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The effect of developing countries' competition on regional labour markets in Portugal

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Abstract

Portuguese trade with developing countries rose 564% in the last 20 years and China became in 2014 the 8th most important importer among all trade partners. At the same time, Portugal witnessed its manufacturing employment decreasing 34%. Using a sample of persons employed in enterprises between 2004 and 2012, I show whether regions more exposed to Chinese import competition face a larger decline in manufacturing employment. My results show that an increase of 1000 EUR in imports per worker throughout the period considered causes a decrease in the share of manufacturing employment in the working age population by approximately 0.12 percentage points or a decline of 0.431 log points. Moreover, my estimations did not show a clear conclusion about the impact of import competition on non-manufacturing employment and on whether people move to other regions in response to a trade shock, but they indicate a rise in unemployment.

JEL Classification: F14, F16, F66

Keywords: Import Competition, Local Labour Market, Portugal, China.

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1. Introduction:

It is well known that trade has been increasing around the world with many countries lowering trade barriers and creating incentives for trade. According to the World Trade Report 2014 of the WTO, world merchandise trade grew on average 5.3 per cent per year between 1993 and 2013. Part of this pattern can be explained by the opening to international trade of many developing countries, highlighting the role of China; in 2009, China became the world largest first exporter and the second largest importer[3].

More importantly is that the increase of trade is not only among developing countries but instead between developing and developed countries. In the case of Portugal, while total trade with developed countries increased approximately 181% between 1993 and 2014, trade with developing countries rose 564%, with exports and imports growing 964% and 411%, respectively. Moreover, it is important to highlight that trade with developing countries represented 24% in 2013; while in 1993 it was only 11%. On the top of that, both China and Angola deserve a particular attention because they are the two most important Portuguese trade partners among all the developing countries, with China moving from the 11th place in 2000 to the 2nd in 2014, in terms of exports, and moving from the 6th in 2000 to the 1st in 2014, in terms of imports; and Angola being always the 1st in terms of exports and moving from the 25th to the 2nd, in terms of imports.

However, my research will focus only on China because not only China became the most important importer amongst all the developing countries for Portugal but also one of the most important importers for many other developed countries, such as U.S.A[4] and Spain[5]. Moreover, while the trade relationship with Angola may be explained by the similarities between the two countries, in terms of language, culture and history; the trade with China is based on its growing export-capacity. Looking at the figure 1.1, one observes a sharp rise of Chinese imports of approximately 836% between 1995 and 2012, especially after 2001, when China had access to the World Trade Organization, with growth rates of two digits in 2004-2008. Although during the same period, exports to China increased much more (approximately 2983%), the absolute value of imports is higher, with Portugal showing a continuous trade deficit with China. In fact, the trade deficit increased almost 640% between 1995 and 2012 and imports from China represented in 2012 already 2,5% of total imports, with China becoming the eighth most important importer (vs 17th in 1995). In addition, looking at figure 1.2, one can observe that import penetration rate[6] of Chinese imports

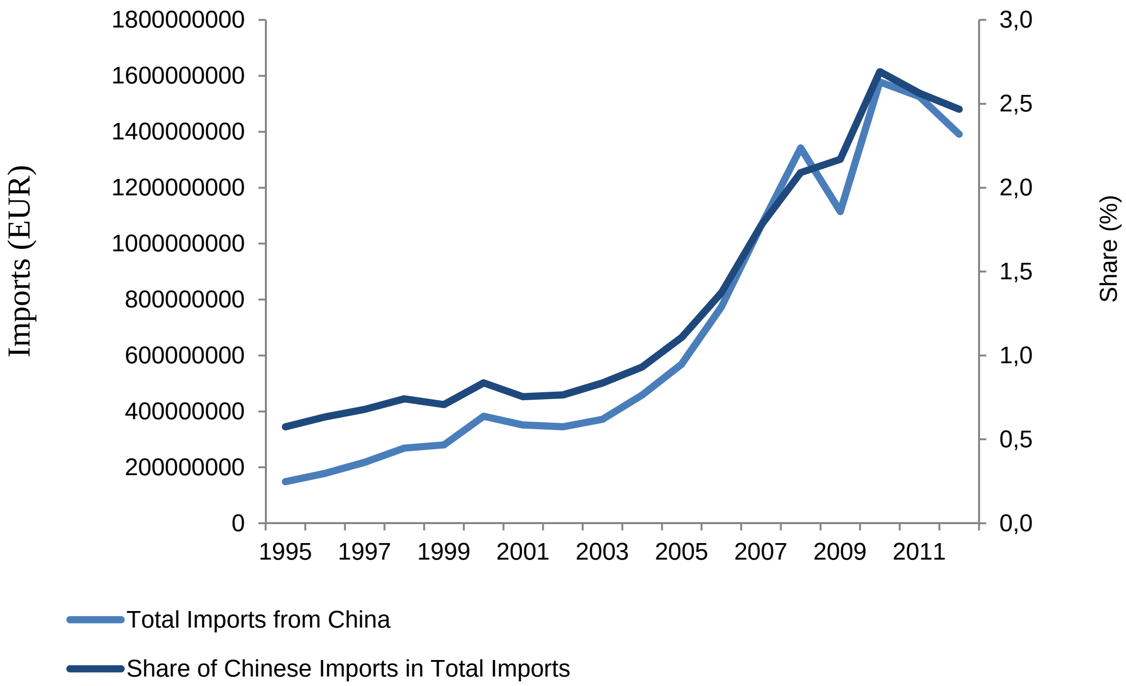
3 China – Ficha de Mercado (Março 2014), AICEP Portugal Global.
4 Autor et al. (2012)
5 Donoso et al. (2013)
6 The import penetration rate is calculated as $\frac{\text{Imports}}{\text{GDP}-(\text{Exports}-\text{Imports})} * 100$

shifted from 17% in 1995 to almost 80% in 2012; this means that imports from China have becoming more and more important to the Portuguese domestic economy.

Considering imports per sector, and observing figure 1.3, one may conclude that the sectors with the highest growth between 2000 and 2012 are motor vehicles, other transport equipment and basic metals. However, when one considers the weight of each sector in total imports (figure 1.4) one observes that the sectors with the highest growth are not the most representative. In more detail, it is communication and computers sector which signifies the most in total Chinese imports , both in 2000 and in 2012 (16% and 17%, respectively). Moreover, one can note that while in 2000, furniture and other manufacturing goods were the second most important sector, representing 14%; in 2012, the second most important is electrical equipment (11%). Another notable fact is that basic metals which weighted only 2% in 2000, twelve years later were worth 10%. Textiles, leather and wearing apparel kept approximately the same share. It is also important to highlight that the total manufacturing sector accounts for almost 95% of all Chinese imports.

This pattern may be explained by the fact that China became more and more competitive in giving low-wage assembly services and it changed its exports from apparel and textiles toward electronic, machinery and other sophisticated goods[7].

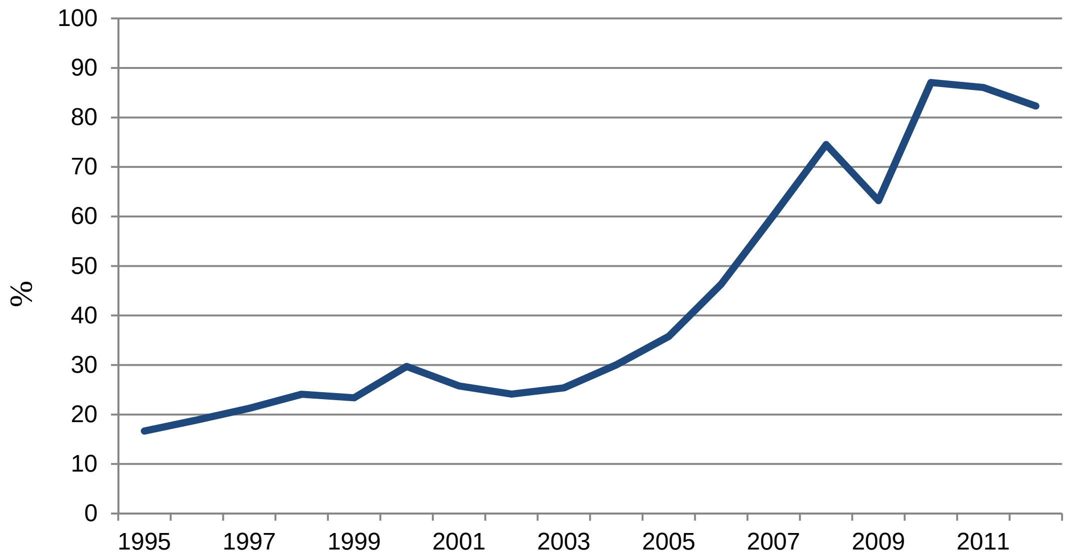
Figure 1.1. Chinese Imports in Portugal, 1995-2012



Source: Statistics Portugal (www.ine.pt)

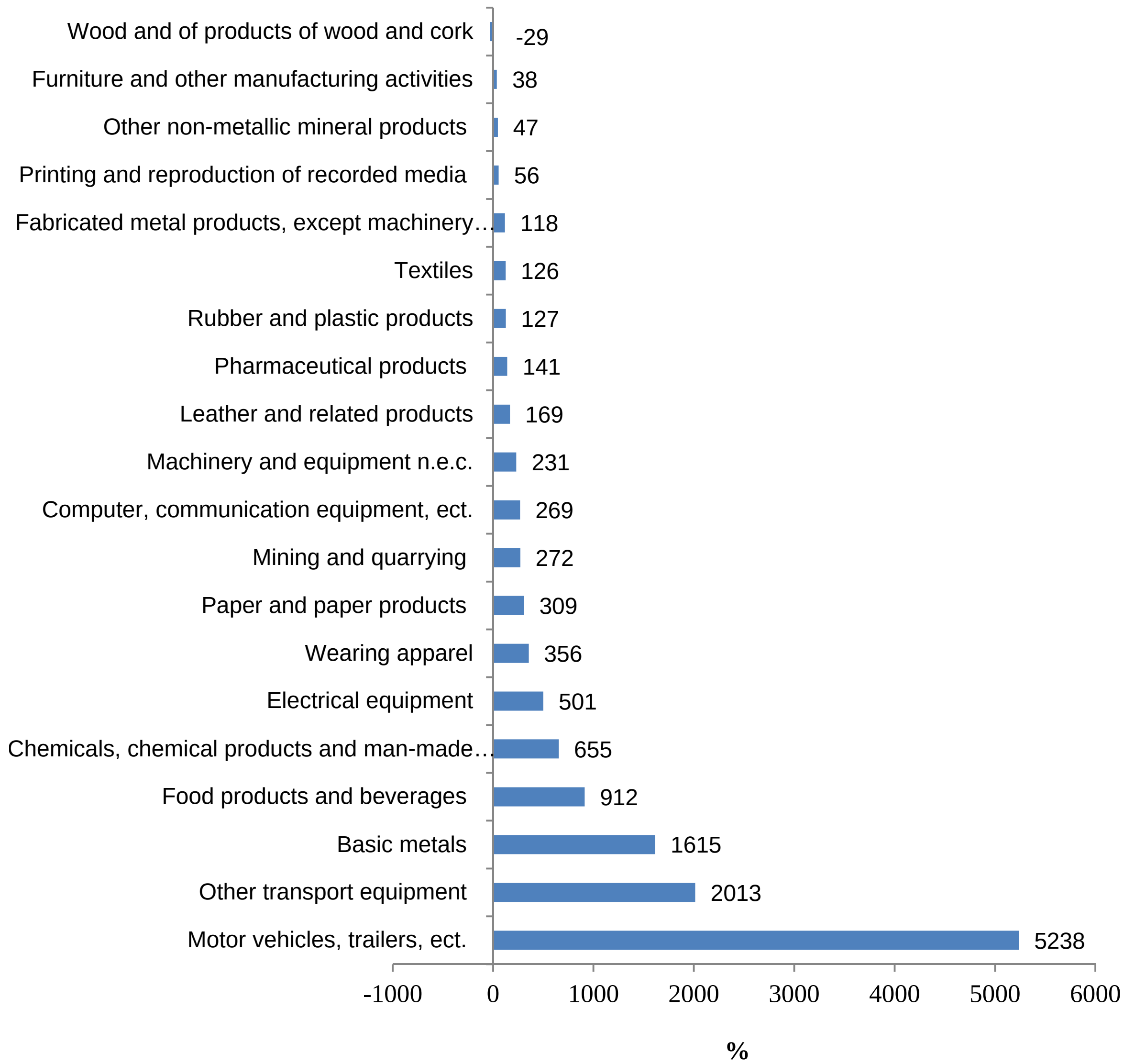
7 Amiti and Freund (2010)

