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The Wage Impact of Immigration into the UK after the Great Recession

Abstract

Over the last two decades immigration has become a major policy concern in the UK, largely driven by EU enlargement, the Great Recession, and the UK's exit from the EU. With the end of the COVID-19 pandemic, evidence indicates that the UK faces labour shortages due to the withdrawal of EU workers. This paper aims to assess the effect of immigration on the wages of native UK workers in the decade after the Great Recession and before the COVID-19 restrictions were lifted. It provides new evidence on the wage impact of immigration in the UK from 2009-2020. On balance, the evidence suggests that fears about adverse consequences of rising UK immigration have been unfounded, with immigration into the UK having a positive effect on native wages after the Great Recession. This positive effect remains when internal migration adjustments are incorporated.

Key words : Immigration; Wages; Employment; Occupation skill mismatch; UK natives

1. Introduction

In the first two decades of this century the issue of immigration has progressed from a minor issue to one of the leading public issues facing the United Kingdom (UK) today, ultimately becoming widely regarded as the primary catalyst for the Brexit referendum (Evans and Mellon, 2019). The enlargement of the European Union (EU) in 2004, with the addition of ten Eastern and Central European countries, triggered one of the largest immigration inflows in UK history (Salt and Miller, 2006). In 2008, the UK entered what was to be the worst recession since the Second World War in terms of output. However, in contrast to previous recessions, immigration into the UK did not fall during the Great Recession, but the rate of immigration did slow down. In 2016, the pattern of immigration into the UK experienced another change, with the UK voting to leave the EU as a result of the controversial Brexit referendum, which led to a significant decrease in EU migration into the UK. Arguably, much of the public debate surrounding the Brexit referendum centred on the impact of arriving immigrants on the labour market outcomes of UK-born workers. Concerns around economic displacement and wages being undercut were highlighted by populist groups, the media, and politicians on the right side of the political spectrum (Reed and Latorre, 2009). The opposing argument in support of immigration relied on the positive gains that can accrue from foreign workers filling labour shortages in the UK labour market and the employment and wage benefits to native workers who are complementary to the new immigrant inflows.

The issue of immigration has therefore become a key policy concern for the UK government. In response to rising public concern surrounding increased immigration into the UK since the EU enlargement, the current UK government (elected in 2019) promised to “end free movement, take back control of our borders and introduce a new points-based immigration system” that would select immigrants based on their skills (The Home Office, 2020). Given the end of freedom of movement into the UK from the EU (that became effective on 31st December 2020), and the policy shift towards a points-based immigration system, it is extremely timely to reassess the effect of immigration on the wages of UK native workers and bring the literature for the UK up-to-date. Was the anti-immigration narrative of the Brexit referendum warranted, and were the concerns about the displacement of native workers by immigrant labour justified? To investigate

these concerns, we estimate the wage impact of immigration on UK workers over the period 2009 to 2020.

A considerable number of papers have already quantified the effects of immigration on native workers' wages and employment. However, most of these empirical studies use United States (US) data, with some studies for European countries and the UK. On aggregate, the empirical research finds little evidence of overall adverse effects on the labour market outcomes of natives across a wide range of countries and time periods. One possible explanation for why the impact of immigration is predominantly found to be modest or negligible is that increased immigration may stimulate an internal migratory response whereby native workers leave local labour markets with high immigration inflows, thus spreading the wage effects of immigration throughout the national economy (Kritz and Gurak, 2001; Hatton and Tani, 2005).

To assess the wage effects of immigration into the UK, we adopt a range of econometric specifications to address the problems that arise in empirical studies. We estimate the effects of immigration at the national and regional levels to explore whether UK workers respond to immigration by engaging in internal migration; and we also explicitly take into consideration the problem of the occupational downgrading of immigrants in the UK economy by estimating regressions by education and occupation. The paper brings the UK evidence up to date by investigating the impact of immigration on the average wages of British natives over the period 2009 to 2020. Our study updates the current UK evidence that predominantly focuses on the pre-recession period, and highlights whether the economic downturn in the UK and the Brexit period led to a change in how immigration into the UK affected the wages of UK workers.

The paper is organised as follows. Section 2 provides a brief summary of the empirical literature on the impact of immigration on native wage levels in the UK. Section 3 discusses the data used and recent trends in immigration. Section 4 discusses the methodology. Section 5 presents the empirical results, and Section 6 concludes.

2. Review of the UK empirical evidence

Most studies of the impact of immigration on the UK labour market have employed some variant of the spatial correlation approach, and the broad message from the UK studies is that there is

little impact on the labour market outcomes of native workers. For the impact of immigration on native wages, studies such as Dustmann et al. (2005, 2013), Nickell and Salaheen (2015), Lemos and Portes (2008) and Manacorda et al. (2012) all find relatively small effects on wages in the aggregate. However, there are some statistically significant associations for particular types of workers or in particular sectors of the labour market (Clark et al., 2014). Dustmann et al. (2013) consider how immigrants affect not only wages on average but also the effect of immigration across the whole of the UK wage distribution. Using the UK Labour Force Survey (LFS) over the period 1997 to 2005, they find that the effect of immigration on average wages is positive and significant, but at the lower end of the wage distribution immigration has a negative effect while at the upper end a positive effect exists. They suggest that the positive wage effect of immigration is consistent with a labour market in which immigrant and native workers are imperfectly substitutable in the production process. This is partly because of the 'downgrading' immigrants experience in host country labour markets where they often work in occupations for which they are overqualified.

