The Effect of Chinese Imports on EU Employment

Roderik H. van Rinsum

Abstract

Import competition is a concept suggesting that importing a good can cause a country's domestic industry to face additional competition, thereby potentially harming the real return to factors used in the production of these goods. China's impressive export growth caused by liberalization of trade policy since the 1980's may be considered a supply shock of manufactured goods to the world market. Indeed, developed countries such as the US and the EU have seen a considerable increase in their Chinese imports in the last 20 years. In this paper, a measurement of exposure to import competition, adapted from Autor, Dorn & Hanson (2012) is used to assess the effect of Chinese import competition on employment in the manufacturing industry in 27 EU countries. The results presented here suggest a negative relationship between import exposure and employment and that early EU members are less sensitive to imports from China than late EU members. Also, some adaptations are suggested to improve the empirical approach.

Keywords: EU, China, trade liberalization, export growth, import competition, manufacturing industry, employment.

Acknowledgements

I'd like to express the deepest gratitude for the many valuable insights, tips and corrections presented to me by my supervisor Joakim Gullstrand. His feedback has helped me enormously in writing this paper and greatly enhanced the quality of the end result.

Introduction

One important aim of traditional trade theories has always been to analyze the welfare effects of opening up economies to trade. The general consensus is that every country as a whole benefits from free trade, increasing the variety and quantity of consumption possibilities. At the same time, it is predicted theoretically that within economies, redistribution of welfare can occur. For some groups, free trade can lead to lower wages and temporary unemployment, driven by a reallocation of resources between sectors when workers are forced to move to a different industry. For example, the Stolper-Samuelson theorem in the Heckscher-Ohlin framework states that if the relative price of a good decreases, the real return to the factor that is used intensively in the production of that good will decrease.

There could be several underlying causes to a decreased relative price of a good. Sudden increases in either demand or supply, called shocks, can contribute to price changes. Both negative demand shocks and positive supply shocks can cause decreases in the relative price of a good and subsequently affect welfare redistribution. A positive supply shock of a certain good on the world market, seen from a foreign country compared to the country that caused the supply shock, will press down world prices and thereby cause a decrease in the real return to the production factor used intensively in the production of that good. An example of a supply shock can be that suddenly, a new deposit of a certain natural resource is discovered. The sudden increase in availability can, if large enough, cause a sudden decrease in the price of that natural resource, effectively decreasing the relative price. Another cause of supply shocks can be increased productivity of labor or increased technology. Such shocks, however, are rather uncommon since changes on the world market usually occur gradually.

In an international economy, domestic producers do not only compete with other domestic firms, but also with foreign firms, both on domestic and foreign markets. Therefore, both supply shocks that are caused by foreign and domestic economies can have effects on domestic producers. This makes all countries trading on the world market potential competitors. The level of competition partly depends on the similarity in goods that are produced. Every country produces goods according to a 'cone of diversification', depending on its factor endowments. If two countries have similar or overlapping cones of

diversification, they will produce similar or identical goods. Naturally, this increases competition, as similar goods are at least partly substitutes to each other. When countries' cones of diversification are not similar, they will produce different goods. These goods may not be substitutes to each other, which means that the firms producing them are not competing with each other. Competition is also affected by other factors, such as productivity, state of technology, and access to the goods.

When comparing the Western world with less developed countries, the latter are usually abundant in unskilled labor. As mentioned earlier, factor endowments are an important factor in deciding a country's cone of diversification. It is expected that countries that are abundant in unskilled labor produce labor-intensive goods. Therefore, unskilled labor intensive goods such as manufactured goods are usually exported to the US and Europe, who have different factor endowments and therefore different cones of diversification. China, being the country with the world's largest population, has been an important exporter of these goods in the last 30 years. Since changes in trade policy have been made, China has become one of the world leaders in the production of unskilled labor intensive goods.

EU 15 imports from China increased from € 26 343 million to € 261 770 million (a 893% increase) between 1995 and 2011 and EU 27 imports from China increased from € 52 597 million to € 292 132 million (a 455% increase) between 1999 and 2011. These figures show the incredible increase of imports since China adapted a more open trade policy. This leads to the essential purpose of this paper, which is to analyze the effects of increased exports by China on EU employment in the manufacturing industry.

The rest of the paper will be divided as follows: In section I, some background information on changes in China's economy role in the world economy, as well as some literature on the effect of import competition will be presented. In Section II, a theoretical framework on the effect of foreign competition will be discussed. Section III contains the empirical methodology used to analyze indirect import competition in the EU. Data sources will be discussed in section IV. Section V will analyze the empirical results of this study and finally, in

section VI, the results as well as future studies are discussed and improvements to the model are suggested.

