Universitat Pompeu Fabra Barcelona
Faculty of Economics and Business

Academic year: 2021-2022

*Final Year Project*

# The impact of EU immigration on wages and employment of natives in the UK:

## an analysis exploiting changes in migration patterns after the Brexit referendum

Pau Ariño Luque (Double Degree in Economics and Law)

Project code: EJE01

Tutor

Albrecht Glitz

Juan José Ganuza Fernández

**Abstract**

After the 2016 UK referendum on EU membership, in which the topic of immigration played a prominent role, net EU migration to the UK dramatically fell. This study aims to exploit this change in migration patterns and empirically analyse the impact of EU immigration on the wages and hours of work of natives in the UK in the period after the referendum. Results indicate that EU immigration has a positive effect on average native wages (and thus an outflow of EU workers after 2016 could have led to a wage decrease), although this effect is unevenly distributed across native skill groups. While those at the upper part of the wage distribution are positively impacted by EU immigration, its effect on the outcomes of low-skill natives is negative, which, given the educational composition of EU immigrants, points to the persistence of considerable downgrading upon arrival.

Project code: EJE01

**Acknowledgements**

I would like to thank my tutor, professor Albrecht Glitz, for his guidance, his time and his interest in my project. I would also like to thank Paul Bloomfield from the Social Surveys division of the Office for National Statistics for attending my requests so kindly and quickly.

**Table of contents**

## 1. Introduction

On 23 June 2016, the UK voted to leave the European Union 51.9 to 48.1. This came after an intense two-month official campaign and, more in general, a public debate between Eurosceptics and pro-EU that had lasted, maybe, since the accession of the UK to the three European Communities in 1973 itself.

The issue of immigration of workers from other EU countries to the UK played a prominent role in the discussion, probably due to the substantial inflow of EU citizens arrived at the UK especially after the 2004 and 2007 EU enlargements. Indeed, Leave supporters warned about the negative consequences that immigration of low-skilled EU workers could further have on the financial situation of the left-behind working class, already hit by globalisation, mainly with regard to employment and pay. Some research shows that less-educated, older and low-income people voted in large numbers to leave and that those who felt that their financial situation had deteriorated were more likely to vote Leave (Hobolt, 2016). During the last weeks of the campaign, the topic of immigration received a 13%-attention in the media's coverage of the referendum (only lower than the topic of the economy), and the issue was prominent even in pro-EU newspapers.

However, economists have failed to find a strong connection between immigration and wages or employment in the UK, at least before 2016 (Wadsworth, 2018, pp. 627-633). The aim of this study is to analyse whether the hopes and fears of those Leave voters have proven to be justified after the referendum. It exploits a marked change in the patterns of immigration and emigration of EU-born workers to and out of the UK since the 2016 decision, a shift that could intensify in the coming years now that Brexit is a reality since the UK left the EU on 31 January 2020 and that freedom of movement of EU workers does no longer apply to the UK since 1 January 2021. Specifically, the approach that will be followed here will consist in estimating the effect of the concentration of EU immigrants to natives on natives' real wages and hours of work across geographical units and years. A finding that a greater concentration of EU immigrants is associated with lower pay or hours of work for the native population, especially for those with lower qualifications or at the lower end of the wage distribution, could be interpreted as a sign that a stop in EU immigration to the UK, or even a net outflow of EU immigrants from the UK, could lead to higher pay or employment of natives.

The study is structured as follows. Section 2 presents the institutional developments around the UK's decision to leave the EU, its impact on the migration behaviour of EU-born workers regarding the UK and the legal situation of already settled EU immigrants in the country.

Section 3 reviews the existing literature on the impact of immigration on UK labour markets. Section 4 presents the sources of the data used throughout. Section 5 displays the main descriptive statistics of the sample, broken down by place of birth (UK, EU and non-EU countries). Section 6 describes the econometric strategy implemented to obtain the relevant estimates and Section 7 presents the results it yields. Section 8 concludes.

## 2. Institutional background

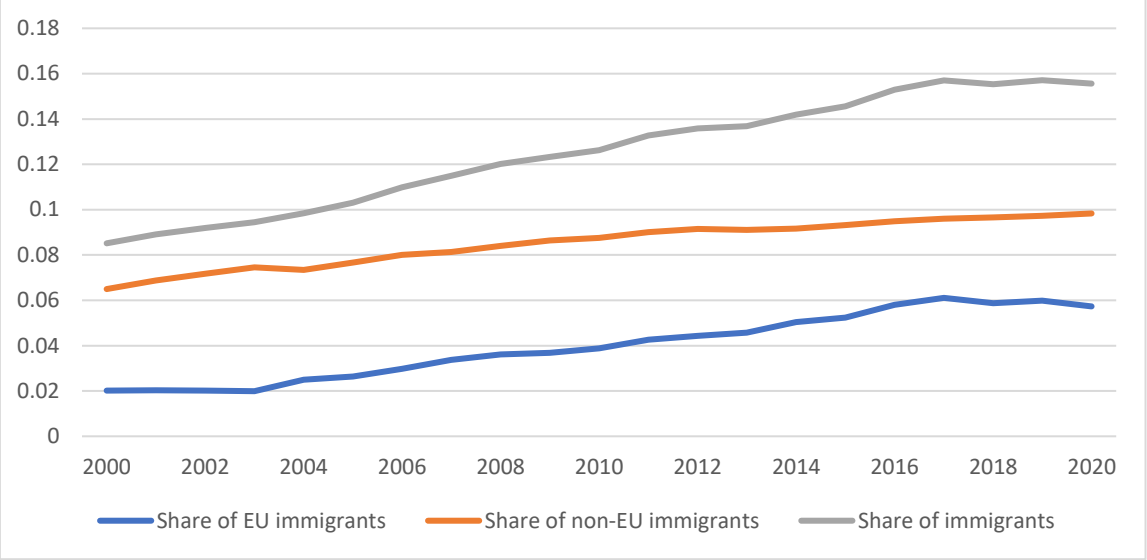
The UK had before the 2016 referendum, and still has today, a considerable number of residents born in EU countries. The UK is indeed a major destination of EU immigrants. In 2016, it had a higher ratio of EU-born over native residents than any of the largest EU countries, except for Germany: 5.7% percent of its residents had been born in the EU, compared to 4.8% in Spain, 3.7% in France and the Netherlands, 3.3% in Italy and as low as 0.7% and 0.6% in Romania and Poland (which entered the EU much later, in 2007), respectively.

Migration from EU countries to the UK increased decisively after ten new member states joined the EU on 1 May 2004. The UK, Ireland and Sweden were the only three member states that decided to grant nationals from those acceding States the same rights to move freely to work in the country as any other national of the existing member states immediately from the date of accession[1]. EU immigration to the UK peaked in 2015; this was in part due to the fact that transitional controls that had restricted the access of Bulgarian and Romanian nationals to the UK labour market were finally lifted in January 2014 (Office for National Statistics, 2021). 2016 constitutes a major turning point in the pace of EU migration to the UK. Although the proportion of EU immigrants over total UK population has remained relatively stable since, the positive trend of this share completely stopped since the date of the referendum, as Figure 1 shows, while the proportion of non-EU immigrants over population kept increasing. In fact, estimates from the Annual Population Survey show a *decline* in total EU-born population in the UK of 168,000 workers between 2017 and 2020[2].

[1] Whereas the rest of member states preferred to apply provisions in the Accession Treaty that enabled the establishment of transitional restrictions on the free movement of workers from the new member states. See the European Union (Accessions) Bill and the Explanatory Notes to it prepared by the Foreign and Commonwealth Office: https://publications.parliament.uk/pa/cm200203/cmbills/098/2003098.htm.

[2] For a more thorough analysis of the evolution of immigration in the UK after the 2016 vote, see Wadsworth (2018, pp. 633-635).

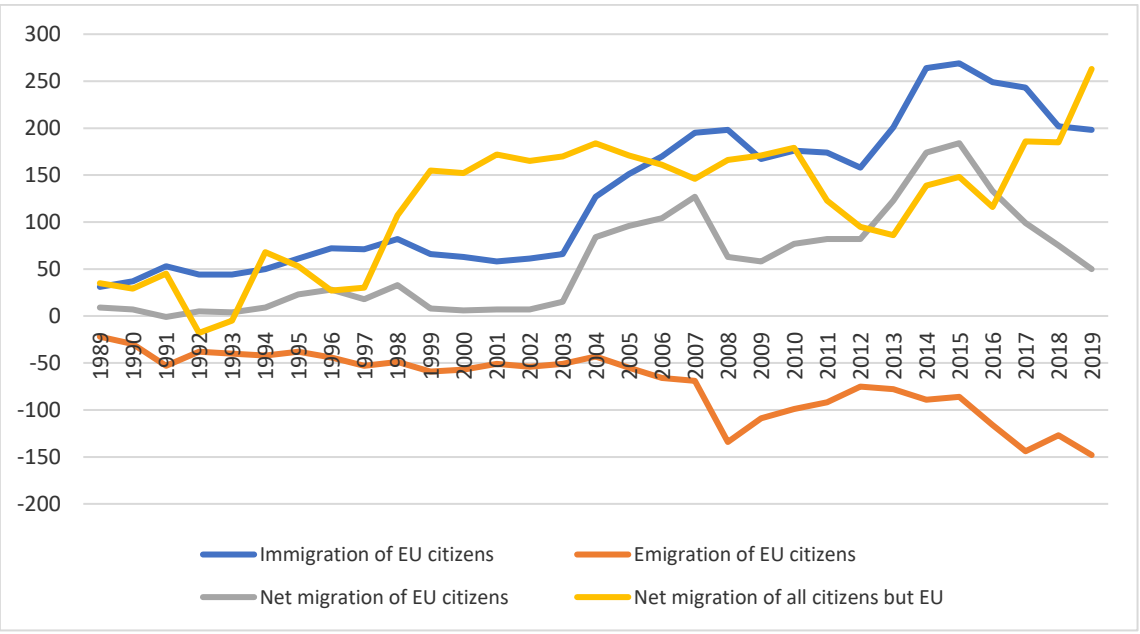
**Figure 1. Share of foreign-born residents in the UK, by place of birth, 2000-2020**




Data source: Office for National Statistics - Population of the UK by country of birth and nationality

Specifically, both immigration of EU nationals to the UK has decreased and emigration of EU nationals out of the country has increased since 2016, while overall net migration in the UK excluding inflows and outflows of EU citizens rose markedly during the same period.

