How Immigrants Affect the UK Natives' Wages

Evidence from the 2004 EU Enlargement

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Abstract:

This paper assesses the effects of immigration on UK natives' wages. More precisely, it evaluates the impact of the large influxes of workers after the EU enlargement in 2004. It uses a *spatial correlation approach* and estimates wage effects on aggregate as well as for low-skill and high-skill individuals. No statistically significant impacts were found, either overall or for both skill groups. These findings go against the general idea that immigration resultant from the enlargement deteriorated natives' wages.

Key words: migration, wages, UK, A8

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1. Introduction

In 2004, 10 new states and 77 million people became EU members, an unprecedented enlargement. It was considered the most ambitious and challenging expansion in European history due to significant differences between the existing members and eight of the new ones: Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Slovakia and Slovenia[1]. These countries, known as the Accession 8, or simply A8 countries, had a per capita income well below the average EU level and scarce employment opportunities. Large migration flows were expected and therefore the majority of the existing countries adopted restrictions on the movement of workers that lasted for a maximum of 7 years. The objective of the constraints was to avoid possible negative impacts on the immigrants-receiving countries' economies, resulting from a large increase in cheap labour. However, Ireland, Sweden and the UK immediately opened their labour markets to migration. Later, in 2007, with Romania and Bulgaria entering the EU, all the original 15 member states, with the exception of Finland and Sweden, imposed restrictions on labour movement.

In 2015, five new candidates are attempting to join the European Union[2] the potential for new migration caused alongside the rise of asylum seekers from North Africa has led to an intense public debate regarding immigration policy. Similar to the 2004 and 2007 enlargements, the majority of these candidate countries represent an economic, political and social challenge, intensifying concerns about the large scale movement of workers.

Immigration concerns have been reinforced by the EU economic crisis and slow recovery in the region. The high rates of unemployment have worsened public opinion towards immigration, especially if immigrants are perceived as

[1] The two remaining ones were Malta and Cyprus, already members of the Commonwealth. Before 2004, they had fewer restrictions to enter in the UK than the A8 countries.
[2] Albania, Serbia, Turkey, Montenegro, The Former Yugoslav Republic of Macedonia

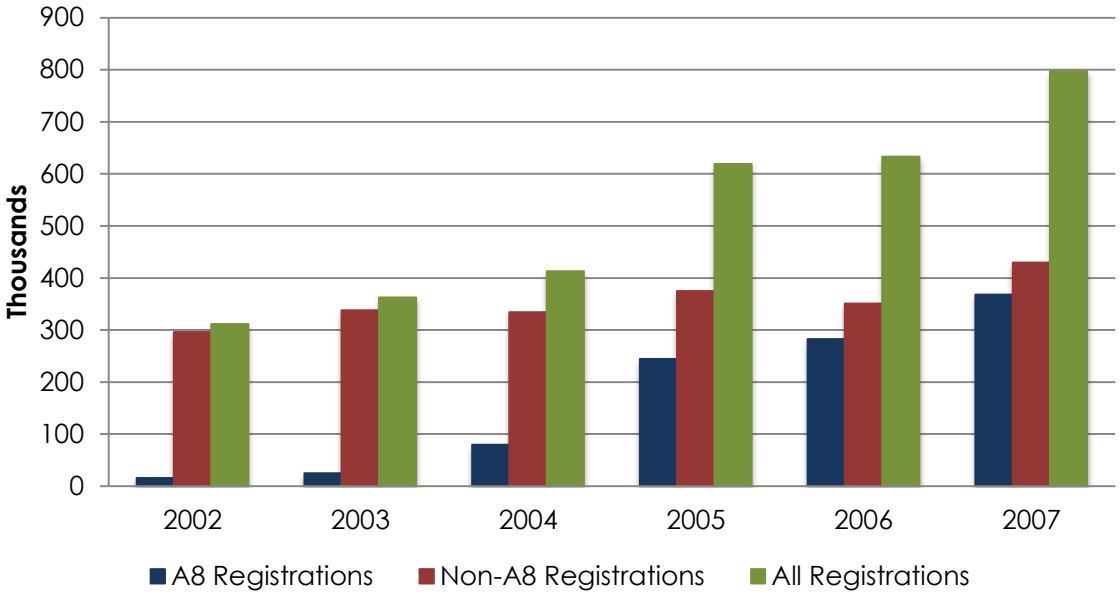
'job stealers'[3]. In this environment, it becomes difficult to explain to the public how both goals of reducing unemployment and successfully integrating new immigrants can be reconciled. For politicians, the most attractive solution may involve restricting immigration in the short term. It is therefore crucial to understand the cause and effects of migration in order to generate adequate and effective policies in Europe and thus, solve the actual imbalance between the free movement of labour and national labour-market protection.

The fact that the feared mass migration in 2004 did materialize is the base of this study. Its purpose is to evaluate the possible impact of the migration movements from Central and Eastern Europe (CEE) on the recipient countries' labour market. The effect of the enlargement, if any, is expected to be found in UK, Austria, Germany and Sweden the main receiving countries. Nevertheless, even among these countries, the impact may differ due to different magnitudes of inflows and different approaches to the enlargement.

This thesis gives focus to the British case, where immigration levels from the A8 rose to much higher levels than expected from previous analysis. For example, Dustmann et al. (2003) forecasted an inflow of 15-39 thousand workers between May 2004 and September 2006. Approximately 521 thousand National Insurance Numbers (NINo) were actually allocated to A8 migrants entering the UK in the period. Figure 1 presents the NINo registrations from 2002 to 2007, distinguishing A8 migrants and non-A8 migrants. The number of A8 registrations rapidly increases after 2004, while the number of registrations from the other countries remains relatively constant over the period.

[3] International Organization for Migration report: Migration and the economic crisis in the European Union: Implications for Policy

Figure 1 NINo registrations to adult overseas nationals entering the UK, 2002-2007



Source: National Insurance Recording and Pay as you Earn System (NPS)

There has been numerous empirical studies to measure the impact immigration has on the UK labour market, however, no consensus has been found. This study contributes to the literature by using British Household Panel Survey (BHPS), a social and economic longitudinal study in which individuals are followed in consecutive waves and by estimating a different specification from the other studies in order to capture the real impact of the enlargement, instead of the total impact of immigration.

This paper is organized as follows: section 2 discusses economic theory concerning the impact of immigration in the labour market outcomes. In the short run, it depends essentially on the skill composition of the immigrants and native workers and on the elasticity of capital. In the long run, the economy is expected to fully adjust and this adjustment will depend on the economy's flexibility of output mix and on the technology developments.

Section 3 presents previous empirical literature for the USA and the UK. The fact that there is no consensus on the impact of immigration can be

explained, among other factors, by the use of different methodologies, data sources or different time periods studied.

The data section is divided in three parts. Firstly, it explores the characteristics of the A8 migrants including their nationality and settlement patterns within the UK. Afterwards, there is the descriptive statistics about the sample from the BHPS, from September 2003 to September 2006. Lastly, there is some discussion regarding the main independent variable, the ratio of Non-UK born population to the UK-born population.

The empirical strategy, based on the spatial correlation approach, is discussed in section 5. The main assumption is the existence of correlation between changes in labour market outcomes and the ratio of immigrants, meaning that regions with higher rates of immigration should be the most affected ones in terms of wages and unemployment.

Results are presented in section 6. The model was estimated for the entire sample, as well as for the low- and high-skilled sample separately. The main reason is to find whether the enlargement had a different impact, depending on the occupation of each worker. There is no evidence that enlargement had a negative or positive impact on natives' wages. Section 7 shows these results are robust: there were no significant changes when the dependent or independent variable were altered or when the notion of low- and high-skilled workers was redefined.

Section 8 discusses caused by the spatial correlation approach. The first issue is due to internal migration of native workers as a result of immigration. The second problem is the non-random allocation of immigrants. In particular, they may choose the most prosperous economic regions, becoming unclear whether immigration leads to changes in the labour market or vice versa. Section 9 concludes.

