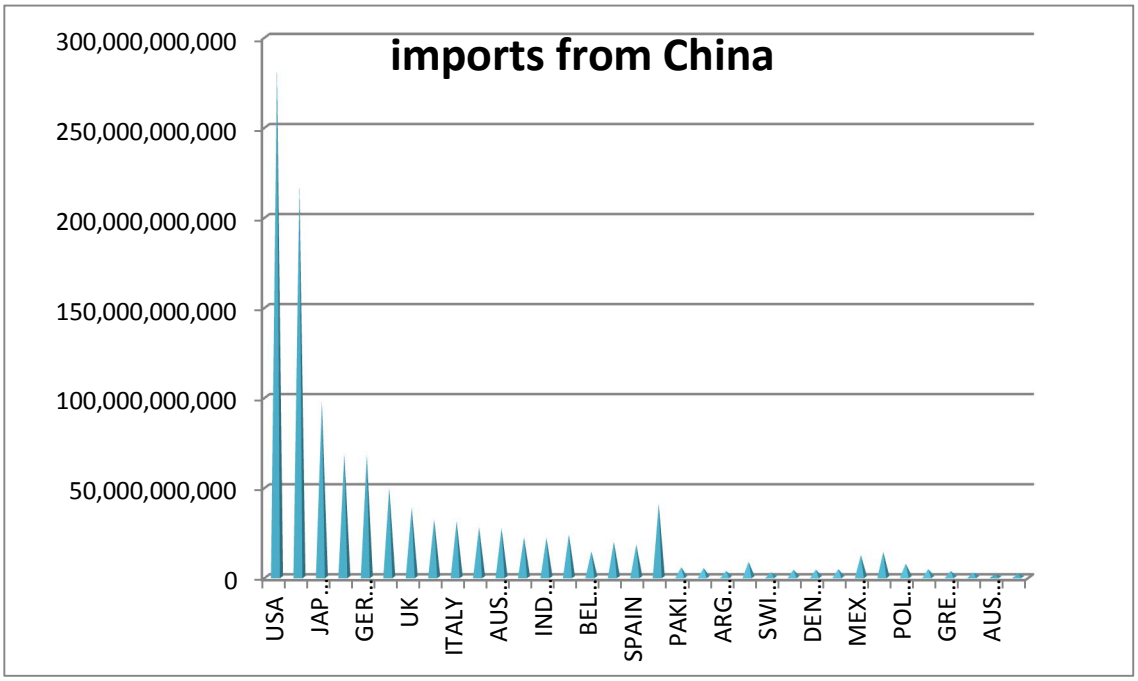

Figure 2: Imports value from China in 2010 in USD across importing countries
Source: World Development Indicators Database

1.4 Purpose

The purpose of this thesis is to examine the GDP elasticity of the 34 most important trade partners of China, observing whether the U.S. imports from China are more sensitive to GDP than what applies to other countries. Because the United States is the largest importing country for China, I want to observe whether the U.S. imports are more China-oriented than the imports in other countries? This thesis will use panel data with observations for 34 countries from 1992 to 2010 to examine the GDP coefficient for each country.

1.5 Outline

The organization of this thesis is as follows: Section 2 presents an overview of exports from China to the U.S. and explores the United States' economic development situation during the last twenty years as well as the trade pattern between China and the United States. Section 3 presents a model of export demand and its relation to the gravity model. Section 4 introduces the regression model, and presents descriptive statistics. Section 5 draws conclusions about my thesis and make suggestions for further studies.

2. Trade between China and the United States

2.1 Overview of the United States economy 1990-2011

In the age of integration of the world economy, the United States as the most developed country plays in a crucial role. The fluctuations of the U.S. economy will directly influence the countries highly associated with it. This applies especially to China, which is the largest trading partner of the United States since 2005.

In the following discussion of American economic history, a division will be made in 2000. In the 1990s, after a short economic depression in the period from August 1990 to March 1991, the United States experienced a thorough information technology reformation (Wang, 2002). Most of the achievements were based on aircraft industry, information and communications technology, biological engineering, and environment protection. These fields are the new pattern of industry which brought high economic growth to the United States. Consequences were an increasing GDP, a decreasing inflation rate, a higher employment rate and a gradually decreasing government deficit (Li, 2007).

Zuo (2008) observes that in the 1970s and 1980s, the average GDP growth rate in America was 3.1% and 3.2% respectively. Until the 1990s the average growth rate reached 5.8%, unemployment rate and the inflation rate fell to 4.8% and 2.1% respectively, the lowest point in the last thirty years. The federal budget deficit of 290 billion dollars in the first half of the 1990s fell to 40 billion dollars in the late 1990's. Furthermore, the American government actively pushed its trade relation with European and Asian countries with the approaches of free trade and trade protectionism.

However, after the boom, the economy of the United States was facing an economic depression. According to a research report from the National Bureau of Economic Research (NBER), the economy of the United States was condemned to start the economic recession in March 2001 after ten years of extended economic development.