I. China and the world market

China, being the country with the world's largest work force, has recently made considerable steps towards a more open trade policy. Although trade liberalization started in the late 1980's, the major reforms took place during the 90's (Branstetter & Lardy (2006)). This made China one of the major players on the world market in less than 20 years. It is plausible that this has had major effects on China's economy, and indeed, China has shown impressive economic growth since these reform policies. However, China's growth may also have caused considerable effects on the world market, thereby even affecting foreign economies. When China joined the world market, the potential labor force of the world increased by around 20%. Such an increase in labor force may be viewed as a positive supply shock from the world's point of view. This supply shock may have affected the wages of foreign countries through the aforementioned Stolper-Samuelson mechanism. Supply shocks caused by an increase in labor force are usually not considered realistic as a 'shock' implies a sudden increase whereas population is a factor that increases gradually. China's economic growth may thus be used as an interesting perspective to analyze the effects of trade liberalization on foreign countries.

Translating this idea to country-level analysis, a positive supply shock on the world market caused by China will be considered by foreign countries as an increase in competition. This leads to a negative demand shock for domestically produced goods, in turn leading to a decrease in demand for the production factors used intensively in these goods' production. Empirically, the effects of import competition have been reported extensively, but this strand of literature has mostly been restricted on the effect of import competition on wages (Autor, Dorn and Hanson, 2012). However, it is likely that due to the decreased demand for production factors, employment in industries that face import competition from China has decreased.

In order to understand the effect of Chinese exports on employment in the EU, a brief account of China's growth and the driving forces behind this growth is required and will now be presented.

China's integration in the world economy

The first trade reforms that China implemented were introduced in 1978. Before that, nearly all imports were controlled by a state commission. Trade was not based on comparative advantages or relative prices. In other words, no market mechanisms were used to decide trading patterns. As a result of the first trade reforms, the average tariff decreased from 56% in 1982 to 43% in 1985, at which it was maintained for seven years. As part of the WTO reforms, tariffs were continually decreased until WTO accession, when the average tariff was 15%. Also, other trade restrictions such as quotas were removed. During this entire period of time, the government decided which firms could trade internationally by handing out trading rights. However, the number of firms that was allowed to trade increased from 800 in 1985 to 35 000 in 2001 (Branstetter & Lardy 2006).

In 1979 a new law was passed that allowed foreign direct investment (FDI) in four special economic zones (SEZ). In these zones, foreign firms enjoyed preferential tax rules. Later on, more municipalities were opened up for small FDI projects. These changes, combined with additional liberalization policies during the 1980s, caused a large increase in FDI, peaking at the start of the 1990s. Originally, this flow came from nearby regions such as Taiwan and Hong Kong, but during the 1990s, western firms became more and more interested. The enormous increase in domestic demand was somewhat halted by fiscal policy and the Asian financial crisis of the second half of the 1990s. Also, firms that had rushed to the Chinese market encountered unexpected problems, mostly connected to cultural differences. However, after these initial problems and following the Asian crisis, FDI began to rise again. Branstetter and Lardy (2006) argue that export has not consistently driven GDP growth. However, they suggest other beneficial effects for China, such as higher marginal productivity of labor due to competition, and better living standards of the Chinese by increasing their consumption possibilities of both variety and quantity. These effects are effects of trade liberalization and not export growth (which is itself a consequence of trade liberalization).

An important moment in the process of trade liberalization has been China's accession to the WTO in 2001. The conditions of membership were an important driving force behind unilateral liberalization of tariffs during the 90s. China's government realized that there was no realistically viable alternative for the future than to join the economic globalization process and large commitments were made in order to show China's will to reform. The international policy might be seen as just one part of China's move from a planned economy to a market economy. Some of the conditions for WTO membership that China committed to were removing trade barriers for importing manufactured goods, decreasing tariffs on industrial goods and agricultural goods to an average of 8.9% and 15% respectively, allowing any foreign or domestic firms to participate in international trade, allowing foreign firms more autonomy in distributing goods domestically, introducing quality and health standards, removing export subsidies on agricultural goods, and has even agreed to discriminatory terms in some issues, meaning that China will have limited power in certain issues compared to other WTO members. These regulations were put in place in the years prior to WTO accession. Therefore, it is plausible that the effect of WTO accession itself might be overestimated. Of all developing countries, China is considered to be the most open (Branstetter & Lardy 2006).

Shift from agricultural to manufacturing production

During the economic reforms, focus shifted from agricultural to manufacturing production, which was located in the cities, mainly the SEZs. Demand for labor in the manufacturing industry therefore increased, and a massive migration from rural areas to urbanized regions took place. It is likely that discrepancy in wages has been an important factor to this migration. Indeed, Lin et al. (2004) show that urban to rural relative wages were 1.82 in 1985 and 2.42 in 2000, suggesting that the wage gap was present and increasing throughout the time of economic reform.

