Global Competition and UK Labour Market Adjustment*

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Abstract

We explore the adjustment of local labour markets in the UK to the sharp rise in import competition from low-wage countries since the early 2000s. We find that the increase in UK imports from China and Eastern Europe accelerated the long-term trend decline in UK manufacturing jobs and led to a short-term increase in the unemployment rate in exposed areas. But, many workers in these areas found lower paid low-skilled jobs outside manufacturing, mitigating the effects of import competition on joblessness. Local labour markets that were most exposed to import competition shrank in size relative to other areas as highly educated workers left behind these parts of the UK.

JEL: F16, H53, J23, J31, R11.
Key words: Import Competition, De-Industrialisation, Labour Mobility

*Correspondence: f.foliano@ucl.ac.uk, rebecca.riley@kcl.ac.uk. We are grateful for discussions with Will Abel, Richard Blundell, Michael Gasiorek, S. G. Brian Henry, Gavin Kelly, Peter Levell, Jan Mohlmann, Marta Paczos, L. Alan Winters, Garry Young and participants at workshops ("Brexit Up Close", ESCoE-NIESR; "Brexit and Trade Choices in Europe and Beyond", CEPR-NIESR; "Jobs: Causes and Consequences of Brexit", ESRC-Nuffield-NIESR) and seminars at the CPB Netherlands Bureau for Economic Policy Analysis, the University of Sheffield, the University of New South Wales and the Institute for Fiscal Studies. We thank Jessica Ebner-Statt for research assistance. We are particularly grateful for the help provided by the ONS Geography team. The project has been funded by the Nuffield Foundation, but the views expressed are those of the authors and not necessarily the Foundation.

1 Introduction

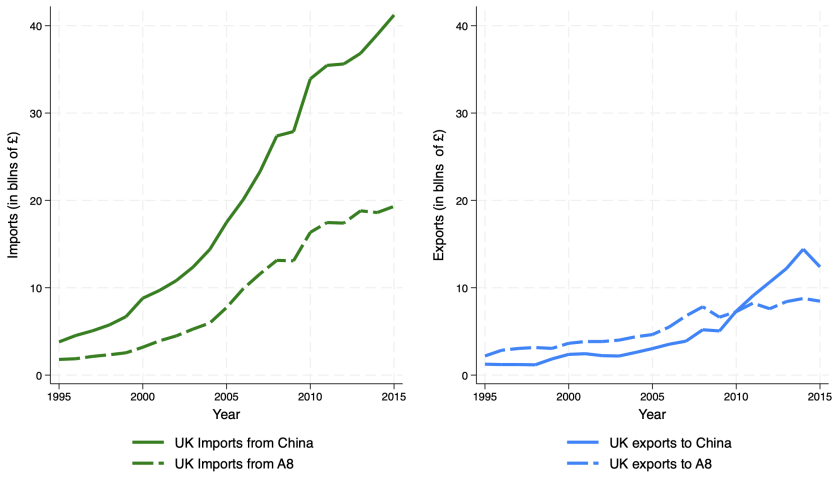
The past few decades have witnessed a significant increase in cheap imports from low-wage economies flowing into advanced economies. This trend, part of broader global economic integration, has sparked growing concerns about the uneven distribution of trade benefits across the population in developed countries (Autor *et al.*, 2013; Balsvik *et al.*, 2015; Dauth *et al.*, 2014; Costa *et al.*, 2016; Greenland *et al.*, 2019). This interest has been further stoked by political change in both the US and Europe, which has, at least in part, played to a narrative of winners and losers from globalisation, see e.g. Rodrik (2018). In this paper we contribute to this literature and debate, examining the effects on local labour markets in the UK, in both the shorter and longer term, of the increases in trade with China and East European countries that followed changes in trading agreements in the early 2000s.

Over the last twenty years, the UK experienced a significant increase in goods imports from China and Eastern European countries. Figure 1 shows that between 2000 and 2015 the share of UK goods imports from China, in overall goods imports, rose by a factor of 5 and from the A8 countries by a factor of 6. At the same time the share of exports to China rose by a factor of 4 whereas the exports to A8 countries did not experience a dramatic change. Similar changes in trade patterns are evident in many other countries following China's accession to GATT/WTO in 2001 and the collapse of the Soviet block. China's accession to GATT/WTO happened at the end of long period of progressive liberalisation of foreign trade and investment that determined radical structural changes in the Chinese economy and paved the way for a sustained increase in productivity that resulted in a global supply shock.[1] Similarly, eight of the ten countries that accessed the European Union in

[1] Branstetter and Lardy (2006) describe the changes that led to a greater openness since the 1970s; after abandoning the planned economy, China introduced very high tariffs to imports and restricted further the international trade with quotas and licences. From 1978 however China started to slowly open to foreign trade by reducing the tariffs and allowing more domestic firms to engage in foreign trade. A more radical liberalization affected the imports of goods used in the manufacturing sector: in 1987, the government allowed duty-free import of all raw materials, parts, and components used in the production of goods for export and at the same time introduced an increasingly more open regime for FDI. All these reforms prepared the ground for the WTO accession that required China to reduce its tariffs to 8.9% on industrial product and completely eliminate quotas, licensing and non-tariffs barriers within a short period of time.The only exception was the imports of cars on which China was allowed to maintain a high tariff of 25%. The final set of liberalization commitments that China accepted to oblige was far more stringent than the terms agreed by other developing countries who joined the WTO in the same years. The immediate effect of the accession was

2004, namely the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia (henceforth the A8), had started their process of liberalisation in the 1990s by joining the WTO. In the same years the labour productivity of Eastern European countries increased and caught up with the productivity of Western European countries (Dauth *et al.*, 2014), leading to another supply shock affecting in particular other European economies.

Figure 1: UK Imports and Exports as a share of totals, 1995-2015

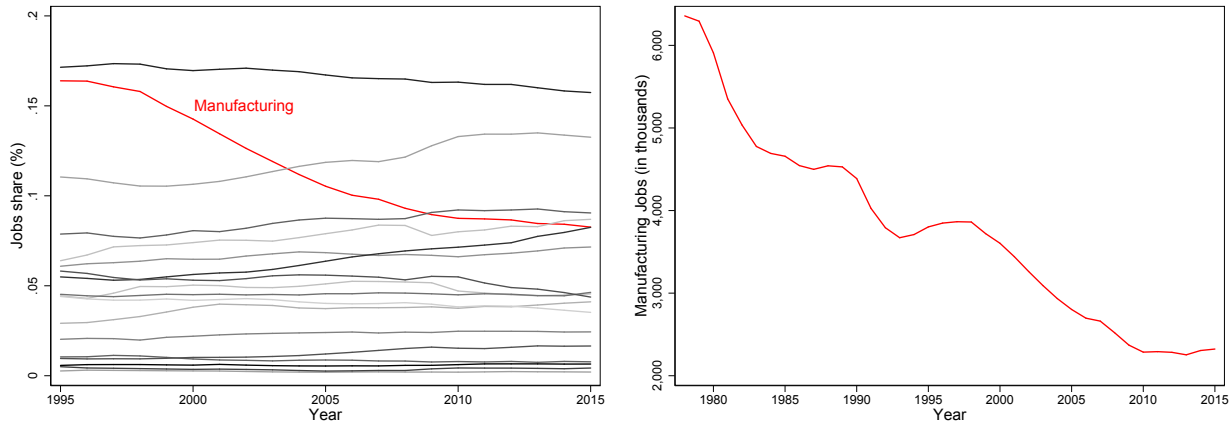


Note: data from OECD STAN Database for Bilateral Trade in Goods.