Huang (2010) demonstrates that in the late 1990s, the main factors that supported the development of the American economy were enormous consumer demand and fixed assets investments. However, since the second quarter of 2000, both of the two factors decreased rapidly. Up to the fourth quarter of 2000, the household consumption in the United States declined from 7.4% to 1.3%. Enterprise investment dropped sharply from 21% to -1.4%, the first drop within the last nine years. Meanwhile, the commodity retail sales kept on decreasing by 1.6%

In the industry department, from 2000 to 2002, industrial production kept on decreasing for fifteen months, a decreasing period as long as during the great depression. The growth rate of gross industrial production fell from 5% to -4.5%. From 2001 to 2002, the production in the high-tech department decreased by 13.8%. The average manufacturing equipment utilization rate dropped to 73%, of which the high-tech department dropped to 60%. The decrease of production spread to the entire economy with household income and unemployment declining simultaneously. From 2000 to 2001, 380,000 job opportunities disappeared, of which 133731 jobs were lost in the

motor industry and in retail production. The total unemployment rate increased from 3.9% to 5.8%, the highest level in the last three years. Regarding the stock market, the nasdaq stock index dropped from 5048 in 2000 (the highest record in the history) to 2000 points in 2001, a decrease of 62% in one year. The Federal Reserve Board was trying to change the decreasing trend by declining interests, however without success. Furthermore, due to the housing recession and the collapse of the subprime mortgage market, a hidden economic crisis started in the American market Wang (2004). By the end of 2006 and up to 2008 it had spread not only in the US economy but severely affected economies all over the world. Even today, the U.S. government still faces severe difficulties and challenges when it comes to economic recovery

2.2 Trade between China and the United States reflects comparative advantage

Since the Sino-U.S. trade agreement that has been settled in 1979, the trade relation between the two countries could continue developing. This is due to the economic features of the two countries: China is a labor intensive country with an advantage in manufacturing products. Since the United States relies on excessive consumption to drive the economic growth, the production in the United States cannot match the high aggregate demand of consumers so that many products need to be imported from China.

According to the history of the American personal saving ratio, back in the late 20th century, from 1947 to 1984, the American saving ratio remained at a level of 6% to 11%. However, from 1984 up to 2001, the ratio dropped to 1% and in the next ten years almost kept the level of 0-1%. Regarding the consumption ratio, since the 1990s, the ratio in the United States remained at a level of 67%. In the basic macro-economic theory, a low savings ratio and excessive consumption are the main factors influencing the enormous trade deficit and negatively affecting the current account. From 2002 to 2007, the current account deficit reached 731.2 billion dollars which is equivalent to 5.2% of the GDP in America (Liu 2011).

The consumption in the United States is a country relies to a large extent on imports from China (and other Asian countries like Japan, Singapore, Korea and Taiwan). This reflects the comparative advantage pattern between U.S. and China. China's advantage lies in the enormous economies of scale. China has large labor market. Topel (1999) claimed that labor market distortion can be counted as an institutional characteristic of China compare to the other countries. Cai and Wang (1999) found that the labor mobility contributes a significant GDP growth to China. Since China announced the Reform and Opening up policy, hundreds of millions of workers were involved in the international trade stage sharing the burden of international manufacturing which benefits the great amount of consumption in the United States. China itself also took advantage of the export which pushed forward the economic growth and increased employment Liu (2011).

2.3 American demand for Chinese commodities

Zhang Yanhong (2008) of the Renmin University of China has specialized in the research in three categories out of five based on the classification of the United States Census Bureau. She classified the three categories as: In category 1, industrial supplies and materials were classified as intermediate goods; in category 2 capital goods except for automobiles were classified as capital goods; in category 4 manufactured non-durables and manufactured durables were classified as consumption goods (the category 4 and 5 were not included in her research).

Zhang Yanhong (2008) researched the quarterly growth rate from 1989 to 2008 and concluded that within twenty years, China has become the biggest consumption good source for America. 40% of consumption goods as well as 25% and 5% of capital and intermediate goods in the United States are imported from China. From 1989 to 2008, the percentage of USA's consumption-good imports from China increased from 7 to 40, where a 24% increasing comes from capital goods and intermediate goods which increased by 4%. The statistics of the personal consumption in the United States consist of service and manufacturing goods, where manufacturing goods represents one fourth of total consumption. 50% of the manufacturing goods were imported by the U.S. from China in 2008, an increase from 7% in1989.

From the evidence presented above it can be concluded that the industrial structure in the United States changed from manufacturing to service industry which can be combined with the information technology reform in 1990s that is mentioned in part 1. After the reformation, the comparative advantage in the United States changed to the service industry, where most of the social sources are allocated to the development of high technology and aviation and corresponding fields.

Stern (1979) investigates paper researched whether the U.S. composition of aggregate imports from different exporting countries has changed from 1950s to mid-1976. By estimating this, he used U.S. real GNP, U.S. import prices. Stern (1979) used several tests that indicated that the structure of commodities indeed changed in the mid-to late 1960's and much more severely in the first quarter of 1972. Before the evidence was presented in his paper, there were also some previous investigations that drew the same conclusion.

However, this situation also has its disadvantage, in 2000 the American economy started to experience a slow growth period, especially after the economic crisis had erupted in 2008. Chinese export markets are highly dependent on the United States' market that will change as the United States' economy changes.

3. Theoretical framework

3.1 Aggregate demand and supply

The single equation model can be used to estimate the aggregate demand for imports. However, one may conclude that "*the theory of international trade gives little guidance on the appropriate functional form to use when specifying and estimating an import demand equation"* (Khan and Ross, 1977). These authors have tested which standard empirical form could be used for the aggregate demand function by examining the United States, Canada and Japan. They found that the best empirical form is the log-linear specification.

Carone and Nazional (1996) have used the export demand function to estimate the United States demand for export flows from other countries which shows that GDP and relative prices are highly related to the elasticity of import volume, since a country's demand for imports is related to the level of real income and the import price.
The function can be expressed as:

$$M_d = F(Y, P_m, P_d) \qquad \text{(Eq. 1)}$$

The variables are defined as:

M_d = Demand for imports from China
P_m = China's price level
P_d = the importing country's domestic price (can be measured by consumer price index)
Y = real income in USA (can be measured by GDP)

Normally, the price is expressed as relative price to explain why trade between countries occurs. Therefore, we may for each importing country consider China's export demand function as describe as in the following equation:

$$M_d = F(Y, RP) \qquad \text{(Eq. 2)}$$

Where the RP stands for the relative price calculated as the ratio between P_d and P_m, that is, the ratio between each importer's domestic price index and China's price level. In the empirical exercises China's export demand function is given by $M_{di} = F(Y_i, RP_i)$ reflecting China's export to each country i.