Using the data from UK LFS and the Annual Survey of Hours and Earnings for 1992-2014, Nickell and Salaheen (2015) similarly argue that the downgrading of immigrant skills is important in determining the impact of immigration on wages, and report that a 10% rise in immigration reduces average wages by 1.0%, but a 1.88% reduction in wages for workers in unskilled and semi-skilled services. Manacorda et al. (2012) also investigate the impact of immigration on the structure of wages, allowing for imperfect substitutability between immigrants and UK-born workers, and report that a ten percentage point rise in the immigrant share across the UK economy has no significant effect on real wages of natives. The UK Migration Advisory Committee's report (2018) analysed the wage effect over the longer period of 1998-2017 and estimated a wage effect of -1.31%.

Overall, the majority of the UK research indicates that, at most, only small negative effects on average wages of UK born workers from increased immigration have occurred over the last two decades. These negative effects have been more pronounced (though still small) for low-paid native UK workers, previous immigrants into the UK, and for low-skilled service sector workers (Reed and Latorre, 2009).

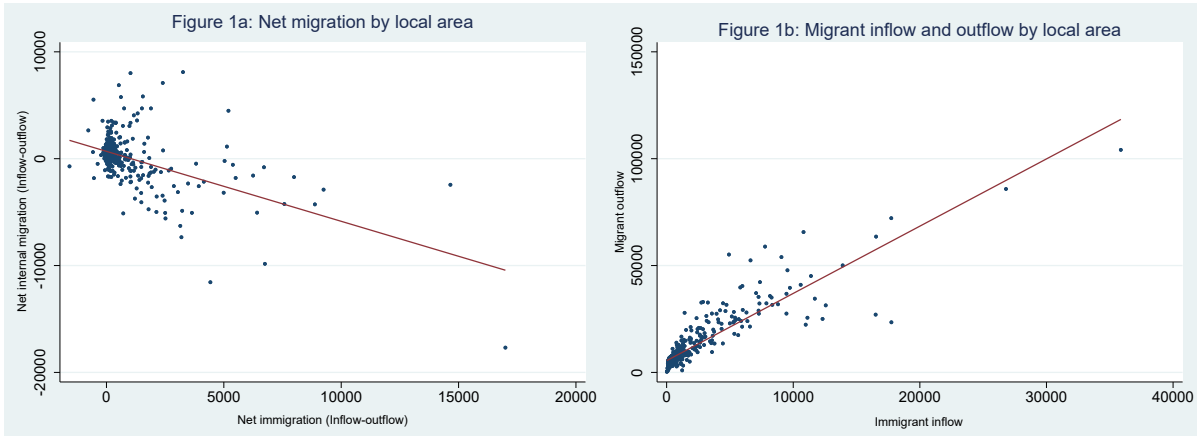
The economic consequences of the change in immigration flows caused by Brexit have been the focus of recent studies on immigration into the UK. Most of these studies simulate scenarios based on historic data to analyse the wage impact of immigration. Using a short panel of the UK Household Longitudinal Survey from 2010-2016, Angioloni and Wu (2020) estimate the native-migrant elasticity of substitution at sector level and conclude that the wage effect of immigration varies between 0.02 to 4.19 percent depending on the industry, with the average wage effect being 1.26%. With the removal of restrictions after the Covid pandemic, labour shortages in the UK substantially increased, especially in hospitality and transport sectors. Sumption (2022) indicates that immigration policies formulated on the basis of occupations which face labour shortages might not be optimal as it disrupts the labour market adjustment process. The estimated wage effect of declining immigration may self-correct in time as employers increase wages to attract workers.

3. Data and trends

The empirical analysis uses the UK Household Longitudinal Survey (UKHLS), which is a socio-economic household longitudinal survey that interviews the same people in the same households over time. It currently consists of twelve waves, with data from 2009 to 2021. A secondary dataset used is the UK Claimant Count, which is a count of people who claim unemployment benefits from the Department of Work and Pensions in the UK, and this is available from the Office of National Statistics.

The out migration of natives in response to increased immigration is well-documented (e.g Frey, 1996 for the US; Hatton and Tani, 2005 and Kaufmann, 2023 for the UK). Using migration data from the Office of National Statistics shows a negative correlation between net immigration inflows and net internal migration inflows, and a positive correlation between immigration inflow and internal migration outflow at the local unitary level in the UK (Figure 1a).

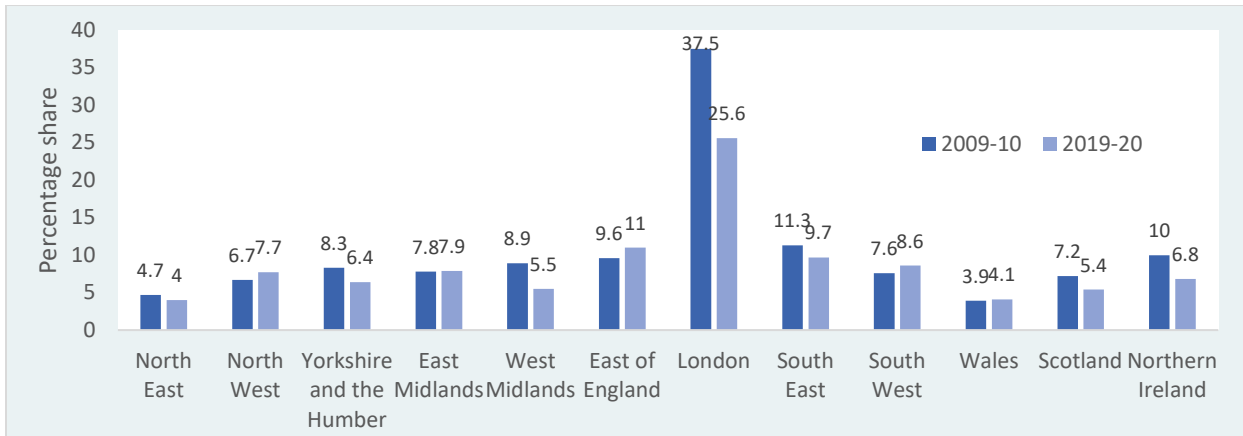
Figure 1: Migration by local area in the UK in 2019