**Figure 2. Immigration, emigration and net migration of EU citizens and net migration excluding EU citizens in the UK, 1989-2019**




Data source: Office for National Statistics - Long-Term International Migration

These numbers notwithstanding, EU nationals living in the UK were never legally forced to depart the country before the withdrawal took place in 2020. In fact, their legal status has been preserved afterwards too: the Withdrawal Agreement between the UK and the EU, which

entered into force on 1 February 2020, protects EU nationals living lawfully in the UK at the end of the transition period (31 December 2020), granting them residence rights that are essentially the same as under the EU free movement regime (European Commission, 2021). The new status was not obtained automatically, but EU citizens had to apply for it under an EU Settlement Scheme before a grace period ended on 30 June 2021. Any EU national who did not apply for the permit could be considered an illegal UK resident. As for the migration from EU member states to the UK after the transition period, freedom of movement ended on 31 December 2020, after which a new points-based immigration system entered into effect which treats EU nationals exactly the same way as non-EU immigrants[3].

However, uncertainty around the legal situation of EU immigrants after Brexit remained high since the aftermath of the 2016 referendum and until an agreement was finally reached. This affected the migration decisions of EU nationals with regard to the UK and is reflected, for instance, in the differences between data from the International Passenger Survey, which records the migrants' *intention* to remain in or out of the UK in the next 12 months, and those from the Registration and Population Interaction Database, which are administrative data that record the *actual* behaviour of migrants (Office for National Statistics, 2021).

## 3. Literature review

Several articles have been published over the last few decades on the topic of the effect of immigration to the UK on natives' earnings and employment. Broadly speaking, as will be seen, a strong association between a higher concentration of immigrants and lower wages and/or higher unemployment of natives (which would be, in principle, the canonical prediction of the labour market theory if capital is imperfectly mobile) has not been found.

Dustmann, Fabbri and Preston (2005) carry out the first empirical analysis for the UK making use of a "spatial correlation" approach. They find no significant impact of changes in the immigrants-to-natives ratio on the employment rate, the unemployment rate, the participation rate nor gross weekly wages of natives on average. They further assess the effect of immigration separately for natives in three different educational-attainment groups (advanced, intermediate and low education) and find that the coefficient of the ratio of immigrants to natives is statistically significant, and negative, for employment, unemployment

[3] Freedom of movement applied also to Norwegian and Icelandic workers, by virtue of the Agreement on the European Economic Area, and to Swiss workers, by virtue of the 2002 bilateral agreement with the EU. In this study, however, the analysis will be restricted to EU-born workers due to lack of disaggregation of data at the level of these three countries.

and participation of intermediate-educated natives, which seems to be in accordance with the greater concentration of immigrants in that particular group.

Dustmann, Frattini and Preston (2013) conduct another analysis of the impact of immigration along the wage distribution of natives, distinguishing between the effects on different skill types of workers. This time however, and unlike in the previous study, skill types are defined according to the location of workers in the wage distribution itself, escaping the more traditional approach of grouping immigrants and natives by age, educational attainment and/or work experience. Their argument is that immigrants downgrade upon arrival, that is, work in jobs which require less skills than those they have, because of cultural and idiomatic barriers, initial mismatch or temporary "job shopping" of migrants not constrained by work permit restrictions, as is particularly the case among EU immigrants (Wadsworth, 2018, p. 640). If that were the case, immigrants would compete with natives who do not have their same observable characteristics. The authors present evidence that, during the years they analyse, immigrants to the UK were better educated than both natives and earlier immigrants (those who had remained in the UK at least for the last 2 years) on average, and yet the proportion of them in occupations with lower wages was clearly higher.

Their results match the pattern of the distribution of immigrants along the wage distribution: an immigrant inflow equivalent to 1% of the native population leads to a 0.7% decrease of the $5^{th}$ wage percentile but to increases of percentiles in the upper part of the distribution, according to the preferred specification. They also find that such an increase in the immigrant population leads to a between 0.1% and 0.3% increase in *average* native wages and suggest that this may be due to the fact that recent immigrants are paid less than their marginal product of labour, precisely because of downgrading and initial mismatch.

Manacorda, Manning and Wadsworth (2012) present a theoretical and empirical model in which they allow for the possibility that natives and immigrants of the same age and level of education are not perfect substitutes, unlike the previous authors. They indeed find that the reciprocal of the elasticity of substitution between immigrants and natives is statistically significantly different from 0, which means that a greater concentration of immigrants increases the native-immigrant wage differential. Another of their results is that the elasticity of substitution between immigrants and natives would increase with age, a finding in the spirit of Dustmann, Frattini and Preston (2013)'s that earlier immigrants seem to compete with natives of their skill cell, but not recent immigrants. However, they do not find evidence that the elasticity of substitution between natives and immigrants changes according to educational attainment (unlike Card, 2009, pp. 15-16, for the US).

They use actual data on changes in the supply of immigrants between 1975 and 2005 in the UK to assess its impact on the outcomes of interest given their estimated parameters. They find that immigration over the analysed period (consisting of an inflow of mainly highly-educated workers) negatively affected the wages of immigrants already in the UK substantially, especially among skilled immigrants, whereas it had no appreciable effect on natives' wages, which contributed to increase the wage differential between immigrants and natives and to a deterioration of immigrants' return to tertiary education relative to that of natives.

Lemos and Portes (2014) study the impact of the big inflow of EU nationals from EU8 countries following the 2004 enlargement on labour market outcomes of UK natives. They argue that the inflow was close to being an exogenous supply shock, since it was largely unexpected and derived from a political decision, and that it is unlikely that either natives moved out of certain areas in response to it or that immigrants chose endogenously where to locate, as reflected by the fact that they mainly followed the settlement patterns of previous immigrants.

Estimating a model that exploits detailed geographical variation, the authors fail to find significant evidence of any effect of the EU-immigrant inflow on the number of Jobseeker's Allowance claimants nor on wages in the UK, even after controlling for working-age population growth and the natives' netflow rate, which seems to confirm that natives' potential response to immigration is not biasing their results. They find, however, that the coefficient of the effect of EU immigration on young workers' unemployment is positive and significant at the regional level but not at district or county levels. According to the authors, that may indicate that migrant and youth labour are more substitutable and that young workers are more mobile (and this is why the significant effect can only be found at the regional level).

One of the explanations of this unexpected result that the article provides is that low-skilled UK residents, with whom EU incoming migrants mainly competed, were protected by minimum wage increases during the period. This is in line with their finding that EU immigration increased unemployment among young workers, who are disproportionately paid the minimum wage.

Lastly, Nickell and Saleheen (2017) find a small negative impact of immigration on average wages (of the entire population, not natives specifically). Their instrumental-variable approach is very similar to the one implemented in the present study. They also estimate the effect of immigration on wages for different occupations and find a bigger negative impact in the semi/unskilled services occupational group, which has experienced an especially high inflow of EU workers, and that this result is not driven primarily by a pure compositional effect due to an

inflow of lower-paid immigrants. Theirs is the only paper that examines whether EU and non-EU immigrants have different effects on UK natives' wages; its conclusion is that they do not.

## 4. Data

The present study will make use of data from the UK Annual Population Survey (APS). APS datasets are constructed by aggregating data from the Labour Force Survey (LFS), which is conducted by the Office for National Statistics (ONS) and the Central Survey Unit of the Northern Ireland Statistics and Research Agency (NISRA). The LFS is a quarterly survey of approximately 37.500 responses from UK residents in private households, NHS accommodation and students' halls of residence. Households that participate in the survey are distributed into five "waves" (or "cohorts") and each wave is surveyed during five successive quarters. A new wave enters the sample every time a given wave completes its five quarters. Each LFS quarterly sample thus includes responses from households of five different waves, as shown in Figure 3.

The APS sample includes responses from households of the "earliest" and the "latest" waves of four consecutive quarters (it is updated quarterly), thus making use of the eight waves that are effectively surveyed during a year's time starting from a given quarter (plus some additional respondents from a sample boost). This avoids that information from any household is included more than once in the same annual APS dataset (Office for National Statistics, 2019, pp. 1-5). As an illustration of this, Figure 3 shows in red the responses that would be included in an annual APS dataset covering the time span between July 2020 and June 2021 (number *i* in each cell indicates that this is the *i*th time that households in the wave have been surveyed).