Thursby (1984) investigated nine models of aggregate export-purchasing demand with regard to five countries: Canada, Germany, Japan, United Kingdom, and the United States. They found that the most appropriate model is a single equation model that describes aggregate export demand by means of estimated elasticities.

Abeysinghe and Rajaguru (2004) used the Quarterly data of real GDP estimated for China and ASEAN4 with a trade forecast evaluation. In their paper the authors estimate the relation between trade and real GDP. Agbola and Damoense (2005) used time series to find out the determinants of export-purchasing demand for pulses in India over the period 1970-2000 with annual data. There are three variables used in the time-series

model: real GDP, relative prices and urbanization which are used to measure the export-purchasing demand. The result of the study shows that the relative price, real GDP and urbanization do positively affect the demand in India.

Tang (2003) investigated other countries aggregate export demand function for the Chinese economy in the period 1970-1999. Based on the theory in his paper, the export-purchasing demand always depends on importing country's income. Tang, (2003) used the Real GDP as income measure and relative prices (ratio between domestic and import price) as a comparative advantage indicator. The result shows that China's export-purchasing demand is not significantly related to its export purchasing price, even though the relative price may affect the tariff, leading to a very small change in the demand for exports from abroad. In this study Real GDP has a strong influence on the export-purchasing demand in China. Thus, the quantity of export flows into a country is significantly influenced by the level of the country's real income. Dutta and Ahmed (2006) investigated the aggregate export-purchasing demand function for India by using relative prices and real GDP. Also in this case the GDP level is a major determinant of the inflow of exports to the importing country (India).

3.2 Distance: the Gravity Model

Distance is a common variable in the analysis of trade relations. Grossman (1996) claims that the bilateral trade volumes are negatively correlated with the geographic distance. Many literatures show that the geographic distance is positively related to the transport cost. Increasing geographic distance thus raises transport costs. Jacks and Meissner (2004) explain that international trade costs consist of transaction and transportation costs related to the trading of goods across national borders. It implies that high trade costs are an important factor in the analysis of export flows. Obstfeld and Rogoff (2000) suggest that when countries choose target markets, they can be assumed to take the geographic distance into account. Some economists conjecture that improving the transport technology may decrease transport costs and hence reduce the effects of distance. However, it still plays an important role in bilateral trade. The geographic distance has been a standard component in the gravity model. Pankaj (2001) divided distance effects into four catagories: cultural, administrative, geographic, and economic. One may also note that the geographic distance also should consider the flows inside a country. In my study I will just include the geographic distance as a control variable, observing that it is a determinant of transportation costs. Especially, for countries that are exporting heavy as well as fragile products. The geographic distance is used in the gravity model as a friction indicator in most of literatures. The gravity model has been used over 40 years in studies of international trade. The gravity model has a similar structure as the aggregate demand formulation that is introduced in the previous section. Bikker (1987) also developed an extended gravity model based on the aggregate demand and supply theory which describes the trade flows from origin countries (supply side) to importing countries (demand side). Therefore, adding the distance into my regression model has a strong theoretical and empirical support.

4. Data, Variables, and Descriptive Statistics

In this section, I describe and explain the data set and each variable as well as the empirical method that applies ordinary least square with panel data. The empirical parts examine the exports from China to its 34 largest import countries with special focus on the United States. The observation period extends from 1992 to 2010.

4.1 Data

The data on export values are collected from United Nations Commodity Trade Statistics Database (UN comtrade) with the 34 countries that are the most important importers from China, ranked according to their import values. The data are from 1992 to 2010 which is the time period during which China started to develop its external trade market. The export value is counted as all commodities that a country imports from China in U.S. dollars value. The UN comtrade may be considered as the most comprehensive trade database of world trade, because it is collected from the national authorities and standardized by the UN statistics which ascertains a consistent way of measuring trade flows across different countries.

The GDP value of 34 countries is collected from the World Bank databases calculated with current U.S. dollars. The GDP is a macroeconomics concept, which is used as a standard value measuring national production reflects national income. I have also introduced price in the analysis which is employed to calculate relative prices as indicators of export advantages. The statistical analysis uses consumer price index of each importing country that measures its national commodies price level, as registered in the World Bank databases. The World Bank database is compiled from official international sources and provides information about all 34 importing countries.

The data of geographical distance between each importer and China is collected from the GeoDist database which is specialized in providing bilateral distance between any of two countries out of 225 countries in the world. The GeoDist is offen used in so-called gravity model (Mayer and Zignago, 2005). Following (Mayer and Zignago, 2006) was assigned an average distance for each trade link between China and each of its 34 importing countries.

4.3 Variables

The variable GDP is gathered from the World Bank database and is calculated in current U.S. dollar value. It is better for this study than using the constant U.S. dollar value, because the constant dollar value cannot reflect the changes in the exchange rate between countries. For instance, consider the exchange rate between the China RMB and the U.S. dollar. Before the financial crisis, at that time the ratio of RMB/Dollar is almost 8. However, because of the financial crisis, the depreciation of U.S. dollar makes the ratio between RMB and U.S. dollar decrease to almost 6.

GDP that reflects a country's demand capacity is frequently used in bilateral trade analysis. The GDP variable is the market value of final goods and services produced by the nation. Therefore, it can be employed as a proxy for national income. In macroeconomic theory, a higher GDP of a country directly generates a higher national demand of the country. As a rule, the trade volume increases slightly more than the GDP value of an importing country. The trade relation between two countries is closely

dependent on the GDP changes of each country (Isidro and Alan, 2001). The most crucial determinants of the increase/decrease in export volume are the importing country's GDP growth, and changes in relative price level. A greater market size in an importing country will cause larger exports from the other countries (Freund and Weinhold, 2004). Therefore, the analysis uses GDP as the major explanatory variable in a regression model that describes how China's export flow is distributed across importing countries.

