The impact of the Chinese import shock on Finnish regional labor markets

Veera Holappa
Dept. of Economics, University of Tampere
Pellervo Economic Research
veera.holappa@ptt.fi

Abstract

The rapid rise of Chinese exports over the past few decades has raised concerns about manufacturing jobs and internal labor market outcomes in high-income countries. I analyze the effect of rising Chinese import competition on Finnish regional manufacturing employment between 1995 and 2007. The analysis exploits the cross-regional variation in initial industry structures and uses Chinese imports to other high-income countries as an instrument for Chinese imports to Finland. I find that rising Chinese import competition has a negative effect on the share of manufacturing employment in Finnish sub-regions.

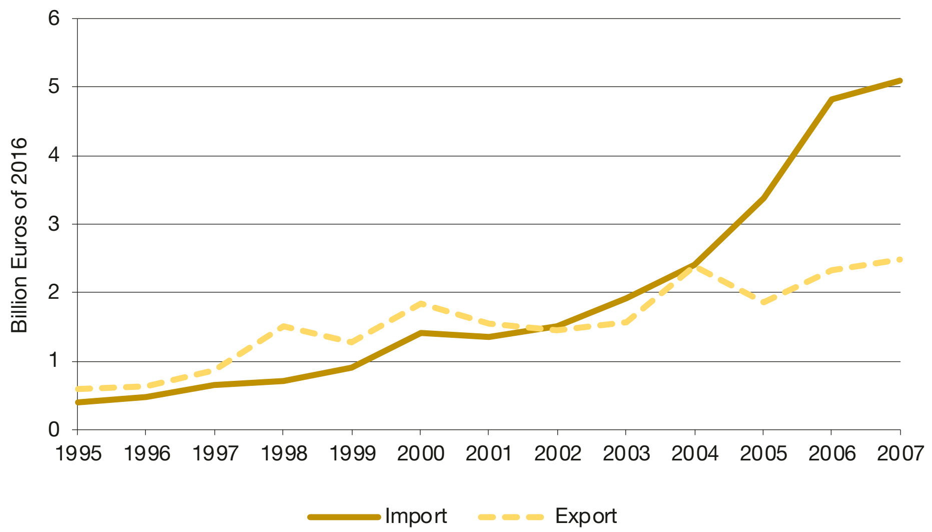
Keywords: *globalization, import competition, labor market, manufacturing employment*
JEL: *E24, F16, J23, L60, R23*

1. Introduction

Increasing globalization and the rise of Chinese power in world trade have caused concerns during the last decades. The World Trade Organization (WTO) was established in 1995 to boost trade openness. China got its WTO membership in 2001, leading the Chinese economy to a fast opening to the world markets. At the same time, there was a rapid productivity increase in China, which led the Chinese economy to huge growth. After the international trade barriers were eased, China has become one of the most important exporters and importers in world trade. In times with wide global value chains, the effect of Chinese trade is very crucial for many countries, directly and indirectly. The opening of the Chinese economy and the membership of WTO have been a good opportunity for many Western companies to organize their production in a new way. Defining the size and importance of this change for local labor markets has induced a large body of research.

As Figure 1 shows, Chinese trade has also increased significantly in Finland. In 1995, Chinese imports were only 0.4 billion euros, but by 2007 annual import volumes had increased to 5.1 billion euros. Thus, Chinese imports to Finland increased by almost 1200 percent between 1995 and 2007, with an accelerating pace after 2001. At the same time, Finnish total imports increased only by about 100 percent. Finnish exports to China have increased only slightly more than 300 percent during the same period. Between 1995 and 2007, the Chinese import penetration ratio[1] increased from 0.2 to 1.3 percent, indicating the increased importance of China as a trading partner.

Figure 1. *Finnish trade volumes with China, 1995–2007.*
Source: UN Comtrade Database.



During the same period, Finland experienced variable changes in manufacturing employment share[2]. The magnitude and direction of the changes varied greatly between industries and regions. Manufacturing employment increased by 1.2 percent between 1995 and 2000 but decreased by slightly more than 0.8 percent between 2000 and 2007. It is important to note that Finland suffered a severe recession at the beginning of the 90s and started to recover in the middle of the decade. As overall employment increased, the number of people working in manufacturing increased also until the year 2000. Although employment in manufacturing was increasing, its share of total employment was decreasing, meaning that the manufacturing sector was losing its relative ability to employ people.

[1] *Import penetration is defined as Finnish imports from China divided by total Finnish expenditure on goods, measured as Finnish gross output plus Finnish imports minus Finnish exports.*

[2] *Manufacturing employment divided by working-age (15–64 years) population.*

In this paper, I study how Chinese import competition changed the Finnish regional labor markets during the years 1995–2007. The main outcome of interest is how the regional manufacturing employment share of the working-age population has changed in the Finnish sub-regions. Sub-regions may be differently exposed to Chinese import competition due to the variation in sectoral employment patterns at the regional level and within the manufacturing sector, where commodity trade occurs. Sub-regions strongly specialized in export-oriented industries may benefit from new trading opportunities, while sub-regions specialized in industries whose intermediate production may be offshored may experience significant changes in their employment structure when exposure to foreign competition rises.

I find a strong negative effect of direct Chinese import competition on local manufacturing employment shares in Finland. On average, Chinese import penetration increased by 1512 euros per worker between 1995 and 2007 in Finland. Estimates show that this increase in import exposure results in a decline in the manufacturing employment share of 0.9 percentage points. During the second period from 2000 to 2007, the manufacturing employment share of a sub-region at the 75th percentile of import exposure declined by 0.4 percentage points more than in a sub-region at the 25th percentile. I do not find evidence that increased export opportunities to China have compensated for the negative impact of import competition in Finland. Further, I find small effects on the relative wages of highly skilled manufacturing workers. Relative wages for high-skilled manufacturing workers increased 0.35 percentage points during the whole research period. Wage effects are predictably mild and mostly insignificant in a welfare state like Finland due to high unionization and wages being rigid downwards.

This analysis of Finnish local labor markets is based on the empirical approach developed by Autor, Dorn, and Hanson (2013). They studied the impact of increased Chinese imports on various labor market outcomes in US commuting zones. Autor et al. (2013) find that local labor markets that are exposed to Chinese import competition experienced larger decreases in manufacturing employment share. Chinese import competition accounts for approximately 44 percent of the contemporaneous aggregate decline in US manufacturing employment between 1990 and 2007. Their results also showed that larger increases in Chinese import competition are connected to higher unemployment, decreased labor-force participation, and increased use of disability and other transfer benefits, as well as lower wages.

Dauth, Findeisen, and Suedekum (2014) have reported opposite effects in Germany. Growing export opportunities in Eastern Europe increased labor demand while Chinese import competition had only modest negative labor market effects. Their empirical findings suggest that in Germany the rise of Eastern Europe affected local labor markets more strongly than the rise of China, thus leading to an increase in manufacturing employment demand. These opposite labor demand effects in Germany seem to be mainly driven by the structure of imports from Eastern Europe and China.