**Figure 3. Construction of APS datasets through the aggregation of LFS responses**

| | Q3 2019 | Q4 2019 | Q1 2020 | Q2 2020 | Q3 2020 | Q4 2020 | Q1 2021 | Q2 2021 | Q3 2021 |
|---|---|---|---|---|---|---|---|---|---|
| Wave A | 1 | 2 | 3 | 4 | 5 | | | | |
| Wave B | | 1 | 2 | 3 | 4 | 5 | | | |
| Wave C | | | 1 | 2 | 3 | 4 | 5 | | |
| Wave D | | | | 1 | 2 | 3 | 4 | 5 | |
| Wave E | | | | | 1 | 2 | 3 | 4 | 5 |
| Wave F | | | | | | 1 | 2 | 3 | 4 |
| Wave G | | | | | | | 1 | 2 | 3 |
| Wave H | | | | | | | | 1 | 2 |

Source: Office for National Statistics - Annual Population Survey

The APS has an overall sample size of 280,000 people (Office for National Statistics, 2020, p. 26). Therefore, the use of APS instead of LFS datasets has the advantage of a larger sample size. This study uses APS micro data in July-June annual datasets from July 2016 to June 2021. The reason for this is that the 2016 UK EU membership referendum was held on 23 June 2016, and thus it is possible to analyse its effects over the five 1-year periods immediately after it was held. For the sake of clarity, from this point on, whenever the "2021 dataset" is mentioned, this will refer to the July 2020-June 2021 dataset, and so on.

The LFS and the APS provide exhaustive information on respondents' socioeconomic characteristics and working conditions, among which hours of work and earnings. Furthermore, the APS's large sample sizes make it possible to obtain reliable estimates even at detailed geographical levels. However, responses corresponding to variables related to geographical disaggregation below the "region" level (local authority districts, counties or NUTS-2 regions) are not accessible under the standard End User License with the UK Data Service. The only remaining possibility is to make a request of results of specific variables to the Office for National Statistics, in which case average population estimates can be provided with, but not detailed micro data. Lack of detailed geographical disaggregation of LFS responses constitutes an issue across the literature (Lemos and Portes, 2014, pp. 306-307; Dustmann, Fabbri and Preston, 2005, p. 337). In the present case, those limitations have led to the adoption of a twofold approach that will be explained below.

Those under age 16, of age 65 or more and currently enrolled in an education course are excluded from the sample that will be used in this study. 16 is the UK school leaving age[4]. As for the State Pension age, it was different across individuals during the period of study depending on sex and the date of birth (ranging from 63 to 66 years)[5], so the traditional male State Pension age of 65 is used here. Gross hourly pay is used as a measure of average earnings and weekly total number of hours of work in main and second job, including overtime, over the entire working-age population, counting those unemployed or inactive as working 0 hours, is used as a measure of employment (as in Borjas, 2003, p. 1372). "EU immigrants" are UK residents born in any of EU27 countries, "natives" are UK residents born in the UK and "non-EU immigrants" include the rest of UK residents.

[4] Although in England some form of education, training or apprenticeship is required beyond age 16 until age 18; see Sections 1 and 2 of the Education and Skills Act 2008: https://www.legislation.gov.uk/ukpga/2008/25/part/1/chapter/1/crossheading/duty-to-participate-in-education-or-training.

[5] See Schedule 4 of the Pensions Act 1995: https://www.legislation.gov.uk/ukpga/1995/26/schedule/4/enacted; and Section 1 of the Pensions Act 2011: https://www.legislation.gov.uk/ukpga/2011/19/part/1.

Finally, both the LFS and the APS data must be weighted with sampling weights, which must be used to compute all estimates. Weights are helpful against potential non-response bias when non-response is distributed unequally among the different subgroups of the population (Office for National Statistics, 2020, p. 64).

## 5. Descriptive statistics

**Table 1. Descriptive statistics of UK working-age residents, 2017 and 2021**

| | 2017 | | | 2021 | | |
|---|---|---|---|---|---|---|
| | EU | Non-EU | Natives | EU | Non-EU | Natives |
| Share over entire sample | 0.071 | 0.110 | 0.820 | 0.068 | 0.116 | 0.817 |
| Educational attainment | | | | | | |
| Low | 0.048 | 0.094 | 0.087 | 0.026 | 0.060 | 0.056 |
| Intermediate | 0.452 | 0.380 | 0.635 | 0.416 | 0.351 | 0.619 |
| Advanced | 0.501 | 0.526 | 0.277 | 0.558 | 0.589 | 0.325 |
| Age | | | | | | |
| 16-30 | 0.299 | 0.165 | 0.238 | 0.217 | 0.136 | 0.235 |
| 31-49 | 0.548 | 0.567 | 0.403 | 0.595 | 0.587 | 0.390 |
| 50-64 | 0.153 | 0.269 | 0.359 | 0.188 | 0.277 | 0.376 |
| Average gross hourly wage | | | | | | |
| Total | 13.13 | 15.37 | 14.66 | 17.49 | 18.59 | 16.69 |
| Low education | 10.45 | 9.18 | 10.72 | 10.63 | 9.73 | 12.81 |
| Intermediate education | 10.40 | 11.89 | 12.82 | 13.38 | 13.96 | 14.49 |
| Advanced education | 15.39 | 18.16 | 18.97 | 20.15 | 21.31 | 20.54 |
| Average weekly hours of work | | | | | | |
| Total | 29.57 | 24.06 | 25.77 | 28.01 | 23.38 | 24.41 |
| Low education | 22.93 | 13.45 | 17.64 | 16.76 | 13.00 | 16.05 |
| Intermediate education | 28.82 | 22.44 | 25.38 | 25.98 | 19.94 | 23.14 |
| Advanced education | 30.77 | 27.45 | 29.31 | 30.15 | 26.70 | 28.37 |
| Year of arrival to the UK | | | | | | |
| 2 years ago or less | 0.107 | 0.063 | | 0.029 | 0.052 | |
| Between 3 and 5 years ago | 0.174 | 0.080 | | 0.098 | 0.092 | |
| Between 5 and 10 years ago | 0.258 | 0.152 | | 0.239 | 0.124 | |
| More than 10 years ago | 0.462 | 0.706 | | 0.634 | 0.732 | |

Note: The table shows the main descriptive statistics of UK residents aged 16-64 not currently enrolled in any education course, broken down by place of birth (UK, EU27 countries or rest of the world). Educational attainment is considered to be low if the individual completed full-time education before age 16 or never had education, intermediate if it was between ages 16 and 19 and advanced if it was at age 20 or later. Average gross hourly wage is in nominal terms. Average weekly hours of work include overtime, refer to main and second job and are computed such that unemployed or inactive individuals are considered to work 0 hours.

Table 1 shows the main descriptive statistics of the three groups of UK residents analysed in this study: natives, EU immigrants and non-EU immigrants; for the first and the last yearly period included in the sample.

The proportion of EU immigrants seems to have slightly decreased between the two time periods considered, although the difference is not statistically significant at the 5% significance level. On the contrary, the small increase in the share of non-EU residents *is* statistically significant. According to estimates from the 2021 dataset, of those born outside the UK, the main countries of origin were India (9.22%), Poland (8.12%), Pakistan (4.89%), China (4.07%), Lithuania (4.02%), Romania (3.82%), Nigeria (3.73%), Germany (3.70%), Italy (3.43%), the Republic of South Africa (3.11%), Philippines (3.09%), Portugal (2.85%), the Republic of Ireland (2.84%), Bangladesh (2.61%), Australia (2.49%) and Spain (2.28%).

Regarding educational attainment, EU-born individuals have a lower proportion of observations with low or no education than both natives and non-EU immigrants. The educational differences between immigrants (both classes) and natives are striking: the percentage of immigrants who are advanced-educated more than doubles that of natives.

As for age, immigrants tend to be younger than natives, with a few nuances: the proportion of EU immigrants of younger age, which is fairly similar to that of natives, is however substantially (and significantly) higher than that of non-EU immigrants. This may have to do with the facilities to migrate across the European internal market thanks to the free movement regime.

Compared to low-educated individuals, average pay is higher for observations with a higher educational attainment, especially those with advanced education. Nevertheless, as will be assessed in more depth later, the marked difference in educational attainment between EU immigrants and natives does not always translate into higher wages for EU immigrants (they are in 2021 but not in 2017; in both cases differences are statistically significant). A potential explanation to this phenomenon may be that EU immigrants leaving the UK between 2017 and 2021 are concentrated in the lower part of the wage distribution (those leaving out of fear of an uncertain future in the UK would be those earning less). There are some differences inside education groups too. While there are no statistically significant differences between natives, EU immigrants and non-EU immigrants in the advanced-education group in 2021, differences are indeed significant in 2017. Natives earn more than immigrants among intermediate- and low-educated individuals as well.

Those differences between immigrants and natives in average wages do not arise in the same way in the case of hours of work. As said before, the measure presented here counts those

who are inactive or unemployed as working 0 hours. Accordingly, it is a measure of both employment and labour force participation, and it also accounts for the phenomenon of part-time work. Some clear patterns seem to stand out: hours of work increase with the level of education, EU immigrants work more hours than natives and natives work more hours than non-EU immigrants (differences are statistically significant almost for all education groups and years). Conditioned on being employed, EU immigrants remain the ones who work more hours a week (35 in 2017), but non-EU immigrants work more hours (33.5) than natives (32.9), and the difference is statistically significant. It turns out, however, that non-EU immigrants are the group with a higher proportion of unemployed (4.25% as a share of the whole non-EU-immigrant sample) and inactive (24%), despite having a higher proportion of advanced-educated (who, not surprisingly, are the ones with the lowest rates of unemployment and inactivity); while the proportion of EU immigrants who are inactive is the lowest (12%), probably due to the fact that the EU right to free movement of workers is subject to the condition of working or being registered as unemployed, at least during the first five years of residence.