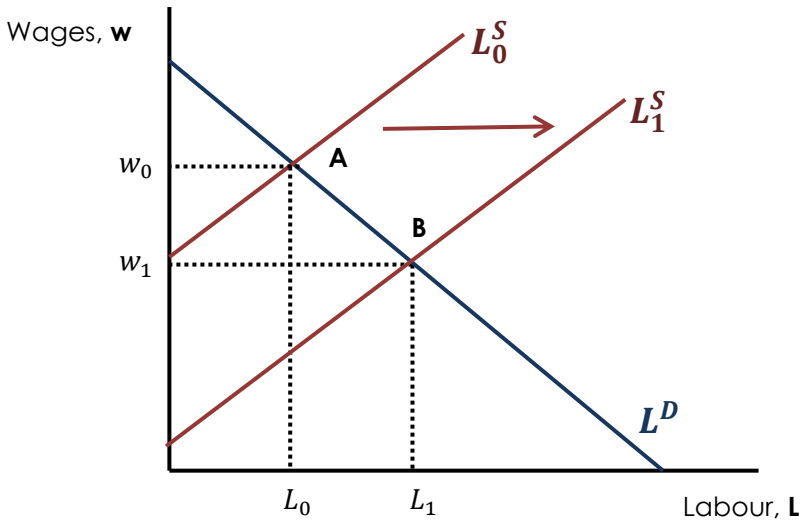
2. Theoretical Background

2.1. Homogeneous Labour

The impact of immigration on the labour market can be explained by using a model with the following assumptions: firstly, there is only one type of labour; secondly labour supply is elastic; thirdly, immigrants and natives are perfect substitutes in production; fourthly, the labour market is perfectly competitive and hence, wages equal their marginal products; finally, in the long-run, markets will adjust in order to restore the equilibrium in both the labour and products market.

In this economy, wages are determined by the intersection between labour supply and labour demand, as illustrated in figure 2. Point A is the initial equilibrium, in which wages are equal to w_0 and the amount of labour is L_0. An increase in immigration increases labour supply – it shifts to the right - and lowers market wages to w_1. The new equilibrium is B.

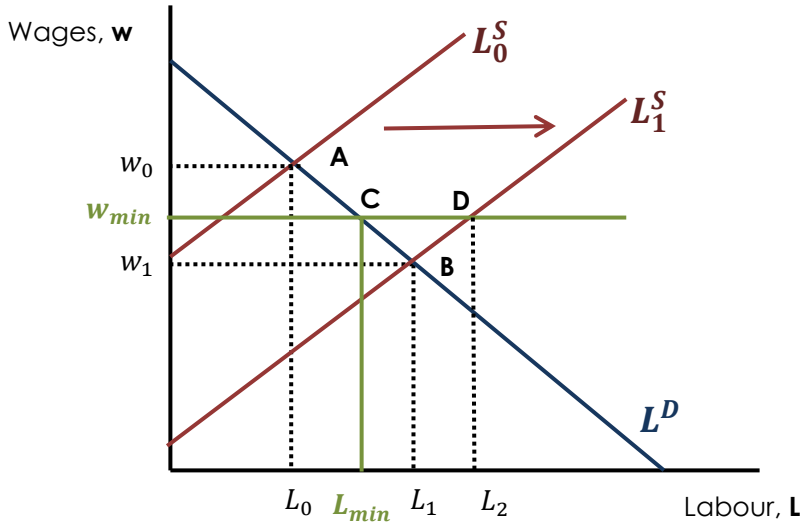
Figure 2 Homogeneous Labour Model, Increase in Immigration



However, due to the existence of labour contracts, union activities or minimum wages, wages are not fully adjustable. Therefore, the new equilibrium wages may be higher than w_1. For illustration, figure 3 shows the labour market with a biding minimum wage set at w_{min}. Because wages

cannot adjust to w_1, the new equilibrium is at C: the maximum amount of labour firms are willing to employ at the minimum wage. Since at the minimum wage, workers want to supply L_2, immigration leads to involuntary unemployment[4], from L_{min} to L_2. In sum, the new equilibrium, wages are lower than before immigration and unemployment is present.

Figure 3 Homogeneous Labour Model with minimum wage. Increase in Immigration



2.2. Heterogeneous Labour

In reality, labour supply is not homogenous and there is a distinction between low- and high-skilled labour. Normally skills are defined according to education (Dustmann et al., 2005), occupation (Card, 2001) or even both education and experience (Borjas, 2003).

The main prediction from the economic theory is that impacts on the labour market will mainly arise if there is a mismatch between native and immigrants skill distribution (Dustmann et al., 2003, 2008). In other words, if immigration creates changes in the relative supply of low and high skill groups, the labour market will be in disequilibrium. The subsequent analysis is mainly based on four assumptions. First, if native workers and immigrants have the same skillset,

[4] There can also be voluntary unemployment if, facing lower wages, workers rather prefer to be unemployed.

they are interchangeable in production; second, labour supply elastic and capital supply is perfectly elastic; thirdly, the market is perfectly competitive and hence, wages and rental rates of capital equal their corresponding marginal products; finally, just as before, in the long-run, markets will adjust to restore the equilibrium. The assumption concerning the elasticity of capital will be dropped later.

To better understand the theory, suppose first there is an economy in which all natives are high skilled workers. If all natives and migrant workers can be considered substitutable (i.e. both natives and immigrant workers are high skilled), then figure 3 perfectly describes the new equilibrium: labour supply and competition in the labour market increases and wages are expected to decline due to immigration. However, since wages are not fully adjustable and the labour supply is elastic, unemployment is likely to increase. Conversely, if all natives and immigrants are complementary (i.e. all native workers are high skilled and all immigrants are low skilled), wages are likely to increase due to an increase in productivity. This last one is a result of more knowledge and innovation in the economy and greater specialization of workers (because natives do not have to work in low skilled jobs anymore, they are free to specialize).

However, an economy is not composed of high skilled workers only. Moreover, the inflows of substitute and complementary workers are not two distinct events: immigrants are competing with some indigenous and are complements to others. Therefore, some workers will benefit, while others will be harmed, depending on the skill composition of migrants and on which part of the skill distribution natives are. If on average immigrants are complementary to natives, the overall impact on the labour market will be positive.

Labour demand is expected to increase with migration as immigrants expand demand for goods and services. Therefore, the impact on wages and employment from the demand side is positive. Nevertheless, this effect

varies substantially according to the country's economic conditions. For instance, in economic downturns, the effect may be minimal or even null: firms will be less willing to expand production since demand for goods and services is weaker.

The events described above are related to short run adjustments. In the long run, economic theory does not predict any disequilibrium since the economy will fully adjust. Nevertheless, the required period for this adjustment depends on the economy's flexibility of output mix and on the technology developments (Dustmann et al., 2008). More precisely, there might be alterations in the composition of production and, consequently in the scale of industries. The sectors that most benefit from lower wages will suffer a relative expansion in production. Regarding the second channel, higher utilization and developments would occur in the technology that uses more intensively the type of workers that is now relatively available in the economy.

Until now, for simplicity, capital was considered perfectly elastic and thus, gains and losses occur solely between low- and high-skilled groups. When this assumption is relaxed and capital is somewhat inelastic, capital owners will also benefit from immigration. Although some workers will still benefit and others will still be harmed, the overall average wages will decrease[5] (Dustmann et al., 2008).

In sum, for the short-run, three main conclusions can be drawn. First, immigration will only affect wages if there is a relative modification in the skill distribution. Second, the effects will be felt asymmetrically across the skill distribution: workers competing with immigrants will suffer. Finally, the immigration impact on the overall average wages relies heavily on the elasticity of capital: the impact on the overall average wages will be negative if capital is inelastic, the most reasonable assumption.

[5] even if the relative composition of skill distribution does not change

3. Previous Literature

There is an extensive empirical literature on the impact of immigration on the destination labour market. The studies, from across many countries, have used different methodologies: spatial correlation, skill-cell, general equilibrium, among others. Firstly, this section analyses the most relevant studies for the USA, a traditional destination country and with a large body of evidence. It should be kept in mind that USA results cannot be extrapolated to the British case, due for instance to differences in labour market institutions and differences in the scale of immigration. The second part is devoted to the most relevant studies regarding the UK.