Balsvik, Jensen, and Savanes (2015) found a negative impact of exposure to competition from China on the manufacturing employment share in Norwegian local labor markets. Increasing Chinese import competition can explain 10.5 percent of the decrease in manufacturing employment share, which is a substantially smaller effect than in the United States. They also found that unskilled workers bear the brunt of the reduction in manufacturing employment caused by the Chinese import shock. According to Balsvik et al. (2015), there was a negative wage effect, which is quite expected in the Nordic welfare state with central wage bargaining and flexible rules for employment adjustment. Also, Malgouyres (2017) has found a strong effect of increased Chinese imports on local manufacturing employment in France. His study shows that wages are rather uniformly negatively affected in the manufacturing sector. On the contrary, increased Chinese imports magnify the wage polarization within the nontraded sector, which can be explained by the strongly binding minimum wage legislation.

Comparing the Finnish results with the ones from the US and another Nordic welfare country Norway, one can see that the magnitude of the Finnish results settles between the results of the US and Norway. Taking currency conversion into account, during the first period Chinese import competition decreased manufacturing employment share by 0.06 percentage points a year in Finland, by 0.07 percentage points a year in the United States and by 0.01 percentage points a year in Norway. During the second period, the corresponding figures were 0.09; 0.16; and 0.02 percentage points a year, respectively.

The rest of this paper is organized as follows. Section 2 describes the empirical approach and the data. Section 3 provides estimation results of the impact of Chinese import competition on regional employment in manufacturing. Section 4 goes through the results of other outcome variables such as local population and employment counts, wages, and net exports. Section 5 concludes.

2. Empirical Approach

2.1 Import Exposure Across Local Labor Markets

Autor et al. (2013) have created a theoretical model for international trade effects on local labor markets. This approach is based on the monopolistic competition model of international trade with cross-country productivity differences. The model explains how growth in US imports from China affects the demand for goods produced by US regional economies. These product demand shocks motivate their empirical measure of exposure to import competition. In this study, the effects of Chinese import competition on Finnish local labor markets are analyzed with the same approach.

The measure for local labor market exposure to import competition is the change in Chinese import exposure per worker in a sub-region. Imports are apportioned to a sub-region according to its share of national industry employment:

(1)
$$\Delta IPW_{fit} = \sum_j \frac{L_{ijt}}{L_{fjt}} \frac{\Delta M_{fcjt}}{L_{it}}.$$

In this equation (1) ΔM_{fcjt} is the observed change in Finnish imports from China in industry *j* between the start and end of the period. L_{it} is the start of period total employment (year *t*) in sub-region *i*, L_{ijt} is employment in sector *j* in sub-region *i* and L_{fjt} is overall employment in sector *j* in Finland. The subscript *f* refers to Finland and *c* refers to China. The equation (1) shows that the increase in Finnish imports from China in industry *j* affects labor demand only in those sub-regions where industry *j* is located. The increase in imports of industry *j* over a period *t* is allocated to sub-region *i* according to the region's share of total national employment in industry *j* at the beginning of the period. This measure is then scaled by the total employment in sub-region *i* at the beginning of the period. Lastly, I take the sum of import changes over all industries and get the measure of import exposure per worker ΔIPW_{fit} for all sub-regions. Thus, this measure in equation (1) captures the potential increase in import exposure of a Finnish sub-region *i* given its initial sectoral employment structure.

Consequently, differences in regional import exposure may be due to two reasons: firstly, a different distribution of labor between manufacturing and non-manufacturing employment; and secondly, different specialization in import-intensive industries within local manufacturing. If the relative amount of manufacturing employment is low in a sub-region, the Chinese import exposure is small because there is no direct channel for import competition. Also, if the share of import-intensive manufacturing employment is low, the Chinese import exposure is small. Although there is plenty of manufacturing employment in a sub-region, but the production is centralized in industries whose products are not imported from China, the import competition per worker is small.

The empirical analysis aims to identify the extent to which the change in exposure to competition from China affected manufacturing employment in the Finnish local labor markets. The model regresses the change of a regional overall manufacturing employment share between *t* and *t+1* on the change of regional import exposure over the same period while controlling for the start of period regional characteristics:

(2)
$$\Delta L_{it}^{m} = \beta_0 + \beta_1 \Delta IPW_{fit} + X_{it}'\beta_2 + \varepsilon_{it}.$$

Manufacturing employment share in a sub-region, denoted as ΔL^{m}_{it}, is calculated as a share of total working-age people and measured as the percentage point change from the start to the end of the period. The change of import penetration per worker ΔIPW_{fit} is constructed as shown in equation (1). Equation (2) is estimated in first differences.

The data covers the period 1995–2007, which is split into two sub-periods: 1995–2000 and 2000–2007. Thus, the vector X'_{it} in equation (2) includes a period dummy that controls for the general trend in manufacturing labor demand changes in all sub-regions over these two periods. The vector also includes three dummies for different Finnish grand areas (NUTS 2 regions). These dummies correspond to controlling for region-specific trends in the development of manufacturing employment. There are also other controls which may reflect other changes at the regional level that may be correlated with both changes in imports and manufacturing employment share. The first of these control variables is the start-of-period share of the population employed in manufacturing, which reflects the role of manufacturing in the region. It controls that the coefficient of the variable for import exposure to China does not include the general trend of a decline in the manufacturing share. The included variable for the start-of-period share of routine occupations separates the effect of general technological change from the effect of Chinese import competition. The rest of the control variables, the employment share of high-skilled workers, the share of foreigners, and the share of working women, control for the start-of-period demographic structure of sub-regions.

2.2 Identification Strategy

Unobserved demand and supply shocks at the regional level affect the number of goods imported to Finland from abroad. If these shocks affect simultaneously both the sectoral imports from China and regional economic performance and employment, the variable for Chinese import competition in equation (2) is endogenous. In this case, OLS estimates will be biased.

I use an instrument variables strategy to identify the causal effect of rising Chinese import exposure on Finnish manufacturing employment. This strategy takes into account the potential endogeneity of Finnish trade exposure. This kind of instrument variable strategy for import competition has been previously used by Autor et al. (2013). The strategy is based on the idea that during the sample period much of the growth in Chinese imports stems from the rising competitiveness of Chinese manufacturers and lower trade barriers. The Chinese supply shock has also increased Chinese exports to other developed countries, but the increase in imports from China in these countries is uncorrelated to labor demand shocks in Finnish regional labor markets. Therefore, the measured import exposure variable ΔIPW_{fit} will be instrumented with a Bartik-style[3] non-Finnish exposure variable ΔIPW_{oit} that is constructed using data on contemporaneous industry-level growth of Chinese exports to eight other high-income countries

(3) $$\Delta IPW_{oit} = \sum_{j} \frac{L_{ijt-1}}{L_{fjt-1}} \frac{\Delta M_{ocjt}}{L_{it-1}}.$$

In equation (3) ΔM_{ocjt} is realized imports from China to other high-income markets. The subscript *o* refers to others. Using the import flows of other countries as an instrument for the local import exposure in Finland identifies the exogenous component of rising competitiveness in Chinese trade and takes away the effect of possible shocks that simultaneously affect Finnish imports and regional employment.