There are remarkable differences across years and place of birth regarding how long immigrants have been in the UK. There is a higher proportion of EU immigrants than non-EU-born residents who arrived at the UK during the last few years. It seems as if large-scale EU migration to the UK were a more recent phenomenon than non-EU migration, which may be due to historical migration patterns from Commonwealth countries and more recent inflows from EU countries fostered by the enlargements of 2004 and 2007. However, this difference appears to have narrowed since 2016, which could be clearly related to Brexit: the share of EU immigrants arrived at the UK during the last 5 years is currently 13%, while it used to be 28% just a few years ago. On the contrary, the proportion of longer-established non-EU immigrants has remained fairly similar. This issue will be discussed a little more in depth below.

Finally, a salient feature of immigration in the UK is the uneven distribution of migrants into different locations, which leads to huge differences in the ratio of immigrants to natives across regions. This phenomenon would point to the existence of very strong network pull effects (Lemos and Portes, 201, p. 309). Specifically, London alone accounted in 2017 for the 36.8% of the total UK immigrant population (and the 30% of total EU-born residents), while it was home to just 9.2% of natives (its ratio of EU immigrants to natives was equal to 0.282). By contrast, the region with the second highest ratio of EU immigrants to natives was East England, with a ratio of *just* 0.09. Finally, 1.5% of immigrants (and of EU-immigrants) lived in North East

England, while 4.6% of natives did (the ratio of EU immigrants to natives was the lowest there, at 0.028).

## 6. Econometric approach

This study implements an econometric strategy that exploits variation across geographic units, in the spirit of the "spatial correlation" approach mentioned above, to assess the labour market impact of EU immigration.

The model is in the style of Dustmann, Fabbri and Preston (2005)'s and Dustmann, Frattini and Preston (2013)'s. Two approaches are taken in turn. The first one makes use of data at the NUTS-2 level[6] for two time periods, just before (2016) and some years after the referendum (2021), provided on request by the Social Surveys division of the Office for National Statistics. It consists in estimating the following simple OLS model in first differences:

$$\Delta \ln y_{i,2021} = \beta \Delta Ratio_{i,2021} + \Delta\alpha_{2021} + \gamma \Delta Controls_{i,2021} + \Delta\epsilon_{i,2021} \quad (1)$$

where $y_{i,t}$ is the outcome variable of interest for natives (real gross hourly wages of those employed or total weekly hours worked over the whole native working-age population), $Ratio_{i,t}$ is the ratio of EU immigrants to natives and controls include the ratio of non-EU immigrants to natives; the mean age of natives, EU immigrants and non-EU immigrants; and the logarithm of the ratio of natives with high education and natives with intermediate education to natives with low or no education; all of these in the *i*th NUTS-2 area. $\alpha_t$ are time fixed effects. The two differenced time periods are 2016 and 2021.

A source of concern regarding endogeneity is the potential correlation between demand shocks caused by the COVID-19 crisis in a given region and both the outcome of interest and the ratio of EU immigrants to natives in that region (for instance, the incidence of COVID-19 on the local labour market may have been greater in those places where there is a higher concentration of EU immigrants, like big cities). Therefore, an additional control is included consisting in the total number of deaths due to COVID-19 over total population in each NUTS-2 area between March 2020 and April 2021.

The second approach consists in the estimation of a fixed-effects regression of the logarithm of real wages or hours of work on the ratio of EU immigrants to natives across 13 regions and 5 time periods in the following manner:

$$\ln y_{i,t} = \beta Ratio_{i,t} + \alpha_t + \alpha_i + \gamma Controls_{i,t} + \epsilon_{i,t} \quad (2)$$

[6] There were 40 NUTS-2 regions in the UK according to the 2013 classification, which is the one used here.

where $\alpha_i$ are region fixed effects. Now geographical disaggregation is not at the NUTS-2-area level, but at the regional level, using the detailed micro data from the UK Data Service for the five yearly periods after the referendum (starting from 2017). Regions are the 9 English regions plus Scotland, Wales, Northern Ireland and Merseyside, which is detached from North West England. Controls are the same as before, plus the proportion of natives who are men.

A different control variable is now alternatively used to capture the incidence of COVID-19 on the economy (thanks to the greater scope of data available when working with the 13 regions instead of the 40 NUTS-2 areas). This variable is constructed as a sort of index that measures the potential incidence of COVID-19 on the economic activity in each region. The index ($Incidence_i$) is calculated in the following way:

$$Incidence_i = \sum_{n=A}^{U} \Delta GDP_n \cdot weight_{n,i} \quad (3)$$

where $\Delta GDP_n$ is the average monthly variation in the GDP of section *n* of the UK Standard Industrial Classification of economic activities 2007 (SIC 2007)[7] at the national level between March 2020 and March 2021; and $weight_{n,i}$ is the proportion of workers in region *i* employed in section *n* in time period 2019.

This index is interacted with an indicator which is equal to one in time periods 2020 and 2021, the two periods potentially affected by the COVID-19 crisis.

Two additional concerns remain regarding endogeneity. The first one is that the error term in the fixed-effects regression is correlated with present, past or future values of $Ratio_{i,t}$, which may happen if, for instance, natives respond to changes in the immigrant concentration by moving to other regions or if immigrants choose the regions they will move to (or whether they will leave the region they live in) according to the past or present economic performance of regions. The first source of potential endogeneity is not so worrying in the present case because of the large definitions of the geographical units used (Dustmann, Frattini and Preston, 2013, p. 157). The second one could be more problematic here. The issue would be circumvented if immigrants' inflows and outflows were exogenous to economic conditions due to the allocation being made on political or administrative grounds (as in Glitz, 2012); in the present case, while it is true that a big portion of EU citizens leaving the UK may have done so for political reasons (related to the consequences of a political decision made by the UK people), a substantial number of EU citizens *entered* the UK during the analysed period and it cannot be excluded that the decision to move to one region or another were indeed endogenous.

A way to try to eliminate the bias introduced by this potential endogeneity is to make use of instrumental variables. Three different instruments will be experimented with here (as in

[7] There are 21 sections, each one identified by a letter from A to U.

Dustmann, Frattini and Preston, 2013): the 4th lag of the ratio of EU immigrants to natives, this ratio as recorded in the 2011 Census for each region and the predicted ratio of EU immigrants to natives. The instrumental-variable approach may additionally remove the bias arising from potential measurement error in the ratio of immigrants to natives in the APS sample due to the small number of EU citizens surveyed (for instance, EU-born represented only 4.53% of observations in the sample of time period 2021, with less than 5,000 observations, although the proportion is higher in the rest of time periods). This may be specially so with the Census instrument, as the measurement error in the Census is independent of that in the APS. Of course, the instrument would still not be valid if region specific productivity shocks are so persistent that past EU-immigrant settlement patterns are correlated with them (Card, 2001, pp. 43-44) or if, for instance, higher concentrations of EU immigrants to natives in a given region in the past influence future economic shocks there. The instrumental-variable approach will only be used to estimate equation 2, due to unavailability of data at the NUTS-2-area level.

The third instrument is inspired in the supply-push component of EU-immigrant inflows as constructed in Card (2001, p. 43; and 2009, pp. 8-9) and Dustmann, Frattini and Preston (2013, p. 158). It is the predicted ratio of EU immigrants to natives according to the proportion of immigrants from different groups of source countries[8] that lived in each region in a base time period (2011):

$$PR_{i,t} = \frac{1}{UK_{i,t-2}} \sum_{n=1}^{N} EU_{n,t} * \lambda_{n,i,2011} \quad (4)$$

Where $EU_{n,t}$ is the national stock of working-age EU immigrants from group of source countries *n* in time period *t*, $\lambda_{n,i,2011}$ is the proportion of EU immigrants from group of source countries *n* living in region *i* in time period 2011 and $UK_{i,t-2}$ is the number of working-age UK natives in region *i* in time period *t*-2 (to avoid correlation with the error term in the second-stage regression: Glitz, p. 183). The reason why the national *stock* of EU immigrants is used here instead of the national *inflow* of EU immigrants is to keep the instrument consistent with the econometric specification, which is a fixed-effects regression and not a first-difference regression. Both the fixed-effects and the first-difference estimators, which are alternative ways to estimate a panel-data model, are unbiased and consistent, although are defined in a different way and thus may yield different results (Wooldridge, 2006, pp. 491-492).

Those same three instruments are analogously constructed for the ratio of non-EU immigrants to natives and included also in the estimated 2SLS regressions[9].

[8] 11 such groups are used: Republic of Ireland; Germany; France; Italy; Spain and Portugal; rest of EU14 countries; Poland; Lithuania; rest of EU8 countries excluding Cyprus and Malta; Romania and Bulgaria; and Croatia, Malta and Cyprus.

[9] 15 groups of non-EU countries are now used: rest of European countries; Eastern Africa; Republic of South Africa; rest of African countries; North America; Central and South America; Caribbean; Middle

There is still an important third factor that could be a source of further endogeneity: changes in trade patterns and other economic shocks related to the decision to leave the European Union during the period of study, as long as they were systematically correlated with changes in the local stock of immigrants. Since this omitted variable is more difficult to be accounted for, no additional control is introduced to try to overcome this issue.

Standard errors robust to both heteroskedasticity and autocorrelation (clustered at the region level) are used throughout. In all cases, regressions are weighted by the estimated working-age population of each geographical unit in 2017.

All findings are presented in the next section. In the first place, estimates of the effect of EU immigration on average labour market outcomes for natives are displayed. Results are then presented of the effect of EU immigration on non-EU-immigrant earnings and hours of work, to see whether this demographic is affected in a different way by changes in the EU-immigrant concentration (the independent variable is now the ratio of EU immigrants to non-EU immigrants and the ratio of UK natives to EU immigrants is now the control variable).