Source: Authors' estimation using data from the Office of National Statistics

According to the UKHLS data¹, in both 2009-10 and 2019-20, London had the highest immigrant-to-native ratio at 37.5% and 25.6% respectively, well above the next two regions of the South East (9.7% in 2019-20) and the East (11% in 2019-20) (Figure 2). However, over the decade there appears to be an outwards shift of immigrants from London to the surrounding regions of the Southwest and the East.

Figure 2: Regional distribution of immigrants



Source: Authors' estimation using the UKHLS

¹ Source of estimations is UK Household Longitudinal Survey (wave 1 and wave 11). The estimates are weighted using cross sectional weights for each wave.

An important issue that arises when estimating the impact of immigration is the question of “who competes with whom?” (Card, 2001). Comparing natives and immigrants based on their educational qualifications will be problematic when immigrant skills are downgraded in the host labour market (Bratsberg et al., 2014), so that they do not directly compete with native workers with the same formal education qualifications. A report from the Migration Observatory (2021) highlights the varied nature of occupational downgrading in the UK. For example, immigrants from India and other Asian communities are overrepresented in high-skilled jobs, whereas EU migrants are concentrated in low-skilled jobs (despite 50% of EU workers who are in low-skilled jobs having achieved either further or higher education). To accurately estimate the impact of immigration on UK workers’ wages, it is important to differentiate between the education level of immigrants and the jobs they actually do given the imperfect transferability of immigrants’ human capital endowments.

Table 1. Occupation by education level

	At least a degree			High school			Some schooling		
	Natives	Immigrants		Natives	Immigrants		Natives	Immigrants	
		Early	Recent		Early	Recent		Early	Recent
Management & professional	63.4	56.3	38.4	28.0	17.9	19.4	13.3	8.3	11.4
Intermediate	16.9	19.7	15.6	22.4	19.6	21.6	15.3	16.2	5.5
Routine	19.7	24.0	46.0	49.6	62.5	59.0	71.4	75.6	83.1
	100	100	100	100	100	100	100	100	100

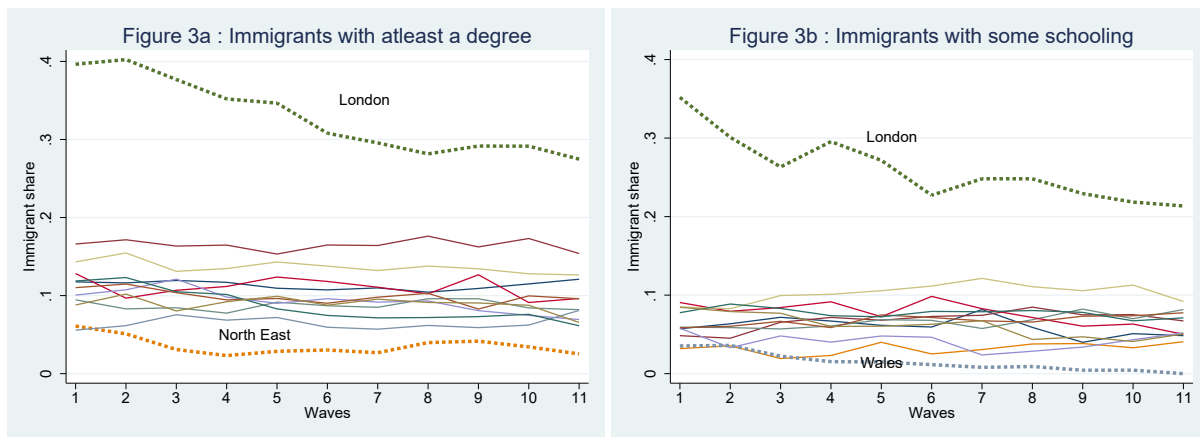
Source: Authors’ estimation using the national Statistics Socio-economic Classification (NS-SEC) in the UKHLS. ‘Early’ migrants are defined as those who have been in the UK at least three years, and ‘Recent’ migrants as those in the UK less than 3 years.

Table 1 reveals that the distribution of immigrations who have been in the UK for at least 3 years is more similar to natives than to immigrants who have been in the country less than 3 years. Table 1 also indicates that, even with similar experience, immigrants who recently arrived face a disadvantage of being employed in lower category jobs compared to the earlier immigrants. This difference is especially pronounced in workers with at least a degree compared to high school graduates and those with some schooling.

This educational differential between natives and immigrants also exists across regions. The number of immigrants in London has declined over time (Sumption, 2021). However, this decline has not been the same across skill sets. Between 2009 and 2020, the number of immigrants with

at least a degree dropped faster than the immigrants with some level of schooling (Figure 3a and 3b). This however was not true for all regions. For example, the North-East of England, which recorded the lowest number of immigrant share of graduates, also recorded almost no decline in number of immigrants in this category.