"International comparativeness may be defined as the relative price of foreign in terms of domestic tradable goods" as stated by (Turner and Golub, 1997). In their sense, the relative price measures a country's comparative advantage, that is, whether the price of producing one product in the domestic country is relatively lower as compared to the foreign country. The country will specialize in producing the goods with relatively lower prices and then export those goods to the other country, and vice-versa. In my study, I will use the relative price as explanatory variable, which is the ratio between the consumer price index in China's importing countries and China's price level. Therefore, based on the previous comparative advantage discussion, the higher the relative price is, the lager the demand for export flows from China. Harry Johnson (1958) investigated how trade volumes between two countries are determined and found that it is strongly dependent on the price elasticity of demand for imports and exports. Houthakker and Stephen (1969) studied the price elasticity in U.S. for both imports and exports and report from period of analysis that it is larger than for other countries. In my study I choose the price as a control variable when focusing on the GDP elasticities. However, the regression provides some information about the price elasticity for U.S. and other China-oriented importers.

Distance is commonly used in gravity models analyzing the bilateral trade. It is a constant for each trade link through the time period. Grossman (1996) claims that both the transport costs and the geographic distances between two countries have negative effects on bilateral trade volumes. In this study, we assume that the geographic distance between China and its each importing country has negative effects on the trade volume.

4.3 Descriptive Statistics

The descriptive statistics for exports, GDP, and price are presented in the Appendix A, informing about the mean, median, minimum, maximum, and standard deviation in detail. The distance is not presented in the Appendix because it is constant through the time period in each country. The data are presented in log form.

5 Empirical Model and Analysis

In order to analyze the results from different aspects, there are two different regression models that will be presented in this part. I will introduce the estimation models in detail. Then, the section will analyze the empirical results and compare the United States with the other countries.

5.1 Empirical Model

This purpose of the empirical model is to examine China's export to U.S. and to find out whether the U.S. demand plays a special role in China's export pattern. Is the U.S. GDP a particularly important attractor of exports from China? This paper is based on the aggregate demand and supply theory and has a special reference to gravity models, which have developed to become a standard framework for analyzing bilateral trade. The approach rests on basic macroeconomic principles, focusing on the demand side (GDP proxy for national income) of countries that import from China, forming a basic for China's different export flows. This study mainly concerns the variable GDP and adds a country dummy to estimate a slope coefficient for the GDP variable of each importer. The subsequent step is to compare each country's GDP elasticity. In this context the price index and geographic distance are control variable to help isolate the GDP effects.

The following export demand function in Eq.1 is used to estimate the GDP elasticity of demand for exports from China as well as relative price index, and geographic distance. The function applies a formulation with the individual GDP elasticity (β_{1i}) for all importers as shown in Eq. 1:

$$\log(E_{it}) = \beta_0 + \beta_{1i}\log(GDP_{it}) + \beta_2\log(D_{ij}) + \beta_3\log(RP_{it}) + \mu_{it} \qquad \text{(Eq. 3)}$$

$$i=1,2,3,\dots,34;\ t=1992, 1993,\dots,2010$$

E_{it} = value of China's export to importing country i of 1992-2010
β_{1i} = GDP elasticity for country i
GDP_{it} = GDP value of importing country i
D_{ij} = the distance between importing country i and China (j)
$RP_i = \frac{\text{importing country i's dometic price index}}{\text{China's price level}}$

The variables in Eq. 1 are defined as follows: (E_{it}) is the value of China's export to 34 imports countries through time period of 1992 to 2010. (GDP_{it}) represents the income in each importing countries through the time is supposed to positively stimulate China's export to country i. When the GDP goes up in China's importing countries, the importing countries' demand for China's export will increase in response. The relative price on an export link from China to an importer is calculated as the ratio between the importer's consumer price index and China's price level on the pertinent trade link. The consumer price index of all commodities is able to reveal the overall costs of commodities in each country. Based on the comparative advantage theory, when the consumer price index in China's importing countries goes up relative to China's price level, the demand for exports will be higher. (D_{ij}) measures the geographic distance between each importer countries and China. The distance is calculated with reference to

the capital city or comparable city of each importing country. Distance is expected to negatively relate to China exports. Besides, the β_{1i} is the GDP elasticity with respect to the 34 importers. By doing this, we are eligible to compare the U.S. GDP elasticity with the elasticities associated with the other 33 importers.

Besides the GDP elasticity in Eq. 3 the study also formulates an equation with a country-specific intercept and combination with slope dummies for each individual country. The larger the coefficient of the individual intercept, the larger the imports from China will be, everything else equal.

$$\log(E_{it}) = \beta_{0i} + \beta_{1i}\log(GDP_{it}) + \beta_2\log(RP_{it}) + \mu_{it} \qquad \text{(Eq. 4)}$$

$$i=1,2,3,\dots,34;\ t=1992, 1993,\dots,2010;$$

E_{it} = value of China's export to importing country i of 1992-2010
β_{0i} = intercept of country i;
β_{1i} = GDP elasticity for country i
$RP = \frac{\text{importer's domestic price index}}{\text{China's price level}}$

Eq. 2 is a variation of Eq. 1. The variables of (E_{it}) (GDP_{it}) (RP_{it}) as well as the slope dummy of GDP (β_{1i}) remain the same as in Eq. 1. The diffidence is that I add the intercept dummies for each country denoted by β_{0i}. However, in this equation I exclude the distance, because the distance and intercept cannot be in the same data set in E-views at the same time. It will lead to singular matrix.