Although the average impact of EU immigration on natives' outcomes could be positive, it may well be that this effect is not uniform across education, age or age-education groups, due to differences in the composition of the native and the EU-immigrant populations. Equation (2) will therefore be estimated once again, this time replacing the outcome of interest with that corresponding to each of three education groups, three age groups and nine age-education groups of natives. This last analysis may be more affected by potential measurement error due to small subsample sizes of age-education groups; the results and discussion around it will be presented in the Annex. Groups distinguish between individuals whose age is between 16 and 30, 31 and 49 and 50 and 64 and those who completed full-time education before age 16 or never had education (low-educated), between ages 16 and 19 (intermediate-educated) or at age 20 or after (advanced-educated), as in Manacorda, Manning and Wadsworth (2012, pp. 138-139). Controls now include the average age of UK natives, EU immigrants and natives in each education, age or age-education group and the ratio of non-EU immigrants to natives, as well as COVID-19 incidence. In the case of age groups, controls also include the logarithm of the ratio of natives with high education and natives with intermediate education to natives with low or no education in each age group.

As explained above, Dustmann, Frattini and Preston (2013) prefer not to assign workers to particular skill groups according to their observed characteristics (as done here) because of initial downgrading. At first glance, it may seem that this phenomenon is not as problematic in the present case, precisely since the inflow of new EU immigrants into the UK has fallen

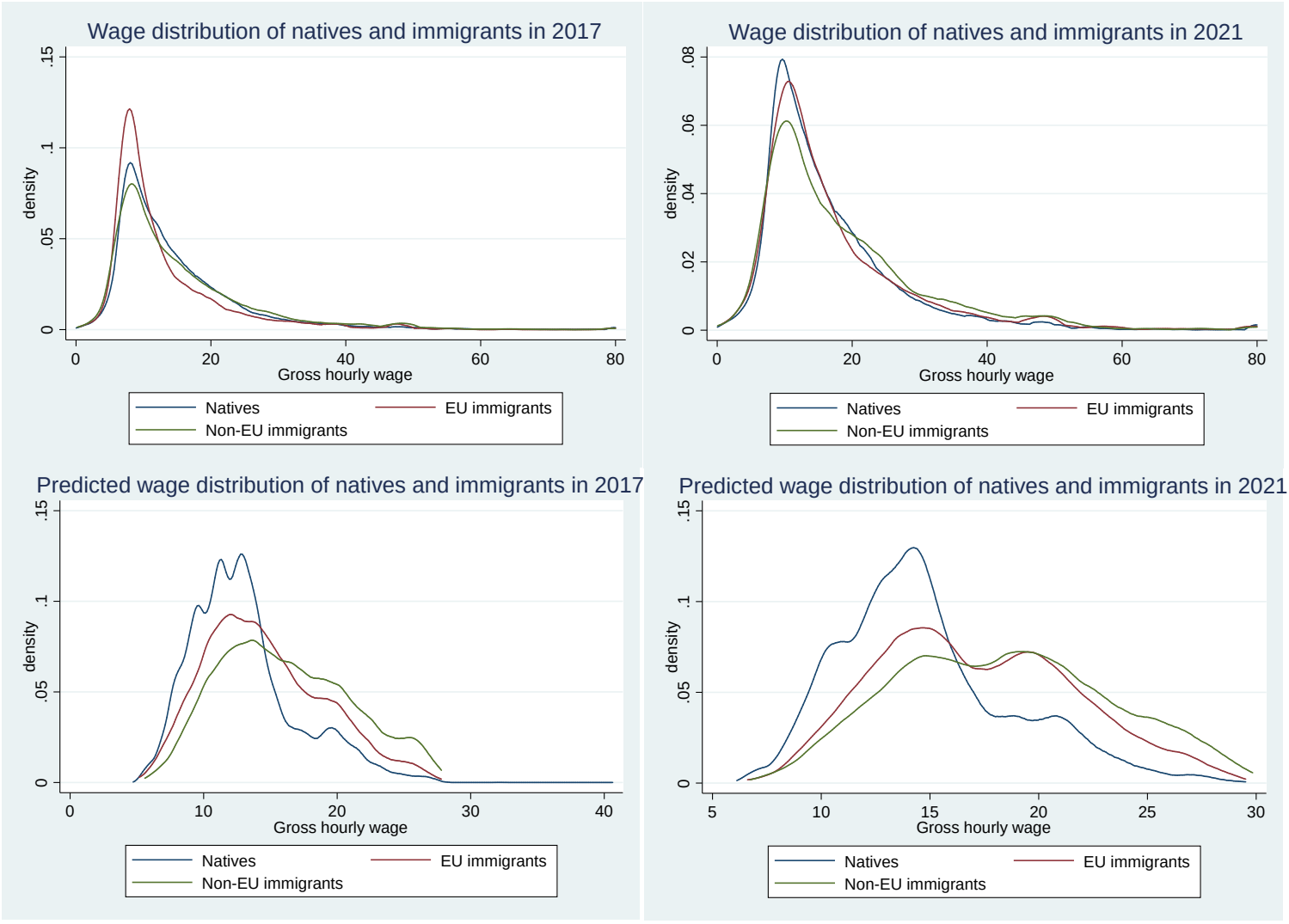
East; China, including Hong Kong and Macao; Bangladesh; India; Pakistan; Philippines; rest of Asia; and Oceania.

dramatically during the time span analysed in this study. In particular, as presented in Table 1, the proportion of EU immigrants arrived in the UK during the previous 2 years over the total subsample of EU immigrants stands at 2.9% in the 2021 dataset, down from 11.6% in the 2016 sample (just before the referendum). This could mean that EU immigrants in the sample used for this study are more likely to have already overcome the downgrading upon arrival pointed out by the aforementioned authors and be effectively competing in the labour market with natives of their same age and education.

On the other hand, the issue of downgrading may be still playing some role even today. As can be seen in Table 1, the proportion of advanced-educated individuals is much higher among EU (and non-EU) immigrants than among natives. But these differences are not reflected in the wage distribution of EU immigrants (or non-EU immigrants) compared to that of natives, shown in the upper panels of Figure 4. The natives' distribution is, if at all, slightly to the right of the EU immigrants'. The non-EU immigrants' wage distribution is closer to that of natives; as seen before, non-EU immigrants have a higher proportion of advanced-educated individuals than EU immigrants and tend to be longer established in the UK, a factor that would mitigate downgrading upon arrival. Interestingly, the wage distribution of EU immigrants seems to be more similar to the native distribution in 2021, when the share of recently arrived immigrants dramatically decreased. The distributions corresponding to the other time periods included in the sample are not displayed here, although were very similar to the distributions of 2017 and 2021.

To further check whether a mismatch between immigrants' educational composition and wage distribution exists compared to those of natives, the distributions in the upper panels of Figure 4 can be contrasted with the *predicted* wage distributions of natives, EU immigrants and non-EU immigrants according to their observed characteristics. To this end, the logarithm of wages has been regressed on age, age at which the individual completed education, sex, region of residence, whether the individual works full-time or part-time and an interaction between age and education (low, intermediate or advanced), only for natives. Using the estimates obtained with this regression, the gross hourly wage has been predicted for every observation in the sample. This predicted value would measure the pay that would correspond to an individual according to his observed characteristics *if he were native*. The lower panels of Figure 4 show the distribution of predicted wages for natives and immigrants. The differences with the distribution of wages are remarkable: immigrants' predicted wages differ much more clearly with natives' wages than actual wages.

**Figure 4. Actual wage distribution and predicted wage distribution of natives and immigrants, 2017 and 2021**




Data source: Office for National Statistics - Annual Population Survey

These results suggest that EU immigrants do not compete with natives of their same age and education, but rather with those who are less educated than them, at least upon arrival. The last results that will be presented are accordingly the estimates of the impact of EU-immigrant concentration on the 5$^{th}$, 10$^{th}$, 25$^{th}$, 50$^{th}$, 75$^{th}$, 90$^{th}$ and 95$^{th}$ percentiles of the natives' wage distribution, to find the effect of EU immigrants on the outcomes of those natives with whom the former effectively compete.

## 7. Results

Table 2 displays the results of the 40-NUTS-2-area and the 13-region analyses of the effect of EU immigration on natives' average outcomes. As for the 13-region regressions, they include the results of four different specifications: the baseline fixed-effects specification (in which no instrument is used), the 2SLS specification using the incidence index as a control for the COVID-19 economic impact, the 2SLS specification using the death rate as COVID-19 control and the 2SLS specification dropping observations from time periods 2020 and 2021 (the two in which COVID-19 may have had an impact). All the 2SLS results presented correspond to regressions in which the 2011 Census ratio of immigrants to natives was used as instrument. Results of the other 2SLS regressions using other instruments are not presented because the instruments appeared to be rather weak in the first stage regression, although yielded similar point estimates.