3.1. Findings for the USA

In the US, Card (2001) was one of the first to find that immigration affects employment rates. The main difference between his work and previous studies lies on the assumption that local labour markets are stratified along occupation or skill categories and not only along regions or cities. Therefore, immigration will lead to changes in wages only if the relative population between skill groups is altered. When analyzing the period between 1985 and 1990, he reached three relevant conclusions. Firstly, the inflows of migrants to a particular city, did not lead to outflows of natives or earlier immigrants. Secondly, relatively high immigration to a certain skill group has an adverse effect on employment. The results, estimated both through Ordinary Least Squares (OLS) and Instrumental Variable (IV) approach, suggest that, for the studied period, employment rates in low-skilled service occupations declines by 1 percentage point. For cities like Miami and Los Angeles, in which immigration inflows were much higher, the estimated impact is larger. Lastly, concerning the relative wages, results are modest and sensitive to different specifications. In general, relative wages declined by around 3 per cent for low-skilled workers. As mentioned by the author, this outcome might be downward biased because workers, when facing lower wages may decide to be unemployed, mitigating the negative effect of immigration.

Although Card's small effects on wages are in accordance with most of the literature, recent studies have found stronger impacts, either negative or positive. In a different approach, Borjas (2003) clustered immigrants only by skill groups rather than by region. In contrast to Card (2001), who defined skill groups accordingly to different occupations, Borjas aggregated workers based on their education and work experience. The assumption is that workers with the same years of education and different years of work experience are not perfect substitutes because skills and knowledge are developed both in school and at work. Therefore, they compete in two distinct labour markets. He concluded that, if the number of workers in a skill group increases by 10 percent, annual wages decline by 6.4 percent and labour supply of native men shrinks by 3.7 percentage points. Finally, when expanding the model by allowing for geographic clustering, the results obtained are smaller in magnitude. One reasonable explanation is that every state was affected, not just the ones receiving immigrants. The intuition is the following: if immigrants downgrade the labour market conditions in a particular state, native workers move to other states. These outflows would restore the market equilibrium implying that a cross-region analysis would fail to find a significant impact, even if the real impact of immigration is not zero.

Unlike Borjas (2003), Ottavianno and Peri (2006) found a positive impact on the average wages of existing workers caused by immigration from 1990 to 2004. When compared to previous studies, there are two distinct features that may explain the results. First of all, they argued that native and immigrant workers are not perfect substitutes even if they have the same education, professional experience or gender. Secondly, they took into account the adjustment of capital in response to immigration. Therefore, they used a general equilibrium approach in order to capture interactions between labour and capital market. Moreover, labour demand for each type of worker depends not only on productivity and employment of the other workers types but also on physical capital. Wage equations and elasticities of substitution were found through market clearing conditions, labour demands

and supplies. Given the wage equations, authors were able to estimate the impact of immigration. The main critic to a 'partial' equilibrium model is that it does not account for the interactions between different types of workers and between capital. In both short- and long-run the U.S.-born workers' average wages increased by 0.7 and 1.8 respectively. On the other hand, the previous immigrants experienced a decline in their average wages, because they are competing directly with the new immigrants. When the analysis is based on education of US-born workers, the less educated group suffers a loss of 1.1% in the long-run and of 2.2 percent in the short-run. All the other groups, high school graduates and college graduates, have an increase in their real wage between 0.7 and 3.4 percent in the long run. In sum, the less educated workers and the previous immigrants are the ones harmed by immigration, overall, society benefits from it.

3.2. Findings for the UK

Dustmann et al. have performed two studies (2003, 2005) evaluating the impact of immigration in the UK labour market. Their studies used long periods of time and do not specifically focus on the 2004 enlargement. The first two studies, from 2003 and 2005, have an identical methodology and similar results. The main differences are the sources of data and the period of time analyzed. The first used data from three different sources, the Labour Force Survey (LFS), the Census and the New Earnings Survey (NES), for the period between 1971 and 1991. The second only used data from the LFS from 1983 to 2000. The authors followed a spatial correlation approach, in which each region is considered a labour market and the impact of immigration is derived from the relationship between the number of immigrants moving to that region and the changes in wages and unemployment. This methodology has been heavily criticized due to its several problems (e.g. Borjas, 2003). Firstly, immigrants may not be randomly distributed across regions; they may choose to reside in areas with high economic prosperity. To overcome this issue, authors estimated the relationship between immigration and labour

outcomes through both *differences* and *within groups* estimation. The second problem is that natives may respond to the migrant inflows by moving their labour to other regions, making it more difficult to estimate the real impact of immigration. A third problem is related to reverse causality, that is, labour market changes are a result of immigration but they may also attract new immigrants. Finally, because sample size is small, the number of immigrants in each region may suffer from measurement error. The solution for these last three problems lies on the use of instrumental variables. In particular, the authors chose the lagged value of immigrants as instruments in each region, because they are unlikely to be correlated with current economic situations and they may attract new immigrants. Different specifications of the data sets revealed similar results: the impact of immigration in unemployment and wages is small and statistically poorly determined. These outcomes are not surprising since before 2000 migration flows were low and therefore, if there was any impact, it is more difficult to estimate.

In contrast, in 2004, the flow of immigrants was unpredicted and large enough to be considered a natural experiment, offering a good opportunity to study the impact of immigration in the UK labour market. Even so, the findings are similar to the previous literature. Lemos and Portes (2008) also used a spatial correlation and IV approach, but with a truncated data set: from 2004 to 2006. Moreover, they controlled for exogenous supply and demand conditions. For instance, some of the supply shifters included were the proportion of the total population who are women, who are young and who are immigrants from outside the A8 countries. The idea is to separate the effect of supply or demand shocks from the effect of A8 migrants. Finally, they extended the model by aggregating data at an occupation-regional level. In general, their findings show there is no statistically significant evidence that A8 migration deteriorates labour market conditions for native workers, regardless of the approach used.

Dustmann et al. (2008), when analyzing the period from 1997 to 2005, expanded the spatial correlation approach by analyzing the effect of immigration along the distribution of wages, without allocating immigrants to skill group. The authors presented two main reasons for the use of this method. Firstly, the overall effect on wages is expected to be close to zero; however, they should differ along the wage distribution. Secondly, immigrants have are more educated natives, but they downgrade upon their arrival. Therefore, assigning them by skills would not be appropriate. The main results suggested that immigration has an adverse effect on wages below the 20th percentile, but has a positive and modest effect in the upper part of the wage distribution. Overall, in contrast to what economic theory predicts, there was a modest and positive effect on average wages. This is possibly explained by immigration downgrading or any mismatch between immigrants' wages and their marginal product.

Results appear to be sensitive to several factors: the methodology used, the time period chosen, the scale of migrant inflows and its composition. At first glance, there is no strong evidence supporting the idea that immigration deteriorates the overall average wages. However, Dustmann et al. (2008) results suggest that along the wage distribution the effects differ. Because someone's wages is usually highly correlated to his or her skills, Dustmann's results reinforce the idea that along skill distribution immigration effects may also differ, which this paper aims to find.

4. Data

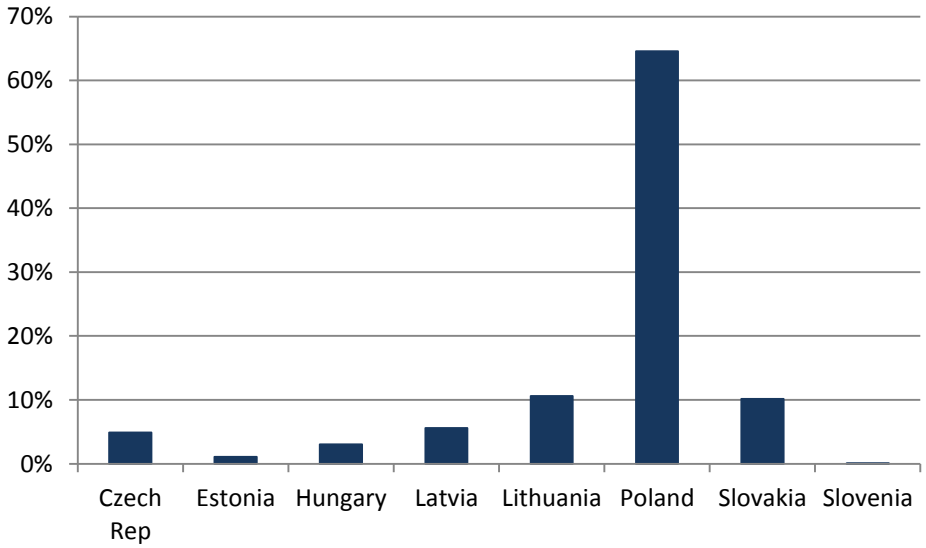
4.1. Characteristics of A8 migrants

As mentioned in section 2, in theory, immigration has an impact on the labour market if immigration changes the relative supply of low skilled and high skilled immigrants. Therefore, it is crucial to compare characteristics between

A8 migrants and natives. In particular, how they differ in terms of their age, education attainment and occupation in which they are employed. Firstly, it is also important to mention from where the immigrant came and their destination within the UK.