5.2 Empirical Results and Analysis

This section presents the regression results of the two models that are presented in the previous section. The result shows the GDP elasticity of export demand for China in each importing country from China. I will specialize by analyzing the export demand in United States to determine whether there is a larger GDP elasticity of export demand in U.S. than for other trade partners with China.

Table 5.1: Regression results with slope country dummies of GDP from Eq. 3

Countries	**GDP elasticities (β_{1i})**	**t-statistic**	**p-value**
United States	2.12***	27.4	0.0000
Hongkong	2.149***	16.826	0.0000
Japan	1.903***	17.356	0.0000
Korea	1.877***	10.875	0.0000
Germany	2.112***	29.595	0.0000
Netherland #	2.226***	29.446	0.0000
United Kingdom	2.13***	29.096	0.0000
Singapore #	2.25***	26.572	0.0000
Italy	2.128***	28.984	0.0000
France	2.027***	27.42	0.0000
Australia #	2.318***	22.088	0.0000
Canada #	2.206***	26.61	0.0000
Indonesia #	2.197***	28.551	0.0000
Malaysia #	2.218***	25.98	0.0000
Belgium #	2.226***	28.779	0.0000
Thailand	2.131***	22.178	0.0000
Spain #	2.174***	27.84	0.0000
India	2.051***	24.08	0.0000
Pakistan #	2.188***	24.156	0.0000
Egypt #	2.286***	28.603	0.0000
Argentina #	2.353***	19.634	0.0000
Philippines	2.138***	20.124	0.0000
Switzerland #	2.177***	28.059	0.0000
Sweden	2.159***	28.6	0.0000
Denmark #	2.2***	28.572	0.0000
Bangladesh #	2.176***	20.693	0.0000
Mexico #	2.239***	24.746	0.0000
Brazil #	2.277***	20.962	0.0000
Poland #	2.212***	29.135	0.0000
Finland #	2.197***	28.389	0.0000
Greece #	2.214***	28.39	0.0000
Norway #	2.175***	28.367	0.0000
Austria	2.156***	28.055	0.0000
Portugal #	2.243***	26.432	0.0000
Totoal average	2.171		
Other variables			
Distance (β_2)	-4.557**	-2.051	0.0407
Price (β_3)	1.19**	11.632	0.0407
Constant (β_0)	-0.659	-0.078	0.9382
R-square	0.935		
F-statistics	242.163		

=significant at 5% level *=significant at 1% level #=country above average level

Table 5.1 shows the regression results with Equation 3 in section 5.1. First of all, we focus on R-square which is 0.93. It says that 93% of China's export can be explained by the variables GDP, relative price, and distance. In statistics principle, it can be said that China's export and the explanation variables are highly related. All explanatory variables are significant. Most of the countries' slope coefficients are around 2 except for Japan and Korea. Based on the literature I presented earlier, GDP changes in importing countries are assumed to have positive relation with their export-purchasing from China. The results show that positive sign is according to the previous assumption. As an average, an increase in GDP by one percent makes the export value of China exports to each country rise by approximately two percents. This is a higher elasticity than found in a study of Sweden's export demand function (Bonninger and Nilsson, 2012). The focus of this study is on the GDP elasticity in the United States. To examine this, I calculated the average coefficient of all countries to see if the United States is above the average level. Overall, the difference of GDP elasticities is not huge. The average coefficient in the column of total average shows 2.17. For the United States, however, coefficient is equal to 2.12 which is slightly lower than the average level. The result is not according to my expectation that the country with the largest GDP value and the largest import flow from China should have a larger than average GDP elasticity. Even through, Carone and Nazional (1996) in their study indicated that the United States demand for imports benefits the U.S.'s domestic economy as well as the economy in the rest of the world. In the 1970s the United States import values came up 13-14 percent of total world trade and until 1992 the import values rose to 15 percent of world trade. Besides, the United States is China's biggest export purchasing country. In contrary, Argentina shows the highest GDP elasticity of exports with a slope coefficient of 2.36. However, Argentina has a relatively small GDP and thus its absolute importance for China exports remains small. In table 5.1, the countries with the sign # have a slope coefficient which is above the average value with small imports from China are likely to have larger slope coefficients of GDP than the countries with large imports. Table 5.2 presents the five countries with the largest GDP in my observations. There countries all have a lower than an average slope coefficient.

Table 5.2: the five largest GDP countries with low slope coefficient of GDP

Country	GDP value (in million dollars)	GDP elasticities
USA	14,586,736	2.120
JAPAN	5,458,837	1.903
GERMANY	3,280,530	2.112
FRANCE	2,560,002	2.027
UK	2,261,713	2.130
	Average: 1,397,989	Average: 2.171

*GDP denotes in unit U.S. dollar, calculated by current U.S. dollar exchange rate

Table 5.3 presents the slope coefficient of GDP for countries in Northern Europe, Sweden has the highest GDP. However, it has the lower slope coefficient of GDP than the other three countries. Except for Sweden, Norway, Denmark, and Finland are above the average level of 2.17.

Table 5.3: the slope coefficient of GDP in Northern Europe

Country	GDP value (in million dollars)	GDP elasticities
SWEDEN	458,552	2.159
NORWAY	417,465	2.175
DENMARK	311,989	2.200
FINLAND	238,041	2.197
	Average: 1,397,989	Average: 2.171

*GDP denotes in unit U.S. dollar, calculated by current U.S. dollar exchange rate

The coefficient estimate of relative price index (β_1) is 1.19 and the P-value is 0.0407 which is significant at the 5% test level. It says that when the ratio between each importer's domestic price index and China's price level increase by 1%, the China exports value to each importing countries will increase by approximately 1%. The result is consistent with the trade theory saying that when the commodity prices are increasing, it becomes cheaper to import from abroad. It will cost more in producing goods in domestic than import goods from foreign countries. It also illustrates that a country with relative by high RP-value can stimulate exports from China (Johnson, 2008). In trade theory, countries can be divided by the endowments of capital-intensive and labor-intensive. China is abundant with labor and the United States and some other developed countries that are presented in my regression model is abundant with capital. China produces manufacturing goods should cost less than most of the other countries. Because the relative price of labor which is part of production cost that is higher than China. That is how the trade occurs between China and its export purchasing countries.