In order to explain the shift in activity, Chen et al. (2009) argue that the shift from agricultural production to manufacturing production occurred through two mechanisms. The first mechanism is the shift of activity within the area of residence, known as Township-Village-Enterprises (TVEs). This means that workers in fact don't need to migrate, but only

change jobs to the manufacturing industry in the same area. The other mechanism is that workers migrate to a city or even a different province in order to find jobs in the manufacturing industry. Lin et al. (2004) show that the discrepancy in wages between urban and rural residents is larger in inland areas than in coastal areas, suggesting that rural areas at the coast benefited more from the economic reforms. It is plausible that this is because the TVEs benefited from their coast location and could thus be more successful. On the other hand, Huang & Pieke (2003) have shown that 45 million people in 1997, 55 million people in 1998 and 67 million people in 1999 migrated from rural to urban areas. Similar numbers were obtained with different data sources. They also note that those rural residents not engaged in agricultural activities do not migrate, suggesting that the aim of migration is in fact to find employment in the manufacturing or construction industry. Altogether, these findings imply that both mechanisms have in fact been prevalent.

It is plausible that this migration from rural to urban areas has increased productivity by moving from agricultural activities to more productive manufacturing activities and therefore has strongly contributed to the increase in value of exports by China, especially the increased labor participation in foreign owned enterprises in coastal areas.

China's post-liberalization position on the world market

The relative abundance of unskilled labor in China compared to capital raises the expectation that if China would export goods according to its comparative advantage, it would export inexpensive manufactured goods. However, China is a major player on the market for high tech electronic products such as computers (Branstetter & Lardy 2006). One explanation for this is that by allowing Chinese firms to import freely, it has been possible to import high tech intermediates and assemble these before exporting them again. Also, these goods are mostly assembled by foreign owned firms. Therefore, it can be concluded that the trade patterns that China shows are not a result of a large increase in technology used by domestic firms.

The discussed changes in trade policy and productivity have had large effects on China's position on the world market. In the first years of the 21st century, China's trade deficit in Southeast Asia has increased since imports from other emerging Southeast Asian countries

have grown faster than exports (Branstetter & Lardy 2006). It might be expected that China's success and growth will enable countries in the region to 'tag along' and benefit from growth by the region as a whole. It should be noted that China's growth could also have negative effects for some countries in the regions, since most countries in the regions are abundant in unskilled labor and therefore compete with each other on the world market with similar products.

The opposite can be seen in the US, whose trade deficit with China has increased by large increases in exports to China but even larger increases in imports (5.4 to 1 imports to exports ratio in 2003). However, this has simultaneously lead to a decrease in trade deficit with other trade partners in the region that the US imports from, caused by decreased imports from these countries (Branstetter & Lardy 2006). This is an example of indirect effects caused by China on the world market and trade flows. However, since the Southeast Asian countries are closely related through FDI, it could be argued that this has not caused a large loss for the countries in the regions. Of all the FDI flow into China since the economy reforms, 70% is from Southeast Asian partners in 2003. Whalley and Xin (2006) suggest that countries in the region are using China as a platform for exporting to the rest of the world, by directly investing in firms situated in China. The US and Europe, on the other hand, seem to attempt to exploit FDI flows in order to gain access to the Chinese domestic market.

Whalley and Xin (2006) also argue that Foreign Invested Enterprises (FIE) account for a large part of Chinese exports. Since 1991, the share of FIE in total exports has grown from 16.7% to 57.1% in 2004. Also, FIE export growth has been continuously growing, at much higher rates than non-FIE export growth. Therefore, while trade data is registered as Chinese, a substantial part of the value of trade is owned by foreign countries, especially by neighboring countries in the region. Therefore, the authors are concerned about China's future economic and export growth being highly dependent on continuous FDI growth. Indeed, it seems that China's export growth cannot grow forever, since there is a limit to the capacity of foreign economies to import goods. This may well prove to be a decisive matter for FDI flows in the near future.

Effects of Chinese exports on foreign economies

As mentioned in the introduction, firms face competition not only from other domestic firms, but also from foreign firms. For example, when a country imports a good from another country, the domestic firm will face less demand of the good than if the country would not import any goods, assuming that the domestic good does not have much better quality or a lower price. This is called import competition. It is likely that the effect of import competition on the domestic market will be larger if the foreign firms can produce the good in question more effectively or cheaper than the domestic firms, because it will be harder for the domestic firms to compete with the low price that the foreign firms set. Therefore, it is plausible that import competition is more profound in industries in which a country has an absolute disadvantage.