This shift-share exposure measure used as an instrument constructs exposure to import competition for each country by multiplying shares of country *i*'s employment in industry *j* by shifts or shocks as measured imports from industry *j* from China and summing across industries. As the shock is constant within the industry across countries, variation in exposure to import competition across sub-regions comes from variation across sub-regions in the shares. Sub-regions with high

[3] *The typical use of a Bartik instrument assumes a pooled exposure research design, where the shares measure differential exposure to common shocks, and identification is based on the exogeneity of the shares. (Goldsmith, Sorkin, and Swift, 2019.)*

exposure to import competition are sub-regions that have high employment in industries (large shares) with relatively high imports (large shifts/shocks).

One disadvantage of this kind of instrument is that it is built on several components, and the exogeneity of all the components should be considered. Because the shares are typically equilibrium objects and likely co-determined with the level of the outcome of interest, it can be hard to assume that the shares are uncorrelated with the levels of the outcome. However, Goldsmith, Sorkin, and Swift (2019) state that this assumption is not necessary for the empirical instrumental strategy to be valid. Important for the strategy is that differential exposure to common shocks leads to differential changes in the outcome. In this case, the outcome variable is the change in manufacturing employment, so it is plausible to assume that the instrument is exogenous.

The quality of the instrument has three important conditions. First, the instrument should not be weak, its correlation with the endogenous regressor should be strong enough. Second, the unobservable supply and demand shocks in the instrument countries should not be strongly correlated with those of Finland. Third, the instrument affects the independent variable only indirectly.

Keeping these conditions in mind, it is important to pay attention to instrument country selection. I have chosen countries whose import structures are similar enough to Finland but changes in their imports do not affect Finnish labor markets. Thus, I have focused on other developed countries, but I have excluded all direct neighbors as well as all members of the European Monetary Union. Supply and demand shocks in these countries are more likely to be too similar to those in Finland, hindering the identification. On the other hand, other EMU countries are highly integrated with Finland through a common currency, so it is likely that shocks that change trade flows between EMU countries and China also directly affect regional performance in Finland, hence violating the exclusion restriction. Taking these restrictions into account, the instrument group is Australia, Canada, Hong Kong, Japan, New Zealand, Singapore, South Korea, and the United States.

If regional employment reacts to expected future increases in Chinese imports, there is a problem with simultaneity bias. To address this concern, the instrumental variable uses employment levels by industry and region from a prior year instead of start-of-period employment levels. Because of data availability and the Finnish economic situation, this instrumental variable uses four years lagged levels of employment variables, for the first period year 1991 and the second period year 1996. The recession at the beginning of the 1990s creates a challenge for this part of the instrument. Employment shares in manufacturing industries changed significantly during the recession and after. During the period from 1995 to 2000, the manufacturing industry as the whole economy was recovering from the recession and total employment in manufacturing was increasing until year 2000. Despite the recovery, some of the manufacturing industries and sub-regions lost employment. The challenge is how to distinguish the effect of Chinese import competition on Finnish local labor markets from the effect of recession and recovery. The identification may have some problems in the first period, but for the second period, when most of the variation occurred, it is plausible to assume the identification is working. In addition, it is good to note that economic downturns can give an impetus or accelerate structural changes. Thus, the exclusion restriction of this model is based on the assumption that the instrument variable, which is based on carefully selected instrument countries' Chinese imports and lagged Finnish employment levels, is correlated with Finnish import exposure, but it is not directly correlated with Finnish manufacturing employment changes.

2.3 Data

This study combines commodity-specific foreign trade data with national employment and employer data. The data covers the years 1995–2007, and this period is split into two shorter periods: 1995–2000 and 2000–2007. This research period settles between the early 90s recession in Finland and the start of the global financial crisis. The crisis had far-reaching effects on international trade and disrupted international value chains. Imports and exports fluctuated much after the financial crisis.

The Finnish labor market data at the regional and local industry level is based on the Finnish Longitudinal Employer-Employee Data (FLEED) provided by Statistics Finland. These data contain a large number of variables about the employment status, occupation, and employer information for all the 15–70-year-old people living in Finland. Regressions are estimated for the working-age population aged 15–64 years.

The wage data is from the harmonized wage structure panel for the private sector for the years 1995–2013 from Statistics Finland. The data provides employment-level information on total earnings and other items relevant to wage formation, such as working hours, overtime earnings, and fringe benefits, as well as non-recurring wage items. The monthly earnings survey is limited to full-time employees. Harmonization makes wage data comparable between years. In this study, wage is defined as the monthly earnings of regular agreed working hours[4].

Data on international trade by commodities is from the United Nations Commodity Trade Statistics Database (Comtrade). This data contains annual international trade statistics of over 170 reporter countries, detailed by commodities and partner countries. I use data on Finnish imports at the six-digit Harmonised System (HS) level. Trade flows were converted into euros in 2016 using the currency conversion factor from Comtrade and a deflator from Statistics Finland. Data on regional employment and international trade are merged by harmonizing industry and product classifications. First, the HS-classified trade data is converted into the CPA2008 classification. Then this classification is converted into NACE rev. 2 four-digit industry codes. The four-digit NACE classification corresponds to the Finnish national industry classification TOL2008[5].

The regional economies are defined as sub-regions. There are 70 sub-regions in Finland, but due to the small size, I excluded three sub-regions situated in Åland, thus my research data consists of 67 sub-regions. Sub-regions are a set of territories formed by a few municipalities. The basis of the establishment of sub-regions is cooperation between municipalities and commuting. Each municipality in Finland belongs to one of the sub-regions, and the member municipalities of the same region must be from the same province. The sub-regions constitute the statistical territory of the European Union LAU 1 (formerly NUTS 4).

2.4 Descriptive overview

In Finland, the changes in manufacturing employment share have been comparatively small. Finland was still recovering from the severe recession of the early 1990s at the start of the research period. The manufacturing sector was leading the recovery, so in the first sub-period manufacturing employment share increased in most of the sub-regions, but the trend reversed in the early 21st century. Manufacturing employment increased by 0.22 percentage points per year on average from 1995 to 2000 but decreased by 0.09 percent per year from 2000 to 2007. During the second period, the largest manufacturing employment share decreases were in the sub-regions of Salo, Eastern-Lapland, and Oulu.