Figure 1.2. Import Penetration Rate of China in Portugal, 1995-2012



Source: Statistics Portugal (www.ine.pt)

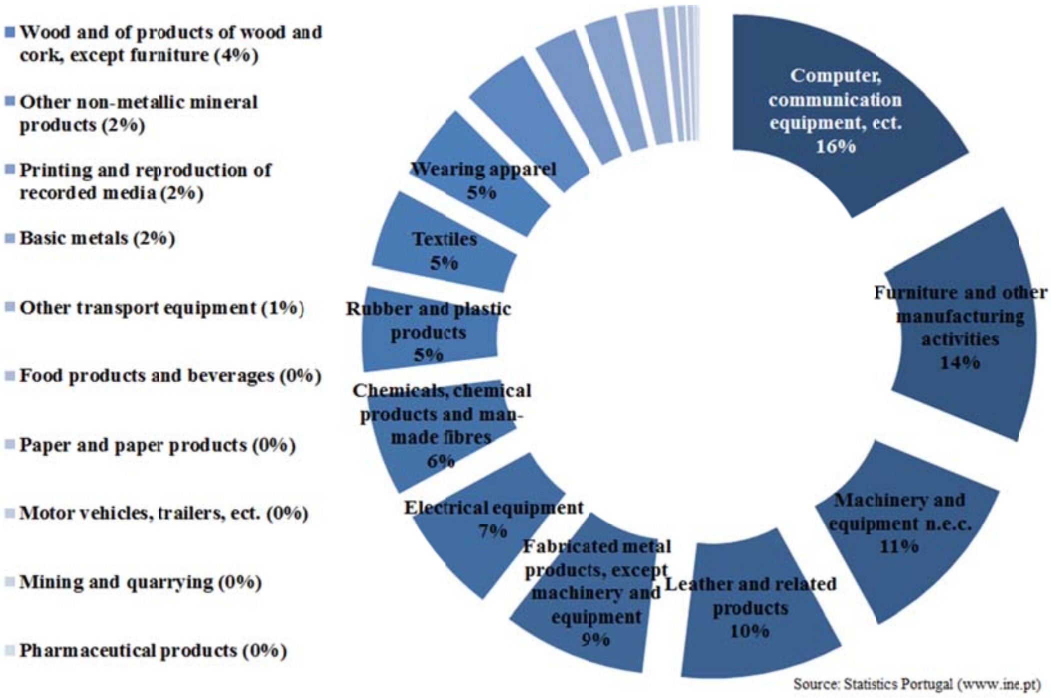
Figure 1.3. Percentage Variation of Chinese Imports in Portugal per sector (2000-2012)



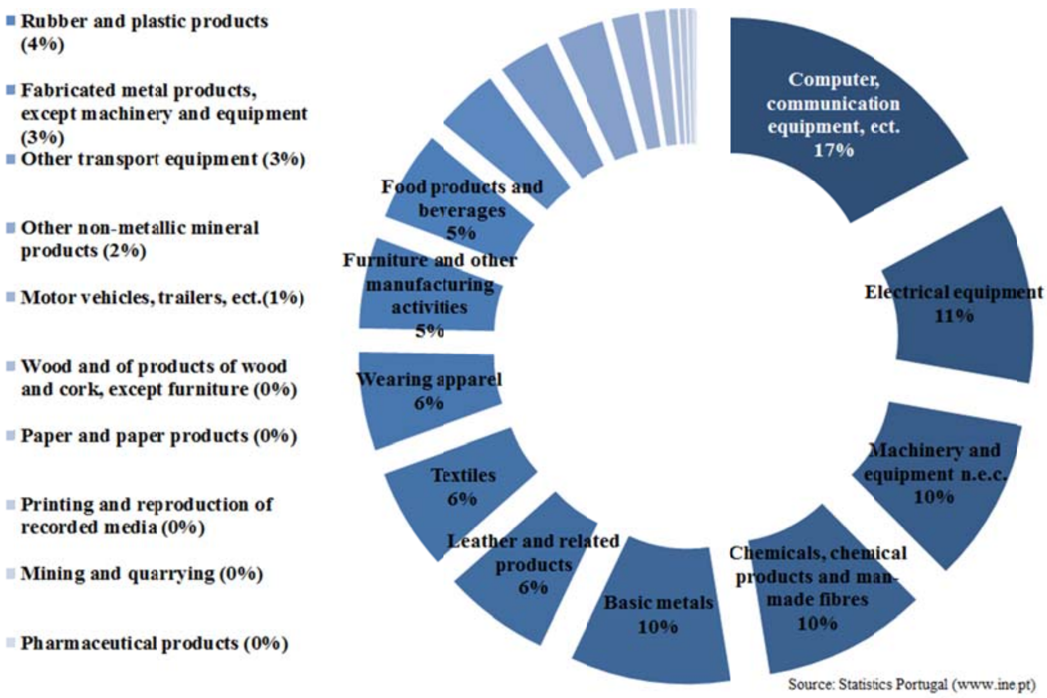
Source: Statistics Portugal (www.ine.pt)

Figure 1.4. Share of Imports per sector in Total Imports from China

(Share of Imports in 2000)

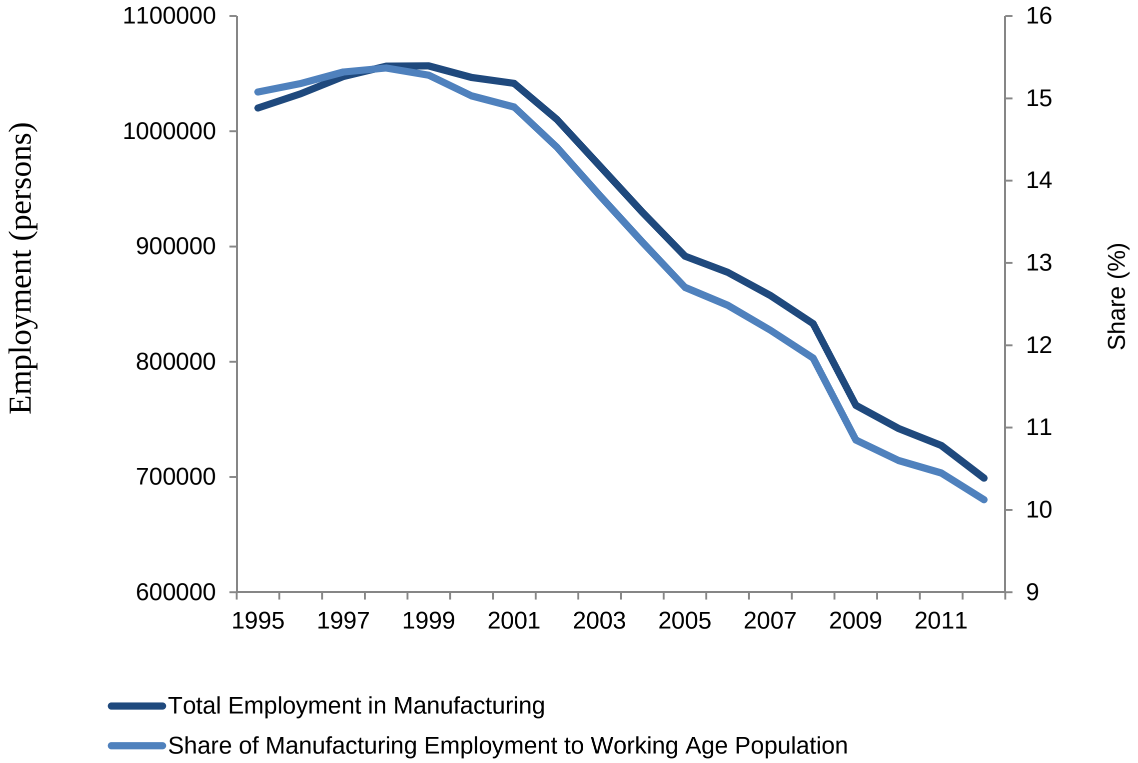


(Share of Imports in 2012)



At the same time, Portugal witnessed a significant decrease in the manufacturing employment. Looking at figure 1.5, one can verify that total manufacturing employment rose slightly between 1995 and 1999, but in 2000, it started to decrease sharply, dropping nearly 34%; the same pattern is seen when taking into account the share of manufacturing employment to working age population, with a drop of approximately 5 percentage points between 2000 and 2012. Moreover, 57% of this negative variation is explained by the textiles, wearing apparel and leather products sectors, followed by the wood and paper products, and printing sectors (12%).

Figure 1.5. Manufacturing Employment in Portugal, 1995-2012



Source: Statistics Portugal (www.ine.pt)

As one can observe, the shape of the manufacturing employment accompanies the shape of the Chinese imports. Therefore, using a methodology proposed by Autor et al. (2012), I am going to study whether this decline in the manufacturing employment can be explained by the import competition from China.

Using the number of persons employed in enterprises between 2004 and 2012 from the Statistics Portugal at the regional and sector level, I am going to show whether regions more exposed to Chinese import competition face a larger decline in the manufacturing employment. Therefore, my study is the first assessing the impact of imports on the Portuguese labour market at the regional level and one of the first papers assessing the impact of trade with low-wage countries on the labour market in Portugal, in general terms. Furthermore, my paper confirms the importance of using the new methodology proposed by Autor et al. (2012) to study the impact of trade with developing countries on the labour markets of the developed countries; and the disruptive effects in the labour markets caused by the trade with China and its increasing export-capacity.

My results show that regions specialized in manufacturing sectors where the rise in Chinese imports was higher, witnessed a larger decline in the manufacturing employment than regions were exposure to import competition was smaller. In more detail, an increase of 1000 EUR in imports per worker between 2004 and 2012 causes a decrease in the share of manufacturing employment in the working age population of approximately 0.12 percentage points or a decline of 0.431 log points. Moreover, my estimations are robust for regional fixed effects and when using net imports per worker, rather than gross imports per worker. However, when I estimate with full controls, my results are weakly or non-statistically significant which may be justified by the low quantity of observations.

In addition to that, I analyse how trade shocks pass through local labour markets. My estimations did not show a clear conclusion about the impact of import competition on non-manufacturing employment and on whether people move to other regions in response to a trade shock, but they do indicate that unemployment rises when import competition is higher. Additionally, when I consider import competition from Angola plus Brazil, rather than China, the results are not statistically significant and conclusive because the trade relationships between Portugal and those countries are considerably different than the trade relationships with China.

The rest of the paper is organized as the following: section 2 presents the literature review about the impact of trade with developing countries on the labour market; section 3 presents the empirical analysis and correspondent results and it has 6 subdivisions; and section 4 concludes.

2. Literature Review

Many developing countries have becoming more and more important in the international markets with its openness to international trade. Examples of that can be found in Brazil, where the Government decided to liberalize overall trade by removing many non-tariff barriers and reducing tariffs (from 54,9% in 1987 to 10,8% in 1995)[8]; in Mexico, where a set of liberalizing reforms in 1985/86 allowed Mexico to have a sharp trade expansion, with non-petroleum exports and imports rising on average 16,5% and 15,7% per year respectively between 1985 and 2000[9]; in India, which shifted from one of the most restrictive trade regimes in Asia to an open economy with a development strategy towards export-led growth in the 1980s and 90s (ratio of trade in manufacturing to GDP increased from 13% in 1980s to 19% in 2000)[10]; and more importantly, in China.

The case of China is particularly interesting due to its massive dimension and it motivated an extensive quantity of literature about its evolution towards an open economy. In Branstetter and Lardy (2006), the authors highlighted the important policy changes in trade and investment over the 1980s and 90s, when China created incentives for firms to export, foreign firms to settle down and lowered import tariffs. Moreover, all these policies aimed at allowing China to access the World Trade Organization in 2001; and thus they turned China in one of the most open economies in the world. In fact, China's real exports increased by more than 500 percent over the last 15 years which turned China into the world's third largest trading economy in 2004, overtaking Japan, and just behind Germany and the United States[11], and making more than $1.1 trillion in trade[12]. Besides, not only China liberalized its manufacturing sector but as well as the agricultural and services sectors, with labour productivity showing an impressive growth of nearly 8 percent over the last 30 years[13].

Over time, due to its competitive advantage in giving low-wage assembly services, Chinese exports became more and more sophisticated and similar to goods produced in capital and skill abundant countries, shifting from an economy based on agriculture and apparel and textiles to electronic, machinery and other sophisticated goods. However, as mentioned in Amiti and Freund (2010), most of the China's

8 Kovak (2011)
9 Verghoogen (2007)
10 Topalova (2007)
11 Amiti and Freund (2010)
12 Branstetter and Lardy (2006, p. 3)
13 Brandt et al. (2009, p. 3)

export growth was concentrated on existing varieties rather than new and more diversified varieties. Therefore, this pattern is associated with the assembling duty-free intermediate inputs. In fact, this point is in line to the type of imports in Portugal, shown previously, where the highest share in total imports from China is associated with computers, communication and electronic products.