A paper published on the effect of Chinese imports on the US domestic manufacturing market by Autor, Dorn and Hanson (2012) considers changes in employment, employment rates and wages caused specifically by changes in China's total factor productivity and trade barriers. Using a 2SLS strategy and defining commuting zones as local economies to perform a regional analysis, they found that when the exposure to direct import competition from China increases with $1000 per employee, employment decreases with around 0.33%, compared to 0.25% with a standard OLS regression. This result is robust for the inclusion of several control variables such as percentage of college-educated population, employment in manufacturing etc. While these seemingly strong results indicate an effect of direct import competition on employment, there are some things that should be noted about the analysis. First, using a Ricardian based trade model to define a measurement for import exposure, the authors use proxies for nearly all variables in this expression. Second, the instrument that is used in order to control for endogeneity replaces Chinese exports to the US by Chinese exports to eight different developed countries. One could discuss if these two strategies are reliable in modeling the effect of imports exposure on employment.

Related to the earlier discussion regarding the effect of China's export growth on the Southeast Asian region, Holst and Weiss (2004) find that in the short run, competition between countries in the Southeast Asian region has increased on third markets. However, the authors conclude that in the long run, the region as a whole could benefit and show

aggregate growth by exploiting regional cones of diversification and producing complementary goods instead of substitute goods.

In a different study by Bloom, Draca and van Reenen (2010), direct import competition from China was associated with firm-level technology. Innovation, as measured as the number of patents, IT intensity, and R&D expenditure increased when firms were more exposed to imports from China. They also found a reallocation effect of labor from low-tech firms to high-tech firms, as well as a negative effect on employment at the industry level.

II. Theory

To consider how import competition can affect demand faced by domestic producers, a theoretical background, based on the trade model by Eaton and Kortum (2002) and adapted by Autor, Dorn and Hanson (2012) will now be presented.

The theoretical point of departure is a world with many countries (exporting regions i and export destination markets n), many industries j, and the basic Ricardian assumption that production technology in a given industry may differ between countries. The absolute state of technology, or productivity, is denoted by T_{ij}, meaning that a high value of T_{ij} compared to other countries will lead to an absolute advantage in the production of good j. Input costs for production of a good is denoted by w_{ij} and d_{nij} denotes trade barriers between country n and i. Because international trade increases with better technology in any country and decreased input prices or trade barriers, it is possible to write an expression of the likelihood for country n to buy a good from country i as $T_{ij}(w_{ij}d_{nij})^{-\theta}$. In the model, these variables are randomly 'drawn' from a pool of values, and θ denotes how much variation the distribution of these variables show. θ is therefore a constant that is equal across all countries. A higher value of θ indicates a lower range of these variables between countries. In that sense, θ is a variable that indicates comparative advantage. $T_{ij}(w_{ij}d_{nij})^{-\theta}$ is therefore an expression for the effect on price competition in country n caused by country i. Therefore, when taking the sum of this expression for all countries i, an expression is obtained for the price competition in country n, dependent on technology, input prices and trade barriers. Mathematically, this is written as $\Phi_{nj} = \sum_i T_{ij}(w_{ij}d_{nij})^{-\theta}$. Because this

expression is summed for all countries, Φ_{nj} is a constant. If Φ_{nj} denotes the price competition in country n, then the chance that country i can compete on this market and sell its goods is $\frac{T_{ij}(w_{ij}d_{nij})^{-\theta}}{\Phi_{nj}}$. Because identical preferences across countries are assumed, this equals country i's share of total sales in country n's market of the good and therefore end up with

$$\frac{X_{nij}}{X_{nj}} = \frac{T_{ij}(w_{ij}d_{nij})^{-\theta}}{\Phi_{nj}} \quad (1)$$

where X_{nij} is the value of the import of good j by country n from country i, and X_{nj} is the value of total imports of good j by country n. Rewriting this expression as $X_{nij} = \frac{T_{ij}(w_{ij}d_{nij})^{-\theta}}{\Phi_{nj}} X_{nj}$ and taking the sum of this equation over all destination markets n will result in an expression for the demand for good j produced by country i, denoted Q_{ij},

$$Q_{ij} = \sum_n \frac{T_{ij}(w_{ij}d_{nij})^{-\theta}}{\Phi_{nj}} X_{nj} \quad (2)$$

which is dependent on the price competition in destination countries, caused by the state of technology and trade barriers in competing countries.

III. Empirical methodology

Equation (2) is a direct link to the purpose of this paper since it shows the effect of decreased trade barriers and increased productivity in China on the output in industry j in country i (Q_{ij}), which is reflected by the variables denoted as $d_{ncj}^{-\theta}$ (trade barriers) and $T_{cj}w_{cj}^{-\theta}$ (cost-adjusted productivity) where c denotes China. An increase in these variables will increase Φ_{nj} and thus affect the demand for good j produced by country i by increasing competition on foreign markets. In mathematical terms, we can write the effect of productivity or trade barriers changes as

$$\hat{Q}_{ij} = -\sum_n \frac{X_{nij}X_{ncj}}{Q_{ij}X_{nj}}\left(\hat{A}_{cj} - \theta\hat{d}_{ncj}\right) \quad (3)$$

where $\hat{Q}_{ij}$ is the log change of sales from country i in industry j, $\frac{X_{nij}}{Q_{ij}}$ is country n's imports

from country i as a share of total production by country i, and $\frac{X_{ncj}}{X_{nj}}$ is country n's imports

from China as a share of n's total spending.