According to the gravity theory, the geographic distance has negative effects on bilateral trade. Longer geographic distance means that the transport costs will be much higher, the trade volume between two countries will be influenced by such conditions. In my estimate result the distance coefficient of (β_2) is -4.56 which is in accordance with my expectation.

Table 5.4: Regression results: from Eq. 4: country-specific intercepts

Countries	**intercept of country dummies**	**t-statistic**	**p-value**
Germany	-37.663***	-7.286	0.0000
Finland	-36.773***	-8.901	0.0000
France	-32.829***	-8.622	0.0000
Japan	-31.076***	-9.17	0.0037
Denmark	-29.651***	-7.02	0.0000
Italy	-28.769***	-8.483	0.0000
United States	-28.554***	-8.401	0.0000
Belgium	-27.328***	-3.849	0.0000
Sweden	-27.328***	-8.264	0.0000
Switzerland	-27.256***	-5.818	0.0000
Netherland	-26.735***	-7.081	0.0000
United Kingdom	-26.667***	-6.963	0.0000
Portugal	-26.46***	-6.698	0.0000
Austria	-24.438***	-5.905	0.0000
Canada	-22.795***	-8.697	0.0000
Spain	-20.752***	-7.105	0.0000
Hongkong	-18.685***	-4.902	0.0001
Malaysia	-18.563***	-3.862	0.0000
Thailand	-16.748***	-3.465	0.0000
Greece	-16.464***	-2.617	0.0000
Australia	-16.25***	-2.1	0.0000
Singapore	-16.041***	-2.059	0.0000
Korea	-15.831***	-1.773	0.0000
India	-15.524***	0.624	0.0000
Norway	-15.058***	1.667	0.0000
Mexico	-12.673***	-7.286	0.0000
Brazil	-8.695***	-8.901	0.0001
Philippines	-8.619***	-8.622	0.0006
Argentina	-7.624***	-9.17	0.0091
Bangladesh	-5.982**	-7.02	0.0361
Poland	-3.906**	-8.483	0.0399
Egypt	-3.874*	-8.401	0.0767
Pakistan	1.433	-3.849	0.5329
Indonesia	3.28*	-8.264	0.0961
Totoal average	-19.144*		
Other variables			
Price	1.890***	19.621	0.0000
R-square	0.963		

*=significant at 10% level **=significant at 5% level ***=significant at 1% level

The table 5.4 is the estimate result of the second model that was presented with not only slope dummies of GDP in each country, but also with intercept dummies for each individual country. However, the distance variable is removed from this model, because of technical problems. The distance and intercept dummies will cause a singular matrix problem in e-views. The intercept dummies of each country are expected to have

positive effects on trade volume. The larger intercept coefficient of China's importing country illustrates the larger export flow from China. The result above is ranked in ascending order, the smallest intercept coefficient of Germany ranks at the top and Indonesia has largest intercept coefficient which ranks at the end. The R-square is 0.96 in this case, which is larger than the first model. Almost all countries are significant except Pakistan. Focus on my study purpose, I am particularly eager to analyze if GDP elasticity to China export is more sensitive in the United States than in other China's importing countries. The intercept of U.S. coefficient shows -28.55 which is lower than the average level of -19.14. The situation is similar with the slope coefficient of GDP in the first model. I still present five countries with the largest GDP values contribution in Table 5.5. The results are similar to those presented for the slope coefficients. The intercepts of GDP in the five countries with the largest GDP are lower than the average level. The coefficient of relative price in this model is 1.89 which is greater than 1.19 in the first result (see Table 5.1).

Table 5.5: GDP value and GDP elasticity for five countries with largest GDP

Country	GDP value (in million dollars)	Country specific intercepts
USA	14,586,736	-28.554
JAPAN	5,458,837	-31.076
GERMANY	3,280,530	-37.663
FRANCE	2,560,002	-32.829
UK	2,261,713	-26.667
	Average: 1,397,989	Average: -19.14

*GDP denotes in U.S. dollar, calculated by current U.S. dollar exchange rate

6. Conclusion

This paper is based on the aggregate demand and supply theory as well as the gravity model, while focusing on China's export to its most important 34 importing countries. Overall, a country's aggregate demand is strongly influenced by the GDP-level in each importing country. Therefore, I estimate the GDP elasticity in each of China's importing countries by adding a slope country dummy to my regression model. By doing this, it is possible to identify a slope coefficient for each of China's export flows to see if the United States is more or less GDP sensitive for China exports than what applies for other countries. Besides, in my regression model I also observe the price and distance which are another two influential variables when analyzing bilateral trade. Theoretically, when an exporting country has a relatively lower price than the domestic price in the importing country, this will have positive effects on the exporting country's export flow. Distance is assumed to have negative effects on bilateral trade, a larger distance will cause higher transportation and other trade.