Figure 3: Immigrant share by educational qualification in each region



Source: Authors' estimation using the UKHLS

4. Methodology

The predominant methodology in the empirical literature in the 1990s and 2000s was the spatial correlation approach. However, criticism for this approach has arisen due to two issues. Firstly, the potential for endogeneity bias due to immigrants moving into specific regions that are experiencing growth. Since immigrants tend to cluster in areas with higher economic growth, any correlation observed between immigration and regional labour market outcomes may be spurious. Secondly, if in response to immigrant inflows, native workers are displaced in the labour market and respond by leaving that area, any economic impacts of the immigration shock may not be picked up by the spatial correlation approach, and coefficients will be biased towards zero. In other words, internal migration by natives tends to disperse the impact of immigration throughout the national economy, making it difficult to identify the wage impact of immigration by comparing conditions across geographical labour markets.

In response to the concerns surrounding the spatial correlation approach, Borjas (2003) introduced the skill cell approach and estimated the impact of immigration at the national level.

Estimation at the national level circumvents the problem of endogenous mobility between geographical labour markets by aggregating the data at broader levels. Borjas (2006) argued that defining the labour market at the national level more closely approximates the theoretical counterpart of a closed economy, and estimation at this level eliminates all boundaries allowing native mobility within a fully closed national labour market. While numerous studies have treated immigrant workers as one factor of production and various subgroups of natives as separate factors, it has become more common in the theoretical and empirical literatures to define skill categories within which immigrants and natives are perfect substitutes, and to classify individual immigrants and natives into these skill groups.

4.1 Estimation procedure

We adopt the skill cell approach suggested by Borjas (2003, 2006) and estimate the wage effects of immigration on the wages of UK natives at two different geographical levels. Firstly, national wage equations are estimated for 2009 to 2020 for the UK, plus for each of the four home nations of the UK separately (England, Northern Ireland, Scotland and Wales). Secondly, at the regional level, wage equations are estimated for the same time period, with England further disaggregated into six broad regions (the North; the Midlands; Yorkshire and the Humber; the East; London; and the South).

We conduct both national and regional analyses because the national skill cell approach has faced criticism on the basis that it involves using data from a single host country. This results in only one observation of the national labour market at each point in time, and therefore the national approach may confound immigration with other skill group-specific labour supply or demand shocks that affect relative wages over time (Bratsberg et al., 2014). In support of the spatial correlation approach, Lewis and Peri (2014) argue that the criticism it faces is not a good reason to abandon it as regional and city level data contain rich variation in immigrant inflows and their labour market effects.

4.2 Construction of skill cells

The identification strategy in the skill cell approach may not be entirely satisfactory if immigrants and natives are categorised according to their educational qualification. This is due to the

occurrence of occupational degradation. The UKHLS data (Table 1) also indicate the prevalence of occupational degradation among immigrants in the UK. In order to address this issue, we stratify the labour market by education and occupation based skill cells. The occupation-based skill cells assume that individuals who work in the same occupation are perfect substitutes for each other regardless of educational qualification. The following paragraphs explain the construction of the skills cells in detail.

First, three categories of education are defined: (i) no educational qualifications and some schooling; (ii) high school graduates; and (iii) university graduates and postgraduates. The education categories also include vocational training/education, and these are grouped according to the National Qualification Framework. Years of experience are defined as years of potential labour market experience and are calculated by subtracting age of entry into the labour market from the current age of the individual. Depending on the highest level of education and/or vocational qualification received, the age of entry is assumed to be: (i) 16 years for those with no education qualifications or qualifications lower than or equivalent to GCSE; (ii) 18 years for a high school graduate or equivalent vocational training; (iii) 20 years for other higher degree such as nursing; and (iv) 21 years for a degree and above. Workers are then grouped into eight experience intervals to reflect the idea that workers in adjacent experience cells are more likely to affect each other's labour market opportunities than workers in cells that are further apart (following Aydemir and Borjas, 2011). These three education categories and eight experience groups are combined into twenty-four distinct skill groups defined by educational attainment and work experience (following Borjas: 2003, 2006). Since each skill group contains workers who have a particular level of schooling and a particular level of experience, each cell defines a particular labour market at a point in time.

Second, skill groups are defined by occupation and experience. Four occupation categories are defined based on the skill level grouping by the Office of National Statistics: (i) high skilled; (ii) high-medium skilled; (iii) low-medium skilled; and (iv) low skilled. Combining the four occupational groups with the eight experience categories results in thirty two distinct skill groups defined by occupation and work experience. Thus, each cell defines a particular occupation-based labour market at a point in time.

4.3 Model specification

The wage equation is estimated first with the skill cells defined by education level and labour market experience, and second by defining the skill cells by occupation and labour market experience.

The national model is specified as follows:

$$\log w_{it} = \theta_w p_{it} + s_i + \pi_t + (s_i * \pi_t) + \Phi_{ijt} \quad (1)$$

where w_{it} represents average wages in skill group i at time t . The linear fixed effects (s_i, π_t) control for differences in labour market outcomes across skill groups and over time respectively, and the interaction $(s_i * \pi_t)$ controls for secular changes in the returns to skills.