Along with this growing position in the international, there are some patterns occurring in the labour markets of the developed countries. For instance, as mentioned in Krugman and Lawrence (1993), only highly educated workers saw their compensation rise and the real wages of blue-collar workers fell in most years since 1973. In addition, the fraction of the U.S. workers employed in manufacturing decreased steadily after 1950. Furthermore, in the paper of Feenstra and Hanson (1999), the authors stated that wages of the less-skilled workers declined relative to the high-skilled workers during the 1980s and the 1990s.

With many people believing that these facts may be partly explained by the growing trade with the low-wage countries, an emergent literature started to appear with many economists studying the impact of the developing countries on the developed countries and especially on the labour markets.

In the 1990s, when these issues started to be widely analysed and most of the studies were produced at the country-level, and using only aggregate data, the findings about the impact of trade exposure to developing countries were unequal. While some studies such as Wood (1995), which used a new methodology based on the Heckscher-Ohlin factor content model, showed a negative and significant effect of the imports from developing countries on the demand for unskilled workers in developed countries, contributing to intensify the wage gap between unskilled and skilled workers; others, like Krugman (1995), stated that the unemployment in Europe and wage inequality in the U.S.A. caused by trade with low-wage countries were small and barely insignificant. In particular, Krugman and Lawrence (1993) gave weight to the argument about automation and growing productivity as the cause for rising income inequality and lower manufacturing employment, where the authors found nearly insignificant impacts of trade with low-wage countries.

However, in 2008, Krugman reconsidered the results and concluded that since developing countries are specialized in labour-skilled intensive niches and developed countries continue to have a high degree of unskilled labour, the impact of trade may be higher than the estimated previously, with an increase in the wage gap.

Two other important studies in the 1990s are Feenstra and Hanson (1996 and 1999). In their studies, by using outsourcing as a measure for international trade, the authors found that outsourcing is positively associated with employment in non-production workers. However, it is weakly negatively correlated with their relative average annual earnings, because the increase of relative wages of non-production workers is explained at a larger extent by technology shifts rather than outsourcing activities.

Nevertheless, with the access to better data, new methodologies and new ways to treat that data, a flourishing quantity of new studies during the 2000s showed that trade with low-wage countries have consequences on the labour markets of the advanced economies.

One of these novelties is using firm-level data which became more and more available and it allows a more in depth analysis at the microeconomic level of key aspects that are missed at the macroeconomic level[14]. In other words, it allows researchers to control for firm heterogeneity and analyse within industry re-allocation effects, which is not possible when using industry-level data; having access to imports at firm-level, it is possible to distinguish between and industry-wide import competition effect and a firm-specific effect for those firms importing goods directly from low wage countries (outsourcing)[15]. As an example, there is the study of Harrison and McMillan (2009), where they estimated the impact of changes in foreign affiliate wages on U.S. manufacturing employment. They found that offshoring activities affect domestic

14 Brandt et al. (2009, p. 3)
15 Mion and Zhu (2010, p. 3)

manufacturing employment, despite not being the major driver of declining U.S. manufacturing employment of multinationals between 1982 and 1999. Moreover, the negative effects are compensated when tasks are different at home and abroad, because employment is complemented, and the effects vary according to the destination (high- or low-wage countries) and type of the offshoring activities.

In 2010, Mion and Zhu, using Belgian industry and firm-level and distinguishing between industry-level import competition and firm-level outsourcing of final versus intermediate goods, found that trade with China is associated with lower firms employment growth, especially in low-tech industries and higher skill upgrading (import competition from China accounts for 42% of the within firm increase in the share of skilled workers). However, import competition has no effect on Belgian firms' survival and outsourcing of finished goods to China actually increases the chance of firm survival.

Unlike Belgium, the impact of trade with China on firms' survival in Japan and in the United States was negative and significant. As mentioned in Mayda et al. (2012), rising industry exposure to low-wage countries is associated with lower plant's survival and employment growth; in addition, they found heterogeneous effects according to plants size, regions and sectors with different factor intensities and the results confirmed the standard international trade models since there was a reallocation of resources from labor-intensive comparative disadvantage sectors to more skill- and capital-intensive comparative advantage sectors. In the case of the U.S.A., in Bernard et al. (2006), they found that a larger exposure to imports from low-wage countries, especially China and India, means a shorter plant survival and lesser employment growth. Besides, plants more exposed to low-wage country imports switch their industries into industries with less exposure and consequently with greater capital- and skill-intensity. For the first time, there was evidence that firms adjust their product mix in response to trade pressures. Once again, the results confirmed the international trade theory since U.S. manufacturing was moving away from comparative-disadvantage industries towards comparative-advantage ones through exit, growth and industry switching. Likewise, this study was very important to the literature at the time because it was capable to identify multiple margins of adjustment to low-wage country imports, such as exit and product upgrading, or whether reallocation within industries was consistent with U.S. comparative advantage; and it diverged from ancient measures of import competition by focusing on where imports come from as well as their level, using a factor proportions framework.

In a different perspective, Ebenstein et al. (2009) used worker-level data from the Current Population Surveys and studied the impact of trade and offshoring on wages across occupations and sectors. This specification is important because it allows to control for workers heterogeneity and to examine the impact of globalization on wages both within the manufacturing sector and across sectors and occupations, in which the impact may be large and significant. Therefore, they concluded that the impact of globalization is stronger on occupational exposure than industry exposure because the effect is produced between rather than within economic sectors. In other words, when hit by a trade shock, workers are reallocated across sectors and occupations and the wage losses are higher when workers switch occupations along with manufacturing than workers who only exit manufacturing. Besides, this effect is larger for routine tasks.

Another example using workers-level data is found is Autor et al. (2013), in which they analysed the impact of exposure to import competition on earnings and employment over the medium and long-run in the U.S.A. By using data on where a worker was employed in the first year of the period, the results showed that workers who faced higher import competition were more likely to experience lower cumulative earnings, lower earnings per year worked, higher risk of exiting the labour force and obtaining public disability benefits. In addition to that, workers spent less time working for their initial employers, less time working for their initial two-digit manufacturing industries and more time working for a different manufacturing industry or outside manufacturing. The most negatively touched by rising import competition were those with low initial wage, low initial tenure, low attachment to the labour force and those working in large firms with low wage levels.

In the case of Spain the results were different to those found for U.S.A. as stated by Donoso et al. (2013). By using Spanish workers' micro-data, the authors found that rising import competition from China increased the probability of becoming unemployed but there is no evidence of lower manufacturing wages. This point may be justified by the fact that Spain presents a more rigid labour market wherein import competition affects employment and/or unemployment rather wages.

Apart from the studies using firm- and worker-level data, a new measurement was proposed by Autor et al. (2012) focusing on the impact of import competition at the regional level rather than country level. Thus, they used 722 commuting zones of the United States as a proxy for the local labour markets and 397 different types of manufacturing industries to make its study. By doing so, they can control for the fact that these commuting zones diverge according to their exposure to import competition as a result of the regional variation in the importance of different industries for local employment. Once I am going to use the same methodology in my study, it is important to well review the full research.

First of all, the methodology used by Autor et al. (2012) is based on a monopolistic competition trade model (Helpman and Krugman, 1985) in which the trade follows a gravity structure. In this way, the authors built a variable wherein the local-labour-market exposure to import competition is the variation in Chinese imports per worker in a commuting zone shared by its national industry employment at the start-of-period. Using decadal change in the manufacturing employment share working age population in commuting zone i as a dependent variable, the authors fitted several models where they included as well as a set of control variables about the commuting zone start-of-period labour force and demographic composition.

In addition to that, they computed instrumental variables using imports to other high-income economies to control for potential endogeneity issues and lagged employment to control for simultaneity bias. The use of these instrumental variables was quite important because it takes into account the fact that imports surge comes from specific Chinese factors and openness to trade rather than import shocks in the U.S. and the possibility of anticipated Chinese trade. Following this, the estimations showed that a 1000 dollar exogenous decadal rise in the import exposure per worker is associated with a decline in the manufacturing employment per working age population of about 0.75 percentage points, which is significantly higher than my estimations for Portugal. Besides, the rising import exposure competition to China explains 44% of the decline in the U.S. manufacturing employment between 1990 and 2007. When controlling for all the variables, the estimations showed that the decline in manufacturing is larger in regions more exposed to import competition, with a greater initial manufacturing employment share and where employment is concentrated in routine-task intensive occupations; it is lower where there is a larger initial share of foreign born population.

In all these control variables, the most important are the share of manufacturing in the commuting zone's start-of-period employment because it accounts for the possibility of import exposure variable being affected by an overall trend decline in the U.S.A. manufacturing employment, and the percentage of employment in routine-task intensive occupations because it takes into account the impact of technology in the labour market, since this type of job is quickly subject to computerization.

In addition to the impact of Chinese import competition on the manufacturing employment, Autor et al. decided to evaluate the impact on aggregate labour markets, using the log of the working age to assess whether the impact on local manufacturing causes the reallocation of workers across commuting zones, the non-manufacturing employment, the unemployment and the non-participating individuals. They found no significant effects of import competition on local population size, meaning that people do not move in adjusting to trade shocks and no evidence of a rise in non-manufacturing employment. However, the results showed a severe rise in unemployment and labour-force exiting. Moreover, at the worker-level, the non-college adults are the ones most affected by the trade shock, with no significant differences between males and females, and between young, mid-career and older workers.

Along with the adjustment margin in terms of employment, the authors also evaluated the adjustment margin in terms of earnings by using the mean log weekly earnings in a commuting zone i. They found a statistically significant and negative effect of import exposure from China on average weekly earnings, concluding that there is a reduction in the household's income and consumption that comes from fewer employment and lower wages. Nevertheless, this reduction is partly offset by a positive public transfer benefits variation in response to the same import competition.

In order to prove that the effect comes from the growing Chinese productivity and openness to trade, rather than labour demand shocks in the U.S.A., Autor et al. added other developing countries like Mexico to China and they found barely no changes in the estimations.

Likewise, to give robustness to their research, they decided to use alternative measures of trade exposure. For instance, they built the same treatment variable but weighted by the initial share of spending in markets importing the same goods from China to account for the competition in other foreign markets; or building the treatment variable without imports of intermediate inputs, since this may affect productivity in the U.S. industry; or even taking exports into account, by using net imports. In all the cases, the results are similar in significance. Two more different specifications were also analysed: a gravity-based approach which can take in consideration the growing productivity and lower trade costs, and an approach based on the usual Heckscher-Ohlin trade theory or labor content of U.S. net imports from China by replacing the change in imports per worker for the change in the net imports of effective labour services. Once again, the results were analogous to the findings from other measures of trade exposure.

Overall, the paper of Autor et al. (2012) was quite important because it gave relevant contributions to the topic of exposure to low-wage countries in terms of labour-market adjustments to trade that were missed in previous literature. Moreover, it inspired the study of Donoso et al. (2013) for Spain, which can be considered as comparable to mine.

In its paper, by using the same methodology, Donoso et al. concluded that an increase in 1000 US dollar of Chinese imports per worker caused a decline in the manufacturing employment per working age population of about 1.3 percentage points. The results are also robust for control variables, anticipated increase in imports and province heterogeneity through fixed effects. Additionally, the authors found that the reduction in the manufacturing employment was offset by a rise in non-manufacturing employment, with no evidence of workers mobility across Spanish provinces, unemployment or labour force participation. Contrary to the study of Autor et al. (2012), the authors did not go beyond the manufacturing employment and they did not study the impact of import exposure on public benefits and wages as well as on workers heterogeneity.

Another important point in studying the impact of trade concerns the difference in terms of methodology used (Gravity based model vs. Heckscher-Ohlin factor content model). Roughly speaking, the gravity based model is used in international trade to describe trade flows in quantities between two regions based on their economic sizes and distance between them. In this case, distance can be interpreted as trade costs, proximity or similarities between the two regions. The gravity equation approach was used, for instance, in the study of Autor et al. (2012) to build the treatment variable and in the study of Arkolakis et al. (2012) to analyse the welfare gains from trade using new micro-level data. In the last example, the authors used the Armington model which played a central role in the gravity literature and states that no two countries can produce the same good or goods are differentiated by country of origin.

The Heckscher-Ohlin factor content model is an alternative way to measure trade between two regions based on the relative prices of the factors (land, labour and capital). Therefore, countries will export goods that use intensively the factor of production with which they are relatively abundantly endowed, and import factors goods that use intensively factors that are relatively scarce at home[16]. Moreover, while the gravity-based approach is linked through changes in product quantities, the Heckscher-Ohlin factor content model

16 Wood (1995, p. 3)

is linked through changes in product prices. For instance, in the paper of Wood (1995), the author used an approach based on the Heckscher-Ohlin factor content to study the impact of trade with developing countries on the unskilled workers in the developed countries. In the paper of Kovak (2011), the author also uses a model based on the Heckscher-Ohlin factor content at the regional level to examine the national price changes on local labour markets and measure how the trade liberalization affected local labour market wages and internal migration patterns. A similar approach is used by Topalova (2007 and 2010) to investigate the impact of trade reforms on poverty and inequality in India districts.