**Table 2. Effect of EU-immigrants-to-natives ratio on labour market outcomes for natives**

| | NUTS-2 areas | 13 regions | | | |
|---|---|---|---|---|---|
| | Differences | FE | 2SLS (Census) | 2SLS, death rate | w/o 2020 and 2021 |
| Real wages | -0.04 | 0.24 | 1.34*** | 1.46*** | 0.97 |
| | (0.49) | (0.38) | (0.39) | (0.45) | (1.14) |
| Hours of work | -0.01 | -0.25 | -0.58 | -0.58 | -0.43 |
| | (0.31) | (0.37) | (.45) | (.50) | (1.00) |
| F-statistic | | | 34.76 | 15.17 | 10.8 |
| Observations | 80 | 65 | 65 | 65 | 39 |

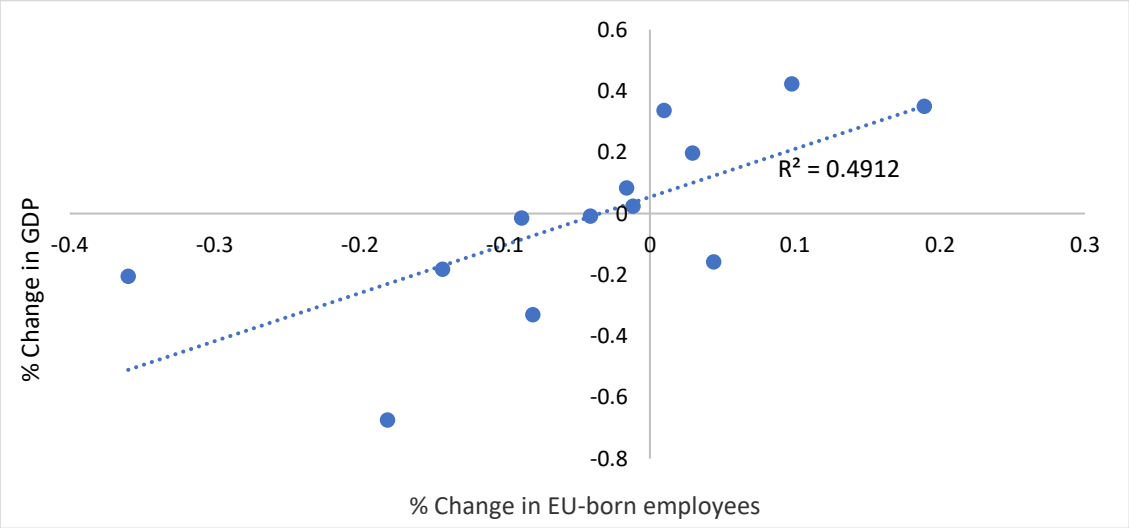
Note: The table displays the results of the estimation of the effect of the ratio of EU immigrants to natives on real wages and hours of work of natives. The first column shows the results of the simple OLS model in first differences using NUTS-2 areas. The rest of the columns shows the results of the fixed-effects model using the 13 regions, with four different specifications: only fixed effects (FE), two-stage least squares (2SLS), 2SLS using death rate as COVID-19 control instead of industry incidence, and 2SLS dropping observations from time periods 2020 and 2021. In all these 2SLS specifications the ratio of immigrants to natives from the 2011 Census was used. The F-statistic row shows the results of the test of significance of instruments in the first-stage fixed-effects regression. An asterisk, two or three of them indicate that the coefficient is significantly different from 0 at the 10%, 5% or 1% significance level, respectively.

There is no estimate in the table significantly different from 0 except for the estimates of the 2SLS specifications in which all time periods are included. According to the preferred one, a decrease of one percentage point in the ratio of EU immigrants to natives would lead to a 1.34% decrease in the average wage of natives. This latter finding would be reinforced by a relatively high F-stat for the significance of the instrument in the first-stage regression. The fact that the 2SLS estimates are higher than the basic FE one, and that all of them are positive, seems to suggest that measurement error may be biasing the baseline estimate towards zero.

Results do not change much when using the incidence index or the death rate as a control for the COVID-19 incidence. Point estimates are also quite similar when dropping observations from time periods 2020 and 2021, which suggests that the COVID-19 economic impact is not biasing the coefficients when using the whole sample or, at least, the COVID-19 controls avoid that bias. However, the loss of information arising from the substantial drop in the number of observations increases the standard error, which makes the coefficient of the effect on real wages no longer significant.

The sign of the 2SLS coefficients is positive. The reason of this may be related to the arguments presented by Dustmann, Frattini and Preston (2013, pp. 165-166) concerning an equilibrium surplus, imperfect substitutability between immigrants and natives, skill shortages or the possibility that immigrants are paid less than the value of the marginal product because of downgrading. In the present case, however, an additional explanation may be that a substantial outflow of EU-born residents triggered by Brexit leads to serious labour shortages in regions most affected by emigration and that those shortages spread to other sectors and cause local economic downturns that negatively impact the wages of natives. The channel through which labour shortages would be transmitted to regional economies would be an output fall in economic activities with a relatively high concentration of EU-immigrant workers, which would lead to wage cuts in the region affected by the negative economic shock. Although this is not the most accurate way to test the hypothesis just explained, a simple regression of the percentage change in GDP on the percentage change in EU-born employees in a given industry section over the period 2017-2021 is presented below.

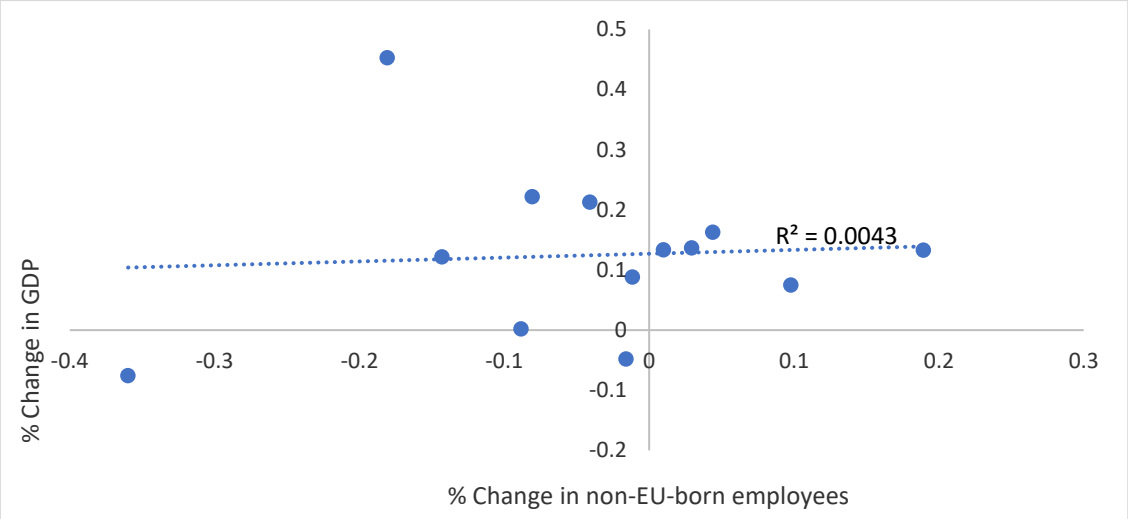
**Figure 5. Percentage change in EU-immigrant employment and in GDP (2017-2021) in main UK industry sections**




Data source: Office for National Statistics - Annual Population Survey, Monthly gross domestic product

There seems to be a clear positive relationship between the two, which would suggest that a decrease in EU-born employment in a certain industry section is associated with a more severe GDP contraction in that same industry. What is more, such relationship is apparently inexistent between the percentage change in non-EU-born employees and the percentage change in GDP across industries, as shown in Figure 6. Indeed, the 2SLS estimates of the effect of the ratio of non-EU immigrants (not shown in Table 1) on natives' average pay are *negative* and significant, not positive.

**Figure 6. Percentage change in non-EU-immigrant employment and in GDP (2017-2021) in main UK industry sections**




Data source: Office for National Statistics - Annual Population Survey, Monthly gross domestic product

On the other hand, the coefficient of the effect of the ratio on total hours worked over the whole working age population is never significantly different from 0, which would confirm the idea that adjustments in UK labour markets to changes in the concentration of immigrants take place, if at all, through wages (Manacorda, Manning and Wadsworth, 2012, p. 140).

In any case, results should be interpreted with caution due to the low number of clusters throughout. Moreover, the estimated IV coefficients could be biased due to the potential existence of correlation between the instrumental variable (the lagged or Census ratio of EU immigrants to natives, or predicted inflow of immigrants) and the error term in equation (2), as warned in the previous section, and the more so the weaker the instrument (so the smaller the correlation between the instrument and the regressor of interest).

Table 3 presents the same results as Table 2, but now dependent variables (wages and hours of work) refer to non-EU immigrants instead of natives.

**Table 3. Effect of EU-immigrants-to-natives ratio on labour market outcomes for non-EU immigrants**

| | NUTS-2 areas | | 13 regions | | |
|---|---|---|---|---|---|
| | FD | FE | 2SLS (Census) | 2SLS, death rate | w/o 2020 and 2021 |
| Real wages | -0.02 | -0.01 | 0.03 | 0.04 | -0.07 |
| | (0.08) | (0.07) | (0.08) | (0.09) | (0.12) |
| Hours of work | 0.08 | 0.05 | -0.08 | -0.08 | -0.04 |
| | (0.07) | (0.07) | (.08) | (.09) | (0.16) |
| F-statistic | | | 27.4 | 15.73 | 11.79 |
| Observations | 80 | 65 | 65 | 65 | 39 |

Note: Same as for Table 2.

All the estimated coefficients are now very small in magnitude and insignificant at any significance level, regardless of the specification. As before, only results corresponding to the 2SLS specification that yielded a higher F-statistic in the first-stage regression (the one with the 2011 Census ratio as instrument) are reported.

These estimates suggest that non-EU immigrants do not benefit from EU immigration nor they are negatively impacted by it, which is consistent with the huge resemblance between the skill composition of EU immigrants and that of non-EU immigrants: according to the theoretical model by Dustmann, Frattini and Preston (2013, p. 149), the second-order impact of immigration is only positive if immigrants differ at all from natives in their skill mix. Results may be, however, read with caution due to the low number of non-EU immigrants in the samples used.