Finally, taking the sum of the last equation over all industries and simplifying gives

$$\hat{Q}_i = -\sum_j \frac{Q_{ij}X_{nij}X_{ncj}}{Q_i Q_{ij}X_{nj}}\left(\hat{A}_{cj} - \theta\hat{d}_{ncj}\right) = -\sum_j \frac{X_{nij}X_{ncj}}{X_{nj}Q_i}\left(\hat{A}_{cj} - \theta\hat{d}_{ncj}\right) \quad (4)$$

where $X_{ncj}\left(\hat{A}_{cj} - \theta\hat{d}_{ncj}\right)$ can be considered as China's export growth to country n, driven by technology and trade barrier changes. This is the mathematical expression that will be tested empirically in subsequent sections.

As mentioned before, the purpose of this paper is to analyze the effect of import competition from China on employment in the EU. In order to test this, a measurement of import competition, more specifically the exposure of different regions to import competition from China, is required. Import competition was earlier defined as competition a domestic firm faces when competing with a foreign firm. Usually, import competition is considered to be the competition domestic firms face on the domestic market. A perhaps slightly less often considered form of competition is the competition that domestic firms face on a foreign market. For example, if country A and B both export a certain good to country C, country A will face competition from country B, but the transactions occur on a third market, country C. This competition could occur even if country A does not import any units of this good. Therefore, it seems inaccurate to call this 'import competition'. On the other hand, the competition faced is in fact due to imports, the only difference is that the country facing competition is not necessarily the country directly importing the goods that are causing competition. In order to explain the purpose of this paper in more carefully defined terms, I propose to call the conventional definition of import competition as 'direct import competition', whereas I will refer to the form of competition described in this

paragraph as 'indirect import competition'. It is important to note, however, that in the literature these forms are usually not distinguished and simply referred to as 'import competition'.

In the Autor, Dorn and Hanson (2012) paper, analysis was performed based on regions within the US. Since the US is a single country importing goods from China and the concerned regions are part of the US, this analysis considers the effect of direct import competition. As we now address import competition in the EU, we will use the different countries within the EU as regions. Using the outcome of the discussed theoretical model, a time dimension is added to the equation in order to model the increase in exposure to import competition per unit of output. To simplify the equation we look at import competition that countries face on the EU market. Therefore, $n = e$ where e denotes the EU. Thus, we have only one destination market. Defining the observed change in China's export growth as ΔM_{ecjt} and the change in exposure to import competition on the EU market per unit of output as ΔIPO_{eit}, we can define the change in exposure to import competition from China per unit of output as

$$\Delta IPO_{eit} = \sum_j \frac{X_{eijt} \Delta M_{ecjt}}{X_{ejt} Q_{it}} \quad (5)$$

However, this equation does not consider the specific increase in exposure to direct import competition in region i since our measurement of imports from China is an aggregate of the entire EU. Instead, what this measurement of exposure expresses is the increase in competition faced by region i on a third market, the EU. It is therefore important to note that this equation, unlike in the Autor, Dorn and Hanson (2012) paper, expresses increased exposure to indirect import competition, as opposed to direct import competition. One could argue that this equation expresses both indirect and direct import competition since all regions are included in the aggregated imports, but because each region only accounts for a relatively small part of aggregated imports, it is likely that direct import does not account for a large part of the overall effect. Measuring the effect of direct import competition can be done by simply expressing exposure to import competition from China as China's share of total imports by a country.

Also, equation (5) differs from the one used in Autor, Dorn and Hanson (2012) in the sense that data on sales from specific regions to a target market (X_{eijt}) and data on total output per region (Q_{it}) are not available for regional economies in the U.S. and therefore forced the authors to use employment proxies for this data. However, in the case of the EU, this data is available and in this paper, the regression will be tested without proxies. This also leads to the definition of import competition exposure being different. Whereas Autor, Dorn and Hanson (2012) define their measurement as change in imports per worker, in this paper this measurement is defined as change in imports per unit of output (ΔIPO_{eit}), because ΔM_{ecjt} is divided by Q_{it} and not by an employment proxy for output. Because these data are closer to the original theoretical model, this approach might be more reliable in estimating the effect of import exposure on employment.