In the specific case of Portugal, the literature about the interaction between trade and labour market is rather scarce and most of it focuses on examining the occurrence of the Smooth Adjustment Hypothesis in the Portuguese economy, which states that intra-industry trade leads to relatively lower adjustment costs in the labour market in comparison to inter-industry trade. All the studies (Silva and Cabral, 2006; Faustino, 2010; Bastos and Silva, 2012; Leitão et al., 2013) confirm the presence of the SAM when intra-industry trades increases. That is the reason why my paper gives an important contribution to the Portuguese literature about the impact of trade on the labour market and especially the trade with low-wage countries.

Although most of the trade with developing countries is based on manufacturing goods (approximately 80%)[17], the services sector has been growing recently. According to the WTO, world commercial services exports and imports grew each one 8 percent per year in 2005-2013[18]. Therefore, Liu and Trefler (2011) decided to study the impact of trade in services, rather than manufacturing products, with China and India on the U.S. labour market. Their research is then one of the few studies about trade in services and it is focused also on skilled workers in low-wage countries. Besides, this study highlights the rise of services offshoring to China and India and the competition between educated U.S. workers and educated low-paid foreign workers. By using a model of occupational choice that deals with endogeneity of imports and the role of worker sorting, Liu and Trefler found that the rise of imports in services from India and China between 1996 and 2007 is associated with an increase of 17% on downward occupation switching (moving to an occupation that pays less) and an increase of 4% on upward occupation switching (moving to an occupation that pays more). Moreover, transition to unemployment increased by 0.9 percentage points, and earnings for workers who stay in the same occupation fell by 2.3%.

So far I have been reviewing the negative impacts of trade with low-wage countries on the labour markets of the developed countries. However, trade with low-wage countries may also bring advantages to the developed countries. For instance, in Auer and Fischer (2008), by using industry-level data, they found that producer prices decreased in the U.S. industry, partly due to productivity growth and partly due to lower markups as a result of trade with low-wage countries. In a deferent perspective, Broda and Weinstein (2004) studied the impact of the growth in product variety from U.S. imports as a result of growing globalization. They showed that the amount of varieties imported had increased by four between 1972 and 2001. By calculating the decline on the conventional import price index (-28%), they found that the welfare gains from more imported varieties alone were approximately 3 percent of GDP during the same period. Therefore, Broda and Weinstein confirmed the importance of thinking in international trade using the Dixit-Stiglitz framework, in which consumers love variety. However, in the study of Hsieh and Ossa (2015), the authors found that even with a surge in exports and productivity in China, the world welfare was only marginally affected (1.5% of the worldwide gains).

17 Figure calculated from WTO database.
18 World Trade Report 2014, from WTO.

3. Empirical Analysis

3.1. Data

In order to make my analysis I use the number of persons employed in enterprises at the regional and industry level from integrated business accounts system of the Statistics Portugal (INE) between 2004 and 2012. In particular, I have 28 regions from the Portuguese continent which correspond to the NUTSIII level; a statistical division used by the institute. Due to lack of consistent data, I decided to ignore the insular regions of Portugal, Madeira and Azores. Concerning the manufacturing sector, I use 20 different industries at CAE Rev. 3 level. Data about Chinese imports are also from the Statistics Portugal. However, the data concerning imports to other developed countries, used to build the instrumental variable, is from the UN Comrade Database. All the data used in section 4, 5 and 6 is from the Statistics Portugal as well.

It is important to note that, in order to have consistent results and a match between imports and employment data, I needed to change the data by summing some of the manufacturing sectors. The summary statistics of the data are presented in figure 3.1.1.

Figure 3.1.1. Summary Statistics

Variables	**Mean**	**Std. Dev.**	**Max.**	**Min.**
Dependent Variables				
Manufacturing Emp. (var.)	-.024089	.0198668	-.0819782	.0123444
Manufacturing Emp. (log diff.)	-.2645926	.1446679	-.585494	.2325974
Working Age Pop. (log diff.)	-.0351686	.0393539	-.1185026	.0393782
Non-Manufacturing Emp. (var.)	.0097155	.027072	-.0508238	.0597827
Unemployment (var.)	.0360695	.0111094	.0166592	.0654945
Independent Variables				
Import Competition	.2065382	.1456011	.0265828	.562766
IV	80.6866	69.34701	7.396362	329.6991
Net Import Competition	.0139768	.1550255	-.3044465	.4912963
Import Competition (BRZ+ANG)	.9465219	1.186672	-.0857846	5.098211
Foreign-born	.0017292	.0022906	.0000798	.0118565
Manufacturing. Emp.	.2507909	.1287506	.0603183	.5679009
Graduated	.0081118	.0062608	0	.0259841
Women	.5052559	.0075707	.4877729	.5191988
Young	.1864026	.0106603	.1706831	.2141159

3.2. Building the Treatment Variable

As already mentioned, in order to study the impact of the developing countries on the Portuguese labour market I am going to use a methodology from the study of Autor et al. (2012). Therefore, I found it important to explain the framework behind the treatment variable presented in their study.

To build the treatment variable, the authors developed a model based on a monopolistic competition approach and they considered one region as a small open economy. With the view to measure the monopolistic competition model, Autor et al. applied a gravity structure wherein they took into account variations in trade quantities as an alternative to the Heckscher-Ohlin approach for trade prices. Then, they assumed that each region (i) produces traded and homogenous non-traded goods, in which the traded goods are produced by firms in a monopolistic competition framework with differentiated varieties.

Next, they assumed two channels in which China may affect region i: the export-supply channel related to the competition in the markets where each region sells its production (as a function of changes in labour costs, trade costs and the number of varieties made in China); and the import-demand shocks in China captured by the expenditure of each industry (j). Consequently, the labour-market outcomes, which are the change in wages, the change in employment of traded goods and the change in employment of non-traded goods, correspond to the sum of the two channels.

The following equations concern the log change in employment of traded and non-traded goods built by Autor et al.:

$$\hat{}L_{Ti} = \rho_i \sum_j C_{ij} \frac{L_{ij}}{L_{Ti}} \left[\theta_{ijC} \hat{\mathrm{E}}_{Cj} - \sum_k \theta_{ijk} \emptyset_{Cjk} \hat{\mathrm{A}}_{Cj} \right]$$

$$\hat{}L_{NTi} = \rho_i \sum_j C_{ij} \frac{L_{ij}}{L_{NTi}} \left[-\theta_{ijC} \hat{\mathrm{E}}_{Cj} + \sum_k \theta_{ijk} \emptyset_{Cjk} \hat{\mathrm{A}}_{Cj} \right]$$

Where $\hat{\mathrm{A}}_{\mathrm{Cj}}$ denotes the growth in China's export-supply capability (export-supply channel) and $\hat{\mathrm{E}}_{\mathrm{Cj}}$ the increase in expenditure in China (import-demand channel). Then, the first channel is multiplied by the initial share of output by region i that is shipped to each market k ($\theta_{ijk} \equiv \frac{X_{ijk}}{X_{ij}}$) and the initial share of imports from China in total purchases by each market k ($\emptyset_{Cjk} \equiv \frac{M_{kjC}}{E_{kj}}$); the second channel is multiplied by the initial share of output by region i that is shipped to China $\theta_{\mathrm{ijC}} \equiv \frac{\mathrm{X_{ijC}}}{\mathrm{X_{ij}}}$ and by the decrease in demand for each region i's shipments to all markets in which it competes with China. Moreover, the shocks are summed across sectors, weighted by the initial ratio of employment in each industry j to total employment in both traded and non-traded goods ($\frac{L_{ij}}{L_{Mi}}, M = N, T$) and a general-equilibrium scaling factor ($\mathrm{C_{ij}} \geq$) ; and the employment equations are scaled by the share of the current-account deficit (ρ_{i}) in total expenditure in each region i.

As one can see, positive shocks to China's export supply decrease employment traded goods and increase employment in non-traded goods. On the other hand, positive shocks to China's import demand increase employment in traded and decrease in non-traded goods.

In order to meet the purpose of the analysis, the authors assumed a trade imbalance and a general equilibrium scaling factor that are equal for all the regions ($\rho_{\mathrm{i}} \mathrm{c_{ij}} = \alpha$) and they consider only the growing export-capability of China channel. In fact, as seen in the U.S[19] and also in Portugal, there is a trade deficit with China, wherein imports are much more important than exports. Besides, the U.S. market accounts for the large majority of demand for most of the U.S. industries. For instance, the equation of employment for traded goods becomes:

$$\hat{}L_{Ti} = -\alpha \sum_j \frac{L_{ij}}{L_{Ti}} \frac{X_{ijU}}{X_{ij}} \frac{M_{CjU}}{E_{Uj}} \hat{\mathrm{A}}_{Cj} \approx -\alpha \sum_j \frac{L_{ij}}{L_{Ui}} \frac{M_{CjU} \hat{\mathrm{A}}_{Cj}}{L_{Ti}}$$

Where the traded-sector employment in each region i depends on the imports growth from China caused by the growing China's export-supply capability ($\mathrm{M_{CjU}} \hat{\mathrm{A}}_{\mathrm{Cj}}$), divided by the labour force in each region ($\mathrm{L_{Ti}}$) and weighted by the share of each region's employment in U.S. employment in industry j ($\frac{\mathrm{L_{ij}}}{\mathrm{L_{Ui}}}$).

19 Autor et al. (2012)

Following this, and substituting employment in the U.S. by employment in Portugal, the treatment variable becomes:

$$\Delta ImpComp_{it} = \sum_{j} \frac{Emp_{ijt}}{Emp_{Pjt}} \frac{\Delta Imp_{Cjt}}{Emp_{it}}$$

Wherein $\Delta \mathrm{Imp}_{\mathrm{Cjt}}$ indicates the variation of Chinese imports to Portugal by industry j between 2004 and 2012, $\mathrm{Emp}_{\mathrm{it}}$ is the total employment in each NUTSIII in 2004 and $\frac{\mathrm{Emp}_{\mathrm{ijt}}}{\mathrm{Emp}_{\mathrm{Pjt}}}$ is the share of employment in each NUTSIII and industry j in total employment of industry j in 2004 as well. In other words, the treatment variable captures the import competition from China per worker and the variation in the treatment variable across regions comes entirely from the variation in local industry employment at the start of the period t (2004). Therefore, the labour market is more exposed to imports competition if imports grow at a larger scale during the period of time studied.

Calculating the treatment variable I found the following results in figure 3.2.1 and 3.2.2.

Figure 3.2.1. Chinese Import Competition per worker (EUR) by NUTSIII region, 2004-2012