For Finland, the three biggest Chinese import product categories are electronics, machinery, and textiles. Imports in all these categories increased between 1995 and 2007, but the speed of growth varied significantly, changing the structure of Chinese imports. In 1995, textiles were the most important product category imported from China by Finland, accounting for approximately 35 percent of total Chinese imports. Machines and electronics were the second-largest categories, with approximately 18 percent share each. In 2007, textile imports accounted for less than 10 percent of total imports. The import share of machinery had increased to 27 percent, while electronics had increased to 49 percent.

---

[4] *Monthly earnings of regular agreed working hours include monthly basic salary; job, professional skills, years of service, etc. allowances payable; allowances payable according to the location and circumstances of the workplace; working time allowances; commissions; and the tax value of benefits in kind.*

[5] *I have left Manufacture of office machinery and equipment (except computers and peripheral equipment) (TOL 2008, industry 2823) out of the data because it has strongly positively deviant values. Although the changes in imported values are large, this industry is relatively small employing only a few people in a few sub-regions. Thus, the outlier values have a strong effect on some sub-regions' import penetration per worker.*

Appendix Table 1 lists more specifically the changes in import penetration per worker in Finnish sub-regions. Panel A shows that, on average the import penetration more than doubled from period to period. Between 1995–2000, the average import penetration per worker was 98 euros per year and between 2000–2007 it was 211 euros per year. In the first period, the sub-regions at the 75th percentile of import exposure experienced an increase in import exposure per worker that was almost three times as large as that faced by sub-regions at the 25th percentile. In the second period, the difference between these two percentiles was only twofold.

As panel B shows, import penetration grew in all the sub-regions during the two periods, but there are sizeable differences between the amount of growth in import penetration in sub-regions. During the second period sub-regions that experienced the sharpest increases in import penetration were Raahe, Salo, and Oulu. The rankings show that there have been changes in the top 10 sub-regions. Only four of the sub-regions that were in the top 10 of import exposure growth rank in the first period were there in the second period. Eight of the sub-regions in the bottom 10 in the first period were there also in the second period, only the order had changed a little.

Figure 2. *Exposure to Chinese Import Competition (ΔIPV_{fit}) (panel a) and Manufacturing Employment Growth (ΔL^{m}_{it}) (panel b) during 2000–2007. (The colors for panel (b) are reversed.) Source: UN Comtrade Database and Statistics Finland.*

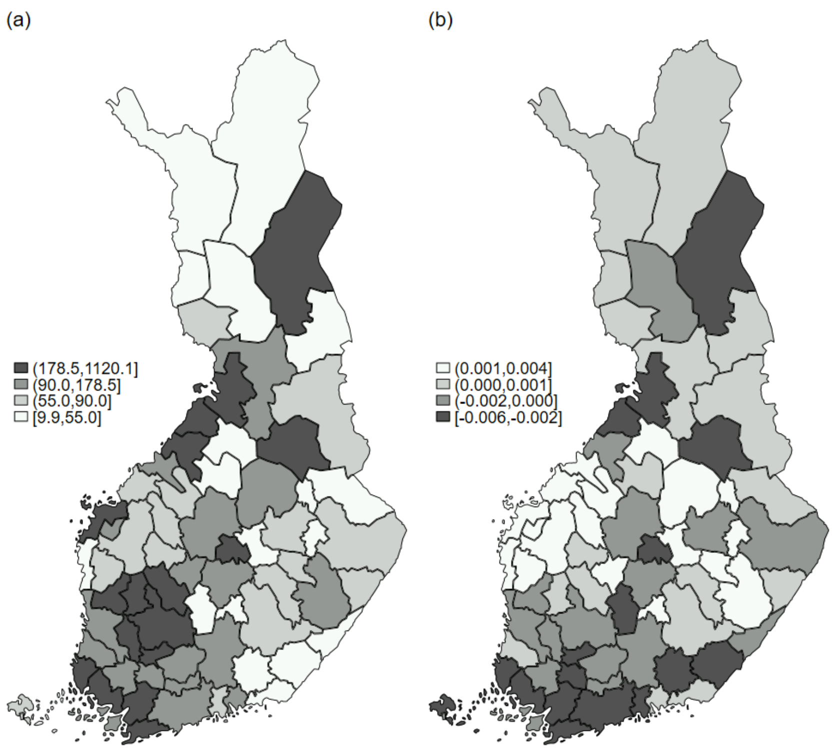


Figure 2 shows that there has been a large variation in import penetration in sub-regions in Finland during the second period. Panel (a) of Figure 2 shows the regional division of growth in import penetration per worker per year, and panel (b) shows the change in manufacturing employment share per year during the period from 2000 to 2007. Panel (a) shows that the most of Chinese import growth is accumulated in southern and southwestern Finland. Another Chinese import growth accumulation is in the sub-region of Oulu and its surrounding sub-regions. Many of these sub-regions that have experienced the largest increases in Chinese import growth per worker have also experienced the largest decreases in the change in manufacturing employment share, as panel (b) in figure 2 shows. The colors in panel (b) are reversed; the darker the area, the weaker the manufacturing employment share evolved from 2000 to 2007.

3. Results

I start by estimating the relationship in equation (2) and use the variable (3) to instrument the main import exposure variable (1). The dependent variable is the annual change in manufacturing employment as a share of working-age people in region *i*, denoted as . Models are weighted by the start of period sub-region share of the national population. To account for spatial and serial correlation, the robust standard errors are clustered at the level of 18 Finnish provinces. All the model specifications are estimated using a period dummy for the two periods: 1995–2000 and 2000–2007. The latter gets the value of 1. Given that my regressions are in first differences, this dummy controls for the general trend in manufacturing labor demand changes in all sub-regions over these two periods.

The instrumental variable strategy identifies the component of Finnish import growth that is due to increases in Chinese productivity. The identifying assumption in this strategy is that the common within-industry component of rising Chinese imports to Finland and other high-income countries is due to China's rising comparative advantage and falling trade costs. The results of first-stage regressions are in panel (b) of Table 1. For the simplest specification in column (1), the Kleibergen-Paap F-statistics is 28.90. This and all the other F-statistics are well above the critical value of 16 suggested by Stock and Yogo (2015) for 2SLS estimates. The instrumental variable as an explanatory variable stays highly significant although other exogenous variables are added to the model. These results show that the chosen instrument is a strong predictor of the endogenous variable.

3.1 Manufacturing Employment Growth

Results from the instrumental variables regressions are listed in Table 1 panel (a). The coefficient for import exposure shows the effect of a one euro change in import penetration per worker per year. The first column shows the simplest model, where there are no control variables. Five other specifications add different sets of control variables. In all six specifications, a change in import exposure has a negative and statistically significant impact on manufacturing employment growth.