At the same time the share of UK jobs in manufacturing fell drastically: figure 2a shows that this share more than halved in the period 1995-2015 decreasing from 16% to 7% and that manufacturing was the only UK sector experiencing such decline. The manufacturing sector shrunk over this period as part of a longer term decrease in employment in the sector as shown by figure 2b, reflecting many factors including technical change, changing tastes and the progression to a services based economy. Over a similar period of time, areas that in the early 2000s presented a greater share of manufacturing jobs experienced a lower growth in the population with college degrees, as shown in figure 3 exacerbating the already existing

a greater market access through the most-favored-nation (MFN) treatment granted to China by other WTO members on a permanent basis.China had already been granted the MFN access by some trade partners such as the US, however the accession guaranteed the normalisation of this status and helped improve investor confidence in China's future exports flows. The results was an increase in both, the intensive and extensive margin of trade.

Figure 2: Jobs by industry (Sections A to R in SIC 2007)



(a) (b)

Note: figure a reports jobs share and figure b number of jobs by sector in the UK based on ONS data on Employee jobs by industry (JOBS03) for all available SIC 2007 sections.

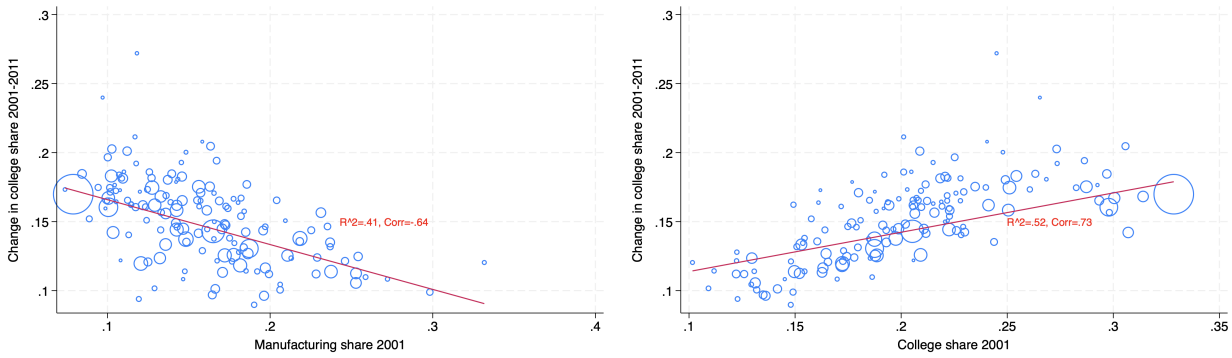
differences in skills across areas.

In this paper investigate the impact of the China+A8 trade shock to the UK and we ask the following research questions: first, how much did the trade shock contribute to the decline in manufacturing jobs? Secondly, how did local labour markets adjust over time to this trade shock? Finally, did the increase in global competition contributed to a geographical polarisation of skills?

We adopt the theoretical and empirical framework pioneered by Autor *et al.* (2013) to investigate the effect of these recent trade shocks on UK manufacturing employment and other local labour market outcomes. We define local labour markets as Travel to Work Areas (TTWAs hereafter). Local labour markets are considered differentially exposed to trade competition according to their initial employment structure. Identification of the parameters of interest - the effect of an increase in trade exposure on changes in UK labour market outcomes - relies on the strong assumption that changes in local trade exposure are driven by supply and demand shocks external to the state of the economy in local labour markets. As unaccounted for changes in local economic conditions can drive both increases in trade exposure and changes in employment and wages, we adopt a shift-share methodology that allows us to isolate the exogenous component of trade shocks and give a causal interpretation to our estimates.

Existing evidence, reviewed later in this paper, has shown that the the process of labour

Figure 3: Geographical polarisation of graduates, 2001-2011



(a) (b)

Note: data from Census 2001 and 2011, TTWAs 2001.

market adjustment to import competition from low-wage countries, as well as labour mobility triggered by the shock, differs according to the importing country's initial institutional settings, economic structure and manufacturing base (Autor *et al.*, 2013; Dauth *et al.*, 2014; Costa *et al.*, 2016; Donoso *et al.*, 2015; Greenland *et al.*, 2019; Faber *et al.*, 2022). Our results suggest that the way that UK labour markets adjusted to the trade shocks described above is in many ways different to the experience elsewhere. We find that any resulting joblessness arising with the increase in UK trade exposure to China and Eastern Europe was short-lived. Decreases in average weekly pay in those areas more exposed to competing imports, particularly in the long-term and in sectors outside manufacturing, helped counter joblessness in the longer term. The jobs that were created were mostly in low-skilled occupations outside manufacturing. These results suggest a gradual adjustment of the labour market to a structural change in the economy as workers moved from the manufacturing sector to low skilled services after a period of unemployment. These results are in line with the predictions of the theoretical model in Autor *et al.* (2013). Unlike other studies however, we obtain strong evidence of *deskilling* in those areas more affected by a change in trade exposure. The proportion of college educated people grew less in those areas more affected by a rise in import competition. High skilled employees living in areas more affected by import exposure were more likely to leave and relocate in areas less affected by this change in local competition. This result is consistent with the conclusions of Langella and Manning (2022) who find that individuals who are more educated are more likely to move away when faced with negative economic conditions. We suggest these patterns of adjustment reflect an economy with a

relatively flexible and mobile labour market, which was generally expanding[2].

Our findings regarding population decline and the deskilling of areas more exposed to import competition are important. First, labour mobility effects have not generally been found in similar studies. An exception is the recent study by Greenland *et al.* (2019) for the US. There, labour mobility and population decline mainly occurred as low-skilled workers moved away from exposed areas. Our findings for the UK suggest that low-skilled workers found jobs outside manufacturing in the same area and did not move away. Instead, it was the more highly educated workers that left exposed areas. Thus these trends in globalisation contributed to an increasing geographical polarisation of the UK workforce in terms of education. Second, these findings have important implications for understanding the relationship between globalisation trends and the Brexit vote suggesting that the rise in import competition mainly affects the local Leave vote through its effects on the labour mobility of highly educated workers who simply moved away from exposed areas (and voted) elsewhere in the UK. Thus, it is difficult to extrapolate from these findings to a significant *aggregate* effect of globalisation on the UK decision to leave the EU.

The rest of the paper is structured as follows: section 2 describes the measures of trade exposure employed in the empirical analysis; section 3 explains the empirical strategy employed for the analysis; section 4 details data and relevant descriptive statistics; section 5 presents the results while section 6 reports some robustness checks; we then conclude in section 7.