IV. Data

Import data at the three-decimal SITC rev. 4 product level (83 industries) was obtained from the Eurostat external trade database. M_{ecjt} was calculated as EU27's import in industry j from China in year t. ΔM_{ecjt} then, is $M_{ecjt} - M_{ecjt-1}$. X_{eijt} is defined as EU27's imports in industry j in year t from region i. Defining X_{ejt} is possible in two ways. It could be interpreted as EU27's total imports from all EU27 countries combined, or it could be interpreted as EU27's total imports from the whole world. To deal with this ambiguity, both definitions were applied and tested. Trade data are expressed as value in Euros.

Q_{it}, or total output in country i in year t, was obtained from the Eurostat Prodcom database. This database lists production of manufactured goods by NACE classification. However, since we sum the production of all manufactured goods to obtain Q_{it}, it is not necessary to convert this classification to SITC classification. The data used here is classified by the NACE rev. 1.1 D classification. This data is also expressed as value in Euros.

Employment data was obtained from the Eurostat Labour Market database, which is also classified according to the NACE rev. 1.1 D classification. This data is expressed as x1000 manufacturing employees between the ages of 15-64.

The collection of aforementioned data has been obstructed by the lack of data from certain years and industries. The industries for which no data was available have been left out. Import data that was lacking only for certain years in certain countries has been replaced with 0. Altogether, the sample included 27 countries during the years 2000-2008, ultimately leading to a sample size of $n = 243$, minus observations in country/year combinations where data on employment or total output was lacking.

V.Results

To assess the effect of import competition of China on employment, several econometrical models were tested. Both definitions of X_{ejt} were examined. Considering the theoretical model, coefficients are expected to be negative because the hypothesis is that import exposure decreases employment in the manufacturing sector.

First, an ordinary OLS regression was performed with the following specification:

$$\Delta E_{it} = \alpha \Delta IPO_{eit} + \gamma_t + \varepsilon_{eit}$$

where ΔE_{it} denotes the change in employment, γ_t a time dummy and ε_{eit} a random error term. The results of this regression are presented in column 1 of Table 1. Surprisingly, these coefficients are positive, indicating that increased exposure to imports from China increases employment in the manufacturing industry. However, these effects are not significant on a 5% significance level.

Then, a lagged variable model was used to examine possible time effects that incorrectly link import competition and employment, specified as

$$\Delta E_{it} = \alpha \Delta IPO_{eit-1} + \gamma_t + \varepsilon_{eit}$$

These results are shown in column 2. This model doesn't seem to improve the results much, with the exception of slightly higher significance.

To test the data with a more advanced specification to control for various factors that could distort the effect such as omitted variables, a fixed effect model was used, specified as

$$\Delta E_{it} = \alpha \Delta IPO_{eit} + \gamma_t + \lambda_i + \varepsilon_{eit}$$

where λ_i denotes the fixed effect. The results of this model are shown in column 3. Using the fixed effect model, the sign of the coefficients has now changed. Instead of predicting a positive effect, the fixed effect model indicates a negative relationship between import exposure and employment. The question is, then, which model is most reliable. For λ_i in the fixed effect model, coefficients with p-values under 0.001 are obtained. This suggests that the fixed effect is strong and therefore the fixed effect model is most reliable, indicating a negative effect of import exposure on employment. These results show a significance level of around 10%, which is reasonable considering the small dataset.

Table 1 | *The effect of import competition on employment. Coefficients (p-value).*

	(1)	(2)	(3)
X_{ejt} **= total imports**			
ΔIPO_{eit}	2428 (0.485)	3298 (0.182)	-5155 (0.102)
X_{ejt} **= intra-EU imports**			
ΔIPO_{eit}	1346 (0.575)	1756 (0.263)	-3766 (0.091)

Notes: N=226 (243-17). p-values are based on robust standard errors. Column 1 shows an ordinary OLS regression with a time dummy (R^2=0.075). Column 2 shows a lagged (1 year) variables model with a time dummy (R^2=0.078, 0.077). Column 3 shows a Fixed-Effect (FE) model (R^2=0.10).

Assuming the fixed effect model is the most reliable of the three, these results suggest a negative relationship between import exposure and employment. However, compared to the effect of import exposure on US employment, the precision of the parameters estimated here is low. Underlying causes to this difference will be discussed in a later section. Also, it can be concluded that the definition of X_{ejt} does not influence the results of the analysis.

In order to see whether the imprecise effects may be explained by regional differences in country characteristics within the EU, the effect of being an early or late EU state was tested.

In order to test this, the EU15 states (Austria, Belgium, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal and Sweden) were collected in a dummy variable and linked to ΔIPO_{eit} to obtain the regression

$$\Delta E_{it} = \alpha \Delta IPO_{eit} + \beta \Delta IPO_{eit} EU15 + \delta EU15 + \gamma_t + \varepsilon_{eit}$$

The results of this specification are shown in column 1 of Table 2. The EU15 dummy shows a significant effect of whether EU countries are early or late members. Since the effect is negative, this can be interpreted as early EU countries facing decreasing employment in the manufacturing sector.