Table 1. *Imports from China and Change of Manufacturing Employment in subregions, 1995–2007: 2SLS and OLS Estimates.*

a: Dependent variable: annual change in manufacturing employment/working-age population (in % pts)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	2SLS	**2SLS**	**2SLS**	**2SLS**	**2SLS**	**2SLS**	**OLS**
Δ import exposure	-0.00060***	-0.00074***	-0.00049***	-0.00055***	-0.00060***	-0.00059***	-0.00013
	(0.00009)	(0.00015)	(0.00009)	(0.00014)	(0.00009)	(0.00014)	(0.00015)
% employment in mfg		0.00596**	0.00223	-0.00105	0.01120*	0.00542	-0.00201
		(0.00278)	(0.00257)	(0.00486)	(0.00592)	(0.00581)	(0.00605)
% high-skilled				0.02353***		-0.02273***	-0.02526***
				(0.00484)		(0.00504)	(0.00495)
% foreign born				-0.02902		-0.02645	-0.02020
				(0.02442)		(0.02552)	(0.02851)
% women				0.02776***		0.02372***	0.01852**
				(0.00856)		(0.00793)	(0.00640)
% routine occupations					-0.01661**	-0.01386**	-0.00945
					(0.00819)	(0.00617)	(0.00682)
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	No	No	Yes	Yes	Yes	Yes	Yes
b: 2SLS first stage estimates							
Δ import exposure, others	0.04876***	0.04770***	0.04880***	0.04310***	0.04584***	0.04266***	
	(0.00907)	(0.00920)	(0.00917)	(0.00687)	(0.00791)	(0.00671)	
R^2	0.60	0.60	0.62	0.69	0.64	0.69	
F-test of excluded inst.	28.90	26.90	28.35	39.42	33.62	40.43	

*Note: N=134 (67 subregions and two time periods). All regressions include a constant and period fixed effects for the 2000–2007 period. First stage estimates in panel (b) include the same control variables indicated in the corresponding columns of the panel (a). Control variables are constructed as the number of workers in a particular group relative to total employment in sub-region. % women is calculated as the share of employed women among female working-age population. Routine intensive occupations include jobs that involve routine information processing or repetitive motion and monitoring. Robust standard errors in parentheses are clustered at the level of 18 Finnish provinces. *** p<0.01, ** p<0.05, * p<0.1.*

The coefficient in column (1) suggests that one additional euro in import penetration per worker decreases manufacturing employment by 0.0006 percentage points a year. A one-thousand-euro increase in import penetration would decrease manufacturing employment by 0.6 percentage points. This effect may not seem large, but it has economic significance as well, as I show later.

In the second column, I add control for the start-of-period manufacturing share of the working-age population. This control focuses on the variation in import exposure caused by differences in industry mix within local manufacturing sectors. The result implies that a sub-region with a one percentage point higher initial manufacturing share experiences a differential manufacturing employment share increase of 0.006 percentage points in a year. The more there is manufacturing employment in a sub-region at the start of the period, the more the manufacturing employment share increases. In this specification, the coefficient for import penetration per worker is larger than in column (1), so this specification indicates that the effect of Chinese import competition has been larger in sub-regions with a high initial share of manufacturing employment. Column (3) augments the regression model with geographic dummies for the three grand areas[6] that absorb region-specific trends in the manufacturing employment share. Although the start-of-period manufacturing share of the working-age population is controlled, these regions may have different trends in changes in manufacturing employment shares due to the different composition of manufacturing industries in the areas. These regional dummies decrease the estimated effect of import exposure on manufacturing employment.

[6] *The division is based on NUTS 2 (2012). The areas are Helsinki-Uusimaa and Southern Finland, Western Finland, and Northern and Eastern Finland.*

In column (4), I add controls for other start-of-period local labor market structures. Including these controls allows each sub-region to have a specific trend proportional to each of these initial shares. A higher initial share of the high-skilled[7] labor force is negatively related to changes in manufacturing employment. The share of the high-skilled labor force takes into account the possibility that high-skilled and low-skilled workers have different employment and unemployment trends. Also, the share of the foreign-born population in sub-region decreases with the change in manufacturing employment share. Instead, the share of female workers is positively correlated with manufacturing employment share changes. The smaller the share of employed working-age women is at the start of the period, the smaller the manufacturing employment share growth is. These controls decrease the main result only a little, and the coefficient for import penetration per worker remains significant.

Column (5) introduces a variable that captures the routine intensiveness of a sub-region's occupation structure. Routine intensiveness reveals the potential of technological substitution. Routine occupations are defined by using the method of Acemoglu and Autor (2010), which is converted into Finnish occupation titles by Böckerman, Laaksonen, and Vainiomäki (2013). Routine intensive occupations are jobs, whose primary tasks follow precisely prescribed rules and procedures that make them easy to replace with computers. This category includes white-collar positions whose primary job tasks involve routine information processing (e.g., accountants and secretaries) and blue-collar production occupations that primarily involve repetitive motion and monitoring tasks. This variable of routine intensiveness takes into account the potential exposure of sub-regions to technological change and automatization that could lead to a decline in labor demand by the manufacturing sector independently of globalization. If a sub-region that has a large start-of-period employment share in routine occupations experiences strong displacement of manufacturing jobs due to automation, a negative relationship between the routine share variable and the change in manufacturing share would be expected. The estimates in column (5) suggest that the employment share in manufacturing falls by about 0.017 percentage points a year for each additional percentage point of initial employment in routine occupations. This coefficient for routine intensiveness is significant and adding it into the model increases the coefficient for import penetration per worker.

The fully augmented model in column (6) indicates the sizeable negative impact of increasing import exposure on changes in manufacturing employment. A one euro change in Chinese import penetration decreases the manufacturing employment share by 0.00059 percentage points. The decline in manufacturing employment share is larger in sub-regions with a larger initial share of high-skilled employment and employment in routine occupations. Instead, a higher initial share of working women makes the decline smaller.

In column (7), I report the full model estimated with OLS. Results in column (7) imply that a one euro increase in the Chinese import penetration ratio is associated with a 0.00013 percentage point decrease in the manufacturing employment share growth rate. The 2SLS coefficient in column (6) is larger in absolute value, thus the OLS estimate for import exposure is biased towards zero. This upward bias has two countervailing sources: an upward bias due to measurement error in subregions' employment levels and a downward bias due to the impact of unobserved supply shocks.

[7] *The high-skilled labor force is defined as people with a short-cycle tertiary education or more.*

3.2 Economic significance and the results compared

To assess the economic significance of the results, I explore the effect of an increase in import penetration per worker in different regions. The point estimate for import exposure in column (6) implies that the manufacturing employment share in a sub-region at the 75th percentile of import exposure declined by 0.4 percentage points more than in a sub-region at the 25th percentile during the whole second period from 2000 to 2007.