2 Measures of trade exposure

To study the impact of global competition in the UK we follow the conceptual framework introduced by Autor *et al.* (2013) and construct a measure of import competition per-worker that varies across local labour markets through their initial industry specialisation. The definition of this measure of import competition is the following:

$$\Delta Exp_{r,t+1} = \frac{1}{L_{r,t}} \sum_{j} \frac{L_{rj,t}}{L_{j,t}} \Delta M^{Ch+A8}_{UK,j,t+1} \tag{1}$$

Where $\frac{L_{rj,t}}{L_{j,t}}$ is the share of local market r in UK employment in industry j at the start of the period; $\Delta M^{Ch+A8}_{UK,j,t+1}$ is the observed change in UK imports from China and A8 between

[2]UK employment rose by 7 per cent between 2000 and 2007 and by another 7 per cent between 2007 and 2015 despite the financial crisis as labour supply has continued to grow.

t and $t+1$; $\frac{1}{L_{r,t}}$ is the local market i's employment. In our empirical application t is always 2000/2001 whereas $t+1$ is either 2007/2008, when we define the measure of change in trade exposure for the medium term, or 2014/2015 for the measure of change in trade exposure in the long-term.

A more comprehensive measure of trade exposure could also include the competition faced by UK goods in third markets. The growth of China and the A8 countries implied that their goods were likely to replace UK goods not only in the domestic market but also in foreign markets. We therefore consider an additional measure of import competition that captures the growth of third markets imports from China and the A8 weighted by the initial share of spending of these foreign markets in UK goods:

$$\Delta Exp_{r,t+1} = \frac{1}{L_{r,t}} \sum_j \frac{L_{rj,t}}{L_{j,t}} \left(\Delta M^{Ch+A8}_{UK,j,t+1} + \frac{X^{UK}_{All,j,t}}{X_{All,j,t}} \Delta M^{Ch+A8}_{All,j,t+1} \right) \quad (2)$$

Where $\Delta M^{Ch+A8}_{All,j,t+1}$ is the change in imports from China and the A8 from all other trade partners multiplied by $\frac{X^{UK}_{All,j,t}}{X_{All,j,t}}$ that is the share of UK goods in these trade partners'expenditures at the beginning of the period. We consider the changes in imports from China and the A8 countries because, unlike what has been found for other western economies, these sets of imports where highly correlated. The liberalisation and increase in productivity in China and the A8 exogenously determined a demand shock. We take this into account in our third measure of *net* import penetration where we subtract the growth in UK exports to China and A8 from the measure of of import competition:

$$\Delta Exp_{r,t+1} = \frac{1}{L_{r,t}} \sum_j \frac{L_{rj,t}}{L_{j,t}} \left(\Delta M^{Ch+A8}_{UK,j,t+1} + \frac{X^{UK}_{All,j,t}}{X_{All,j,t}} \Delta M^{Ch+A8}_{All,j,t+1} - \Delta X^{UK}_{Ch+A8,j,t+1} \right) \quad (3)$$

Here $\Delta X_{UK,j,t+1}$ is the change in UK exports to China and A8 between t and $t+1$.

The main measure of import competition we will consider in our empirical study is the one defined by equation 1. To present a comprehensive picture of the effect of global competition on the outcomes of intererst We also consider and report results for the alternative measures defined by equations 2 and 3.

Finally we note that the increase in productivity in China and A8 countries is likely to have boosted their production of intermediate goods and lowered their costs. UK firms may have taken advantage from better and cheaper inputs becoming more productive and, as a consequence, increasing their demand for employment. We consider this in an additional measure of trade exposure where imports of intermediate goods are not included in the total

change of imports from China and A8 countries. The results for this additional measure are not reported in the paper, as they are in line with main findings, but are available upon request.

3 Empirical strategy

3.1 Model and Identification Strategy

The aim of our main empirical analysis is to consistently estimate the effect of an increase in trade exposure on a wide range of labour market outcomes and population growth at TTWA level while controlling for the initial conditions of the local labour markets and their changes over time. Specifically we estimate the following equation for local labour market outcomes and population growth:

$$\Delta y_{r,t+1} = \alpha + \beta \Delta Exp_{r,t+1} + \boldsymbol{X_r'\phi} + \epsilon_{r,t+1} \quad (4)$$

Here X_r includes the following controls: start of period ratio of manufacturing jobs per head, the share of employment in agriculture, the share of population with college degrees, the share of workers paid at or below the National Minimum Wage, the share of foreign born and change in share of foreign born over time. The unit of analysis in the study of local labour market outcomes and local population growth is TTWA.

The identification of β relies on the exogenous nature of the growth of China and the A8 as a consequence of their liberalization and increased productivity. However it is still possible that part of the growth in trade exposure is driven by local economic shocks that would also affect labour market outcomes. To address this possible empirical challenge we use the shift-share IV approach. The measures of trade exposure are instrumented by a weighted average of the change in trade with China and the A8 of other high-income countries (the *shift*) where the weights are now lagged local industry specialisations (the *shares*). The instrument for the measure in 3 is described in the following equation:

$$\Delta Exp^{Instr}_{r,t+1} = \frac{1}{L_{r,t}} \sum_j \frac{L_{rj,t-1}}{L_{j,t-1}} \left(\Delta M^{Ch+A8}_{Oth,j,t+1} + \frac{X^{Oth}_{All,j,t}}{X_{All,j,t}} \Delta M^{Oth+A8}_{All,j,t+1} - \Delta X^{Oth}_{Ch+A8,j,t+1} \right) \quad (5)$$

The intuition behind this identification strategy is the following: by using changes in industry trade of high income countries other than the UK the instrument isolates the component of trade exposure determined by exogenous supply and demand shocks of China and A8

countries that affected all their trade partners at the same time. We construct the instrument by using changes in sectoral trade of the EU15 countries minus the UK.[3] We choose these countries because, similarly to the UK, they were affected by the A8 supply shock as well as the China supply shock. Finally the change in trade is weighted by lagged start of the period sectoral employment shares to address the case of employment reacting in anticipation of trade shocks. We use 1997 sectoral employment local shares as lagged local industry specialisations.