Table 2 | *The effect of EU membership on employment. Coefficients (p-value).*

	(1)	(2)
X_{ejt} **= total imports**		
ΔIPO_{eit}	-5007 (0.339)	-7774 (0.124)
$\Delta IPO_{eit} EU15$	6683 (0.165)	3812 (0.397)
$EU15$	-39.7 (0.008)	-
X_{ejt} **= intra-EU imports**		
ΔIPO_{eit}	-3083 (0.307)	-4901 (0.092)
$\Delta IPO_{eit} EU15$	4355 (0.124)	2114 (0.409)
$EU15$	-40.6 (0.006)	-

Notes: N=226 (243-17). p-values are based on robust standard errors. Column 1 shows an ordinary OLS regression with a time dummy (R^2=0.12). Column 2 shows a fixed effect model (R^2=0.10, 0.11).

Also, the specification including the EU15 dummy was tested with a fixed effect model, because it was earlier shown that this model was more reliable than an ordinary OLS. Because a fixed effect model is used, the EU15 dummy is dropped.

$$\Delta E_{it} = \alpha \Delta IPO_{eit} + \beta \Delta IPO_{eit} EU15 + \lambda_i + \gamma_t + \varepsilon_{eit}$$

These results are shown in column 2. Similar results are obtained compared to the OLS regression, except for some changes in significance. ΔIPO_{eit} is more significant in the fixed effect model, whereas $\Delta IPO_{eit}EU15$ is more significant using the OLS regression.

Interestingly, these results show that using an EU15 dummy, the sign of ΔIPO_{eit} changes from positive to negative. Because an EU15 dummy is used, the effect of import competition exposure on all countries is considered by ΔIPO_{eit}. The added effect of being an early member is denoted by $\Delta IPO_{eit}EU15$. Consequently, the total effect of increased exposure to indirect import competition in early members using this equation is $\Delta IPO_{eit}EU15 + \Delta IPO_{eit}$, whereas the total effect in late members is ΔIPO_{eit}. The fact that the coefficients for $\Delta IPO_{eit}EU15$ and ΔIPO_{eit} have opposite signs implies that whether a country is an early or late member has important consequences for the effects of indirect import competition. All members seem to be negatively affected by import competition, which can be concluded from the fact that the sign of ΔIPO_{eit} is negative. Early members, however, appear to be less affected by import competition since the added effect of being an early member is positive. Since these results are not significant, they are at best suggestive. Some suggestions on future studies and improvement of the model will be presented in the next section.

VI. Discussion and concluding remarks

As discussed in the results section, it seems that the effect of import competition in the EU is similar to the effect in the US but less precise. Using a similar approach as Autor, Dorn and Hanson (2012) but using data that is closer to the original theory, this paper suggests a negative relationship between indirect import competition and employment, but the results found here were not significant. To examine possible explanations for this, it may be useful to consider differences between these regions.

A plausible explanation is the fact that EU imports from China and EU domestic production may be more complementary than US imports from China and US domestic production. Therefore, while increasing exposure to imports, this might not necessarily have led to a large decrease in employment because the domestically produced goods are still demanded. In other words, increased imports may not have led to increased import competition in all

EU countries. Therefore, another explanation for the fall in employment in early EU countries, such as specialization in services, might exist, but discussing possible causes to this is beyond the scope of this paper. This concern was also raised by Edwards & Lawrence (2010), who criticize the assumption that imported goods from developing countries are perfect substitutes to domestically produced goods. Their results suggest that those US industries that compete with imports from developing countries are not as unskilled labor-intensive as expected, implying that goods within one industry are made with different factor endowments in different countries. Intermediate goods may play an important role in this, as developed countries might export skilled labor-intensive intermediate inputs to China, where these inputs are assembled and exported again. All of these trade flows take place within the same industry, but do not actually increase competition due to trade.

It is possible that the analysis presented here, based on the Autor, Dorn and Hanson (2012) paper, is not suitable for analyzing regions such as the EU. Since changes in employment are dependent on whether an EU country is an early or late member, using the aggregate of EU countries as a single destination market may be an unreliable method. The crucial difference is that regions in the US do not directly import from China, whereas regions within the EU do. Therefore, reconsidering the empirical expression and not limiting the summation to $n = e$, it is possible to consider each separate EU27 country as a separate destination market. The problem with taking the aggregate of EU27 is that it is simply the summation of all separate countries' imports from China. However, in the expression we do not weigh for each EU country's share of EU27's aggregate import from China. Therefore, analyzing the expression with each EU country as a destination market might be more realistic in modeling the real exposure to import competition. It is therefore plausible to consider a general expression where n is the 'market' on which region i faces competition. If we, then, want to model the EU countries' exposure to competition on the EU market, i will be defined as all the countries in the EU that are exporting and n all the countries in the EU to which they are exporting. However, since this is a general expression, the analysis could be expanded to consider EU countries' exposure to competition on the world market. In that case, i will be defined as the EU countries and n will be defined as the world's countries as separate destination markets. Analyses of such magnitude are suggested for future studying.