In the empirical part, each country's GDP elasticity shows that the GDP elasticity is proximately around 2 which implies that a one percent increase of an importer's GDP stimulates China's export to that country to increase by 2 percent. By observing the slope coefficients we can see that the slope coefficient of GDP for the United States is not higher than for most other countries that receive exports from China. Though, in some developing countries with lower GDP as well as lower shares of export flow from China, GDP elasticity is more sensitive in those countries than in U.S., e.g. Argentina, and Egypt. I can conclude that the GDP elasticity is not related to the size of GDP as well as the shares of export flow from China. Consider now the result of intercept in the export function. The larger the intercept of each of China's importing countries, the larger the export flow from China. However, the United States still shows lower than the average level of intercept. From both of the two cases, we can conclude that though U.S. has the largest GDP contribution in the world as well as the largest export flow from China, it is not more GDP sensitive to China exports than other importing countries. Bonninger and Nilsson (2012) examined the Sweden export to Germany by estimating the slope coefficient of GDP of Germany as well as to all other importing countries of Sweden. The result shows that the slope coefficients of GDP vary considerably across importers with a mean value around 1. In the present study most slope coefficients are around 2. However, Sweden is a small and mature economy compared to China, and less influenced by so-called export-lead growth. Moreover, the Swedish study shows a greater variation in the GDP elasticity across importers.

Beginning with the trade relation settled in 1979, the total trade value between China-U.S. increased from $2 billion to $457 billion until 2010 (Morrison, 2011). China and U.S. economy now is highly combined and dependent due to the trade relations. As I presented in the background, export is an important contributor to Chinese economic growth, and today it represents around 30% of China's GDP. The U.S. economy is characterized by excessive consumption (Liu, 2011). However, U.S. is not a labor-intensive country and can hence benefit from imports of labor-intensive consumption goods. Thus, the economy is stimulated to import from China as well as other countries. Meanwhile, China also benefits from the trade relations. While, such pattern has its negative effects, for instance, when the economic crisis broke out in 2008 in the United

States, this influenced China's export negatively. China's export to U.S. dropped by 16% during 2008-2009. It is a huge attack to Chinese economy.

6.1 Suggestions for Further Research

This study just focuses on analysis of the GDP elasticities of China's importers. The result shows that the United States is not more GDP sensitive to China export than the other importing countries. However, I do not find out why the GDP elasticity is not more sensitive in United States to the other China's importing countries. What factors can influence GDP elasticity to export. An obvious extension is to estimate export demand functions for a wider set of exporting countries, allowing for country-specific GDP elasticities.

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Appendix A: Descriptive Statistics (all variables except distance)

Country	Export	Export	GDP	Price
USA	Mean	10.81507	13.00142	1.955907
	Median	10.73524	13.01004	1.959041
	Max	11.45298	13.16396	2.049218
	Min	9.934467	12.7967	1.857332
	Std.Dev	0.454789	0.121942	0.061615
HongKong	Mean	10.82414	11.22126	2.009097
	Median	10.66784	11.22166	2.017033
	Max	11.33906	11.35113	2.064458
	Min	10.3434	11.01704	1.892095
	Std.Dev	0.319872	0.084259	0.043318
Japan	Mean	10.66636	12.65116	2.00384
	Median	10.65264	12.64127	2.004321
	Max	11.08294	12.7371	2.012837
	Min	10.06739	12.57934	1.995635
	Std.Dev	0.299676	0.043247	0.005135
Korea	Mean	10.17373	11.77602	1.937523
	Median	10.09756	11.74636	1.944483
	Max	10.86883	12.02087	2.064458
	Min	9.381097	11.51836	1.778151
	Std.Dev	0.468009	0.161277	0.086586
Germany	Mean	10.13128	12.39111	1.975647
	Median	9.989054	12.3845	1.977724
	Max	10.83281	12.55915	2.033424
	Min	9.388807	12.27436	1.90309
	Std.Dev	0.445652	0.090945	0.038308
Netherland	Mean	9.96193	11.69705	1.957993
	Median	9.862038	11.62218	1.963788
	Max	10.69639	11.93992	2.033424
	Min	9.079298	11.51521	1.869232
	Std.Dev	0.514375	0.142072	0.053105
UK	Mean	9.898463	12.21801	1.976843
	Median	9.831263	12.1769	1.973128
	Max	10.58846	12.44915	2.056905
	Min	8.96512	11.99171	1.90309
	Std.Dev	0.482333	0.143935	0.043599
Singapore	Mean	9.89727	11.01789	1.991749
	Median	9.762732	10.98147	1.986772
	Max	10.50984	11.31966	2.056905
	Min	9.307679	10.69058	1.934498
	Std.Dev	0.419255	0.167468	0.031718
Italy	Mean	9.717877	12.15806	1.955313
	Median	9.601142	12.10256	1.959041

	Max	10.49331	12.36311	2.041393
	Min	9.0396	12.01118	1.838849
	Std.Dev	0.473261	0.119113	0.060905
France	Mean	9.698543	12.24288	1.970739
	Median	9.570063	12.19647	1.963788
	Max	10.44496	12.45206	2.033424
	Min	8.883209	12.11294	1.908485
	Std.Dev	0.481576	0.118766	0.038931
Australia	Mean	9.662866	11.71024	1.95519
	Median	9.552601	11.62002	1.954243
	Max	10.43489	12.0537	2.064458
	Min	8.820068	11.49837	1.857332
	Std.Dev	0.491461	0.18331	0.066546
Canada	Mean	9.643327	11.92478	1.963271
	Median	9.524471	11.86029	1.959041
	Max	10.34667	12.19784	2.037426
	Min	8.815032	11.75102	1.897627
	Std.Dev	0.488986	0.161752	0.047783
Indonesia	Mean	9.531471	11.37627	1.793319
	Median	9.48598	11.33395	1.851258
	Max	10.34151	11.84915	2.164353
	Min	8.673419	10.97976	1.342423
	Std.Dev	0.497036	0.229791	0.283397
Malaysia	Mean	9.598835	11.0461	1.963018
	Median	9.508004	11.00366	1.968483
	Max	10.37661	11.37621	2.056905
	Min	8.809848	10.77196	1.851258
	Std.Dev	0.52907	0.179408	0.062683
Belgium	Mean	9.475902	11.48846	1.966813
	Median	9.403087	11.44059	1.963788
	Max	10.17235	11.70503	2.045323
	Min	8.733183	11.34633	1.892095
	Std.Dev	0.482467	0.124578	0.046874
Thailand	Mean	9.514737	11.21243	1.949154
	Median	9.368679	11.17866	1.959041
	Max	10.29537	11.50314	2.064458
	Min	8.875341	11.04709	1.799341
	Std.Dev	0.46176	0.142254	0.080329
Spain	Mean	9.479997	11.90917	1.94559
	Median	9.361027	11.79409	1.944483
	Max	10.31845	12.20246	2.049218
	Min	8.548368	11.70742	1.812913
	Std.Dev	0.550976	0.176396	0.073627
India	Mean	9.442602	11.76354	1.915955
	Median	9.2778	11.67929	1.929419
	Max	10.61187	12.23732	2.181844