3.2 Individual level analysis

In order to further explore and understand the impact of import penetration on population growth we conduct an individual level analysis by using a panel of employees who were observed between 1998 and 2011. Our aim is to estimate the impact of import penetration by workers' quality to disentangle one of the possible drivers of the population changes: the internal migration of qualified workers. To do so we first estimate workers fixed effects as a proxy for work ability by using the full panel of employees and the following model:

$$w_{i,r,t} = \alpha + \boldsymbol{Z_i'\gamma} + \eta_i + \theta_r + \epsilon_{i,r,t} \tag{6}$$

Where $w_{i,r,t}$ is log of wages of worker i living in market r at time t and $\boldsymbol{Z_i'}$ includes age, age squared, loss of pay and indicators for female, low skill occupations, sector, type of contract and part-time job; θ_r are the local labour market fixed effects and η_i are the worker fixed effects. We exploit the heterogeneity of workers by estimating the effect of import penetration on the probability of moving across TTWAs, every three years between 1998 and 2011, for each quartile of work ability with the following linear probability model:

$$\Delta I_{i,t+1} = \alpha + \beta \Delta Exp_{r,t+1} + \boldsymbol{Z_i'\beta} + \boldsymbol{X_r'\gamma} + \eta_i + \epsilon_{i,t+1} \tag{7}$$

The dependent variable $\Delta I_{i,t+1}$ is a binary indicator that equals one when the TTWAs where the worker i lived in 1998 and then again in 2011. $\boldsymbol{X_r'}$ includes additional controls at TTWA level: the start of period ratio of manufacturing jobs per head, share of jobs in agriculture, share of population with degrees, share of working age population that are female, share of population above working age, share of employees in low-skill occupations, share of workers paid at or below the National Minimum Wage, share of foreign born and the change in the share of foreign born.

[3] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden

4 Data and descriptive statistics

Our analysis uses the 2001 definition of Travel-to-Work Areas (TTWAs) as local unit of analysis: the borders of these areas are constructed such that, according to the UK Census, at least 75% of working residents work in the area and at least 75% of workers are resident in the area. This definition guarantees a sufficient overlap between area of residence and of work, approximating the concept of a local labour market. In our analysis we include all 232 TTWAs of England, Wales and Scotland.[4] To study the effect of global trade on local labour market outcomes, population shifts and voter behaviour we combine data from several different data sources.

4.1 Trade

To construct information on net import penetration we rely first and foremost on Commodities Trade Statistics (COMTRADE), a database disseminated by the United Nations Statistical Division and widely used in the analysis of international trade. This dataset is accessible through the UN website or via the WITS platform maintained by the World Bank.[5] COMTRADE include data on USD values and quantities (in different units) of yearly trade flows, both imports and exports, as reported by individual countries to the UN. Reported flows are disaggregated up to the 6-digit level of the Harmonised Standard Classification (HS6) of products and for each product-specific import flow it is possible to identify the country of origin. There are some well known issues with COMTRADE data. First, for some trade flows different values are reported by the exporting and by the importing country. Second, the values of the reported detailed commodity data do not necessarily sum up to the total trade value for a given country. As is relatively standard, we rely on trade values as reported by the importing country. In our analysis we consider averages over two years to minimise the erratic nature of the trade data (particularly in combination with local geographies). We use standard concordance tables (Pierce and Schott, 2009) to associate the HS commodity codes of UK import flows in COMTRADE to different four-digit industry groups. In analysing the impacts of import competition from China on the UK economy the UN COMTRADE data have one particular peculiarity that needs to be considered. There is a sharp shift in reported UK imports from China between 1999 and

[4] We exclude instead the 11 TTWAs of Northern Ireland because for this country the available geographical indicators not always allow us to aggregate information at this level of local geography.

[5] Data can be accessed at: http://comtrade.un.org/data/

2000 which is sustained thereafter. This most likely reflects a change in the treatment of imports from Hong Kong that originate in China, and is discussed in detail in (Baranga, 2017), who proposes a methodology for optimising the information reported by exporter countries and importer countries, which minimises this discontinuity. For this reason here we only consider the COMTRADE data from 2000 onwards, avoiding spurious changes in the level of UK imports from China.

4.2 Local employment specialization

The Business Structure Database (BSD)[6] is a business micro-dataset maintained by the Office of National Statistics. It provides basic information on employment and turnover for a near census of UK businesses on an annual basis since 1997. The sources of this information varies for different types of firm and is described in Evans and Welpton (2009). For our purposes the benefit of this database is that it allows us to construct a detailed picture of the industrial structure of jobs for low level geographies. The database contains employment (or rather jobs) and industry information for plants that operate within the firm. Unlike firms, plants have a fixed physical geographical location, and can easily be assigned to a particular area of the country. The BSD contains plant level part-post codes and super output areas, which allows us to assign plants to TTWAs.

We construct the main measures of local area import and export exposure by using this database for the years 2000/2001 in combination with detailed trade data at the four-digit ISIC Rev.3 level. In constructing the instrumental variables described in the methodology section we produce detailed local area industry structures by using information from the 1997 BSD, that is the earliest available database.

4.3 Labour market outcomes

We use the UK Labour Force Survey (LFS)[7] to create a series of local labour market statistics, including the population of working age, it's skill and gender composition, and measures of the foreign born population. The latter is a relevant control variable because the surge in

[6]Office for National Statistics (2019) Business Structure Database, 1997-2018: Secure Access. [data collection]. 10th Edition. UK Data Service SN: 6697. http://doi.org/10.5255/UKDA-SN-6697-10

[7]Office for National Statistics, Social Survey Division, Northern Ireland Statistics and Research Agency, Central Survey Unit (2019). Quarterly Labour Force Survey, 1992-2018: Secure Access. [data collection]. 15th Edition. UK Data Service SN: 6727. http://doi.org/10.5255/UKDA-SN-6727-16

import competition was also accompanied by a sharp increase in immigration to the UK, in particular from the A8 countries. The LFS has been used extensively to investigate labour market issues in the UK. The LFS is a quarterly survey of approximately 61,000 households across the UK with a 5-quarter rolling panel design. We use information at the individual level aggregating up to our local unit of analysis. We do not use the LFS to construct our main measures of import exposure and the instrumental variables described in the methodology section. This is because the relatively small sample sizes limit granular analysis and because industry is self-reported.

We use the UK Annual Survey of Hours and Earnings (ASHE)[8] to create a series of local labour market wages an employee jobs by industry sector and occupation. The ASHE is based on a one per cent sample of employees, but the sample size in most years is roughly 160,000 employees. The ASHE data is largely sampled from PAYE records and is preferred to the LFS for the purposes of constructing wage data as it is thought to be more precise (employer reported) and due to its larger sample size.

Finally we create historic measures of total and manufacturing job growth at local area level by using extracts of census data at ward level for the years 1981 and 1991.[9]