Another suggestion is to model the effect of increased exposure to import competition on employment at the industry level by calculating and regressing ΔE_{ijt} on ΔIPO_{ijt}. Finally, this expression might even be used to analyze direct import competition. Since X_{nij} is simply defined as 'region i's sales in destination market n', limiting the expression to $n = i$ results in X_{nij} denoting domestic sales, X_{ncj} denoting region i's import from China, and X_{nj} denoting region i's total expenditure on imports in industry j. Therefore, the proposed general expression may serve as a universal tool to analyze both direct and indirect import competition. Also, future studies are recommended to use the SITC classification at the four-digit level, in order to improve the precision of the estimations.

According to Autor, Dorn and Hanson (2012), low income countries' share of total US imports increased from 5.9% in 2000 to 11.7% in 2007. China accounted for over 90% of this growth. In the EU, during the same period of time, China's share of total imports increased from 2.75% to 5.77%. Although imports from China showed impressive growth between 1995 and 2011, imports from other countries also increased substantially. Therefore it might be possible that the effect of imports from China has been larger on the US because the US imports relatively more from China. In the EU15 countries, as shown in the previous section, employment decreased, but the results did not show that import competition from China was a direct cause for this. It is possible that the decreased employment is due to foreign import competition, but that import competition has been more evenly spread out between partner countries, therefore not resulting in a particularly large role for China alone. A possible cause for this effect is that EU countries often have some kind of historical or colonial bond with some developing countries. This bond could make import policy less sensitive for China's export growth, still maintaining high levels of imports from these countries.

Finally, it might also be worth considering the time period of the analysis in this paper. Many reforms were implemented during the 80's, and it is possible that much of the effect of increased import exposure is lost by analyzing employment after 2000. However, it is likely that China's 2001 accession to the WTO has boosted additional export growth as part of the WTO accession agreement included additional reforms to be implemented after 2001.

The role of China on the world market is an increasing factor and it remains to be seen what this role will look like in the near future. An interesting idea that might be considered is thinking of China as a marketplace. The US, for example, is importing more high-tech goods from China and less from its neighboring high-tech countries such as Taiwan, South-Korea and Japan. Interestingly, however, China produces little high-technology parts itself. Most of the intermediate goods that are used are imported from exactly these countries that it competes with to export to the US and undoubtedly other developed parts of the world. Also, Taiwan and Hong Kong have used the FDI reforms during the 80's extensively and therefore own much of the value that would in trade databases be labeled as exports from China. It seems like these countries are using China as a platform to launch their own products into the rest of the world, while at the same time reaping the benefits of the low assembly costs that China offers. This makes the analogy of China as a possible future world marketplace, where countries come and go to sell their products, less of a conceptual idea and more of a reasonable prediction.

References

Autor, D.H., Dorn, D., & Hanson, G.H., "The China Syndrome: Local Labor Market Effects of Import Competition in the United States" (2012), *MIT working paper* No. 6613.

Bloom, N., Draca, M., & Van Reenen, J., "Trade Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity" (2010), *NBER working paper* No. 16717.

Branstetter, L., & Lardy, N., "China's Embrace of Globalization" (2006), *NBER working paper* No. 12373.

Chen, Y., Jin, G.Z., & Yue, Y., "Peer Migration in China" (2010), *NBER working paper* No. 15671.

Eaton, J., & Kortum, S., "Technology, Geography, and Trade" (2002), *Econometrica* Vol. 70 No. 5 pp. 1741-1779.

Edwards, L., & Lawrence, R.Z., "US Trade and Wages: The Misleading Implications of Conventional Trade Theory" (2010), *NBER working paper* No.16106.

Holst, D.R., & Weiss, J., "ASEAN and China: Export Rivals or Partners in Regional Growth?" (2004), *The World Economy*, Vol. 27 No.8 pp. 1255-1274.

Huang, P., & Pieke, F.N., "China Migration Country Study" (2003), *Presented at the Conference on Migration, Development and Pro-Poor Policy Choices in Asia, Dhaka, 22-24 June, 2003.*

Lin, J.Y., Wang, G., & Zhao, Y., "Regional Inequality and Labor Transfers in China" (2004), *Economic Development and Cultural Change* Vol. 52 No.3 pp. 587-603.

Whalley, J., & Xin, X., "China's FDI and Non-FDI Economies and the Sustainability of Future High Chinese Growth" (2006), *NBER working paper* No. 12249.