The regional model is specified as follows:

$$\log w_{ijt} = \theta_w p_{ijt} + s_i + r_j + \pi_t + (s_i * \pi_t) + (r_j * \pi_t) + (s_i * r_j) + \Delta U_{jt-3} + \Phi_{ijt} \quad (2)$$

where w_{ijt} represents average wages in skill group i , in region j , at time t . The linear fixed effects (s_i, r_j, π_t) control for differences in labour market outcomes across skill groups, regions, and over time respectively. The interactions $(s_i * \pi_t)$ and $(r_j * \pi_t)$ control for secular changes in the returns to skills and in the regional wage structure. The interaction $(s_i * r_j)$ implies that the adjustment coefficient θ_w is being identified from changes in wages and immigration that occur within skill-region cells (Borjas, 2006; 2014). To control for pre-existing labour market conditions, lagged unemployment in a region is included in the wage equations. The Claimant Count is used to construct the measure of lagged unemployment in each region as it is a common proxy for measuring unemployment and is directly relevant for policymaking, unlike broader measures of unemployment (Lemos, 2014). Its fit as a regressor is supported by Lucchino et al. (2012) who conclude that immigration does not have any impact on the Claimant Count, and therefore it should not be correlated to the immigrant share in a region. The lag for this variable is a 3-year lag and is in keeping with other studies in the empirical literature. The variable ΔU_{jt-3} captures pre-existing regional labour market conditions and is defined as the annual change in the regional unemployment rate (with a lag of 3 years).

The key explanatory variable is defined as the fraction of foreign born individuals who are working in a particular labour market at a point in time, and is calculated as follows:

$$p_{ijt} = \frac{M_{ijt}}{M_{ijt} + N_{ijt}} \quad (3)$$

where M_{ijt} is the stock of immigrants and N_{ijt} is the stock of native workers in the skill cell i,j,t . A person is classified as an immigrant if they were not born in the UK. The variable p_{ijt} therefore measures the ratio of immigrants to the total workforce in skill group i , who reside in region j , at time t , and represents the immigrant supply shock to that cell.

The dependent variable is measured as average log hourly wages of natives in the skill cell. Hourly wages are first calculated for men and women aged 16 - 64 years and working full-time or part-time, and then deflated using the Consumer Price Index with 2010 set as the base year. Both national and regional CPIs were used to measure real hourly wages more accurately within each region². The deflated log hourly wages are then converted to cell average wages by dividing the sum of log hourly wages for natives in each cell by the number of natives in that cell (following Borjas, 2014).

4.4 Endogeneity concerns

One major econometric issue that is identified in the empirical literature is the possible presence of endogeneity due to the correlation between local demand shocks and immigrant flows. To overcome this problem, various authors have explored instrumental variable estimation (e.g. Borjas, 2001; Card, 2001; Aydemir and Borjas, 2011), where the typical instrument used is the lagged measure of immigrant share as a proxy for historic settlement patterns, indicating that the new immigrants tend to settle in localities where previous immigrants with the same cultural and linguistic background have already settled. Pre-existing immigrant concentrations are unlikely to be correlated with economic shocks if measured with a sufficient time lag since

² The regional CPI adjusted wages are computed using the 2010 regional CPI published in: <https://webarchive.nationalarchives.gov.uk/20151014001900/http://www.ons.gov.uk/ons/rel/cpi/regional-consumer-price-levels/2010/index.html>. This 2010 regional CPI was used to derive the regional CPI in the other years using the following formula:
 $(Regional\ CPI_t)_{for\ base\ year\ 2010} = \left(\frac{Regional\ CPI_{2010}}{100} \right) * (National\ CPI_t)_{for\ base\ year\ 2010}$

existing concentrations are determined not by current economic conditions but by historic settlement patterns of previous immigrants (Dustmann et al., 2005).

However, Jaeger et al. (2018) argue that the use of the past settlement instrument exacerbates potential biases by conflating the short- and long-run responses to immigrant arrivals. In particular, the spatial correlation approach may conflate the (presumably negative) short run wage impact of recent immigrant inflows with the (presumably positive) movement towards equilibrium in response to previous immigrant supply shocks. Thus, estimates based on the shift-share instrument are unlikely to identify the short-run causal effect of immigration on native wages.

A second potential concern is the sampling error in the measures of the immigrant supply shift, and the subsequent attenuation bias in the estimated wage impact of immigration. This problem arises because both average log hourly wages and the fraction of the workforce that is foreign-born in any geographical labour market are estimated from the sample of workers observed in the dataset. Researchers do not usually have an independent measure of the supply shock induced by incoming immigrants in the defined labour market, and this subjects the estimation to a sampling error (Borjas, 2014).

The key to the IV approach is identifying an instrument that is correlated with the immigrant share variable but not correlated with wages. This requires an exogenous change in the supply of immigrants into a particular geographical labour market. To achieve this, we use the Great Recession in 2008-9 as an exogenous demand shock to the UK labour market to identify an instrument from the UKHLS. Unlike Jaeger et al. (2018), we use only one instrumental variable for estimation. The two instruments used by Jaeger et al. (2018) is to absorb long run and short run effects since they use a 40-year time period for their analysis. Since our data only spans 10 years, therefore only one instrument is used to avoid over identification issues during estimation of the IV regression.

Although the instrumental variable estimation described here uses the shift share approach criticized by Jaegar et al. (2018), we argue that the conditions of validity hold in our case. Jaegar et al. (2018) specify that the shift share instruments will hold validity if the economic shock is not

serially correlated with previous economic cycles. In support of this, Bezmer (2009) argues that academics, analysts, and investment bankers who studied private sector debt accumulation in countries such as the US, the UK and Australia predicted that the recession would happen between 2005 and 2007. However, the recession only hit the UK economy in 2008-9, and the 2009 dip was sharp and sudden unlike the previous downturns where the decline in GDP was gradual and of lower magnitude. We might therefore expect the behaviour of immigrants in response to the sudden economic shock of the Great Recession to be very different from the behaviour of immigrants in the previous recessions.