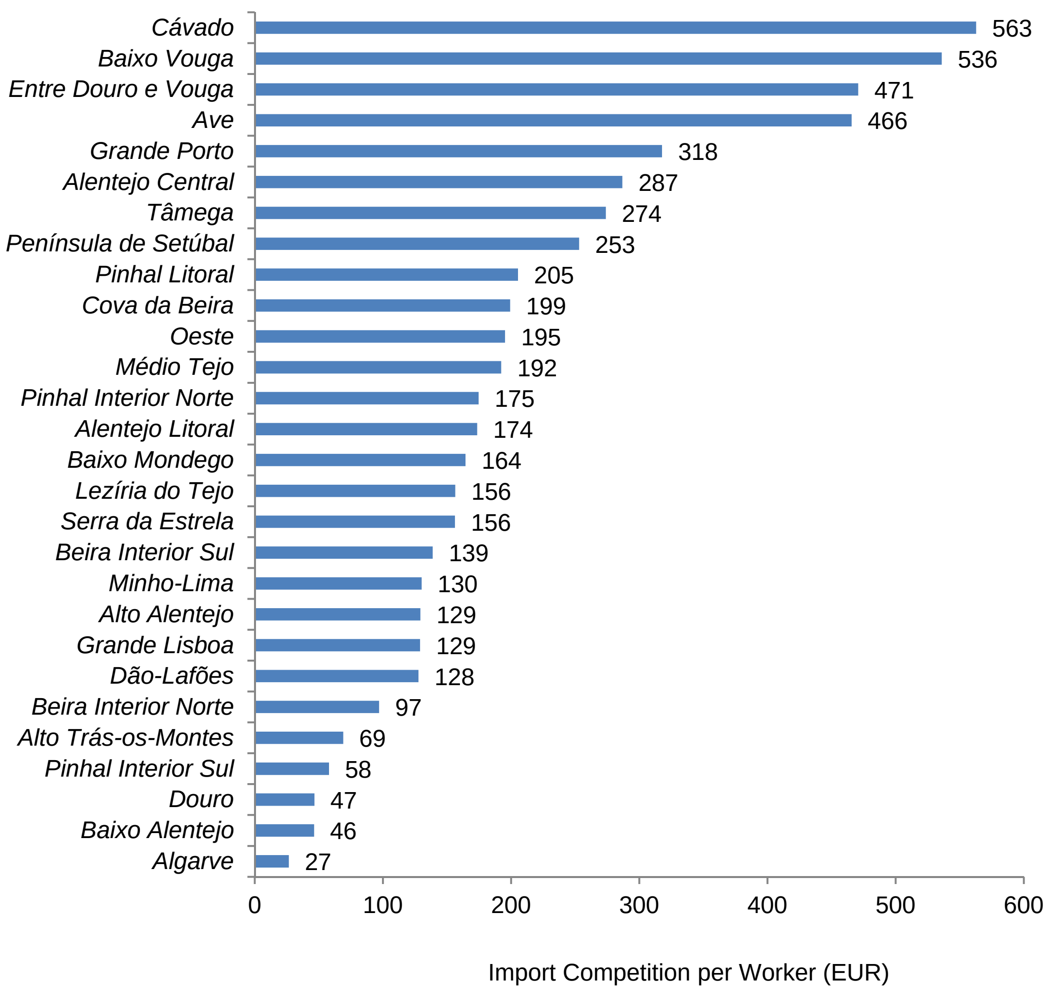
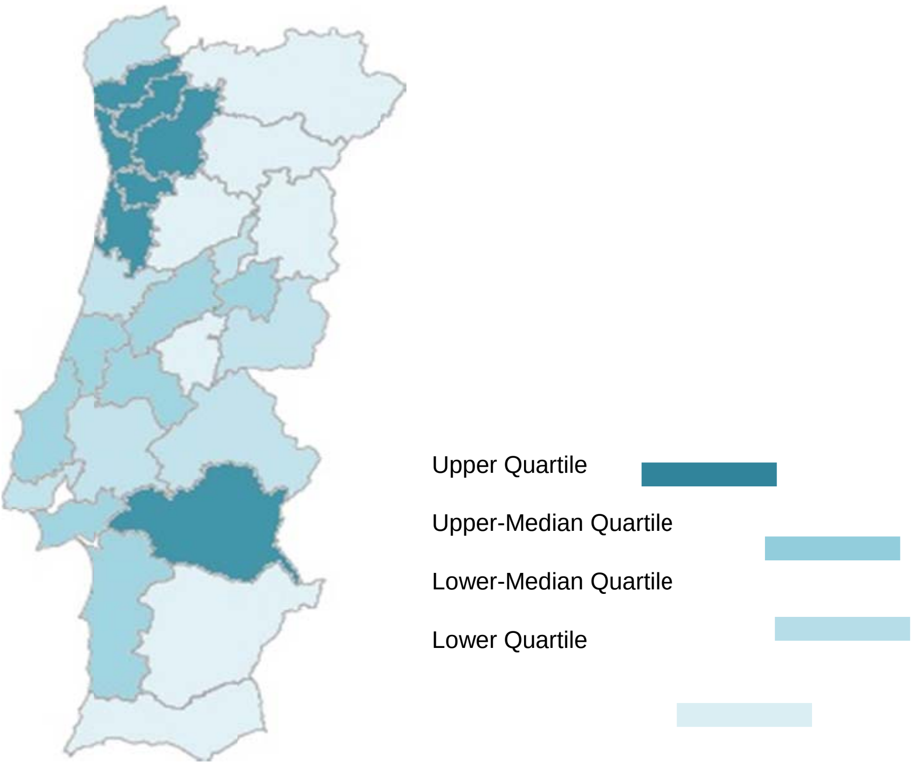


Figure 3.2.2. Chinese import competition in continental Portugal by NUTSIII region, 2004-2012



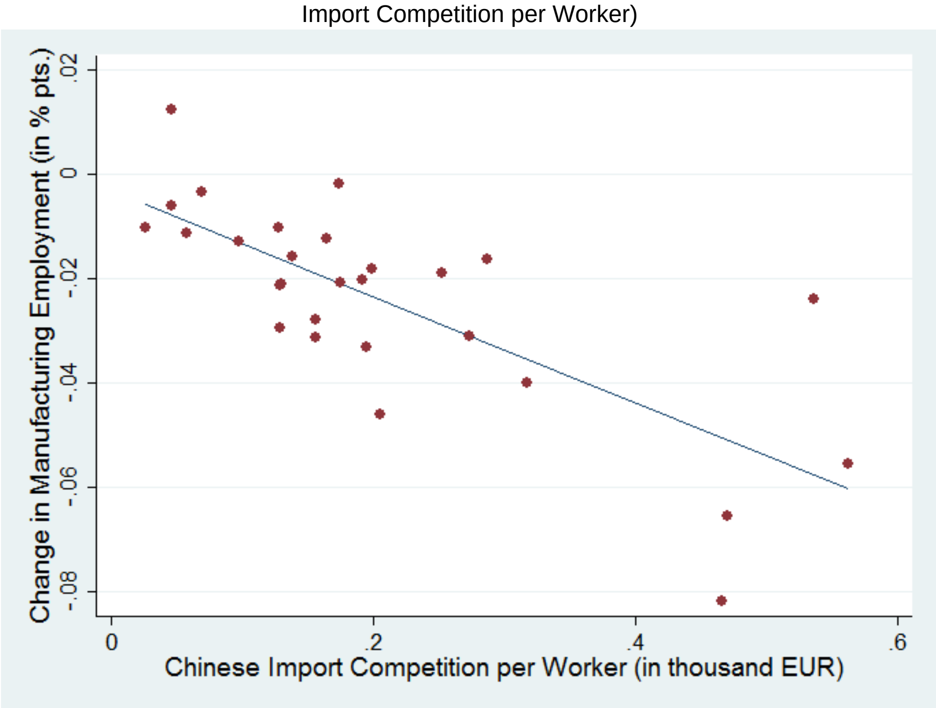
By looking at both figures, one may conclude that the most affected regions (upper quartile) are located mainly in the northern coastline of Portugal which is one of the most industrialized regions of Portugal. The regions less affected are the south and the inner of Portugal. This is expected because it is a region characterized by whether a high level of agriculture and no industry or mostly tourism (case of Algarve). Although being industrialized, the region of Lisbon and central coast is not very affected by the imports competition because these regions have a strong presence of the services sector and it may show a much diversified industry. Moreover, there is a big difference between the most affected and least affected regions. While Cávado shows an increase of 563 euros of Chinese imports per worker between 2004 and 2012, Algarve only shows an increase of 27 euros per worker during the same period. Additionally, the average increase in the upper quartile (416 € per worker) is approximately six times larger than the average increase in the lower quartile (67 € per worker). Comparing to the other studies, these values are quite smaller. For example, in the case of Spain[20], the upper quartile showed an increase of 1788 dollars per worker during 1995 through 2007, and in the case of USA[21], the average increase was 2110 dollars per worker during 2000 through 2007. This difference may partly be explained by the lack of some observations.

3.3. Building the Model

Following my research, I am going now to calculate the impact of the Chinese import competition on the labour market by using a regression.

First of all, figure 3.3.1 shows the relationship between the change in manufacturing employment as a percentage of the working age population and the Chinese import competition per worker. As one can see, there is a negative relationship; regions that are more affected by higher competition (import exposure) face a larger negative change in manufacturing employment between 2004 and 2012.

Figure 3.3.1. OLS reduced form regression (Change in Manufacturing Employment and Chinese Import Competition per Worker)



20 Donoso et al. (2013)
21 Autor et al. (2012)

However this negative relationship may also be affected by other factors. Therefore, in order to further analyse the impact, I fit a regression which is in line to the one used by Autor et al. (2012). The model estimated is the following:

$$\Delta Emp_{mit} = \alpha_0 + \alpha_1 \Delta ImpComp_{it} + X'_{it}\alpha_2 + \varepsilon_{it}$$

Where the dependent variable ΔEmp_{mit} measures the change in manufacturing employment in percentage of the working age population between 2004 and 2012 for NUTSIII region *i*; the independent variable $\Delta ImpComp_{it}$ is the treatment variable explained previously and used to measure the Chinese import competition between 2004 and 2012 at the regional level; and X'_{it} is a vector of control variables at the start of period *t* (2004). In my study, and following the methodology used in Autor et al. (2012), the control variables are related to the labour market specificities and to the demographic structure. All the observations are weighted by the first year share of regional population in total Portuguese population (2004).

In column 1 of table 3.3.1, the result shows a negative and statistically significant at 1% level the effect of the import competition on manufacturing employment. The estimated coefficient states that an increase of 1000 EUR in imports per worker between 2004 and 2012 causes a decrease in the share of manufacturing employment in the working age population of approximately 0.12 percentage points.

Table 3.3.1. Chinese Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012

Dependent Var.: Change in Manufacturing Employment/working age pop (in % pts)		
Independent Var.	Column (1) OLS	Column (2) 2SLS
Import Competition/ worker	-0.125*** (0.0133)	-0.126*** (0.0116)
R-squared	0.854	0.854

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

In column 2 of table 3.3.1, I use an instrumental variable and the coefficient estimated is again statistically significant at 1% level and marginally higher.

The use of the instrumental variable is related to the possibility of endogeneity problems. Actually, during the time considered, Portugal was affected by the financial crisis in 2008 and 2009 and by the austerity program imposed by Troika which started in 2011. Both these two shocks are supposed to affect negatively imports and the labour market, underestimating the coefficient. Once again, I decided to follow the methodology proposed by Autor et al. (2012) to control the endogeneity problems and build an instrumental variable. In this case, instead of using Chinese imports to Portugal, I use Chinese Imports to other 11 high-wage countries[22]. Then, the instrument becomes:

$$\Delta ImpCompOther_{it} = \sum_j \frac{Emp_{ijt}}{Emp_{Pjt}} \frac{\Delta ImpOther_{Cjt}}{Emp_{it}}$$

22 Spain, UK, Belgium, France, Netherlands, Ireland, Italy, Germany, Sweden, Denmark and USA

Considering the coefficient estimated by the instrumental variable, one may conclude that the variation in the manufacturing employment is well explained by the increase of import competition from China, and there is no robust demand factors affecting my results. In fact, while the treatment variable measures the Chinese total impact (supply shocks in China and demand shocks in Portugal), the instrumental variable captures only the Chinese supply shocks. It is important to highlight that both coefficients depict a large R-square, which means that the treatment variable well explains the variation in manufacturing employment.

When using an instrumental variable it is also important to analyse how well the instrument predicts the endogenous variable. In table 3.3.2, the under identification test which is also called Kleibergen-Paap test in the presence of robust standard errors tells that I reject the null hypothesis under the p-value of 0.0172. This means that the model is identified and the instrumental variable is relevant and correlated with the endogenous variable. On the other side, the weak identification test which is used when the instruments are only weakly correlated with the endogenous regressors shows a Kleibergen-Paap F statistic for robust errors higher than the Stock-Yogo 10% maximal IV size (198.976 vs 16.38). This means that the instruments are not weakly correlated. Finally, the Hansen J Statistic for over identification test which is used to test the validity of the instruments reports an F-statistic of 0. In other words, one cannot test the validity of the instrument because the equation is exactly identified. In conclusion, one may say that the instrumental variable well explains the endogenous or treatment variable. In fact, using imports to other developed countries is a good way to take into account the transformations that allowed China to become one of the world largest exporters.

Comparing to the other two studies[23], my results are significantly smaller. In the case of Spain and USA, the coefficients estimated were -1.4 and -0.746 percentage points, respectively. However, one has to take into the account that the period considered is different, the lack of some observations and the smaller values calculated for the treatment variable.

Table 3.3.2. Identification tests of the Instrumental Variable

Under identification test (Kleibergen-Paap rk LM statistic):	5.676
Chi-sq(1) P-val =	0.0172
Weak identification test (Cragg-Donald Wald F statistic):	410.006
(Kleibergen-Paap rk Wald F statistic):	198.976
Stock-Yogo weak ID test critical values: 10% maximal IV size	16.38
15% maximal IV size	8.96
20% maximal IV size	6.66
25% maximal IV size	5.53
Source: Stock-Yogo (2005). Reproduced by permission	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (over identification test of all instruments):	0.000
(equation exactly identified)	

23 Autor et al. (2012) and Donoso et al. (2013)

In table 3.3.3, I add an important control variable which is the percentage of manufacturing employment in total employment at the start of the period. This control variable is used to capture a decline trend in the manufacturing employment that otherwise would affect the treatment variable. With this control, the treatment variable will only show the effect that comes from the differences between industries and their exposure to the Chinese import competition. In column (1) I use the usual OLS and in column (2) I use the instrumental variable. The control variable is negative in both cases but only statistically significant when I use the instrumental variable. Moreover, despite of decreasing considerably, both treatment variables continue to be statistically significant. In conclusion, one can say that the change in manufacturing employment in percentage of the working age population may also be partly explained by a downward trend in the manufacturing employment sector.