The preferred specification in column (6) of Table 1 implies that a 1,000 euro increase in Chinese import penetration per worker reduces the manufacturing employment share by 0.59 percentage points a year. As Appendix Table 1 shows, during the first period from 1995 to 2000, Chinese import exposure rose by 480 euros per worker and during the second period from 2000 to 2007 an additional 1085 euros per worker. Thus, using this estimated coefficient, the increased exposure to Chinese imports reduced manufacturing employment as a portion of employed people by 0.29 percentage points in the first five-year period and by an additional 0.64 percentage points during the following seven-year period. In the second period, the manufacturing employment share decreased by 0.8 percentage points, thus the effect of Chinese import competition has been quite extensive accounting approximately 80 percent of the decrease in manufacturing employment share. Although overall manufacturing employment share in Finland increased in the first period, Chinese import competition has caused pressures to decrease manufacturing employment in some sub-regions. Autor et al. (2013) have noted that the quantitative predictions may overstate the impact of trade on manufacturing employment. Even though the instrumental variables 2SLS estimates identify the causal effect of increased Chinese import competition, the measured changes in trade flows may also stem from other sources such as unobserved shocks.

In Finland, the effects of Chinese import competition have been smaller than in the United States (Autor et al., 2013) but larger than in Norway (Balsvik et al., 2015). Changes in import penetration per worker per year have varied a little between these three countries. In Finland, import penetration per worker per year increased by 97 euros during the first period and 155 euros during the second period. Corresponding values are 95 and 220 euros for the United States and 44 and 166 euros for Norway. In Finland and the United States, the magnitude of the coefficient is quite close to each other. In Finland, a 1000 euro increase in import penetration decreases manufacturing employment share by 0.59 percentage points. In the United States, a 1000-dollar (approximately 830 euros) increase in import penetration per worker decreases manufacturing employment by 0.60 percentage points. In Norway, the effect is smaller, a 10 000 NOK (approximately 980 euros) increase in import penetration per worker decreases manufacturing employment by 0.13 percentage points. Taking currency conversion into account, during the first period Chinese import competition decreased manufacturing employment share by 0.06 percentage points a year in Finland, by 0.07 percentage points a year in the United States and by 0.01 percentage points a year in Norway. During the second period, the corresponding figures were 0.09; 0.16; and 0.02 percentage points a year, respectively. Thus, the magnitude of the Finnish results settles between the results of the US and Norway.

4. Other outcome variables

4.1 Population and Employment Effects in Sub-Regions

This section studies the degree to which import shocks to local manufacturing industries cause the reallocation of workers across sub-regions. If mobility responses are large, indirect effects of trade on local labor markets will be small because initial local impacts will rapidly diffuse across regions. Table 2 shows the results for changes in the structure of the working-age population in sub-regions. Columns (1)–(3) shows that increased Chinese imports have increased significantly only the number of older working-age people. Import competition has not changed the educational structure of the working-age population in sub-regions, as columns (4) and (5) in Table 2 show.

Table 2. *Imports from China and Change of Working-Age Population within Sub-Regions, 1995–2007: 2SLS Estimates.*

	Working-age population (1)	Age 15–40 (2)	Age 41–64 (3)	High educated (4)	Low educated (5)
Δ import exposure	0.00052	0.00036	0.00072**	0.00039	0.00067
	(0.00048)	(0.00080)	(0.00034)	(0.00057)	(0.00060)
Controls	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes	Yes
Observations	134	134	134	134	134
R^2	0.83	0.81	0.82	0.69	0.68

*The dependent variable is the change in log population counts. Each regression contains the same control variables as column (6) of table 1. Robust standard errors in parenthesis are clustered at the level of 18 Finnish provinces. *** p<0.01, ** p<0.05, * p<0.1*

As the earlier results show, the population in sub-regions reacts sluggishly to this kind of negative trade shock. Most likely, the biggest reason for sluggish migration between sub-regions is mobility costs. Housing prices tend to make up the majority of mobility costs. In Finland, labor mobility is relatively limited compared to the US and other European countries (IMF, 2018). The share of owner-occupied housing is large in Finland. For example, Wolf and Caruana-Galizia (2015) have shown with German data that homeownership reduces labor mobility and increases unemployment in Germany. Laamanen (2017) has shown similar results for Finland. Because of this sluggish migration, the trade-induced decline in manufacturing employment should yield a corresponding rise in non-manufacturing employment, unemployment, labor force exit, or some combination of these three. Table 3 shows the results for employment structure in sub-regions. The regression in Table 3 is analogous to the earlier models for the manufacturing employment share, except now the dependent variable is the change in log population counts in sub-regions.

Table 3. *Imports from China and Employment Status of Working-Age Population within Sub-Regions, 1995–2007: 2SLS Estimates.*

	Employment others (1)	Employment Manufacturing (2)	Unemployed (3)	Outside labor force (4)
Δ import exposure	0.00066	-0.00103	0.00123	0.00081
	(0.00120)	(0.00176)	(0.00336)	(0.00075)
Controls	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes
Observations	134	134	134	134
R^2	0.73	0.58	0.37	0.83

*The dependent variable is the change in log population counts. Each regression contains the same control variables as column (6) of table 1. Robust standard errors in parenthesis are clustered at the level of 18 Finnish provinces. *** p<0.01, ** p<0.05, * p<0.1*

Table 3 shows that the shocks to local manufacturing have not led to significant changes in the employment status of working-age people in sub-regions. However, the signs of the coefficient are as expected. Chinese import competition reduces manufacturing employment count while increasing employment in other industries, unemployment, and labor force exit. The reason for the insignificance of the coefficients may be that the effects of a decrease in manufacturing employment have been divided between all these three categories. There are OLS estimates for the working-age population and the status of the working-age population within sub-region in Appendix Tables 2 and 3.

4.2 Wage Effects

In Table 4, I show the results of the effects of import exposure shocks on the sub-region's wage levels. The estimation approach follows the model previously presented except that now the dependent variable is the change in log average monthly earnings in sub-region *i*. The estimate in panel (a) in column (1) shows that Chinese import competition has increased the monthly earnings of high-skilled workers. One euro increase in import penetration increases the monthly average earnings of high-skilled workers by 0.0016 log points. For example, during the second period, Chinese import competition increased the wages of high-skilled workers by 0.25 log points. However, the effect on the incomes of low-educated workers is negative and insignificant. In column (4), the dependent variable is the change in high-skilled relative wages, and it shows that the wages of low-skilled workers have lagged high-skilled wages during the research period. This suggests that the production surviving the Chinese competition uses relatively more high-skilled workers in Finland. Column (5) shows, Chinese import competition has not affected total private sector wages. OLS estimates for wage effects are presented in Appendix Table 4.