	Min	8.199843	11.39015	1.643453
	Std.Dev	0.734709	0.249138	0.152231
Pakistan	Mean	9.163012	10.92408	1.911023
	Median	8.911141	10.8592	1.90309
	Max	9.781832	11.24765	2.257679
	Min	8.718844	10.68695	1.591065
	Std.Dev	0.41421	0.18491	0.181705
Egypt	Mean	9.000417	10.95112	1.928158
	Median	8.93091	10.94375	1.90309
	Max	9.768953	11.34023	2.238046
	Min	8.241944	10.62175	1.653213
	Std.Dev	0.483264	0.191282	0.158258
Argentina	Mean	8.851514	11.37646	1.903796
	Median	8.740136	11.41626	1.799341
	Max	9.703698	11.56672	2.187521
	Min	8.093916	11.00877	1.716003
	Std.Dev	0.479004	0.142219	0.150093
Philippines	Mean	9.308002	10.96705	1.900492
	Median	9.209277	10.91828	1.913814
	Max	9.960577	11.30014	2.10721
	Min	8.321285	10.72408	1.662758
	Std.Dev	0.494486	0.165741	0.137931
Switzerland	Mean	8.957699	11.512	1.984798
	Median	8.829395	11.48395	1.986772
	Max	9.593063	11.72257	2.017033
	Min	8.20377	11.38755	1.939519
	Std.Dev	0.399855	0.112006	0.022648
Sweden	Mean	9.044567	11.48074	1.982084
	Median	8.959049	11.42656	1.977724
	Max	9.708955	11.68678	2.033424
	Min	8.332914	11.30543	1.919078
	Std.Dev	0.439334	0.120391	0.032313
Denmark	Mean	8.989576	11.3148	1.964634
	Median	8.953454	11.26003	1.968483
	Max	9.745723	11.53641	2.045323
	Min	8.181967	11.14807	1.886491
	Std.Dev	0.517534	0.127287	0.051303
Bangladesh	Mean	9.055226	10.70633	1.917504
	Median	8.980074	10.67325	1.90309
	Max	9.658591	11.00155	2.161368
	Min	8.30728	10.50118	1.70757
	Std.Dev	0.42422	0.142529	0.136877
Mexico	Mean	9.200431	11.77375	1.820267
	Median	9.252906	11.79386	1.924279
	Max	10.14197	12.03921	2.093422
	Min	8.192246	11.45743	1.322219

	Std.Dev	0.724208	0.185596	0.255512
Brazil	Mean	9.256687	11.89967	1.82304
	Median	9.130631	11.8859	1.851258
	Max	10.27433	12.31971	2.100371
	Min	7.811251	11.5917	1.342423
	Std.Dev	0.666208	0.205007	0.231484
Poland	Mean	9.102833	11.326	1.861641
	Median	9.006934	11.27971	1.963788
	Max	9.956186	11.72378	2.060698
	Min	8.076378	10.96518	1.322219
	Std.Dev	0.543504	0.232644	0.213814
Finland	Mean	8.94897	11.18552	1.979534
	Median	8.959141	11.11663	1.986772
	Max	9.86626	11.43453	2.041393
	Min	7.966742	10.94125	1.924279
	Std.Dev	0.656441	0.145542	0.037597
Greece	Mean	8.827797	11.24028	1.925095
	Median	8.841259	11.13997	1.939519
	Max	9.610083	11.53299	2.068186
	Min	7.915655	11.01601	1.681241
	Std.Dev	0.553106	0.178438	0.108339
Norway	Mean	8.792972	11.32649	1.967471
	Median	8.72194	11.2328	1.973128
	Max	9.427381	11.65695	2.049218
	Min	8.081461	11.0725	1.886491
	Std.Dev	0.446396	0.194676	0.05011
Austria	Mean	8.616787	11.40454	1.967452
	Median	8.548548	11.37047	1.968483
	Max	9.247963	11.61718	2.037426
	Min	7.842181	11.27482	1.886491
	Std.Dev	0.431782	0.119405	0.04553
Portugal	Mean	8.546352	11.1698	1.944666
	Median	8.416347	11.10183	1.94939
	Max	9.364945	11.40127	2.037426
	Min	7.643379	10.97194	1.80618
	Std.Dev	0.540823	0.141773	0.071629

Appendix B: The full list of China's 34 importing countries

United States	Hong Kong
Japan	Korea
Germany	Netherland
United Kingdom	Singapore
Italy	France
Australia	Canada
Indonesia	Malaysia
Belgium	Thailand
Spain	India
Pakistan	Egypt
Argentina	Philippines
Switzerland	Sweden
Denmark	Bangladesh
Mexico	Brazil
Poland	Finland
Greece	Norway
Austria	Portugal