Estimates of the effect of EU immigration on three education groups of natives are shown in Table 4.

There appears to be a clear pattern in the relationship between the level of education and the impact of EU immigration, at least on average wages. Those worse affected by it (and thus potentially benefited from emigration) are low-educated, while its effect on intermediate and advanced-educated natives' wages is positive, and bigger for the latter group. The effect of EU immigration on natives' hours of work by education group are more confusing. It seems to be negative, although only significantly at the 10% significance level, for low-educated and positive for intermediate-educated, which is in accordance with the effect on pay. However, it is surprisingly *negative* for highly educated natives, although less so than for low-educated. This result could be reconciled with the high proportion of EU immigrants who are advanced-educated, indicating a certain degree of substitutability between EU immigrants and highly

educated natives (just as between EU immigrants and low-educated natives due to downgrading upon arrival). What seems more difficult to rationalise is the divergence between the two coefficients (wages and hours), which could however indicate that positive spillovers from EU-immigrant workers at the workplace, reflected in the positive effect of EU immigration on the wages of advanced-educated natives, more than compensate the substitution between immigrants and some highly educated natives.

**Table 4. Effect of EU-immigrants-to-natives ratio on labour market outcomes for natives, education groups**

| | FE | 2SLS (Census) |
|---|---|---|
| Low education | | |
| Real wages | -3.48*** | -3.21*** |
| | (1.03) | (1.11) |
| Hours of work | -0.54 | -2.48* |
| | (1.62) | (1.41) |
| F-statistic | | 43.89 |
| Intermediate education | | |
| Real wages | 0.06 | 0.55*** |
| | (0.29) | (0.17) |
| Hours of work | 0.37 | 1.02*** |
| | (0.56) | (0.28) |
| F-statistic | | 190.04 |
| Advanced education | | |
| Real wages | 0.53 | 0.76*** |
| | (0.38) | (0.20) |
| Hours of work | -0.10 | -0.47*** |
| | (0.29) | (0.16) |
| F-statistic | | 347.57 |
| Observations | 65 | 65 |

Note: The table displays the results of the estimation of the effect of the ratio of EU immigrants to natives on real wages and hours of work of natives, assessed on three education groups. The first column shows the results of the baseline fixed-effects model using the 13 regions and the second one the results of the two-stage least squares (2SLS) specification using the 2011 Census ratio as instrument. The F-statistic row shows the results of the test of significance of instruments in the first-stage fixed-effects regression. An asterisk, two or three of them indicate that the coefficient is significantly different from 0 at the 10%, 5% or 1% significance level, respectively.

Next, Table 5 displays the results of the regression of the ratio of EU immigrants to natives on three age groups of natives.

Some of these results are in line with what one would have expected; others are more surprising. It is not surprising to find so small an estimate of the effect of EU immigration on workers of higher age: although this is the group of natives with a higher proportion of low-educated individuals (15%) and a smaller proportion of advanced-educated observations (20%), older workers are more likely to have their working conditions protected by, for

instance, collective agreements. Indeed, 2017 estimates from the Labour Force Survey indicate that age groups with a higher proportion of workers who are members of a trade union are 55-59 (33%), 50-54 (32%) and 60-64 (30%); while the percentage stands at 2% for ages 16-19 and 10% for ages 20-24 (Department for Business, Energy & Industrial Strategy, 2021).

**Table 5. Effect of EU-immigrants-to-natives ratio on labour market outcomes for natives, age groups**

| | FE | 2SLS (Census) |
|---|---|---|
| Low age | | |
| Real wages | 0.754*** | 0.991*** |
| | (0.29) | (0.25) |
| Hours of work | -0.304 | -1.003** |
| | (0.94) | (0.47) |
| F-statistic | | 65.58 |
| Intermediate age | | |
| Real wages | 0.152 | 0.609* |
| | (0.39) | (0.37) |
| Hours of work | -0.281 | -0.281 |
| | (0.21) | (0.23) |
| F-statistic | | 120.58 |
| High age | | |
| Real wages | -0.14 | 0.02 |
| | (0.40) | (0.33) |
| Hours of work | -0.14 | -0.15 |
| | (0.57) | (0.41) |
| F-statistic | | 389.32 |
| Observations | 65 | 65 |

Note: Same as for table 4 (referred to three age groups instead of education groups).

Natives of low and intermediate age do not differ much in their educational composition (around 5% of low-educated and 32% of high education), which may be the reason why their results are much more alike. In particular, an outflow of EU immigrants equivalent to 1% of the total native population would lead to a decrease in low-aged natives' pay of 0.99% and of 0.6% in the case of intermediate-aged natives (the latter only significant at the 10% significance level). What is more unexpected is the negative, significant effect that EU immigration has on hours of work of low-aged natives, while it has no significant effect on other age groups. The reason could be in line with what has been said about the advanced-educated group: a high substitutability between EU immigrants and highly educated natives, especially for low-aged workers, who are less likely to be in stable, long-lasting labour relationships.

Finally, Table 6 presents the estimates of the impact of EU immigration on different percentiles of the native wage distribution.

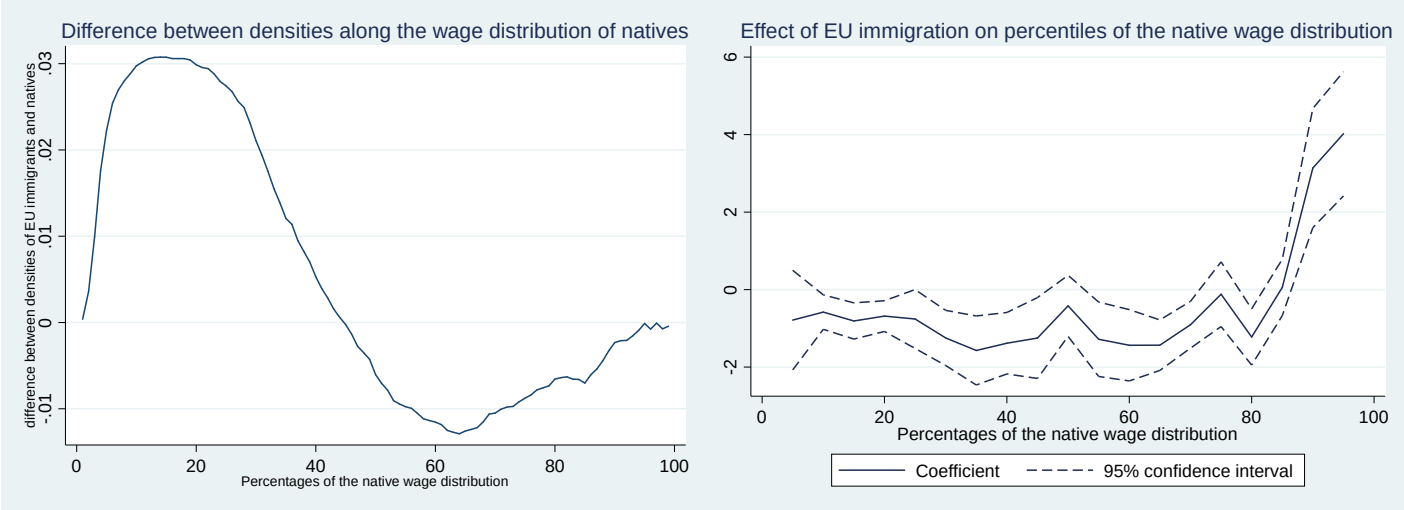
**Table 6. Effect of EU-immigrants-to-natives ratio on labour market outcomes for natives, percentiles**

| | FE | 2SLS (Census) |
|---|---|---|
| 5th percentile | | |
| Real wages | -0.42 (0.69) | -0.79 (0.66) |
| 10th percentile | | |
| Real wages | -0.41 (0.26) | -0.58** (0.23) |
| 25th percentile | | |
| Real wages | -0.79*** (0.30) | -0.76* (0.39) |
| 50th percentile | | |
| Real wages | -0.66*** (0.21) | -0.42 (0.40) |
| 75th percentile | | |
| Real wages | -0.41 (0.38) | -0.12 (0.43) |
| 90th percentile | | |
| Real wages | 1.66 (0.67) | 3.14*** (0.78) |
| 95th percentile | | |
| Real wages | 1.39 (0.96) | 4.02*** (0.82) |
| F-statistic | | 39.56 |
| Observations | 65 | 65 |

Note: The table displays the results of the estimation of the effect of the ratio of EU immigrants to natives on different percentiles of the natives' wage distribution. The first column shows the results of the baseline fixed-effects model using the 13 regions and the second one the results of the two-stage least squares (2SLS) specification using the 2011 Census ratio as instrument. Standard errors are reported in parentheses next to the estimated coefficients. The F-statistic row shows the results of the test of significance of instruments in the first-stage fixed-effects regression. An asterisk, two or three of them indicate that the coefficient is significantly different from 0 at the 10%, 5% or 1% significance level, respectively.

Broadly speaking, these results are consistent with expectations. They suggest that EU immigration has a negative impact on workers at the lower half, no significant impact at the middle of the natives' wage distribution ($50^{th}$ and $75^{th}$ percentiles) and a positive impact on the top end of the distribution which is quite high in magnitude. This picture matches pretty closely the relative location of EU immigrants on the wage distribution of natives and seems to confirm the hypothesis that some downgrading upon arrival still exists among EU immigrants despite the low proportion of recently arrived individuals. This downgrading would lead to competition (and substitution) between EU immigrants and those natives located at the lower part of the wage distribution, who are the less educated, despite EU immigrants having, in general, higher levels of education than natives. To summarise this argument, Figure 7 shows, on the left-hand side, the difference between the Kernel densities of EU immigrants and natives at each percentage of the native wage distribution (so, for instance, when the percentage is 10% it shows the difference between Kernel densities that correspond to the $10^{th}$ percentile of the native wage distribution). On the right-hand side, the figure shows the coefficients (with their 95% confidence interval) of the effect of the ratio of EU immigrants to natives on various percentiles of the native wage distribution.