Panel (b) of Table 4 shows the effect of Chinese import competition on the count of manufacturing workers. The effects for all manufacturing workers and low-skilled manufacturing workers are negative, and for high-skilled positive. These results are quite intuitive with the theory of labor market polarization. The number of low-skilled manufacturing workers has decreased because their jobs are offshored to low-income countries. Hence, the manufacturing jobs retained and created in Finland are high-skilled. However, these results are not significant. Thus, the wage effect is not due to compositional effects.

Table 4. *Wage and Employment Changes in Manufacturing, 1995–2007: 2SLS Estimates.*

			Manufacturing		Private Sector
	All	Low-skilled	High-skilled	High-skilled/Low- skilled	All
	(1)	(2)	(3)	(4)	(5)
Panel a: Dependent variable the change in log earning					
Δ import exposure	0.00124*	-0.00002	0.00167**	0.00021*	-0.00046
	(0.00064)	(0.00079)	(0.00073)	(0.00012)	(0.00100)
R^2	0.41	0.10	0.45	0.20	0.27
Panel b: Dependent variable the change in log number of workers					
Δ import exposure	-0.00068	-0.00256	0.00091		
	(0.00164)	(0.00208)	(0.00165)		
R^2	0.58	0.61	0.52		

*In panel (a) in columns (1)-(3) and (5) dependent variable is the change in log monthly earnings of the group indicated in the column heading. In column (4), dependent variable is the change in high-skilled relative wages. In panel (b) dependent variable is the change in log number of workers in manufacturing. Each regression contains the same control variables as column (6) of table 1. Robust standard errors in parenthesis are clustered at the level of 18 Finnish provinces. *** p<0.01, ** p<0.05, * p<0.1*

These wage estimates should be interpreted with caution because monthly earnings are only available for the employed. As the earlier results show, Chinese import competition reduces manufacturing employment. This reduction concerns with high probability the workers with lower ability and earnings. Thus, the observed changes in earnings may understate the composition-constant changes in wages.

Labor market unions may have a substantial impact on the wage effects. In the US, where unionization is low, Autor et al. (2013) found rather high negative wage effects for both college and non-college educated workers. Whereas, for Norway, which is a similar kind of Nordic welfare state to Finland, Balsvik et. (2015) did not find any wage effects. Finnish wage effects are rather close to those of Norway. Nordic welfare states with high unionization tend to flatten wage changes and especially prevent decreases in wages. In Finland, wages are particularly downward rigid due to union power and centralized wage bargaining. In contrast, employment termination clauses are relatively liberal.

4.3 Net export

The main result in Table 1 consists only of the Chinese import shock. At the same time, also Finnish exports to China increased significantly, though less than imports. The biggest export product categories have been electrical and industrial machinery, especially machinery for making paper, which increased substantially between 1995 and 2007. Also, exports of metals started to increase in the second period. It seems that at least a part of the increased exports is from different manufacturing sectors than the increases in Chinese imports. This may allocate the effects of total Chinese trade differently across Finnish sub-regions.

Following the example of Autor et al. (2013), I construct a measure for net imports from China by subtracting Finnish exports from Finnish imports by industry:

(4) $$\Delta NPW_{fit} = \sum_j \frac{L_{ijt}}{L_{fjt}} \frac{\Delta M_{fcjt}}{L_{it}} - \sum_j \frac{L_{ijt}}{L_{fjt}} \frac{\Delta X_{cfjt}}{L_{it}}.$$

This measure for net import penetration per worker is instrumented with two variables: the first one is the earlier used instrument for import penetration per worker (equation 3), and the second is an analogously constructed potential export exposure measure, built using observed exports to China by industry from eight comparison countries previously used for the potential import exposure measure.

Table 5 presents the estimates for the effect of net import exposure on local manufacturing employment share. The results show that increases in Chinese net imports have negative and significant effect on manufacturing employment share in Finnish sub-regions.

Table 5. *Net Imports from China and Change in Manufacturing employment share in Sub-Regions, 1995–2007: 2SLS and OLS Estimates.*

Dependent variable: annual change in manufacturing employment/working-age people (in % pts)							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
	2SLS	**2SLS**	**2SLS**	**2SLS**	**2SLS**	**2SLS**	**OLS**
Δ net exposure	-0.00871**	-0.00730***	-0.00515**	-0.00850**	-0.00673**	-0.00932**	0.00163
	(0.00342)	(0.00259)	(0.00237)	(0.00391)	(0.00314)	(0.00416)	(0.00104)
% employment in mfg		-0.00011	-0.00150	-0.00643	0.01056	0.00045	-0.00486
		(0.00297)	(0.00313)	(0.00405)	(0.00770)	(0.00646)	(0.00525)
% high-skilled				-0.03005***		-0.02976***	-0.02529***
				(0.00820)		(0.00917)	(0.00451)
% foreign born				-0.11816		-0.12393	0.00001
				(0.08018)		(0.08622)	(0.03599)
% women				0.05740**		0.05572**	0.01031**
				(0.02495)		(0.02615)	(0.00474)
% routine occupations					-0.02456*	-0.01578	-0.00691
					(0.01489)	(0.01158)	(0.00606)
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	No	No	Yes	Yes	Yes	Yes	Yes

*Note: N=134 (67 subregions and two time periods). All regressions include a constant and a dummy for the 2000–2007 period. First-stage estimates in panel II also include the control variables that are indicated in the corresponding columns of panel I. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Column (6) shows that a one euro increase in Chinese net import exposure per worker reduces the manufacturing employment share by 0.009 percentage points. Average net imports increased by 40.8 euros between 1995 and 2007, resulting in a 0.4 percentage point decrease in local manufacturing employment share. Thus, increases in Chinese net imports account for approximately 50 percent of the total decrease in manufacturing employment in Finnish sub-regions between 2000 and 2007. Column (7) shows the OLS estimate for net imports is upwards biased.

5. Conclusions

Chinese imports to Finland started to increase rapidly in the mid-1990s. Finnish exports to China increased also, but not as much, so the dependence on Chinese trade has increased vastly in Finland as in other developed countries. In this paper, I analyze the effects of an increase in Chinese imports on Finnish local labor markets from 1995 to 2007. Differences in regional effects may be due to either differences in industry structure or differences in specialization.

I analyze regional exposure to Chinese import competition and its effects on manufacturing employment. The main objective is to explain how much the increased exposure to import competition can explain the decrease in manufacturing employment share in Finland. I use an instrumental variable approach, which was first presented by Autor et al. (2013). This approach accounts for the possible simultaneity of import demand and labor demand shocks by instrumenting Finnish import growth from China with Chinese import growth in other developed countries. I found a negative impact of regional exposure to Chinese import competition on the manufacturing employment share in Finnish local labor markets. According to my estimates, increased import competition from China decreased manufacturing employment share by 0.9 percentage from 1995 to 2007.