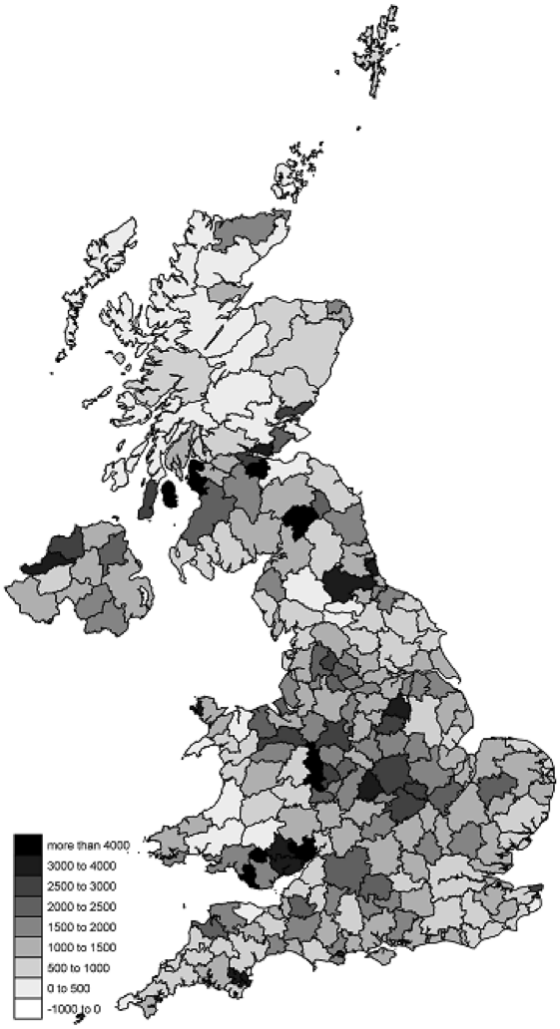
4.4 Population growth

In the analysis at TTWA level we use measures of local population changes constructed by using the LFS: this survey includes information on respondents detailed qualifications and it allows us to define a measure of local population change by qualification levels. To understand whether the effect of import competition on the population change is driven by the migration of skilled workers we use the longitudinal subsample of the ASHE that includes the same individuals from year to year. In particular we focus on the panel of employees who were continuously observed between 1998 and 2011 and for which we have information on wages, gender, tenure and postcode of residence and work.

[8]Office for National Statistics (2019). Annual Survey of Hours and Earnings, 1997-2018: Secure Access. [data collection]. 14th Edition. UK Data Service SN: 6689. http://doi.org/10.5255/UKDA-SN-6689-13

[9]Aggregate data at ward level were accessed through the UK Data Service Census Support web-based interface Casweb at `http://casweb.ukdataservice.ac.uk`

Figure 4: Change in import exposure to China and the A8 (2000/01 to 2014/15)



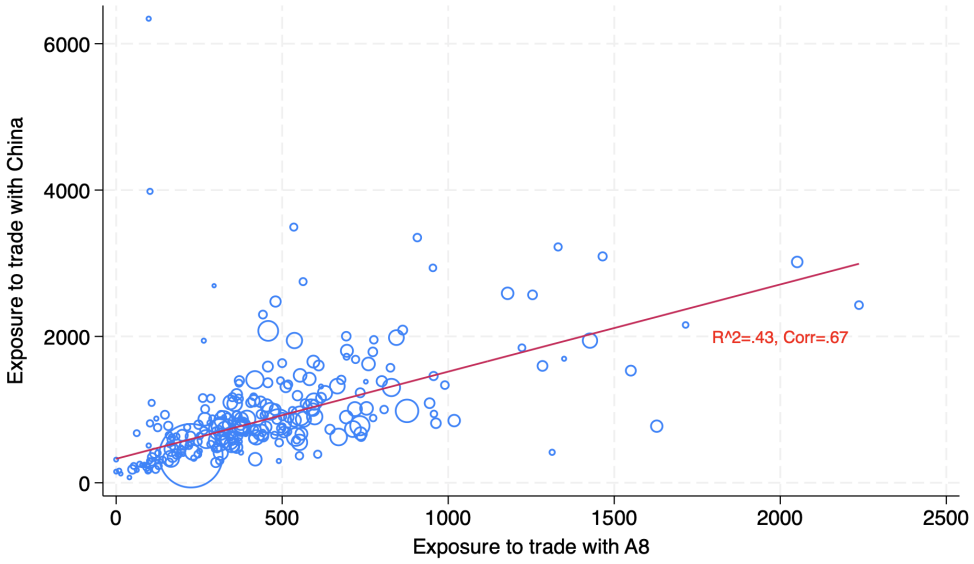
Note: £ per job.

4.5 Data descriptives

Table A1 in Appendix A presents the unweighted and weighted descriptive statistics of the main variables where the unit of observation is TTWA. Changes are measured between 2000/2001 and 2014/2015 and levels refer to 2000/2001. The unweighed mean (median) import penetration shock per worker across TTWA is £1433 (£1164), the mean import penetration shock per worker that included competition in third markets was £1871 (£1541)

and the mean net import penetration shock per worker was £1494 (£1138).The difference between mean and median statistics for the import penetration measures highlights that few TTWAs experiences very big shocks while weighted means and medians are similar to the unweighted ones. Figure 4 shows the geographic variation of the change in import exposure between 2001 and 2015 across TTWAs. The areas with biggest shocks - above £4000 per worker - are found in a few areas scattered across the country whereas most areas experience shocks below £1000 per worker. Finally, Figure 5 illustrates that China and A8 shocks are highly spatially correlated, justifying the decision to consider the combined changes in imports in the empirical analysis rather than analyzing the two shocks separately.

Figure 5: Correlation between China and A8 import exposure measures



Note: correlation between exposure to trade with China and A8, measures at TTWA level.

5 Results

This section summarises the results of our empirical analysis. We present evidence on the effects of a change in UK trade exposure to China and the A8 countries on jobs in the manufacturing sector, mean and median weekly wages, labour market status, population growth, and employees decision to move by occupation and sector. For each outcome variable we present two sets of results: one for the change over the period 2000/2001 to 2006/2007

and one for the period 2000/2001 to 2014/2015. Estimates are reported for the main measure of trade shock, the change in domestic import exposure, and for two additional measures: change in domestic and international import exposure and net import exposure.

Table 1: Impact of change in import competition since 2000/2001 on jobs (2SLS)

	OLS			2SLS		
	Manu Jobs	Non-manu Jobs	All Jobs	Manu Jobs	Non-manu Jobs	All Jobs
Imports (2000/01 to 2006/2007)	-0.006**	0.002	-0.018**	-0.114***	0.035**	-0.023
	(0.003)	(0.007)	(0.008)	(0.039)	(0.016)	(0.015)
Domestic and International Imports	-0.005**	0.000	-0.016**	-0.079***	0.022**	-0.017*
	(0.002)	(0.006)	(0.005)	(0.027)	(0.010)	(0.010)
Net Imports	-0.005**	-0.001	-0.016**	-0.092***	0.027**	-0.019*
	(0.002)	(0.007)	(0.006)	(0.032)	(0.010)	(0.010)
Imports (2000/01 to 2014/2015)	-0.008***	0.009	-0.014	-0.133***	0.029**	-0.027**
	(0.002)	(0.009)	(0.009)	(0.030)	(0.011)	(0.012)
Domestic and International Imports	-0.006***	0.004	-0.011*	-0.092***	0.031**	-0.020**
	(0.001)	(0.006)	(0.006)	(0.000)	(0.012)	(0.009)
Net Imports	-0.005***	0.003	-0.010	-0.105***	0.010***	-0.018*
	(0.001)	(0.007)	(0.006)	(0.021)	(0.002)	(0.010)
N	232	232	232	232	232	232

Note: Unit of observation is the travel-to-work-area (2001 definition). Northern Ireland excluded. Each regression includes 232 observations. COMTRADE, BSD, LFS and ASHE data. Robust standard errors in parentheses, clustered by region. *** 1%, ** 5%, *10% significance. All regressions include a constant. All regressions weighted by the start of period population of working age. Additional controls include the start of period ratio of manufacturing jobs per head, share of jobs in agriculture, share of population with degrees, share of employees in low-skill occupations, share of workers paid at or below the National Minimum Wage, share of foreign born and the change in the share of foreign born. 2SLS estimation. Reported in this table are the reduced form coefficients on the outcome measures in the column headings. Measures of import competition from China and the A8 (Imports, Domestic and International Imports, Net Imports). The first stage regression includes the change in the equivalent measure of import competition for EU countries over the same time period to the UK population of working age in 1994.