**Figure 7. Difference between densities and effect of EU immigration on various percentiles**




Data source: Office for National Statistics - Annual Population Survey

## 8. Conclusion

The results presented in this study do not give an unambiguous answer to the question whether immigration of EU workers to the UK damage the labour market outcomes of natives. On the one hand, EU immigration appears to have a clear *positive* effect on the *average* wage of native workers, which may indicate that an outflow of EU workers due to Brexit could have led to a decrease in natives' wages. This effect on native wages might suggest that immigration increases the productivity of native workers and thus leads to a rightward shift in the demand curve (Wadsworth, 2018, p. 633). The departure of EU-born workers may have been reflected in the labour shortages in certain sectors experienced recently in the UK and the disruption that has come thereof, although it is unclear whether this "exodus" (as some have already called it) is linked to the COVID-19 pandemic or Brexit (Child, 2021).

On the other hand, these positive effects of EU immigration accrue mainly to intermediate and advanced-education workers, while its impact on wages and hours of work of low-educated natives is negative. This is in contrast with the educational composition of EU immigrants, who are clearly more educated than natives, and accordingly suggests that a substantial degree of downgrading persists upon the arrival of immigrants at the host country. A regression of EU immigration on various percentiles of the native wage distribution confirms this intuition: natives at the lower half of the wage distribution are negatively affected by EU immigration and positive effects are concentrated at the upper part of the distribution, in line with what the relative density of EU immigrants along the native wage distribution would have predicted.

## 9. References


Borjas, G. J. (2003). The Labor Demand Curve Is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market. *The Quarterly Journal of Economics*, *118*(4), 1335–1374. https://doi.org/10.1162/003355303322552810

Card, D. (2001). Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration. *Journal of Labor Economics*, *19*(1), 22–64. https://doi.org/10.1086/209979

Card, D. (2009). Immigration and Inequality. *The American Economic Review*, *99*(2), 1–21. https://doi.org/10.1257/aer.99.2.1

Centre for Research in Communication and Culture. (2016, 27 June). Media coverage of the EU Referendum (report 5). https://blog.lboro.ac.uk/crcc/eu-referendum/uk-news-coverage-2016-eu-referendum-report-5-6-may-22-june-2016/#disqus_thread

Child, D. (2021, 15 January). 'Unprecedented exodus': Why are migrant workers leaving the UK? *Aljazeera*. https://www.aljazeera.com/news/2021/1/15/uk-twin-pandemic-and-brexit-crises-prompt-unprecedented-exodus

Department for Business, Energy & Industrial Strategy. (2021). *Trade union statistics 2020*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/988897/Trade_Union_Membership_Statistics_2020_Final.ods

Dustmann, C., Fabbri, F., & Preston, I. P. (2005). The Impact of Immigration on the British Labour Market. *The Economic Journal*, 115(507), F324–F341. https://doi.org/10.1111/j.1468-0297.2005.01038.x

Dustmann, C., Frattini, T., & Preston, I. P. (2013). The effect of immigration along the distribution of wages. *The Review of Economic Studies*, *80*(1), 145–173. https://doi.org/10.1093/restud/rds019

European Commission. (2021). *Questions and Answers – the rights of EU citizens in the United Kingdom after the end of the transition period*. https://ec.europa.eu/info/sites/default/files/file_import/qa-eu-cit-in-uk_en.pdf

Glitz, A. (2012). The labor market impact of immigration: A quasi-experiment exploiting immigrant location rules in Germany. *Journal of Labor Economics*, *30*(1), 175–213. https://doi.org/10.1086/662143

Hobolt, S. (2016). The Brexit vote: a divided nation, a divided continent. *Journal of European Public Policy*, *23*(9), 1259–1277. https://doi.org/10.1080/13501763.2016.1225785

Lemos, S. & Portes, J. (2014). New Labour? The Effects of Migration from Central and Eastern Europe on Unemployment and Wages in the UK. *The B.E. Journal of Economic Analysis & Policy*, *14*(1), 299–338. https://doi.org/10.1515/bejeap-2013-0065

Manacorda, M., Manning, A., & Wadsworth, J. (2012). The Impact of Immigration on the Structure of Wages: Theory and Evidence from Britain. *Journal of the European Economic Association*, *10*(1), 120–151. https://doi.org/10.1111/j.1542-4774.2011.01049.x

Nickell, S. & Saleheen, J. (2017). The impact of EU and Non-EU immigration on British wages. IZA Journal of Development and Migration, *7*, Article 15. https://doi.org/10.1186/s40176-017-0096-0

Office for National Statistics. (2019). *Labour Force Survey User Guide. Volume 6: Annual Population Survey (Local Area Database)*. https://www.ons.gov.uk/file?uri=/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/methodologies/labourforcesurveyuserguidance/volume6.pdf

Office for National Statistics. (2020). *Labour Force Survey User Guide. Volume 1: LFS background and methodology*. https://www.ons.gov.uk/file?uri=/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/methodologies/labourforcesurveyuserguidance/lfsuserguidevolume1oct2020.pdf

Office for National Statistics. (2021). *International migration: developing our approach for producing admin-based migration estimates*. https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/articles/internationalmigrationdevelopingourapproachforproducingadminbasedmigrationestimates/2021-04-16

Schaffer, M.E. (2010). xtivreg2: Stata module to perform extended IV/2SLS, GMM and AC/HAC, LIML and k-class regression for panel data models. http://ideas.repec.org/c/boc/bocode/s456501.html

Wadsworth, J. (2018). Off EU Go? Brexit, the UK Labour Market and Immigration. *Fiscal Studies*, *39*(4), 625–649. https://doi.org/10.1111/1475-5890.12177

Wooldridge, J. M. (2006). *Introductory econometrics: a modern approach* (3rd ed.). Thomson.

## Annex

**Effect of EU-immigrants-to-natives ratio on labour market outcomes for natives, age-education groups**

| | FE | 2SLS (Census) |
|---|---|---|
| Low age, low education | | |
| Real wages | -5.86*** (2.23) | -5.79** (2.80) |
| Hours of work | 4.12 (5.22) | 13.03*** (4.19) |
| F-statistic | | 113.28 |
| Intermediate age, low education | | |
| Real wages | -1.96 (2.59) | -3.07 (2.02) |
| Hours of work | -0.05 (2.71) | -1.59 (2.48) |
| F-statistic | | 64.61 |
| High age, low education | | |
| Real wages | -1.79* (0.98) | -1.44 (1.48) |
| Hours of work | -1.43 (1.21) | -3.65*** (1.04) |
| F-statistic | | 314.22 |
| Low age, intermediate education | | |
| Real wages | 1.01* (0.61) | 0.25 (0.35) |
| Hours of work | 0.72 (0.92) | 0.45 (0.73) |
| F-statistic | | 24.39 |
| Intermediate age, intermediate education | | |
| Real wages | 0.30 (0.48) | 1.29*** (0.23) |
| Hours of work | 0.36 (0.42) | 0.67* (0.36) |
| F-statistic | | 168.78 |
| High age, intermediate education | | |
| Real wages | 0.61** (0.31) | 0.61** (0.29) |
| Hours of work | 0.03 (0.71) | 0.81* (0.44) |
| F-statistic | | 146.44 |
| Low age, advanced education | | |
| Real wages | 0.62 (0.43) | 0.79 (0.54) |
| Hours of work | -0.85 (0.73) | -2.01*** (0.64) |
| F-statistic | | 144.39 |
| Intermediate age, advanced education | | |
| Real wages | -0.23 (0.29) | 0.10 (0.37) |
| Hours of work | 0.18 (0.34) | 0.28 (0.31) |
| F-statistic | | 84.72 |
| High age, advanced education | | |
| Real wages | 1.10 (0.91) | 1.95*** (0.48) |
| Hours of work | -0.24 (0.62) | -0.45 (0.78) |
| F-statistic | | 55.63 |
| Observations | 65 | 65 |

Note: The table displays the results of the estimation of the effect of the ratio of EU immigrants to natives on real wages and hours of work of natives, assessed on nine age-education education groups. The first column shows the results of the baseline fixed-effects model using the 13 regions and the second one the results of the two-stage least squares (2SLS) specification using the 2011 Census ratio as instrument. Standard errors are reported in parentheses next to the estimated coefficients The F-statistic row shows the results of the test of significance of instruments in the first-stage fixed-effects regression. An asterisk, two or three of them indicate that the coefficient is significantly different from 0 at the 10%, 5% or 1% significance level, respectively.

The Table shows the estimates of the effect of the ratio of EU immigrants to natives with a more detailed breakdown (9 age-education groups). Results are rather mixed, but the main conclusion derived from Table 4 seems to be confirmed. EU immigration has a negative impact on low-educated, and especially low-educated and low-aged, natives' earnings. Coefficients are astonishingly high in absolute value, although standard errors are too, and subsamples sizes of some age-education groups of natives are rather small, specifically in the case of the low-educated, low-aged natives.

An EU-immigrant outflow equivalent to 1% of the native population would increase the wages of natives of low education and low age by 5.79% in the preferred specification. The impact of EU immigration on average wages of natives is positive and significant at the 10% significance level for two groups of intermediate-educated natives and one group of advanced-educated natives.