Nationality and Geographical Distribution

Figure 4 Nationality of approved applicants, May 2004 - December 2006



Source: Acession Monitoring Report, May 2004 – September 2007

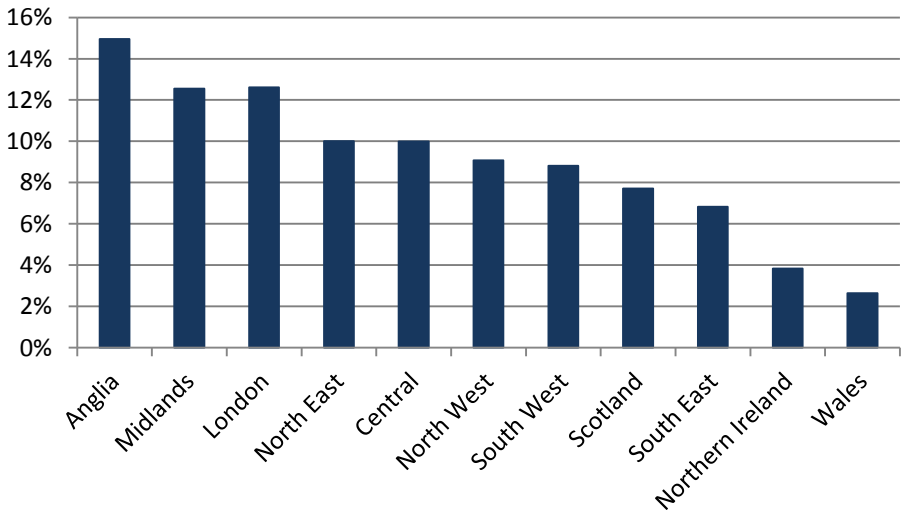
Table 1 Unemployment Rate and Real GDP per capita in the A8 countries, 2004

	Unemployment rate 2004	**Real GDP per capita € 2004**
Czech Rep	8.3	9 600
Estonia	10.1	7 600
Hungary	6.1	8 400
Latvia	11.7	5 200
Lithuania	10.9	5 800
Poland	19.1	6 200
Slovakia	18.4	6 700
Slovenia	6.3	13 800

Source: Eurostat

Figure 4 shows the percentage of approved immigrant applications in the UK by nationality[6] and Table 1 shows the unemployment rate and the GDP per capita of each origin country in 2004. Between the enlargement in May 2004 and 2006, the UK approved a total of 558 705 applications[7]. The majority of the registered workers were from Poland, followed by Lithuania. Interestingly, in 2004, Poland had the highest unemployment rate among the A8 countries, at 19.1 per cent. Although Lithuania's unemployment rate was not so severe, 10.9 per cent, its GDP per capita was the lowest after Latvia's. Conversely, in 2004, Slovenia was the country that was performing the best with the lowest unemployment rate and a much higher GDP per capita when compared to the other countries. These factors may explain why the country made the lowest number of applications.

Figure 5 Geographical distribution of employers of registered workers, May 2004 - December 2006



Source: Acession Monitoring Report, May 2004 – September 2007

Figure 5 shows the percentage of A8 migrants in each region. Although Wales and Northern Ireland had received a much lower number of

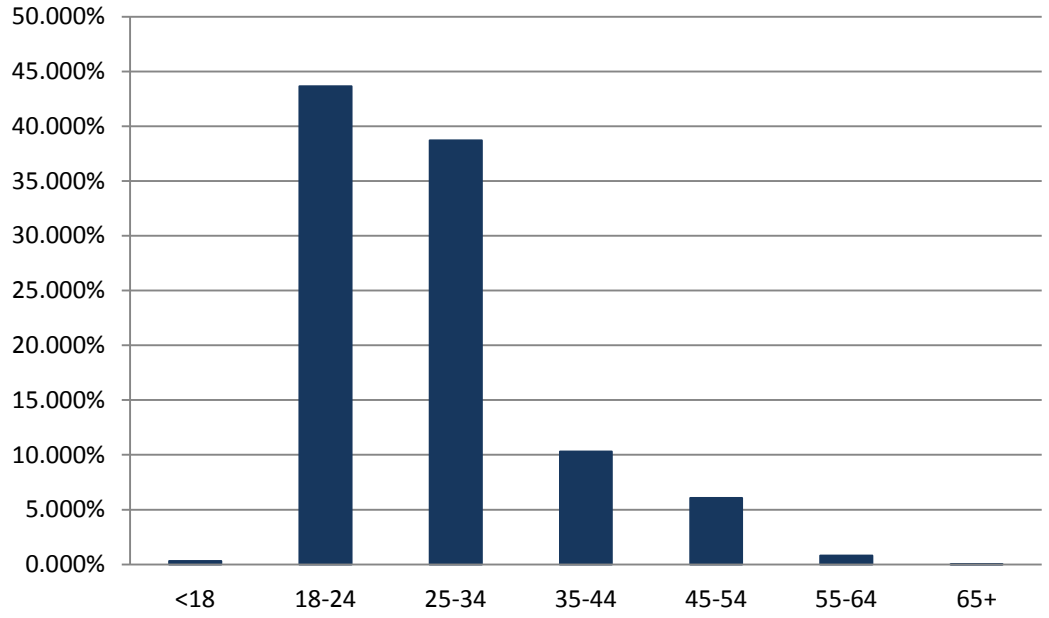
[6] Data was collected by the Worker Registration Scheme (WRS) and is presented in the Home Office Accession Monitoring Report. It only includes immigrants who registered as employees, from May 2004 to December 2006, the relevant period for the study. It does not include self-employed workers.
[7] Source: Accession Monitoring Report, May 2004-September 2007

immigrants, this new wave of migrants was more geographically dispersed than previous ones[8].

Evidence on Age, Education and Occupation

According to figure 6, from May 2004 to December 2006, 43.6 per cent of the registered workers were aged between 18 and 24 and 82.4 per cent between 18 and 34 years old. Besides being much younger than the UK natives[9], they were also more educated than the average Briton[10]. Nevertheless, evidence suggests that the A8 workers were overrepresented in low-skilled and low-paid jobs[11], particularly in elementary and skilled occupations (e.g. cleaning and restaurants). This may be a result of low English language skills, lack of knowledge about local market and unrecognized qualifications.

Figure 6 Age of WRS registered workers, May 2004 to December 2006



Source: Acession Monitoring Report, May 2004 – September 2007

[8] Source: Immigration, the European Union and the UK Labour Market, CEP Policy Analysis
[9] According to the Labour Force Survey (2012), only 49 percent of British people were under 40 years old.
[10] Source: Immigration, the European Union and the UK Labour Market, CEP Policy Analysis
[11] Source: Immigration, the European Union and the UK Labour Market, CEP Policy Analysis

Concluding, A8 migrants were not competing with natives working in high-skilled jobs, even if they had the required skills. There are reasons to believe that, after the enlargement, the relative supply of low- and high-skilled workers changed. According to the economic theory, high-skilled natives should had benefited from the enlargement. On the other hand, because migrants were working in low-skilled jobs, wages in this group should had suffered downward pressure due to higher levels of competition.

4.2. British Household Panel Survey

The British Household Panel Survey is a longitudinal survey conducted by the ESRC UK Longitudinal Studies Centre (ULSC) together with the Institute for Social and Economic Research (ISER). In the first wave, in 1991, around 5000 households were interviewed and each of the individuals is followed in each successive year. If an individual moves to a new household, all the new members are also interviewed. Moreover, an individual becomes eligible for the survey when he or she turns 16 years old. Between wave 9 and wave 11, the survey was extended to Scotland, Wales and Northern Ireland. Hence, the entire UK is covered.

The main goal of the BHPS is to understand the social and economic changes in the UK. Therefore, the survey questions are related to household organization, health conditions and services, education, social values, labour market and income. It includes natives and migrant workers, as well as information on their nationality, age, gender and living area.