The first set of results shows the effect of import competition in the medium-term whereas the second set represents the effect over the long term. Together these results offer a picture of how the labour market gradually adjusted to the economic shock. Table 1 reports estimates of the effect of import exposure on manufacturing and non-manufacturing jobs and reports both the estimates from the OLS and the 2SLS model. The estimates of effects on manufacturing jobs in the 2SLS model are consistently greater in magnitude than the estimates from the OLS model indicating that the OLS estimates are biased downwards as a result of unobservable local economic shocks that affected the trade exposure and the outcome of interest. We find a similar pattern of differences between OLS and 2SLS results and across the three measures of trade exposure for the remaining outcomes, therefore hereafter we present only estimates of the 2SLS model for the change in domestic import exposure. The 2SLS estimates in

table 1 shows that for a £1000 increase in the trade exposure per worker manufacturing jobs decreased by 9 to 11.4 log points in the medium-term and by 10.5 to 13.3 log points in the long-term. Non-manufacturing jobs increased by around 3 log points in the medium term and between 1 to 3 log points in the long term. Small negative coefficients for all jobs - a decrease of around 2 log points - is observed both in the medium and long term.

Table 2: Labour Market Status (2SLS))

	Unemployment rate	Inactivity rate	Employment rate
To 2006/2007	0.007***	-0.002	-0.005
	(0.003)	(0.009)	(0.009)
To 2014/2015	0.001	0.012	-0.013
	(0.002)	(0.008)	(0.008)
N	232	232	232

Note: Unit of observation is the travel-to-work-area (2001 definition). Dependent variable in logs. All regressions weighted by 2001 population of working age. Additional controls include the start of period ratio of manufacturing jobs per head, share of jobs in agriculture, share of population with degrees, share of employees in low-skill occupations, share of workers paid at or below the National Minimum Wage, share of foreign born and the change in the share of foreign born. 2SLS estimation. Reported in this table are the reduced form coefficients on the outcome measures in the column headings.

For a £1000 increase in the trade exposure per worker unemployment rose by 0.7 log points in the medium term, as reported by table 2. This negative effect of an increase in trade exposure dissipates in the long term while inactivity rate and employment rate do not appear to be affected in a statistically significant way by the trade shock.

Table 3 reports the results on the effects of trade exposure per worker on the change in log employees by sector and occupation. This additional evidence uncovers the heterogeneous movements across sectors and occupations of workers in local labour markets affected by trade shocks. A £1000 increase in trade exposure per worker determines a decline in the number of employees in the manufacturing sector over the medium term to 23 log points, and the long-term, by 19.8 log points. At the same time the number of employees in the non-manufacturing sectors (the much larger sector) increases by 5.7 log points over the medium-term, and by 5.5 log points over the long-term. The results by occupation offer an interesting picture of the partial adjustments of the labour market over time. In local labour markets more affected by trade exposure the number of employees in low skilled occupations decreases in the manufacturing sector while it increases in the non-manufacturing sectors in

Table 3: Employment by sector and occupation (2SLS)

	Manufacturing	Non-manufacturing
	All occupations	
To 2006/07	-0.230**	0.057*
	(0.094)	(0.032)
To 2014/15	-0.198***	0.055*
	(0.047)	(0.032)
	Low skilled occupations	
To 2006/07	-0.206*	0.081*
	(0.12)	(0.045)
To 2014/15	-0.134***	0.091***
	(0.051)	(0.033)
	Other occupations	
To 2006/07	-0.224***	0.043
	(0.086)	(0.029)
To 2014/15	-0.197***	0.035
	(0.055)	(0.033)
N	232	232

Note: Unit of observation is the travel-to-work-area (2001 definition). Dependent variable in logs. All regressions weighted by 2001 population of working age. Additional controls include the start of period ratio of manufacturing jobs per head, share of jobs in agriculture, share of population with degrees, share of employees in low-skill occupations, share of workers paid at or below the National Minimum Wage, share of foreign born and the change in the share of foreign born. 2SLS estimation. Reported in this table are the reduced form coefficients on the outcome measures in the column headings.

the medium-term and the long-term. At the same time employees in other occupations of the manufacturing sector decline more drastically than the ones in low skilled occupations while the number of non-manufacturing employees in other occupations does not experience a statistically significant change.

Table 4 presents the results of TTWA-level regressions of differences in log mean and median weekly wages. The estimates for the effects of an increase in the trade exposure shock per worker on earnings show an increase in the medium-term in manufacturing earnings, reflecting the nature of jobs that are lost: for an increase of £1000 in trade shock per worker

mean wages rise by 2.4 log points and median wages by 3.7 log points. This positive effect disappears in the long-term. Conversely earnings in non-manufacturing sectors decrease both in the medium and long-term: for an increase of £1000 in trade shock per worker mean wages decrease by 1.6 to 2.3 log points in the medium-term and by 2.3 to 4.1 log points over fifteen years; median wages decrease respectively by 2.1 to 3.7 log points. In the medium-term the increase in manufacturing wages reflect a compositional effect where workers left in the sector are proportionally more the ones with higher earnings. Manufacturing workers that lost their job partly move to other sectors driving a negative change in wages of these sectors. The negative effect on non-manufacturing wages persists and widens when more workers move to non-manufacturing sectors. In the long-term the overall effect is to depress wages, consistent with the absorption of workers into lower paid jobs. These possible adjustments are supported by the results in table 2 that show a medium-term increase in unemployment that disappears in the long-term as workers who lost their jobs in the manufacturing sector find jobs in other sectors, driving a negative change in wages, or move to inactivity.