The first stage regression in the instrumental variable estimation is given by:

$$m_{ijt} = \theta_w(instrument)_{ijt} + s_i + r_j + \pi_t + (s_i * \pi_t) + (r_j * \pi_t) + (s_i * r_j) + \Delta U_{jt-3} + \Phi_{ijt} \quad (4)$$

Specifically, we use the UKHLS data to identify those immigrants who arrived before or in 2007. From these immigrants, we remove all those who moved regions between 2008 and 2019. Thus, the only immigrants who are included in the instrument are those who did not respond to changes in regional demand or wages over the period. Since the instrument includes only those immigrants who can be considered part of the permanent ethnic base of the region at the start of the period, the instrument should be exogenous to changes in regional demand and wages.

The first step in deriving the instrument is to estimate the share of immigrants in a particular skill-ethnic group who live in a particular region j in a base year $t(0)$ where the base year is 2009:

$$g_{ij}^k(t_0) = \frac{M_{ij}^k(t_0)}{\sum_j M_{ij}^k(t_0)} \quad (5)$$

where $M_{ij}^k(t_0)$ is the number of immigrants who are part of the permanent ethnic base in t_0 in skill group i , region j , and belonging to ethnic group k ³. This regional immigrant share is then used to predict the number of immigrants in a particular skill group who would live in region j in any subsequent period:

³ Ethnicity is categorised according to five major ethnic groups: Whites and mixed white; Indian, Pakistani and Bangladeshi; Chinese and other Asian; Caribbean, African and other black; and Arab and other groups.

$$\widehat{M}_{ij}(t) = \sum_k g_{ij}^k(t_0) M_i^k(t) \quad (6)$$

where $M_i^k(t)$ is the national number of immigrants in skill cell i , who belong to ethnic group k , at time t . The instrument for the immigrant share at time t is then defined as:

$$\hat{p}_{ij}(t) = \frac{\widehat{M}_{ij}(t)}{\widehat{M}_{ij}(t) + N_{ij}(t)} \quad (7)$$

where $\hat{p}_{ij}(t)$ is the predicted immigrant share after the immigrant population present in the country at time t is allocated to each of the regions based on the baseline geographic sorting of each ethnic group (Borjas, 2014)⁴. Similar to Borjas (2014), this instrument explicitly incorporates the ‘ethnic network’ explanation for why immigrants tend to cluster geographically (Lewis, 2011; Peri, 2012).

The assumption that the instrument predicts the ratio of immigrants (p_{ijt}) only through the main independent (m_{ijt}) variable holds true in the present scenario. If the current regional wages were only determined by the assumption of random allocation of immigrants, i.e. m_{ijt} then ethnic concentration would not have played a role. However, given that the existing regional distribution of immigrants based on race affects distribution of new immigrants to different regions and ultimately the wages. Even if a significant portion is divided into regions according to ethnicity, the final effect on wages is only determined by the actual m_{ijt} i.e. including immigrants which migrate to regions due to other reasons. Therefore p_{ijt} affects regional wages only by affecting m_{ijt} first and then eventually m_{ijt} affects the wages.

5. Results

The first step of the empirical analysis is to use the skill-cell approach to estimate the impact of immigration on the average wages of natives at the national level. Table 2 reports these results for skill cells defined by education and experience (columns 1 and 2) and by occupation and experience (columns 3 and 4). The wage equations are estimated for each of the four home

⁴ Borjas (2014) calculates the immigrant share by skill group, region, and country of birth. We use race of immigrant settlement instead of country of birth to avoid losing immigrants from the sample, since not all immigrants have reported their country of birth but have reported their ethnic group.

countries of the UK separately, and then for Great Britain and the UK as a whole (using OLS estimation).

Focusing on columns 1 and 2 of Table 2, the results reveal that, when skill cells are defined by education, immigration has had no significant impact upon average wage levels in Scotland, Wales, Northern Ireland, or for the country as a whole, over the period 2009 to 2020. It is only for England that the average wage impact is significantly positive. The elasticity of this impact is around 0.32, indicating that a 10% increase in immigrants into the UK would reduce native wages by approximately 3%. The coefficients are converted into an elasticity that gives the percent change in wages associated with a percent change in labour supply using the formula specified in Borjas (2006).

Table 2: Impact of immigrant share on native wages - national level estimates

	Education skill cells		Occupation skill cells	
	Wage 1 (1)	Wage 2 (2)	Wage 1 (3)	Wage 2 (4)
England	0.389* (0.200)	0.364* (0.200)	0.118 (0.0975)	0.113 (0.0980)
Great Britain	-0.154 (0.149)	-0.154 (0.149)	0.0260 (0.139)	0.0260 (0.139)
United Kingdom	0.295 (0.183)	0.275 (0.184)	0.188* (0.103)	0.181* (0.104)
Scotland	-0.309 (0.282)	-0.309 (0.282)	0.221 (0.187)	0.221 (0.187)
Wales	-0.343 (0.593)	-0.343 (0.593)	-0.0970 (0.231)	-0.0970 (0.231)
Northern Ireland	-0.154 (0.149)	-0.154 (0.149)	0.0260 (0.139)	0.0260 (0.139)
Adjusted with regional CPI	•		•	
Adjusted with national CPI		•		•

Notes: The figures in parentheses are robust standard errors. All estimates are weighted by survey weights and regressions are weighted by the number of natives in each cell group. Asterisks indicate level of statistical significance: *** <0.01, ** p<0.05, * p<0.1.