To evaluate the impact of immigration in the UK labour market, 3 waves were used, covering the period from September 2003 to September 2006. It would have been preferable to also include a fourth wave, from September 2002 to September 2003 so there would be a larger period before the enlargement in May 2004. Due to lack of information regarding the number of immigrants in 2003, for each region, adding an extra wave was not possible. Nevertheless,

this is not a serious issue for two reasons: first it is unlikely that immigrants find a job immediately after arriving to the UK; secondly, figure 1 showed that the entry of A8 immigrants was much sharper from 2004 to 2005 than from 2003 to 2004. Therefore, if the enlargement had any impact on wages, the impact is unlikely to be seen in the first wave, from September 2003 to September 2004. The model will still be able to capture wage changes from migration from May 2004 onwards.

The sample is restricted to native working age men, aged between 16 and 65 years old. It does not include self-employed individuals, pensioners, and students, individuals in a government training program or individuals that are long term sick.

One problem related to surveys is missing values of certain items on the questionnaire. This is particularly true for the dependent variable, annual labour income. Because individuals who refuse to give information on their earnings are likely to be systematically different from those who do not refuse, eliminating those observations may bias the results. To overcome this problem BHPS provides imputed values for missing values. However, some of those imputed items take low and unrealistic values such as 0.1 and 1.2. Therefore, the 3 percent bottom of the wage distribution was eliminated. This way, the lowest annual wage in the sample is £5 980, a more truthful value[12].

The final sample has 8 238 observations of 2 945 individuals. Table 2 shows descriptive statistics for the sample, distinguishing between high- and low-skilled workers, based on their occupation. The more high-skilled and better paid jobs are related to Administrative and Secretarial occupations, Associate Professional and Technical occupations, Professional occupations and Manager and Senior Officials. On the other hand, individuals working in

[12] According to working time regulations, workers cannot work more than 48 hours a week, on average. Assume that an individual of22 years or older works 39 hours a week. Applying the respective National Minimum rate for 2005 (5.05 pounds per hour), he would receive around 808 pounds per month and 9 696 per year, assuming he works the 12 months. Considering that some individuals might work in part-time, might be younger (meaning that their minimum wage would be lower) or might not have been working all year, 5 980 pounds appears to be a more reasonable value.

Elementary occupations, Personal Service occupations, Skilled Trade occupations and Sales and Customer Service occupations were considered low-skilled workers[13]. The division of high- and low-skilled workers is based on the occupation and not on educational attainment because education not always reflects the individual skills. For example, skills are also acquired at work. Low- and high skilled samples have 3 819 and 4 419 observations, respectively.

The average age of individuals is 40 years old. Regarding the marital status, 60 percent of the sample is married. These results are similar for both low- and high-skilled individuals.

Observations are not equally distributed across regions. Surprisingly, the three regions last added to the survey – Wales, Scotland and Northern Ireland – are the ones with more observations. Together, they account for 47 percent of the total sample. On the contrary, North East is the region with fewer observations, followed by London.

With regard to education, there are 6 possible categories: the Certificate of Secondary School (CSE); the A level, a qualification given to students completing pre-university education; the Higher National Certificate or Diploma (HNC/D), a vocational and professional qualification; 1st Degree, for undergraduate degrees; a higher degree, for master's degree or PhD; and finally, a category for other type of education that may include individuals with lower no education at all. Not surprisingly, the majority of the low-skilled sample does not have a qualification higher than secondary school standards: 43 percent has a CSE degree and 24 percent has an A level. Moreover, 24 percent of the observations are included in the 'other' category, meaning they might not have reached the CSE level. The high-skilled sample is more equally distributed: 46 percent of the observations have a CSE or an A and 49 percent has education after secondary school.

[13] BHPS occupational groups are in accordance to the Standard Occupational Classification 2000 (SOC00). The division between low- and high-skilled workers is based on the description of each group (ONS, 2000).

This supports the idea discussed above regarding the division of low- and high skilled workers.

Focusing attention on job characteristics, 97 percent of the observations work full time and on average individuals work 39 hours per week. These values do not differ within the two subsamples. The main difference is on the annual labour income: the mean for the high-skilled observations is £10 000 higher than the low-skilled[14]. Standard deviation is substantially high, especially for the high-skilled sample, which can be explained by wage differences between regions and between full and part-time workers. Moreover, it is probable that the sample still contains some imputed values. Therefore, any interpretations of the mean income should be drawn cautiously.

Table 3 shows the distribution of observations by occupation. High-skilled occupations account for 54 percent of the total observations.

4.3. The main independent variable: Ratio of Non-UK born Population to the UK-born Population

The BHPS data was used for the dependent and control variables. One issue with the data set is the lack information regarding the immigrants. Therefore, to construct the main independent variable - the ratio of Non-UK born population to the UK-born population - data from the Annual Population Survey (APS) was used. It has the largest survey of private households in the UK and consequently, the population estimates (table 4) can be considered reliable.

The variable in question includes both A8 and non-A8 migrants. Because the research question is whether the 2004 enlargement had an impact on native wages, in order to isolate the effects resultant from A8 migrants, a dummy variable equal to 1 'after the enlargement' was included in the specification. This will be explained in more detail in the following section.

[14] The mean annual income for low skilled sample is significantly lower. The p-value for the t statistic was zero

Although figure 3 shows the number of A8 migrants per region, using that data to create the independent variable would raise two concerns. First, the ratio of migrants to the UK-born population would have two different data sources: WRS and APS. Secondly, the WRS division of regions does not coincide with either the BHPS division or the APS division. Aggregating one classification of regions to be comparable to the second classification of regions is not straightforward. These two problems would lead to measurement error and therefore, simply using the APS data and including a dummy variable for the enlargement is the best alternative.

5. Empirical Strategy

To estimate the impact of immigration from the 2004 enlargement, a spatial correlation approach is used. This approach is often used in the literature[15] and its main assumption is that natives employed in regions where the immigration rate is higher will be worse off compared to natives in regions were immigrants rarely go. In order to exploit the geographic concentration of immigrants, the country is divided into regions and each of them is considered a labour market. Regarding the UK, the country was divided according to the Government Office Regions[16].

The novelty in this study is the use of longitudinal data from the BHPS. It allows for important variables related to each individual to be controlled for. Furthermore, studies either evaluate the impact of total immigration (e.g. Dustmann et al. 2003, 2005, 2008) or the impact of the 2004 enlargement solely (e.g. Lemos and Portes, 2008). Even though the focus of this study is to assess the effects of the A8 migration, the following specification allows the comparison between total migration and A8 migration effects.

$$\ln(w_{i,t,r}) = \beta_0 + \varphi_r + \beta_1 T_t + \boldsymbol{\beta_2} T_t * m_{t,r} + \beta_3 m_{t,r} + \beta_4 year + \beta_5 X_{i,t} + \varepsilon_{i,t,r} \quad (1)$$

[15] For example: Dustmann et. al, 2003, 2005, 2008, Lemos and Portes (2008)
[16] They are: North East, North West, Yorkshire and the Humber, East Midlands, West Midlands, East of England, London, South East, South West, Wales, Scotland and Northern Ireland.

$w_{i,t,r}$ is the monthly wage for individual *i*, from region *r* and period *t*. Since the main assumption of the model is that the number of immigrants and changes in the outcome variable are spatially correlated, a set of dummy variables is included for each region φ_r. It captures region fixed effects: factors that change across regions but not across time.

T_t is a dummy variable equal to zero in the first wave -2004 – and equal to one in the second and third wave - 2005 and 2006. $m_{t,r}$ is the ratio of the non-UK born population to the UK-born population in each region *r* and period *t*. The purpose of the dummy variable is to measure the impact of immigration after the enlargement, when A8 migrants entered the labour market. That is, to distinguish between the effect of the overall immigration and immigration after enlargement. T_t was set to zero in 2004 and not in 2003 for two reasons. Firstly, as previously mentioned, data on immigrants for each region, in 2003, was not available. Secondly, because immigrants take some time to find a job, they are unlikely to have any impact on the labour market in the first wave, especially because the enlargement occurred in May and the wave finishes in September 2004. The variable of interest is the interaction variable between T_t and $m_{t,r}$. Its coefficient measures changes in wages due to the low-skilled workers inflow upon the enlargement. In sum, β_2 differs from β_3 because the latter captures the effect of migration flows in a broader sense, without differentiating between the effect of the A8 migrants and others.