An increase in import competition could also determine population shifts across local labour markets. While Autor *et al.* (2013) and Dauth *et al.* (2014) find no effects of an increase in trade exposure shocks per worker on changes in working age population in the US we do find evidence of population shifts in response to an increase in import competition from China and the A8 countries. Our results are in line with more recent studies on local effects of employment shocks (Faber *et al.*, 2022). Results in table 5 show that the working age population grew less in areas more affected by trade shocks: an increase of £1000 in the trade shock per worker results in a decrease of 3.1 log point in the growth of working age population in the medium-term, and by 2.2 in the long-term. Another result reported in the table is that this negative effect on population growth is greater for individuals with college degrees both in the medium-term and long-term (respectively 8.5 log points and 8.1 log points) and still negative but somewhat smaller when we consider the population of working age without college degrees only in the medium-term (2.3 log points). These results show that over time individuals of working age moved away from (or they avoided to move to) areas more affected by import competition and more educated individuals did so proportionally more than less educated ones. This is a novel result in the literature that studies the effect of trade shocks and is in line with a new study on the long-term adjustments to negative economic shocks in UK local labour markets that shows how more educated individuals are more likely to move away from areas that experience an increase in unemployment than less educated ones (Langella and Manning, 2022). As more educated

Table 4: Wages by sector (2SLS))

	Mean weekly earnings		
	Manufacturing	Non-manufacturing	All sectors
To 2006/2007	0.024*	-0.023*	-0.023*
	(0.013)	(0.013)	(0.012)
To 2014/2015	0.019	-0.041***	-0.043***
	(0.014)	(0.010)	(0.010)
N	232	232	232
	Median weekly earnings		
	Manufacturing	Non-manufacturing	All sectors
To 2006/2007	0.037***	-0.021**	-0.037**
	(0.011)	(0.010)	(0.015)
To 2014/2015	0.021	-0.037**	-0.042***
	(0.018)	(0.015)	(0.014)
N	232	232	232

Note: Unit of observation is the travel-to-work-area (2001 definition). Dependent variable in logs. All regressions weighted by 2001 population of working age. Additional controls include the start of period ratio of manufacturing jobs per head, share of jobs in agriculture, share of population with degrees, share of employees in low-skill occupations, share of workers paid at or below the National Minimum Wage, share of foreign born and the change in the share of foreign born. 2SLS estimation. Reported in this table are the reduced form coefficients on the outcome measures in the column headings.

people move away from areas more affected by import competition we observe a geographical polarisation of skills that strengthens the negative effect for these local labour markets. This geographical polarisation of skills across local labour markets is represented in figure 3 which shows that TTWAs with greater manufacturing sector have a smaller proportion o graduates in 2001, before the increase in trade competition, and TTWAs with higher college share in the working age population are the ones that experience larger increases in the college share of the population between 2000/2001 and 2011. The results of these additional analysis suggests that workers in low-skilled occupations that were affected by the shrinking of the manufacturing sector moved to other low-skilled occupations, possibly in the service sector. At the same time workers in other occupations that lost their job in the

manufacturing sector moved to local labour markets that were less affected by the negative trade exposure. Considered together the results presented so far show how the individuals with better opportunities in the labour market left the areas more affected by trade shocks or avoided to move to them, therefore driving the polarisation of skills across local labour markets.

Table 5: Population growth

	Qualification levels		
	All	Degree level	Other
To 2006/2007	-0.031***	-0.085**	-0.023***
	(0.009)	(0.035)	(0.008)
To 2014/2015	-0.022**	-0.081*	-0.004
	(0.010)	(0.042)	(0.012)
N	232	232	232

Note: Unit of observation is the travel-to-work-area (2001 definition). Dependent variable in logs. All regressions weighted by 2001 population of working age. Additional controls include the start of period ratio of manufacturing jobs per head, share of jobs in agriculture, share of population with degrees, share of employees in low-skill occupations, share of workers paid at or below the National Minimum Wage, share of foreign born and the change in the share of foreign born. 2SLS estimation. Reported in this table are the reduced form coefficients on the outcome measures in the column headings.

Table 6 reports results for the individual level analysis carried out to determine whether individuals in TTWAs more affected by import exposure were more likely to move away between 1998 and 2011. Results in this table show that a £1000 increase in trade exposure per worker increases the probability of observing high skill workers moving to a different TTWA in 2011 by 3.6 percentage points. An additional heterogeneity analysis show that individuals with higher propensity to earn were more likely to leave the affected regions and that the higher the propensity to earn the higher the probability of workers being observed in different TTWAs in 2011: for workers in the second, third and fourth quartile of the propensity to earn a £1000 increase in trade exposure per worker increases the probability of moving to a different TTWA by 2011 by, respectively, 2, 2.8 and 4.44 percentage points.

Table 6: Domestic migration (2SLS): By occupation and income quartile

	All	Low Skilled	Other	Q1	Q2	Q3	Q4
Out-migration							
Imports exposure	0.026**	0.012	0.036**	0.016	0.020*	0.028**	0.044**
	(0.013)	(0.010)	(0.016)	(0.012)	(0.012)	(0.013)	(0.019)
N	95568	35079	60489	23892	23892	23892	23892

Note: Unit of observation is employee observed between 2000 and 2011, data from longitudinal ASHE dataset. Poisson regression that includes individual by year and destination fixed effects. *** 1%, ** 5%, *10% significance.

6 Robustness checks

We implement three robustness checks to support our identification strategy and test the sensitivity of our results. First we show that our measures of change in trade exposure are not associated to changes in the manufacturing sector which pre-dated the China and A8 increase in import exposure. This exercise aims to show that local import exposure is not in fact correlated to a long term decline in the manufacturing sector. Table 7 shows 2SLS results from a placebo exercise where we regress changes in the manufacturing number of employees by TTWA in the periods 1981/1991, 1991/2001 and 2001/2011 on the medium and long term measures of trade exposure using Census data. We find that import competition from China and A8 countries are not correlated to changes in the local manufacturing sector in the periods before 2001 but they are negatively associated with local changes in the size of this sector for the period 2001/2011.

Secondly, we follow Goldsmith-Pinkham *et al.* (2018), who show that the instrument's identification is coming from the shares of local employment given the numerical equivalence $2SLS = GMM$ with shares as instruments weighted by a weight matrix constructed from the growth in trade. Higher weights tell how sensitive the over-specified parameter β is to the endogeneity of the specific instrument (share). We test whether employments shares with higher weights are correlated with the other covariates in the model. Table 8 shows that there is no correlation between employment shares and other TTWAs characteristics for the five sectors with the highest weights (television, office/computing, motor vehicles, textiles and knitted fabrics)

Finally, we estimate an additional specification where we add changes in local employment in manufacturing sectors between 1981 and 1991 as control in all regressions. Results are

highly consistent with the ones presented so far.

Table 7: Placebo test: change in manufacturing employees between 1981-1991, 1991-2001 and 2001-2011)

	Employees in manufacturing 1981-1991	Employees in manufacturing 1991-2001	Employees in manufacturing 2001-2011
Imports (2000/01 to 2006/07)	0.001	-0.014	-0.194***
	(0.008)	(0.009)	(0.039)
Domestic and International Imports	-0.001	-0.01	-0.179***
	(0.006)	(0.01)	(0.027)
Net Imports	0.001	-0.009	-0.092***
	(0.007)	(0.007)	(0.032)
Imports (2000/01 to 2014/15)	0.008	-0.002	-0.193***
	(0.008)	(0.007)	(0.030)
Domestic and International Imports	0.003	-0.003	-0.172***
	(0.005)	(0.004)	(0.000)
Net Imports	0.002	-0.005	-0.105***
	(0.007)	(0.005)	(0.001)
N	232	232	232

Note: Unit of observation is the travel-to-work-area (2001 definition). Dependent variable in logs. All regressions weighted by 2001 population of working age.

7 Conclusions

Large changes in trading relationships and import competition from low-wage countries during the early part of this century have led to a growing literature examining the effect of trade shocks on local labour markets. This literature has demonstrated the uneven gains of international trade in some countries leading to voter discontent with the status quo.