Table 3.3.3. Chinese Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012

Dependent Var.: Change in Manufacturing Employment/working age pop (in % pts)		
Independent Var.	Column (1) OLS	Column (2) 2SLS
Import Competition/ worker	-0.0824** (0.0356)	-0.0827*** (0.0249)
Manufacturing employment (%)	-0.0574 (0.0425)	-0.0570* (0.0338)
R-squared	0.876	0.876

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

In table 3.3.4, I build my model with the full controls. Therefore, I add the control variables regarding the demographic structure of Portugal: the first year period share of working-age population who is foreign-born, the first year period share of working-age population who got graduated, the first year period share of working-age women population and the first year period share of working-age young population.

Table 3.3.4. Chinese Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012

Dependent Var.: Change in Manufacturing Employment/working age pop (in % pts)		
Independent Var.	Column (1) OLS	Column (2) 2SLS
Import Competition/ worker	-0.0201 (0.0391)	-0.0460* (0.0242)
Manufacturing employment (%)	-0.124** (0.0572)	-0.0972** (0.0495)
Share foreign-born population (%)	0.387 (1.334)	0.156 (1.024)
Share of graduated population (%)	-0.594 (0.725)	-0.521 (0.647)
Share of women population (%)	-0.108 (0.0977)	-0.0829 (0.0712)
Share of young population (%)	0.325 (0.307)	0.256 (0.236)
R-squared	0.925	0.922

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

Comparing to the previous situations, the results change significantly. When using OLS, the coefficient becomes statistically insignificant. Moreover, only the percentage of manufacturing employment is statistically significant at 5% level and negative, which means that the variation in manufacturing employment shared by working-age population follows a downward trend due to other factors rather than being caused by Chinese import competition. Specifically, when manufacturing employment in 2004 increases 1 percentage point, there is a negative variation of 0.12 percentage points between 2004 and 2012 in the share of manufacturing employment; all other control variables are not statistically significant. Contrary to the study of Autor et al. (2012) and Donoso et al. (2013), wherein adding control variables do not affect the results, here it is not the case. However, when using the instrumental variable, although being smaller, the treatment variable remains weakly statistically significant at 10% level. In particular, at a 1000 EUR increase of imports per worker, the manufacturing employment to working age population declines 0.0460 percentage points.

If one evaluates each control variable alone in table A.1 and A.2 of the annexes, one can conclude that only the first year share of women and the young population are negative and statistically significant and also the first year share of the graduated population.

Once again, it is important to highlight that, given the low number of observations; it might be possible that the results are not very reliable when I add controls. Therefore, one may conclude that, import competition from China may have a small and negative impact in the Portuguese manufacturing sector.

In order to give robustness to my results, I evaluate the regional fixed effects. Therefore, I created 5 regions which correspond to the NUTSII (Norte, Centro, Lisboa, Alentejo and Algarve) and where each of one includes one or more NUTSIII regions.

Overall, the results lead to the same conclusions as before. In column 1 of table 3.3.5, both coefficients OLS and 2SLS are statistically significant at 1% level and in line with the previous results; increasing 1000 EUR per worker between 2004 and 2012 is associated with a variation of the share manufacturing employment in -0.118 percentage points and -0.119 percentage points, respectively. In column 2, when adding the percentage of manufacturing employment, both coefficients remain statistically significant, although less negative. However, in column 3, the coefficient is only statistically significant when estimated by the instrument variable. Therefore, the decline in the manufacturing employment is larger in regions where the initial percentage of manufacturing employment is larger, where the share of women is higher, where the share of young people is lower and where import competition is stronger. Once again, due to very few observations, the results might not be very reliable when estimating the model with full controls. Therefore, my estimation seems to identify that the variation in manufacturing employment is related in a lower extent to import competition and in a larger degree to some specificities of the population structure and labour market.

Table 3.3.5. Chinese Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012 (Regional Fixed Effects Estimates)

Dependent Var.: Change in Manufacturing Employment/working age pop (in % pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Import Competition/ worker	-0.118*** (0.0138)	-0.0747*** (0.0264)	-0.0128 (0.0284)
Manufacturing employment (%)		-0.0627* (0.0334)	-0.136*** (0.0461)
Share foreign-born population (%)			1.237 (2.119)
Share of graduated population (%)			-0.357 (0.738)
Share of women population (%)			-0.269** (0.111)
Share of young population (%)			0.760** (0.310)
R-squared	0.767	0.800	0.905
NUTSII	5	5	5
Instrumental Variable (2SLS)	-0.119*** (0.0144)	-0.0790*** (0.0305)	-0.0579* (0.0342)

Notes: N= 28 (28 NUTSIII regions x 1 period). Model is estimated by regional fixed effects (5 NUTSII regions). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1. Models are weighted by the start of the period region share of national population. Full IV model in A.3.

Another way to estimate the model is using the dependent variable as the log difference of manufacturing employment. In this case, I added an important control which is the size of the region in terms of working age population because I am not taking it into account directly in the dependent variable.

Table 3.3.6. Chinese Import Competition and Log Difference of Manufacturing Employment in NUTSIII regions, 2004-2012

Dependent Var.: Log Difference of Manufacturing Employment (in log pts)				
Independent Var.	Column (1)	Column (2)	Column (3)	Column (4)
Import Competition/ worker	-1.235*** (0.330)	-0.431*** (0.146)	-0.631** (0.297)	-0.283 (0.258)
Size of Region in Working Age Pop (%)		-1.754*** (0.140)	-1.715*** (0.158)	-0.179 (0.432)
Manufacturing employment (%)			0.247 (0.219)	0.361 (0.285)
Share foreign-born population (%)				9.117 (12.14)
Share of graduated population (%)				-1.073 (3.676)
Share of women population (%)				-1.138* (0.563)
Share of young population (%)				1.193 (1.723)
Observations	28	28	28	28
R-squared	0.564	0.949	0.951	0.970
Instrumental Variable (2SLS)	-1.170*** (0.293)	-0.441*** (0.130)	-0.694*** (0.261)	-0.449*** (0.151)

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1. Models are weighted by the start of the period region share of national population. Full IV model in A.4.

In column (2) of table 3.3.6, when controlling for the size of region in working age population, the coefficient is negative and statistically significant at 1% level. When import competition per worker increase 1000 EUR, manufacturing employment decreases 0.431 log points or 0.431 percent. If I model with the instrument variable, the coefficient becomes -0.441 log points. In column (4), when I add all the control variables, the coefficient becomes statistically insignificant when modelled by OLS, but it remains statistically significant when estimated by 2SLS. In addition, the coefficient remains similar to the one without full control (-0.449 log pts). It is also interesting to note that when I use this different specification in the dependent variable, the manufacturing employment variable is never statistically significant.

Therefore, the decline in manufacturing employment is larger when the share of population women is larger and when import competition from China augments.

In table 3.3.7, when estimating for regional fixed effects, the conclusions are similar. The only difference comes in column (4), where the decline in manufacturing employment is larger in regions with a higher trade exposure, larger size in terms of working age population and share of women population and a lower share of foreign-born and young population.

Applying the value found in table 3.3.4, column 1 (0.0201 percentage points) and the mean presented in figure 3.1.1 (0.20653 thousand EUR per worker), I find that Chinese import competition declined manufacturing employment per population by approximately 0.004 percentage points between 2004 and

2012. Since manufacturing employment per working age population decreased, on average, during the same period, 0.024 percentage points, one may conclude that Chinese import competition explains approximately 17% of the decline in manufacturing employment. When using the log difference of manufacturing employment in table 3.3.6 (0.283 log points), trade exposure explains approximately 22% of the decline in 2004-2012. Both percentages are small, but one cannot forget that the coefficients are not statistically significant and, as mentioned before, due to few observations, the results may be unrealistic.

Table 3.3.7. Chinese Import Competition and Log Difference of Manufacturing Employment in NUTSIII regions, 2004-2012 (Regional Fixed Effects Estimates)

Dependent Var.: Log Difference of Manufacturing Employment (in log pts)				
Independent Var.	Column (1)	Column (2)	Column (3)	Column (4)
Import Competition/ worker	-1.019*** (0.229)	-0.439*** (0.109)	-0.670*** (0.197)	-0.151 (0.188)
Size of Region in Working Age Pop (%)		-1.725*** (0.164)	-1.702*** (0.161)	-0.891* (0.434)
Manufacturing employment (%)			0.326 (0.235)	0.000925 (0.300)
Share foreign-born population (%)				45.63*** (14.80)
Share of graduated population (%)				-3.174 (4.785)
Share of women population (%)				-2.001** (0.767)
Share of young population (%)				4.425** (2.039)
Observations	28	28	28	28
R-squared	0.474	0.916	0.924	0.969
NUTSII	5	5	5	5
Instrumental Variable (2SLS)	-1.020*** (0.238)	-0.448*** (0.114)	-0.696*** (0.232)	-0.376* (0.219)

Notes: N= 28 (28 NUTSIII regions x 1 period). Model is estimated by regional fixed effects (5 NUTSII regions). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1. Models are weighted by the start of the period region share of national population. Full IV model in A.5.

However, in future research, it would be interesting to separate the demand and supply-drive components of Chinese imports that could affect and change the previous estimations; and translate the variation in total number of workers affected by import competition.

3.4. Non-China Trade

Since I am studying the effect of developing countries' competition on regional labor markets in Portugal; and Portugal has a good trade relationships with two other important developing countries which are Brazil and Angola, I decided to study its impact as well.

For this purpose, I build my treatment variable exactly as before, but instead of using the variation of Chinese imports I use the variation of imports from Brazil plus Angola. The results are shown in figure 3.4.1 and the average is presented in figure 3.1.1 (947 EUR per worker between 2004 and 2012).

In table 3.4.1, one can verify that, although the increase in import competition per worker is higher than the Chinese case, the coefficient of the treatment variable is never statistically significant. The only effect comes from the percentage of manufacturing employment, which means that the negative variation in manufacturing employment is due to a larger initial percentage of manufacturing employment.

The reason for that may lie in the type of goods imported from Brazil and China. For example, in 2012, almost 80% of the total imports were concentrated in mining and quarrying, which is a sector with a small percentage of people employed (approximately 1.8% in 2012). In fact, looking at figure 3.4.1, one may see that the most affected regions are those corresponding to the south and inner of Portugal which have a higher degree of agriculture and people employed in mining and quarrying. Moreover, one may say that the increase in trade between Portugal and Brazil and Angola are mostly associated with cultural proximity, same language and historical long-term relationships, rather than being associated with better productivity or lower trade barriers, as the case of China. Another important factor concerns the trade balance which is positive between 2006 and 2012. For instance, the value of exports is multiplied by 2.4 the value of imports in 2009; this situation never occurs with China.

Therefore, further research about the impact of trade with Brazil and Angola on Portugal should focus mainly on the impact of exports, instead of imports, and their interactions with the labour market outcomes or other different variables.