Chinese import competition has not had a statistically significant effect on the wages of low-skilled manufacturing workers, but it has had a positive statistically significant effect on the relative wages of high-skilled manufacturing workers. High-skilled manufacturing workers' relative wages increased 0.35 percent between 1995 and 2007. There are frictions in labor markets due for example to the limited mobility of people. Because of sluggish migration, the trade-induced decline in manufacturing employment should yield a corresponding rise in non-manufacturing employment, unemployment, labor force exit, or some combination of these three. The estimates show that the shocks to local manufacturing have not led to significant changes in the employment status of working-age people in local labor markets, although the coefficients are of the expected sign. The reason for the insignificance of the coefficients may be that the change in the Finnish manufacturing share was quite modest and the effects of the decrease have divided between all these three categories.

A further study could assess the more recent effects of Chinese import competition on local labor markets. After the financial crisis Chinese imports to Finland have decreased significantly. In 2020 Chinese imports were less than half of what they were in 2007. Global value chains are undergoing considerable change, which may have significant effects in European-wide production locations. □

APPENDIX

Appendix Table 1. Descriptive statistics for Growth of Imports Exposure per worker across sub-regions: one-year change in euros.

		1995–2000		2000–2007	
Panel A. Percentiles					
		90th percentile	126	90th percentile	220
		75th percentile	123	75th percentile	181
		50th percentile	75	50th percentile	129
		25th percentile	44	25th percentile	87
		10th percentile	23	10th percentile	55
		mean	97	mean	155
Panel B. Largest and smallest values among sub-regions.					
Rank	1	Salo	568	Raahe	1120
	2	Oulu	398	Salo	827
	3	Äänekoski	255	Oulu	440
	4	Haapavesi-Siikalatva	225	Äänekoski	389
	5	Lounais-Pirkanmaa	179	Ylä-Pirkanmaa	361
	6	Turku	126	Pohjois-Satakunta	267
	7	Oulunkaari	123	Raasepori	244
	8	Helsinki	123	Kajaani	232
	9	Tampere	115	Itä-Lappi	223
	10	Ylivieska	109	Tampere	220
	34	Ylä-Savo	49	Oulunkaari	95
	58	Kouvola	20	Kouvola	36
	59	Kuusiokunnat	20	Pielisen Karjala	36
	60	Kotka-Hamina	19	Kotka-Hamina	35
	61	Koillismaa	18	Koillismaa	35
	62	Imatra	15	Sisä-Savo	32
	63	Pielisen Karjala	15	Koillis-Savo	27
	64	Sisä-Savo	14	Torniolaakso	26
	65	Pohjois-Lappi	9	Pohjois-Lappi	20
	66	Tunturi-Lappi	9	Tunturi-Lappi	15
	67	Koillis-Savo	7	Haapavesi-Siikalatva	10

Appendix Table 2. Imports from China and Change of Working-Age Population within Sub-Regions, 1995–2007: OLS Estimates.

	Working-age population	Age 15–40	Age 41–64	High educated	Low educated
	(1)	(2)	(3)	(4)	(5)
Δ import exposure	0.00122***	0.00171**	0.00068**	0.00163***	0.00135**
	(0.00036)	(0.00069)	(0.00025)	(0.00049)	(0.00048)
Controls	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes	Yes
Observations	134	134	134	134	134
R^2	0.83	0.81	0.82	0.70	0.70

*The Dependent variable is the change in log population counts. Each regression contains the same control variables as column (6) of table 1. Robust standard errors in parenthesis are clustered at the level of 18 Finnish provinces. *** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 3. Imports from China and Employment Status of Working-Age Population within Sub-Regions, 1995–2007: OLS Estimates.

	Employment others	Employment Manufacturing	Unemployed	Outside labor force
	(1)	(2)	(3)	(4)
Δ import exposure	-0.00065	0.00234*	-0.00355	0.00051
	(0.00149)	(0.00121)	(0.00410)	(0.00078)
Controls	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes
Observations	134	134	134	134
R-squared	0.75	0.60	0.40	0.84

*The dependent variable is the change in log population counts. Each regression contains the same control variables as column (6) of table 1. Robust standard errors in parenthesis are clustered at the level of 18 Finnish provinces. *** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 4. Wage and Employment Changes in Manufacturing, 1995–2007: OLS Estimates.

	Manufacturing				Private Sector
	All	Low-skilled	High-skilled	High-skilled/Low- skilled	All
	(1)	(2)	(3)	(4)	(5)
Dependent variable the change in log earning					
Δ import exposure	0.00104***	-0.00043	0.00216***	0.00034***	-0.00046
	(0.00035)	(0.00036)	(0.00041)	(0.00007)	(0.00051)
R^2	0.40	0.10	0.45	0.22	0.29

*In columns (1)-(3) and (5) dependent variable is the change in log monthly earnings of the group indicated in column heading. In column (4), dependent variable is the change in high-skilled relative wages. Each regression contains the same control variables as column (6) of table 1. Robust standard errors in parenthesis are clustered at the level of 18 Finnish provinces. *** p<0.01, ** p<0.05, * p<0.1*

References

Acemoglu, D. and Autor D. (2010). “Skills, tasks and technologies: Implications for employment and earnings.” In O. Ashenfelter and D. Card (eds.), Handbook of Labor Economics, Volume 4B. Amsterdam: North-Holland, pp. 1043–1171.

Autor, D., Dorn, D. and Hanson, G. (2013). The China Syndrome: Local Labor Market Effects of Import Competition in the United States. American Economic Review 2013, 103(6): 2121–2168.

Balsvik, R., Jensen, S. and Savanes, K. (2015). Made in China, sold in Norway: Local Labor Market Effects of an Import Shock. Journal of Public Economics, July 2015, 127, 137–144.

Böckerman. P., Laaksonen, S. and Vainiomäki, J. (2013). Is there job polarization at the firm level?. Tampere University, School of Management and Business, Economics, Working Papers 91.

Dauth, W., Findeisen, S. and Suedekum, J. (2014). The Rise of the East and the Far East: German Labor Markets and Trade Integration. Journal of the European Economic Association, December 2014, 12(6):1642–1675.

Goldsmith-Pinkham, P., Sorkin, I. and Swift, H. 2020. “Bartik Instruments: What, When, Why, and How.” American Economic Review, 110 (8): 2586–2624.

IMF (2018). Regional Labor Mobility in Finland. IMF working papers, November 2018, No. 18/252.

Laamanen, J.-P. (2017). Homeownership and the Labour Market: Evidence from Rental Housing Market Deregulation, Labour Economics, 48, 157–167.

Malgouyres, C. (2017). The impact of Chinese Import Competition on the Local Structure of Employment and Wages: Evidence from France. Journal of Regional Science, June 2017, 57(3), 411–441.

Stock, J. and Yogo M. (2005). Testing for Weak Instruments in Linear IV Regression. In: Andrews DWK Identification and Inference for Econometric Models. New York: Cambridge University Press; 2005. pp. 80–108.