The estimates in columns 3 and 4 of Table 2 indicate a positive impact of immigration on native wages, but only for the UK as a whole. When we account for the occupational downgrading that immigrants face in the UK labour market, the inflow of immigrants into the UK after the Great Recession had a small positive effect on native wages, with an elasticity of around 0.05. For Scotland, Wales and Northern Ireland, the effect of immigration on native wages remains insignificant irrespective of whether skill cells are defined by education or occupation.

The results in Table 2 add empirical support for differentiating skills defined by education as compared to occupation. The estimates in columns 3 and 4 are lower in magnitude than those in columns 1 and 2, suggesting a smaller impact of immigration on native wages when immigrants are classified by occupation rather than education. The improvement of defining skill levels by occupation is that the occupational downgrading suffered by immigrants into the UK is controlled for, as this categorisation of immigrants is more accurately accounting for which immigrants the native workers are competing with in the UK labour market. In the presence of imperfect human capital transferability, and the subsequent occupational downgrading caused by it, the immigrants assigned into skill cells defined by education may, in actual fact, be complements to the native workers in that cell instead of substitutes, which is the opposite of what the skill cell approach intends.

The second step of the empirical analysis is to estimate the wage equations at the regional level (using both OLS and IV estimation). Using education and experience skill cells, the OLS estimates in Table 3 indicate that the effect of immigration on wages is negative for the country as a whole (but at low statistical significance). When correcting for endogeneity through instrumental variable estimation, immigration has no effect on native wages.

For the occupation and experience skill cells, the OLS estimates are insignificant. However, the IV estimates suggest a positive effect of immigrants on wages, implying a 10% rise in immigration results in a 1.8% increase in the wages of native workers in England. For Great Britain, the elasticity is estimated to be 0.01 (a 10% increase in immigrant share leads to a small increase in wages by 0.1%). Finally, the elasticity estimates for the occupational category in the UK indicate that a 10% increase in immigrant share would increase the native wages by 0.5%.

Table 3: Impact of immigrant share on log of hourly wages of natives – regional level estimates

		Education skill cells		Occupation skill cells	
		Wage 1	Wage 2	Wage 1	Wage 2
England	OLS	-0.102 (0.0729)	-0.104 (0.0729)	0.0359 (0.0537)	0.0357 (0.0538)
	IV	-0.000676 (0.0753)	-0.00245 (0.0753)	0.215*** (0.0644)	0.215*** (0.0644)
Great Britain	OLS	-0.114* (0.0652)	-0.116* (0.0652)	0.0218 (0.0484)	0.0215 (0.0484)
	IV	0.0120	0.0104	0.198***	0.198***

		(0.0719)	(0.0719)	(0.0621)	(0.0621)
	OLS	-0.112*	-0.114*	0.0123	0.0120
		(0.0619)	(0.0619)	(0.0461)	(0.0462)
	IV	0.00983	0.00833	0.193***	0.193***
United Kingdom		(0.0710)	(0.0710)	(0.0612)	(0.0613)
Adjusted with regional CPI		•		•	
Adjusted with national CPI			•		•

Note: The figures in parentheses are robust standard errors. Asterisks indicate level of statistical significance: *** <0.01, ** p<0.05, * p<0.1. All estimates are weighted by survey weights and regressions are weighted by the number of natives in each cell. For education (occupation) category, first stage F statistics of the three samples were 517.3 (795), 491 (788) and 492.2 (699) respectively, and the correlations between the instrument and immigrant share variable were 0.91 (0.91), 0.89 (0.90) and 0.86 (0.87) respectively.

The regional analysis allows for internal native migration within the regions of the UK. If inter-regional migration is an adjustment mechanism through which UK workers adjust to immigration into their local areas, then we would expect the labour market effect of immigration to be smaller than the effect at the national level. A comparison of the OLS results in Tables 2 and 3 reveal this to be the case. This supports Borjas’ (2006, 2014) prediction that the larger the geographical area, the larger the estimated wage impact of immigration, due to the dilution of the wage effect through the internal migration decisions of native workers in response to immigrant-induced supply shocks in local labour markets. Our results suggest that natives in the UK may indeed be using regional mobility as a way to protect their wages from immigration.

The theoretical and empirical literatures suggest several explanations for a positive wage impact of immigration. The simple theoretical model represents an immigrant inflow by a rightward shift in the labour supply curve. However, the negative effects of immigration for native workers are overemphasised when the model neglects the indirect labour demand effect (caused by higher consumer demand for goods by immigrants leading to an increase in the demand for labour), and the subsequent increase in native employment and wages caused by the labour demand curve shifting right. If the indirect demand effect outweighs the negative direct effect, then a positive wage effect may result (Bauer and Zimmermann, 1999). Extending the theoretical model to allow for a competitive labour market for skilled workers and a non-competitive labour market for unskilled workers (to better reflect the wage rigidities often present in European labour markets), the impact of an inflow of skilled immigrants is predicted to be initial wage decreases for skilled native workers, but higher demand for unskilled natives who are complementary to the skilled immigrants. This higher demand for unskilled native workers has a further complementary effect

by raising the demand for skilled workers and increasing their wages. Thus, native workers may gain from the immigration of highly skilled foreigners (Bauer and Zimmermann, 1999).