A variable for year is also included to capture changes over time. Since the model already includes T_t, the variable $year$ is treated as a continuous variable instead of year dummies. $X_{i,t}$ is a vector of the individual characteristics, such as age, marital status, educational attainment, occupation, number of weekly hours worked and full-time or part-time job. Finally, $\varepsilon_{i,t,r}$ is an error term for individual *i*, region *r* and year *t*.

Standard errors were clustered by region. Moulton (1990) showed that when merging data with micro observations by regions, standard errors from OLS can be significantly downward biased if they are not clustered. This happens

because individuals from the same region are likely to share unobservable characteristics, meaning that standard errors will be correlated. Results will therefore tend to appear more significant than they are in reality. Therefore, in each specification, standard errors were clustered by region.

6. Results

Table 5 and 6 presents the results for the full sample. The interpretation of the coefficient of interest is that a one percentage point increase in the ratio of migrants, after the enlargement ($T_t = 1$), is expected to change natives wages by β_2 percent, holding everything else constant. In the first specification, without controlling for individual characteristics, the respective coefficient is positive and statistically insignificant. If migration ratio increases by 1 percentage point, natives' annual wages are expected to increase 0.10 percent (estimate from the first column). In order to have a better understanding of this effect, from 2004 to 2005 the immigrant to native ratio increased by 0.58 percentage points in the UK. According to the descriptive statistics, the average annual labour wage in the sample is £24 820. For an individual receiving this amount, his annual wage would increase 0.058 percent in 2005 equivalent to £14.40. Furthermore, the coefficient of T_t is negative and statistically significant and can be interpreted as follows: in 2005 (or 2006), wages were 1.8 percent lower when compared with wages in 2004, *ceteris paribus*. Concerning the coefficient of $m_{t,r}$, it is positive but insignificantly different from zero. Results suggest that after the enlargement, annual wages slightly decrease, but this was not a result of immigration, since β_2 is insignificant.

Results slightly change when individual characteristics are included in the specification. Although the adjusted R-squared increased, as expected, all the coefficients become statistically insignificant.

There are two reasonable explanations for the results found. First of all, the large influx of migrants right after the enlargement may have had no impact

at all in wages and thus coefficients will be either small in magnitude or statistically insignificant. Secondly, according to the theory, it is possible that high-skilled workers had benefited and low-skilled workers had been adversely affected. If both effects cancel each other the overall impact of the enlargement will be null. In order to test these two hypotheses, the model was estimated for both low- and high-skilled samples and results are presented in table 7, 8 and 9. None of the coefficients is significantly different from zero, regardless the skill or controls included. Hence, the first explanation appears to be the most realistic.

Although the estimates are statistically insignificant, it is worth noting that the estimates for $T_t * m_{t,r}$ and $m_{t,r}$ have opposite signs for low- and high-skilled sample. For example, the estimate of the impact of immigration after the enlargement is positive for high-skilled workers and negative for low-skilled workers, as theory predicts. For the full sample the corresponding estimate is positive. On the other hand, the estimates for $m_{t,r}$ are positive for the three samples. If the coefficients were significant, they would suggest that immigration before and after the enlargement had different effects on natives.

Concerning the coefficients of the control variables, they are all statistically significant for the full sample. In particular, an individual working full-time is expected to earn 26.7 percent more, per annum, when compared to someone working part-time, everything else constant. Individuals who continued education after high school have the higher annual wages. Individuals in the 'other' category are the ones who received less. Specifically, they receive less 37.4 percent those individuals with a first degree. In contrast, someone with a higher degree receives 7.7 percent more than someone with a first degree. Data suggests that wages are increasing with the time spent on education. Regarding the occupations, all coefficients are negative and statistically significant, meaning that manager and senior officials have the highest earnings. Low-skilled occupations have

the lowest earnings. For example, a person working in sales or customer service occupations receive 52.2 percent less than someone working in the reference occupation. When dividing the sample in low- and high-skilled observations, some coefficients became insignificant but the main conclusions do not differ much.

In conclusion, according to the data used, A8 migration did not result in any statistically significant impact on native wages, even when the model is estimated according to occupation. These results are similar to results found by Lemos and Portes (2008). Moreover, during the time period considered, both GDP and minimum wage were increasing. These facts might have mitigated the possible negative impacts on low-skilled workers.

7. Robustness Tests

This section presents sensitivity analysis to the results previously found. The tests are related with three important choices faced when preparing the data set and that could eventually lead to different results. Firstly, the dependent variable was changed to the monthly labour income. Secondly, since there is no perfect procedure to divide workers into low- and high-skilled samples, the models is re-estimated using different criteria, based on education. As a final test, the main independent variable was changed. The estimates show that the main results are robust to the sensitivity tests.

7.1. Monthly Labour Income

Apart from the annual labour income, the BHPS also provides information regarding the monthly labour income for the month preceding the interview. Using monthly income might have some advantages. First, it is probably easier for the interviewee to remember how much he earned last month rather than the entire year. Secondly, it is possible that some individuals did not work the complete year. For example, if in wave 1, someone was unemployed during the first months but then stayed the rest of the period

employed, then, from wave 1 to wave 2 there is an increase in the wage. However, the increase is not a result of immigration and there is no variable that can be included in the model to control for it. The two measurement errors just described can be mitigated by using monthly labour income, instead of annual labour income.

A drawback is that interviews from wave 1 were conducted up to April 2005. Therefore, the assumption would be that if the enlargement had an impact on wages, it was felt one year after[17]. Because this is a strong assumption, it appeared preferable to use annual labour income in the main specifications. Nevertheless, the results from monthly income presented in table 10 are similar to the previous ones. Again, the coefficients related to immigration and enlargement are not statistically significant.

7.2. Redefining low- and high-skilled groups

As previously explained, allocating individuals into low- and high-skilled workers according to their occupation seemed to be the most appropriate one. Nevertheless, and especially because all the coefficients from the sub-sample estimations were statistically insignificant, observations were divided according to educational attainment. Consequently, all individuals included in the CSE, A level and 'other' categories were considered to be low-skilled workers. Individuals who spent more time at studying, i.e. with a first degree, a higher degree or a HDN/C, were considered high-skilled workers. Results for the new samples are shown in table 11. The three main estimates are still statistically insignificant.

7.3. Redefining the main independent variable

As mentioned before, including both A8 and non-A8 immigrants in the independent variable seemed to be the best approach. Nevertheless, as a sensitivity test, the independent variable was re-constructed in order to

[17] When using monthly income, any impact resultant from immigration would start to be felt on September 2004 since the annual income from 2004 starts in September 1st 2003 and finishes in September 01st 2004. The same applies for 2005 and 2006.

distinguish between both types of immigrants. It uses data from the WRS[18] for the number of A8 migrants and data from the APS for the number of UK-born population. In sum, there will be two variables related to migration influxes. The first one - $A8m_{t,r}$ - is the number of A8 migrants that arrived after the enlargement. The second one - $nonA8_{t,r}$- includes all the remaining migrants, regardless of their arrival in the UK[19]. Now, the $A8m_{t,r}$ estimate measures changes in wages due to A8 migrants upon the enlargement, it is similar to β_2 in equation (1). Since the main goal of the dummy variable - T_t - was to differentiate the effect of both groups of immigrants, it is not needed in this specification[20]:

$$\ln(w_{i,t,r}) = \beta_0 + \varphi_r + \phi_t + \boldsymbol{\beta_1}\, A8m_{t,r} + \beta_2 nonA8_{t,r} + \beta_3 X_{i,t} + \varepsilon_{i,t,r} \qquad (2)$$

ϕ_t is a set of dummy variables for the years and everything else remains the same. Table 12 presents the estimates for the three samples. The following analysis is relates to column 2, the preferred specification. For the full sample, the A8 migrant ratio is not statistically significant from zero, implying A8 inflows did not have an impact on natives' wages. On the other hand, non-A8 migrants had a positive and statistically significant impact on the annual wages of natives: a 1 percentage point increase in the ratio led to an increase of 0.55 percent of natives' wages, *ceteris paribus*. Concerning the sub-samples, the new estimates are much larger in absolute magnitude; nevertheless, they are still statistically insignificant.