Figure 3.4.1. Brazil + Angola Import Competition per Worker (EUR) by NUTSIII region, 2004-2012

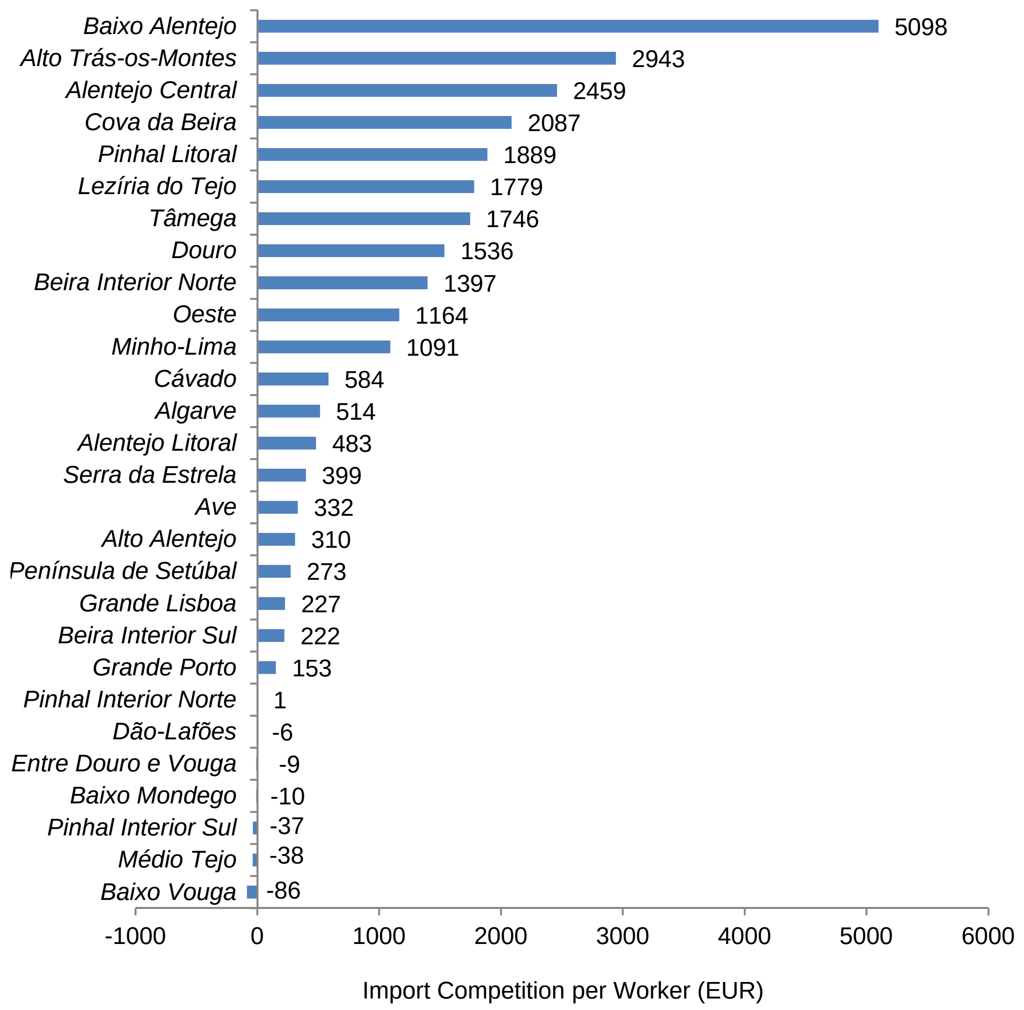


Table 3.4.1. Brazil + Angola Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012

Dependent Var.: Change in Manufacturing Employment/working age pop (in % pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Import Competition/ worker (BRZ+ANG)	-0.00683 (0.00738)	0.00366 (0.00719)	0.00265 (0.00390)
Manufacturing employment (%)		-0.152*** (0.0202)	-0.133** (0.0481)
Share foreign-born population (%)			0.712 (1.305)
Share of graduated population (%)			-0.535 (0.728)
Share of women population (%)			-0.102 (0.112)
Share of young population (%)			0.279 (0.350)
Observations	28	28	28
R-squared	0.016	0.814	0.925

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1. Models are weighted by the start of the period region share of national population..

3.5. Importance of Exports

Another way to study the robustness of my results is using alternative measures to evaluate the impact of trade exposure. As mentioned in Autor et al. (2012), and following the methodology used by them, I decided to use net imports, in substitution of imports as an alternative measure. Therefore, the treatment variable becomes:

$$\Delta ImpComp_{it} = \sum_{j} \frac{Emp_{ijt}}{Emp_{Pjt}} \frac{\Delta(Imp - Exp)_{Cjt}}{Emp_{it}}$$

Wherein $\Delta(\mathrm{Imp} - \mathrm{Exp})_{\mathrm{Cjt}}$ is the variation of difference between imports from and exports to China.

The use of net imports is an important specification because despite having a negative trade balance with China, Portuguese exports increased much more than imports between 2004 and 2012 (670% vs 203%). However, it is important to highlight the differences between the type of imports and exports. As mentioned previously, in 2000, Portugal imported mostly computers and communication equipment, furniture and other manufacturing goods and machinery, and exported, as well, mostly, machinery, products of wood and electrical equipment. This similarity in machinery products may be explained by the fact that I am not taking into account the division between final and intermediary goods. Nevertheless, the specialization of China in producing more sophisticated products is so extraordinary that Portugal was exporting in 2012 mostly motor vehicles and parts thereof and mining and quarrying products and importing computers and communication equipment, electrical equipment and machinery.

Since Portugal just as the U.S. may not be in the same production chain as China, one needs to be cautious when analyzing the results. Moreover, contrary to Autor et al. (2012), I am not using any instrumental variable, which may affect my estimations.

The results presented in table 3.5.1 show a statistically and significant coefficient of the net imports competition per worker with and without controls. In column (1), when net import exposure per worker increases 1000 EUR, manufacturing employment to working age population ratio declines 0.145 percentage points. In fact, by removing exports, the coefficient is approximately 16% higher than the coefficient of gross imports. Moreover, contrary to the gross imports estimates, when I add full controls, the coefficient remains negative and statistically significant at 1% level. This means that exports had a negative impact on the treatment variable and take them into account was a good strategy to improve my estimations and conclusions. In addition, by using regional fixed effects, the coefficients are similarly precisely estimated.

Table 3.5.1. Chinese Net Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012 (Regional Fixed Effects Estimates)

Dependent Var.: Change in Manufacturing Employment/working age pop (in % pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Net Import Competition/ worker	-0.145*** (0.0471)	-0.0503** (0.0209)	-0.0716*** (0.0149)
Manufacturing employment (%)		-0.124*** (0.0222)	-0.110*** (0.0334)
Share foreign-born population (%)			0.653 (0.806)
Share of graduated population (%)			0.609 (0.380)
Share of women population (%)			-0.301*** (0.0868)
Share of young population (%)			0.781*** (0.272)
Observations	28	28	28
R-squared	0.501	0.847	0.964
Using Regional Fixed Effects			
Net Import Competition/ worker	-0.138*** (0.0231)	-0.0767*** (0.0186)	-0.0711*** (0.0132)

Notes: N= 28 (28 NUTSIII regions x 1 period). Model estimated by regional fixed effects using 5 NUTSII regions. Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1. Models are weighted by the start of the period region share of national population. Full regional fixed effects model in A.6.

In table 3.5.2, when using the dependent variable as the log difference of manufacturing employment, the conclusions are the same. With or without full controls, the coefficient is statistically significant even when using regional fixed effects. In column (4), a 1000 EUR increase in net import competition per worker reduces manufacturing employment in 0.517 log points. In this case, one may conclude that exports had an important impact because, contrary to gross imports, the coefficient is now statistically significant when using full controls.

Future research could take into account other alternative measures of trade exposure. One of them is the competition in other foreign markets, since exports from China to other high-wage countries also create competition pressures in Portuguese exports to those countries. For example, in 2012, Portugal exported mostly motor vehicles and parts thereof, beverages and food products, machinery and equipment and also textiles and wearing apparel; all industries where China has competitive advantage and exports in large quantities to other countries. In this way, the treatment variable not only captures domestic but also international import exposure to Chinese trade.

Secondly, as I mentioned previously, I am not taking into account the intermediate products. Therefore, it would be interesting to analyse the impact in distinguishing final from intermediate products, as cheaper intermediary products may increase productivity in the Portuguese firms and consequently intensify their demand for labour and technology upgrading. As mentioned in the paper of Goldberg et al. (2008), new imported inputs varieties in India depressed the import price index for intermediary inputs. Another example comes from the paper of Mion and Zhu (2010), where they found that firm-level outsourcing to China of intermediate goods has a small but significant increase in the share of non-production workers; and import competition from China induces a large effect in skill upgrading.

A different approach that could be used in future analyses is the gravity-based methodology. This is an important measure because it accounts changes in productivity and/or trade barriers between Portugal and China. Moreover, this technique can neutralize adverse demand conditions, such as a crisis. Or I could use the standard factor content of Portuguese imports from China based on Heckscher-Ohlin trade models and replace imports per worker. It is important to mention that all these approaches were applied in Autor et al. (2012).

Table 3.5.2. Chinese Net Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012 (Regional Fixed Effects Estimates)

Dependent Var.: Log Difference of Manufacturing Employment (in log pts)				
Independent Var.	Column (1)	Column (2)	Column (3)	Column (4)
Net Import Competition/ worker	-1.174* (0.683)	-0.322 (0.261)	-0.124 (0.238)	-0.517*** (0.154)
Size of Region in Working Age Pop (%)		-2.007*** (0.220)	-1.912*** (0.179)	0.456 (0.360)
Manufacturing employment (%)			-0.311 (0.183)	0.389* (0.226)
Share foreign-born population (%)				12.81 (8.215)
Share of graduated population (%)				5.330 (4.119)
Share of women population (%)				-3.048*** (0.632)
Share of young population (%)				5.446*** (1.520)
Observations	28	28	28	28
R-squared	0.220	0.921	0.934	0.981
Using Regional Fixed Effects				
Net Import Competition/ worker	-1.402*** (0.285)	-0.384* (0.202)	-0.225 (0.224)	-0.413*** (0.116)

Notes: N= 28 (28 NUTSIII regions x 1 period). Model estimated by regional fixed effects using 5 NUTSII regions. Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1. Models are weighted by the start of the period region share of national population. Full regional fixed effects model in A.7.

3.6. Trade Shocks and Local Labour Markets

Considering that greater exposure to Chinese imports affected negatively manufacturing employment, it is also relevant to examine whether those people who leave the manufacturing sector are moving to regions lesser exposed to trade, or are being employed in the non-manufacturing sector or become unemployed. I did not analyse in terms of leaving the labour market because of lacking of data at the NUTSIII level.

First of all, I analyse the impact of import competition on the reallocation of workers among regions by using the log difference of working age population as dependent variable.

In table 3.6.1, I found a positive and statistically significant coefficient only when using full controls in both OLS and instrumental variable. This means that when import competition increases 1000 EUR per worker, working age population grows 0.108 percent during the period considered. At first sight this result may seem inconsistent, since one would expect a reduction in working age population in regions with a larger exposure to trade. However, considering the lack of some observations, the results may not be very reliable. Therefore, one may conclude that mobility across regions following a trade shock is very small or inexistent, since the coefficients are very small and not strongly statistically significant.

Given the previous outcome, I studied the impact of import competition on the change in non-manufacturing employment to working age population ratio. If workers do not move and unemployment does not increase, one should expect a rise in non-manufacturing employment and/or labour force non-participating. In a different margin of adjustment to trade, one could think of the effect on wages, which I will not study.

In table 3.6.2, column (1) shows a positive and weakly statistically significant coefficient, meaning that non-manufacturing employment increases with Chinese trade exposure. However, when using full controls in column (4), the coefficient becomes negative and similarly precisely estimated; at 1000 EUR increase in imports per worker, non-manufacturing employment to working age population ratio declines 0.153 percentage points. The same happens when using the instrumental variable. Once again the results may not be very reliable due to very low observations; thus, it is difficult to reach an appropriate conclusion. However, considering that the regression is better specified with full controls, one may conclude that employment in non-manufacturing sector also deteriorates. This may be justified by the connection between the industrial and some services sectors, which are affected along with the industrial sector.

Nevertheless, given the estimations in table 3.6.3, where the coefficients describe a smaller rise in unemployment when import competition increase, one may conclude that trade shocks rather than replacing people from manufacturing to non-manufacturing employment, are driving people to unemployment. More specifically, when import competition increases by 1000 EUR per worker, unemployment to working age population ratio decreases 0.0775 percentage points. In fact, as stated by reports from *Eurobank* and *OECD*, the Portuguese unemployment insurance system was one of the most generous in Europe at the financial bailout time in 2011, which provide disincentives for re-employment. In addition, Portugal had strict employment protection legislation in favor of permanent jobs and a high degree of segmentation, which makes difficult for workers to move across occupations, firms and sectors. All these features make the Portuguese labour market rather rigid and may be an explanation for the estimations found previously.

Therefore, in future research, it would be interesting to analyse the outcome using heterogeneous workers because it may exist substantial differences in terms of college versus non-college workers, young versus older workers and women versus men workers. Moreover, given the long history of Portugal in terms of emigration, it would be very fascinating to study whether people emigrate following a negative trade shock.

Table 3.6.1. Chinese Import Competition and Log Difference of Working Age Population in NUTSIII regions, 2004-2012

Dependent Var.: Log Difference of Working Age Population (in log pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Import Competition/ worker	-0.0356 (0.0347)	-0.121 (0.0717)	0.108*** (0.0341)
Manufacturing employment (%)		0.116* (0.0571)	-0.0890* (0.0488)
Share foreign-born population (%)			5.163*** (1.383)
Share of graduated population (%)			-2.708*** (0.638)
Share of women population (%)			-0.307** (0.121)
Share of young population (%)			0.886** (0.341)
Observations	28	28	28
R-squared	0.072	0.161	0.866
Instrumental Variable (2SLS)	-0.0240 (0.0368)	-0.0591 (0.0987)	0.149*** (0.0276)

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1. Models are weighted by the start of the period region share of national population. Full IV model in A.8.