In the aftermath of the European Referendum in the United Kingdom politicians envisaged the possibility for the country to engage in new trade agreements with partners outside the EU, such as South Korea and the US. Any such agreements would imply a structural change in UK international trade driven by policy changes rather than by a domestic demand or supply shock. With this perspective in mind it is relevant to understand the consequences of recent trade shocks on the domestic labour market in the UK and how the groups most affected by these structural changes adjusted in the medium and long run. Earlier studies

Table 8: Relationship between industry shares and local characteristics)

	Television and radio	Office/computing machine	Motor vehicles	Textiles	Knitted fabrics
Manuf. Jobs per-head in year	-0.133	0.006	-0.046	0.093**	0.199
	(0.12)	(0.03)	(0.07)	(0.03)	(0.12)
Share of jobs in agricolture	-0.028	-0.11	-0.067	-0.092*	-0.12
	(0.05)	(0.06)	(0.09)	(0.04)	(0.08)
Share of population with degrees	0.002	0.007	-0.416	-0.094	-0.014
	(0.05)	(0.03)	(0.25)	(0.06)	(0.07)
Share of employees in low-skill occupations	-0.047	-0.004	-0.108	-0.017	0.079
	(0.03)	(0.02)	(0.08)	(0.02)	(0.07)
Share of females	-0.093	0.015	0.267	0.008	0.172
	(0.16)	(0.12)	(0.18)	(0.07)	(0.14)
Share of old population	-0.176	-0.019	-0.007	0.029	0.167
	(0.13)	(0.05)	(0.1)	(0.04)	(0.16)
	(0.12)	(0.05)	(0.75)	(0.17)	(0.32)
Share below the National Minimum Wage	-0.177	-0.268	0.528	0.015	0.054
	(0.16)	(0.16)	(0.32)	(0.1)	(0.19)
Change in % of foreign born	0.104	0.013	-0.251	-0.051	0.402
	(0.07)	(0.05)	(0.26)	(0.07)	(0.24)
N of observations (TTWAs)	232	232	232	232	232
R^2	0.146	0.131	0.378	0.364	0.158

Note: Unit of observation is the travel-to-work-area (2001 definition). Dependent variable in logs. All regressions weighted by 2001 population of working age.

have shown that the impact of globalisation for a country's labour market differs according to the initial institutional settings and economic structure.

We examine the effects of rising import competition on UK labour markets and find that the resulting reduction in manufacturing did not lead to longer-term consequences for unemployment in affected areas as lower-skilled workers found jobs outside manufacturing. We also find that higher-skilled workers tended to leave exposed areas. From a policy perspective these findings point to an increasing regional polarisation of the UK economy along the lines of education arising with globalisation trends. This also explains to a large extent the observed correlation between globalisation and the local Brexit vote. Therefore, our results suggest that it is erroneous to extrapolate from the local effects of trade shocks to the aggregate level UK vote to leave the EU.

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A Descriptive statistics

Table A1: Descriptive statistics (232 Travel-to-Work Areas)

		Unweighted			*Weighted*		
		Mean	Median	SD	Mean	Median	SD
Change in Imports (£1000 per job)	Domestic imports	1.433	1.164	0.980	1.408	1.199	0.818
	Domestic and International Imports	1.871	1.541	1.385	1.856	1.599	1.132
	Net Imports	1.494	1.138	1.325	1.403	1.176	1.055
Change in jobs per head	All	0.030	0.014	0.170	0.005	0.005	0.066
	Manufacturing	-0.042	-0.039	0.034	-0.051	-0.045	0.025
	Non-manufacturing	0.072	0.059	0.154	0.055	0.051	0.057
Log change in jobs	All	0.122	0.126	0.083	0.129	0.138	0.076
	Manufacturing	-0.372	-0.375	0.281	-0.481	-0.518	0.185
	Non-manufacturing	0.200	0.201	0.079	0.214	0.220	0.067
Log change in mean weekly earnings	All	0.376	0.366	0.092	0.368	0.356	0.058
	Manufacturing	0.419	0.416	0.211	0.391	0.397	0.120
	Non-manufacturing	0.384	0.387	0.097	0.378	0.369	0.058
	Low skilled non-manufacturing	0.364	0.369	0.174	0.366	0.389	0.102
Log change in median weekly earnings	All	0.381	0.376	0.094	0.369	0.367	0.056
	Manufacturing	0.416	0.405	0.227	0.403	0.382	0.109
	Non-manufacturing	0.401	0.402	0.108	0.388	0.384	0.059
	Low skilled non-manufacturing	0.373	0.365	0.273	0.365	0.378	0.106
Log change in mean weekly earnings (low skilled occupations)	All	0.359	0.351	0.106	0.363	0.367	0.072
	Manufacturing	0.373	0.377	0.236	0.337	0.348	0.159
	Non-manufacturing	0.415	0.419	0.113	0.420	0.435	0.072
	Low skilled non-manufacturing	0.395	0.384	0.229	0.420	0.417	0.126
Log change in median weekly earnings (low skilled occupations)	All	0.361	0.358	0.149	0.356	0.372	0.082
	Manufacturing	0.351	0.363	0.263	0.325	0.314	0.151
	Non-manufacturing	0.430	0.430	0.163	0.428	0.420	0.094
	Low skilled non-manufacturing	0.360	0.360	0.320	0.378	0.385	0.154
Log change in mean weekly earnings (other occupations)	All	0.370	0.372	0.101	0.361	0.355	0.057
	Manufacturing	0.389	0.370	0.211	0.361	0.361	0.129
	Non-manufacturing	0.372	0.376	0.109	0.366	0.359	0.059
	Low skilled non-manufacturing	0.357	0.348	0.237	0.333	0.319	0.128
Log change in median weekly earnings (other occupations)	All	0.380	0.380	0.110	0.371	0.363	0.056
	Manufacturing	0.402	0.398	0.235	0.386	0.362	0.118
	Non-manufacturing	0.388	0.385	0.125	0.376	0.368	0.063
	Low skilled non-manufacturing	0.368	0.371	0.238	0.351	0.341	0.115
Change in unemployed per working age population		0.001	0.005	0.022	0.005	0.006	0.011
Change in inactivity per working age population		-0.014	-0.011	0.051	-0.012	-0.012	0.028
Change in employed per working age population		0.014	0.009	0.056	0.007	0.008	0.032
Log change in population of working age		0.081	0.092	0.184	0.123	0.130	0.081
	with degrees	0.850	0.773	0.829	0.764	0.775	0.220
	without degrees	-0.058	-0.046	0.195	-0.042	-0.053	0.082
Change in share of population with degrees		0.112	0.112	0.062	0.126	0.120	0.041

Unit of observation is the travel-to-work-area (2001 definition). Northern Ireland excluded. 232 observations. COMTRADE, BSD, LFS and ASHE data. Levels measured at 2000/01. Changes measured between 2000/01 and 2014/15. Weighted numbers are weighted by start of period population of working age.