8. Discussion and suggestions for further research

Using the spatial correlation approach to evaluate the impact of immigration in the labour market raises two endogeneity problems often discussed in the

[18] For the region aggregation, East Midlands and West Midlands became one region, Midlands; Yorkshire and the Humber and North East became just North East; Anglia and Central were considered to be East of England and South East, respectively. Hence, the regions are now: Midlands, East of England, London, North East, North West, Northern Ireland, Scotland, South East, South West and Wales.

[19] It is the non UK-born population (from APS) minus the A8 migrants (from WRS), divided by the UK-born population (from APS).

[20] Similar to Lemos and Portes (2008).

literature (e.g.: Borjas, 1999; Dustmann et al., 2003). The first one is related to natives' responses to immigration. Because regional labour markets are not closed, if natives feel 'economically threatened' by immigrants, they are able to look for better opportunities in other region. The second and the most serious problem is due to the endogeneity of the migrants' decision to settle. Immigrants do not choose where to locate randomly and thus, results presented before might be biased. The following part of this section discusses in more detail these two issues and some suggestions for further research in the UK.

8.1. Internal Migration

If after the enlargement natives felt that the large fluxes of immigration had a negative impact on their wages or employment opportunities, they may had moved their labour or capital to another region, dispersing the negative impact. If so, the coefficient of interest, β_2, would be biased towards zero: the *spatial correlation approach* would fail to find any difference across regions (Borjas, 1999) .

The most straightforward solution is to include a variable for internal migration in the model. Nevertheless, this variable is likely to be endogenous as natives would move to economically prosperous regions. The choice of instrument is more difficult in this case. Dustmann et al. (2008) used lagged values of the variable. However, it is difficult to believe that the instrument is uncorrelated with the dependent variable.

Figure 7 shows the net internal migration as a percentage of resident population in each region. Overall internal migration does not appear to be a major concern: rates are low and in several regions are close to zero. The most significant and interesting case is London. The capital has the highest share of immigrants and also the highest out-migration rates, between 1.5 and 1 percent.

Figure 7 Native net migrations by region (% of resident population)

Source: Office for National Statistics, Labour Force Survey

In order to better evaluate the impact of immigration on internal migration, a simple model was estimated. Based on Hatton and Tani (2005) and Nathan (2011), the ratio of net native immigration to resident population is regressed on the previous main independent variable, $m_{t,r}$, on the annual average wages, on the average house prices and on the percentage of jobs in each region. Table 13 shows results for four different specifications in which all the coefficients have the expected sign. While there is a positive and statistically significant relationship between the ratio of immigrants and the internal migration rate, this is small in magnitude. For example, according to the fourth column, if the share of immigrants increases by one percentage point, the internal migration rate is expected to increase by 0.09 percentage points, keeping everything else constant. Although this might have an impact on the model in section 5, it does not raise much concern. The results presented in table 13 should be interpreted with some caution since it does not take into account the possible existence of endogeneity.

8.2. Migrant Selection

It is unlikely that immigrants settle randomly within different regions. There may exist simultaneity between wages and the ratio of immigrants. That is, not only immigration may lead to changes in wages, but also, changes in wages may

influence inflows. Due to endogeneity of the main independent variable, β_2 would not be a consistent estimate. In particular, β_2 would be upwardly biased since the negative effect of immigration is neutralized by prosperous economic conditions.

This problem is usually addressed by exploiting exogenous variation in the ratio of immigrants through an instrumental variable approach. Usually, the instrument choice is based on studies such as Munshi (2003) that found areas where established immigrants were present also had higher levels of immigration in the succeeding years. The presence of these social-networks is crucial for them when trying to find a job. In sum, recent immigrants tend to cluster in areas with a relatively high concentration of previous immigrants. Consequently, the instrumental variables used was the share of immigrants in each region in 1991, interacted with year dummies. This instrument was used by Dustman et al. (2008) and Lemos and Portes (2008). It was computed from the Census of Population performed in the respective year. Since the ratio of immigrants is present twice in the equation, there are two endogenous variables, $m_{t,r}$ and $T_t * m_{t,r}$, meaning there are two first stage regressions.

For the coefficient β_1 to be consistent and the IV approach to be valid, two assumptions must hold. Firstly, the instrument cannot be correlated with the error term of the second stage regression, equation (1). That is, the share of immigrants in 1991 should only affect-wages in 2004-06 because it influenced the allocation of A8 immigrants. Economic theory predicts that, even if immigration leads to a disequilibrium in the labour market, in the long-run, the economy will adjust. Hence, it is unlikely that the concentration of immigrants in 1991 was related to changes in wages in 2004.

The second assumption requires the instrument to be informative. That is, it needs to be correlated with the endogenous variable, $m_{t,r}$, after conditioning on all remaining exogenous variables. The extremely high R-squared values from the first stage regressions proved that this last assumption holds. However, a problem occurs after estimating equation (1) through an IV

procedure. According to the Hausman test, the null hypothesis - $m_{t,r}$ and $T_t * m_{t,r}$ are exogenous - cannot be rejected. This means that both IV and OLS yield similar consistent coefficients however, IV's estimates are less efficient[21]. Consequently, OLS estimates are preferred[22].

There is one possible explanation for the instruments' inefficiency. Previous studies have used the IV approach to correct for both endogeneity and measurement error in the independent variable. The measurement error was due to small sample size. For example, LFS has few observations regarding immigrants and thus, measures of regional concentration are highly imprecise (see Dustmann et al., 2003). However, in this study, the independent variable does not use sample observations but uses population estimates and thus, the measurement error is significantly lower. A lower measurement error may result in a less efficient IV estimation

8.3. Further Research Suggestions

Research in UK has mainly focused on the impact of immigrants on the labour market. In particular, the effects on wages and unemployment. Nonetheless, it is worthwhile to study the other dimensions through which migration may affect natives.

Less attention was given to the natives' decision regarding human capital investment, participation in the labour market and chosen occupation.

Education is a particular important subject of study. As an example, if immigrants' children have a worse prior education when compared to natives, then the quality of education at schools might decrease. On one hand it implies lower earnings capacity in the future and therefore, lowers incentives to invest in education. On the other hand, as education system becomes easier, graduation rates may increase. It is crucial to understand

[21] It means that the instrument is weak, not that the variables are exogenous.
[22] Equation (2) was also estimated by instrumental variables. However, the null hypothesis could not be rejected either. Moreover, other specifications for the first stage regression were tried, but p-values for the Hausmann test remained high.

which effect dominates. If immigration does have a negative effect on the education system, inequality between richer and poorer families is likely to increase. Richer parents are better able to move their children to an educational environment not so affected by immigration, such as private schools (Betts and Fairlie 2003).

Although estimating the impacts of immigration on wages is essential, ignoring all the other social and economic adjustments may lead to a wrong estimation of the true effects of immigration on the host society (Llull, 2010).

9. Conclusion

Since the EU enlargement in 2004, free movement of European labour has become a controversial issue in the UK (Springford, 2013). The country decided not to impose any restriction and immediately opened its labour market after the A8 accession. The inflows from the A8 were much larger than expected and public concerns about labour market deterioration started to emerge.

Although numerous studies have been undertaken on the impact of immigration in the British labour market, few of them focused specifically on the 2004 EU enlargement.

This paper tried to find evidence on the impact of A8 migration on natives' wages by using a *spatial correlation approach* and BHPS data. Although the several limitations previously discussed, results show enlargement had no effect on natives' wages. According to economic theory the impact could be felt differently among groups of workers. However, when dividing individual into low and high skill groups, estimates do not support the theory. Moreover, the statistically insignificant estimates are robust to the tests performed.

Although no impacts were found, migrants have the potential to affect natives through other channels such as education or participation in the

labour market. All these channels should play a central role in policy making and the immigration debate.

References

Dustmann, C., Frattini, T., & Preston, I. P. (2005). *The impact of immigration on the British labour market.* The economic Journal, 115.

Betts, J., & Fairlie, R. (2003). *Does immigration induce 'native flight' from public schools into private schools?* Journal of Public Economics.

Borjas, G. (1999). *The Economics of Immigration.* Handbook of Labor Economics, Vol.3, 1697-1760.

Card, D. (2001). *Immigrant Inflows, Native Outflows, and the Local Market Impacts og Higher Immigration.* Journal of Labor Economics, Vol. 19, No. 1., pp. 22-64.