Table 3.6.2. Chinese Import Competition and Change of Non-Manufacturing Employment in NUTSIII regions, 2004-2012

Dependent Var.: Change in Non-Manufacturing Employment/working age pop (in % pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Import Competition/ worker	0.106* (0.0602)	0.187 (0.135)	-0.153* (0.0738)
Manufacturing employment (%)		-0.109 (0.103)	0.174 (0.133)
Share foreign-born population (%)			-1.969 (3.769)
Share of graduated population (%)			5.232** (2.256)
Share of women population (%)			0.0121 (0.236)
Share of young population (%)			-0.169 (0.634)
Observations	28	28	28
R-squared	0.218	0.244	0.848
Instrumental Variable (2SLS)	0.100* (0.0491)	0.158* (0.0815)	-0.149* (0.0799)

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1. Models are weighted by the start of the period region share of national population. Full IV model in A.9.

Table 3.6.3. Chinese Import Competition and Change of Unemployment in NUTSIII regions, 2004-2012

Dependent Var.: Change in Unemployment/working age pop (in % pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Import Competition/ worker	0.0775***	0.0849*	0.0106
	(0.0191)	(0.0488)	(0.0211)
Manufacturing employment (%)		-0.0101	-0.0468
		(0.0602)	(0.0402)
Share foreign-born population (%)			1.502
			(1.232)
Share of graduated population (%)			-0.231
			(0.468)
Share of women population (%)			-0.187**
			(0.0767)
Share of young population (%)			0.720***
			(0.216)
Observations	28	28	28
R-squared	0.510	0.511	0.933
Instrumental Variable (2SLS)	0.0757***	0.0745*	0.00483
	(0.0176)	(0.0430)	(0.0204)

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1. Models are weighted by the start of the period region share of national population. Full IV model in A.10.

4. Conclusion

While total Portuguese trade with developed countries increased approximately 181% in the last 20 years, trade with developing countries rose 564%. With China explaining 17% of this variation, it became in 2014 the 8th most important importer among all trade partners and the 2nd among all developing countries. Although exports have grown much more impressively in the last years, the trade deficit with China increased almost 640% between 1995 and 2012. Moreover, with import penetration rate of Chinese imports reaching almost 80% in 2012, it is undeniable the growing importance of trade with China to the Portuguese economy.

At the same time, Portugal witnessed its manufacturing employment decreasing 34%, which may be explained by the growing trade exposure to China. Many studies before concluded that trade with developing countries affects negatively the labour markets in the developed countries, with, for instance, less manufacturing employment, lower earnings and wages, more unemployment, lower firms' employment growth and firms' survival and lower demand for unskilled workers.

Using a methodology proposed by Autor et al. (2012), my study is the first examining whether the decline in the manufacturing employment in Portugal can be partly explained by the import competition from China. Using a sample of persons employed in enterprises between 2004 and 2012, I show whether regions more exposed to Chinese import competition face a larger decline in manufacturing employment.

My results show that regions specialized in manufacturing sectors where the rise in Chinese imports was higher, witnessed a larger decline in the manufacturing employment than regions were exposure to import competition was smaller; and they are robust for regional fixed effects and when using net imports per worker, rather than gross imports per worker. Specifically, an increase of 1000 EUR in imports per worker throughout the period considered causes a decrease in the share of manufacturing employment in the working age population by approximately 0.12 percentage points or a decline of 0.431 log points.

When analyzing how trade shocks pass through local labour markets, my estimations did not show a clear conclusion about the impact of import competition on non-manufacturing employment and on whether people move to other regions in response to a trade shock, but they indicate a rise in unemployment. As cited previously, this may be explained by the rigidity of the Portuguese labour market.

Additionally, when I consider import competition from Angola plus Brazil, rather than China, the results are not statistically significant and conclusive because the trade relationships between Portugal and those countries are considerably different than the trade relationships with China.

With better data, future research can use different specifications of import competition or trade exposure and evaluate the difference before and after China accessing the World Trade Organization. Moreover, in order to improve the estimations, one should use more types of industries and more disaggregate regions.

In addition to that, it would be very interesting to estimate the impact of import competition on wages and benefits received from the State and look at the aggregate impact on income, as Autor et al. (20120) have done in their study.

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Appendix

Table A.1. Chinese Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012

Dependent Var.: Change in Manufacturing Employment/working age pop (in % pts)				
Independent Var.	Column (1)	Column (2)	Column (3)	Column (4)
Imports' Competition/ worker	-0.125*** (0.0137)	-0.110*** (0.0218)	-0.0982*** (0.0240)	-0.0940*** (0.0250)
Share foreign-born population (%)	-0.00515 (0.0361)			
Share of graduated population (%)		-0.347 (0.256)		
Share of women population (%)			-0.0167* (0.00819)	
Share of young population (%)				-0.0551** (0.0253)
Observations	28	28	28	28
R-squared	0.854	0.872	0.880	0.883

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

Table A.2. Chinese Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012

Dependent Var.: Change in Manufacturing Employment/working age pop (in % pts)				
Independent Var.	Column (1)	Column (2)	Column (3)	Column (4)
Imports' Competition/ worker	-0.0664* (0.0374)	-0.0302 (0.0389)	-0.0400 (0.0405)	-0.0430 (0.0416)
Manufacturing employment (%)	-0.0710 (0.0447)	-0.0943* (0.0482)	-0.0715 (0.0490)	-0.0650 (0.0501)
Share foreign-born population (%)	-1.095 (0.648)			
Share of graduated population (%)		-0.603*** (0.168)		
Share of women population (%)			-0.0202*** (0.00617)	
Share of young population (%)				-0.0607*** (0.0211)
Observations	28	28	28	28
R-squared	0.893	0.919	0.912	0.909

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

Table A.3. Chinese Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012 (Instrumental Variable and Regional Fixed Effects Estimates)

Dependent Var.: Change in Manufacturing Employment/working age pop (in % pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Imports' Competition/ worker	-0.119*** (0.0144)	-0.0790*** (0.0305)	-0.0579* (0.0342)
Manufacturing employment (%)		-0.0580 (0.0375)	-0.0813 (0.0529)
Share foreign-born population (%)			-0.489 (2.348)
Share of graduated population (%)			0.112 (0.807)
Share of women population (%)			-0.236** (0.119)
Share of young population (%)			0.640* (0.335)
Observations	28	28	28
NUTSII	5	5	5

Notes: N= 28 (28 NUTSIII regions x 1 period). Model is estimated by regional fixed effects (5 NUTSII regions). Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1. Models are weighted by the start of the period region share of national population.

Table A.4. Chinese Import Competition and Log Difference of Manufacturing Employment in NUTSIII regions, 2004-2012 (Instrumental Variable Estimates)

Dependent Var.: Log Difference of Manufacturing Employment (in log pts)				
Independent Var.	Column (1)	Column (2)	Column (3)	Column (4)
Imports' Competition/ worker	-1.170*** (0.293)	-0.441*** (0.130)	-0.694*** (0.261)	-0.449*** (0.151)
Size of Region in Working Age Pop (%)		-1.746*** (0.123)	-1.693*** (0.132)	-0.326 (0.324)
Manufacturing employment (%)			0.309 (0.206)	0.517** (0.237)
Share foreign-born population (%)				7.514 (9.732)
Share of graduated population (%)				-0.170 (2.459)
Share of women population (%)				-0.888* (0.525)
Share of young population (%)				0.618 (1.568)
Observations	28	28	28	28
R-squared	0.562	0.949	0.951	0.970

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

Table A.5. Chinese Import Competition and Log Difference of Manufacturing Employment in NUTSIII regions, 2004-2012 (Instrumental Variable and Regional Fixed Effects Estimates)

Dependent Var.: Log Difference of Manufacturing Employment (in log pts)				
Independent Var.	Column (1)	Column (2)	Column (3)	Column (4)
Imports' Competition/ worker	-1.020*** (0.238)	-0.448*** (0.114)	-0.696*** (0.232)	-0.376* (0.219)
Size of Region in Working Age Pop (%)		-1.718*** (0.166)	-1.694*** (0.165)	-0.997** (0.456)
Manufacturing employment (%)			0.352 (0.265)	0.254 (0.332)
Share foreign-born population (%)				38.71** (15.73)
Share of graduated population (%)				-0.864 (5.093)
Share of women population (%)				-1.774** (0.807)
Share of young population (%)				3.766* (2.148)
Observations	28	28	28	28
NUTSII	5	5	5	5

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Model estimated by regional fixed effects using 5 NUTSII regions Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

Table A.6. Chinese Net Import Competition and Change of Manufacturing Employment in NUTSIII regions, 2004-2012 (Regional Fixed Effects Estimates)

Dependent Var.: Change in Manufacturing Employment/working age pop (in % pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Net Import Competition/ worker	-0.138***	-0.0767***	-0.0711***
	(0.0231)	(0.0186)	(0.0132)
Manufacturing employment (%)		-0.101***	-0.118***
		(0.0180)	(0.0198)
Share foreign-born population (%)			1.835
			(1.115)
Share of graduated population (%)			0.503
			(0.454)
Share of women population (%)			-0.412***
			(0.0711)
Share of young population (%)			1.121***
			(0.194)
Observations	28	28	28
R-squared	0.620	0.848	0.964
NUTSII	5	5	5

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Model estimated by regional fixed effects using 5 NUTSII regions Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

Table A.7. Chinese Net Import Competition and Log Difference of Manufacturing Employment in NUTSIII regions, 2004-2012 (Regional Fixed Effects Estimates)

Dependent Var.: Log Difference of Manufacturing Employment (in log pts)				
Independent Var.	Column (1)	Column (2)	Column (3)	Column (4)
Net Import Competition/ worker	-1.402*** (0.285)	-0.384* (0.202)	-0.225 (0.224)	-0.413*** (0.116)
Size of Region in Working Age Pop (%)		-1.766*** (0.233)	-1.765*** (0.227)	-0.330 (0.351)
Manufacturing employment (%)			-0.262 (0.177)	0.112 (0.180)
Share foreign-born population (%)				42.99*** (10.56)
Share of graduated population (%)				1.238 (3.725)
Share of women population (%)				-3.208*** (0.638)
Share of young population (%)				7.047*** (1.613)
Observations	28	28	28	28
R-squared	0.525	0.873	0.885	0.982
NUTSII	5	5	5	5

Notes: N= 28 (28 NUTSIII regions x 1 period). Model estimated by regional fixed effects using 5 NUTSII regions Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

Table A.8. Chinese Import Competition and Log Difference of Working Age Population in NUTSIII regions, 2004-2012 (Instrumental Variable Estimates)

Dependent Var.: Log Difference of Working Age Population (in log pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Import Competition/ worker	-0.0240 (0.0368)	-0.0591 (0.0987)	0.149*** (0.0276)
Manufacturing employment (%)		0.0468 (0.0968)	-0.131*** (0.0416)
Share foreign-born population (%)			5.526*** (1.219)
Share of graduated population (%)			-2.823*** (0.735)
Share of women population (%)			-0.346*** (0.0984)
Share of young population (%)			0.994*** (0.294)
Observations	28	28	28
R-squared	0.064	0.123	0.857

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

Table A.9. Chinese Import Competition and Change of Non-Manufacturing Employment in NUTSIII regions, 2004-2012 (Instrumental Variable Estimates)

Dependent Var.: Change in Non-Manufacturing Employment/working age pop (in % pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Import Competition/ worker	0.100*	0.158*	-0.149*
	(0.0491)	(0.0815)	(0.0799)
Manufacturing employment (%)		-0.0773	0.170
		(0.0570)	(0.141)
Share foreign-born population (%)			-1.934
			(3.753)
Share of graduated population (%)			5.221**
			(2.273)
Share of women population (%)			0.00824
			(0.236)
Share of young population (%)			-0.159
			(0.642)
Observations	28	28	28
R-squared	0.217	0.242	0.848

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.

Table 10. Chinese Import Competition and Change of Unemployment in NUTSIII regions, 2004-2012
(Instrumental Variable Estimates)

Dependent Var.: Change in Unemployment/working age pop (in % pts)			
Independent Var.	Column (1)	Column (2)	Column (3)
Import Competition/ worker	0.0757***	0.0745*	0.00483
	(0.0176)	(0.0430)	(0.0204)
Manufacturing employment (%)		0.00151	-0.0408
		(0.0578)	(0.0386)
Share foreign-born population (%)			1.450
			(1.253)
Share of graduated population (%)			-0.215
			(0.453)
Share of women population (%)			-0.182**
			(0.0714)
Share of young population (%)			0.704***
			(0.202)
Observations	28	28	28
R-squared	0.510	0.509	0.933

Notes: N= 28 (28 NUTSIII regions x 1 period). Robust standard errors in parentheses. Statistical significance is indicated by *** p<0.01, ** p<0.05, * p<0.1 Models are weighted by the start of the period region share of national population.