The empirical literature does provide examples of these complementary effects and positive wage impacts of immigration (for example: Haisken-DeNew and Zimmermann, 1995 for Germany; Dolado et al., 1996 for Spain; and Orrenius and Zavodny, 2007 for the US). For the UK, Dustmann et al. (2013) report an overall positive wage effect of immigration over the period 1997 to 2005. Their proposed explanation is simply that wages paid to immigrants are below their marginal product due to the downgrading of immigrants' skills after entry into the host labour market. If newly arrived immigrants are unable to fully utilise their human capital (as they may lack complementary skills such as language or job search), they will start lower down the occupational distribution and compete with native workers much further down the distribution. Since this downgrading is substantial in the case of the UK (Dustmann et al., 2013), and that immigration into the UK is not concentrated at the lower end of the skill distribution, native workers were to some extent cushioned from the immigrant inflow due to their imperfect substitutability with newly arrived immigrants. Manacorda et al. (2012) similarly note that the skill composition of immigrants to the UK is more biased towards skilled workers so that immigrants and native-born workers are not, on average, close substitutes. They find that within narrowly defined age-education cells, immigration depresses the wages of previous immigrants relative to the native-born so that British-born workers are cushioned from rises in supply caused by rising immigration (Manacorda et al., 2012). Thus, the positive effect on wages in high-wage labour markets may occur due to the imperfect substitutability between native workers and newly arrived immigrants, and if it takes time for the skills that immigrants bring to transfer to the host country labour market.

6. Conclusion

The impact of immigration on native wages is complex and influenced by various factors such as the skill level of immigrants, labour market conditions in both the home and host countries, and the host country's institutional context. Neo-classical economic theory proposes that an increase in labour supply caused by immigration may depress wages for native workers. However, the

relationship is not straightforward due to the ambiguous nature of whether natives and immigrants are complements or substitutes in the labour market. In some cases, immigrants may complement native workers by filling labour shortages or bringing unique skills, while in other cases, they may compete directly with native workers for the same jobs. Given this neoclassical argument, the rapid increase in immigration into the UK during the last two decades has put the issue of the labour market effects of immigration firmly on the political and economic agenda. In particular, the possible negative effect on the labour market outcomes of UK workers was a key issue in the UK Brexit referendum in 2016, and continues to be one of the core concerns in the public debate surrounding immigration even after the UK's departure from the EU in 2020. Exiting the EU has already led to falling EU migration into the UK, and the prediction that the UK will face skill shortages that will hamper growth (Tiwasing, 2021) will have consequences for the UK government's immigration policy in the future.

This paper sits within the context of the end of freedom of movement into the UK from the EU, and the policy shift towards a points-based immigration system that prioritises selection on skills (e.g. the Global Talent Visa introduced in 2020). Our analysis allows us to explore whether the anti-immigration narrative of the Brexit referendum was warranted, and acts as a test of the argument that immigration harm natives' labour market outcomes. We evaluate the impact of immigration on the wages of native UK workers while considering the interplay of native-immigrant complementarity or substitution dynamics based on education/occupation level and years of experience.

On balance, the evidence suggests that fears about the adverse consequences of rising immigration into the UK are unfounded. For both England and the UK, immigration over the last decade has positively affected natives' wages. Our findings also support the theoretical argument that the effects of immigration may be attenuated due to the internal migration of natives in response to immigration flows. This aligns with the internal migration trends within England between 2008 and 2020, which indicates an increase in the net migration rate to predominantly rural areas and a decrease in the net migration rate to predominantly urban areas, particularly London (Department of Environment and Rural Affairs, 2023). Thomas (2023) investigates the potential drivers behind this internal migration and finds that it is those individuals who stand to

benefit the most from labour market migration in terms of enhancing career advancement opportunities, securing employment, or attaining higher financial rewards. This is an important finding as it reveals that UK natives may indeed use mechanisms such as regional mobility to protect their wages from immigrant induced increases in labour supply

This paper adds to a growing literature on the wage impacts of immigration in the UK. Our contributions to the body of empirical research include: (i) the advantage of using a nationally representative panel dataset to estimate a range of regression models that allow us to overcome various econometric problems faced by previous studies; (ii) estimation at both the national level and regional level to allow for the possibility that native workers respond to immigration by leaving areas with high immigrant inflows in order to avoid increased competition in the labour market; (iii) providing new evidence on the effects of immigration into the UK after the Great Recession, given the changes in immigrant inflows that it caused; and (iv) defining skill cells to control for the reality of occupational downgrading for immigrants into the UK economy.

However, there are several limitations to the study. First, we recognise the great challenge in addressing the endogeneity problem when estimating the wage impact of immigration on native's wages. Drawing on the literature, we have attempted to control for endogeneity, but acknowledge that we cannot rule out the possibility that bias is confounding the estimates. Existing empirical studies are still exploring ways to correctly estimate the impact of an immigrant inflow on wages, and this continues to be the central empirical challenge within the literature.

Second, in common with many other studies, is the inability to assess the impact of immigration on local labour markets (e.g at a granular level such as NUTS3). More aggregate labour market studies will fail to capture the local impacts on labour market outcomes, particularly in the short-run. This could be overcome by improving currently available datasets to allow for a greater geographical disaggregation that would help facilitate research on the local labour market impacts of immigration, as well as shed more light on internal native migration as an important adjustment mechanism used by natives to mitigate the labour market effects of immigration into the UK.

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