Dustmann, C., Fabbri, F., Preston, I. P., & Wadsworth, J. (2003). *The local labour market effects of immigration in the UK.* Home Office Online Report 06/03.

Dustmann, C., frattini, T., & Preston, I. P. (2008). *The effect of immigration along the distribution of wages.* Review of Economic Studies.

Gilpin, N., Henty, M., Lemos, S., Porte, J., & Bullen, C. (2006). *The Impact of Free.* London: Department for Work and Pensions Working Paper No. 29.

Hatton, T., & Tani, M. (2005). *Immigration and Inter-Regional Mobility in the UK, 1982-2000.* The Economic Journal, 115.

(2014). *Immigration, the European Union and the UK Labour market, CEP Policy Analysis.* Center for Economic Performance.

Lemos, S., & Portes, J. (2008). *The impact of migration from the new European Union Member States on native workers.* London: Department for Work and Pensions.

Llul, J. (2010). *Immigration, Wages, and Education: A Labor Market Equilibrium Structural Model.* Job Market Paper.

Migration, I. I. (2010). *Migration and the Economic Crisis in the European Union: Implications for Policies.*

Moulton, B. (1990). *An illustration of a pitfall in estimating the effects of aggregate variables on micro units.* The Review of Economics and Statistics, Vol.72, No. 2, pp. 334-338. The MIT Press.

Munshi, K. (2003). *Networks in the Modern Economy: Mexican Migrants in the US Labor Market.* The Quarterly Journal of Economic, 118, 549-599.

Nickell, S., & Saleheen, J. (2008). *The impact of immigration on occupational wages: evidence from Britain.* Federal Reserve Bank of Boston, Working Paper No.

Ottaviano, G., & Peri, G. (2006). *Rethinking the effects of immigration on wages.* National Bureau of Economic Research, Working Paper 12497.

Salaheen, J., & Shadforth, C. (2006). *The economic characteristics of immigrants and their impact on supply.* Bank of England.

Springford, J. (2013). *Is immigration a reason for Britain to leave the EU?* Centre for European Reform.

(2000). *Standard Occupational Classification 2000 - Volume 1 Structure and Descriptions of Unit Groups.* London: The Stationery Office: Office for National Statistics.

Appendix

A. Data

Table 2 Summary Statistics

	Full sample		Low-Skilled		High-Skilled	
Age (Mean; S.D)	40.53	11.37	40.22	12.30	40.81	10.49
Married (%)	60.77		57.24		63.82	
Region (%)						
North East	2.80		2.72		2.87	
North West	7.90		8.67		7.24	
Yorkshire and the Humber	6.14		6.55		5.79	
East Midlands	5.54		5.92		5.20	
West Midlands	5.34		5.13		5.52	
East of England	5.84		5.24		6.36	
London	4.66		2.64		6.40	
South East	8.58		7.25		9.73	
South West	6.17		5.42		6.81	
Wales	15.70		17.75		13.92	
Scotland	17.67		18.20		17.22	
Northern Ireland	13.66		14.51		12.92	
Education (%)						
CSE	31.40		42.92		21.45	
A level	24.24		23.59		24.80	
HND/C	9.88		5.81		13.40	
1st Degree	16.06		3.72		26.73	
Higher Degree	4.81		0.26		8.74	
Other	13.61		23.70		4.89	
Full-time (%)	96.93		97.64		96.31	
Nº of hours worked per week (Mean; S.D))	39.43	6.66	40.03	6.56	38.91	6.71
Annual Labour Income (€) (Mean/S.D)	24 820.79	15 272.66	19 241.69	10 504.53	29 642.37	17 010.73
Number of Observations	8 238		3 819		4 419	

Table 3 Summary Statistics – Occupation

	Full Sample	Low-Skilled	High-Skilled
Manager and Senior Officials	19.14		35.69
Professional Occ.	13.03		24.28
Associate Professional and Technical Occ.	14.72		27.45
Administrative and Secretarial Occ.	6.75		12.58
Skilled Trades Occ.	18.54	39.98	
Personal Service Occ.	2.27	4.90	
Sales and Customer Service Occ.	3.36	7.25	
Process, Plant and Machine Operatives	14.40	31.06	
Elementary Occ.	7.79	16.81	
Number of Observations	8 238	3 819	4 486

Table 4 Ratio of Non-UK born to UK-born population by year and region (%)

	2004	**2005**	**2006**
North East	3.42	3.80	3.57
North West	5.37	5.96	6.65
Yorkshire and the Humber	6.28	6.65	7.82
East Midlands	6.65	7.26	8.38
West Midlands	8.18	8.65	9.61
East of England	7.79	8.35	9.14
London	42.10	44.95	47.14
South East	9.10	9.46	10.34
South West	5.28	5.43	6.07
Wales	3.52	3.77	4.27
Scotland	4.24	4.62	4.73
Northern Ireland	4.40	3.79	4.70
UK	9.72	10.30	11.15

Source: Office for National Statistics (ONF)
Note: A year starts in January and finishes in December. Estimates were derived from the Annual Population Survey (APS)

B. OLS Results

Table 5 OLS Estimates, full sample

	$\ln(w_{i,t,r})$	
	(1)	(2)
T_t	-0.018*	0.003
	(0.010)	(0.011)
$m_{t,r}$	0.465	0.595
	(0.841)	(0.784)
$T_t * m_{t,r}$	0.100	-0.009
	(0.075)	(0.072)
Age		0.007***
		(0.001)
Married		0.154***
		(0.012)
Full time		0.267***
		(0.032)
Weekly Hours Worked		0.012***
		(0.002)
A level		-0.193***
		(0.029)
CSE		-0.266***
		(0.031)
Higher Degree		0.077*
		(0.036)
HND/C		-0.076**
		(0.026)
Other		-0.374***
		(0.029)

Note: Standard errors are clustered by region.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1
Table continues in the next page.

Table 6 OLS Estimates, full sample – Cont.

	$\ln(w_{i,t,r})$	
	(1)	(2)
Professional Occ.		-0.045**
		(0.021)
Professional and Technical		-0.152***
		(0.030)
Administrative and Secretarial		-0.346***
		(0.057)
Skilled Trade Occ.		-0.288***
		(0.022)
Personal Service Occ..		-0.476***
		(0.034)
Sales and Customer.		-0.522***
		(0.045)
Process, plant and Machine		-0.308***
		(0.018)
Elementary Occ.		-0.466***
		(0.035)
Region Fixed Effects and $year$	Yes	Yes
Observations	8 238	8 238
R-squared	0.038	0.400
Adjusted R-squared	0.036	0.393

Note: Standard errors are clustered by region.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 7 OLS Estimates, Low-skilled Sample

	$\ln(w_{i,t,r})$	
	(1)	(2)
T_t	0.011	0.021
	(0.021)	(0.026)
$m_{t,r}$	0.404	0.589
	(1.341)	(1.467)
$T_t * m_{t,r}$	-0.015	-0.076
	(0.117)	(0.127)
Age		0.004***
		(0.001)
Married		0.163***
		(0.017)
Full-time		0.175***
		(0.047)
Weekly Hours Worked		0.013***
		(0.002)
A level		-0.106*
		(0.055)
CSE		-0.169**
		(0.057)
Higher Degree		0.145
		(0.276)
HND/C		-0.001
		(0.069)
Other		-0.269***
		(0.058)

Note: Standard errors are clustered by region.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1
Table Continues in the next page.

Table 8 OLS Estimates, Low-skilled Sample- Cont.

	$\ln(w_{i,t,r})$	
	(1)	(2)
Personal Service Occ.		-0.173***
		(0.030)
Sales and Customer.		-0.235***
		(0.034)
Process, plant and Machine		-0.015
		(0.020)
Elementary Occ.		-0.174***
		(0.028)
Region Fixed Effects and $year$	Yes	Yes
Observations	3 819	3,819
R-squared	0.016	0.237
Adjusted R-squared	0.013	0.232

Note: Standard errors are clustered by region.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 9 OLS Estimates, High-skilled sample

	$\ln(w_{i,t,r})$	
	(1)	(2)
T_t	-0.033	-0.013
	(0.020)	(0.019)
$m_{t,r}$	-0.453	0.169
	(1.487)	(1.409)
$T_t * m_{t,r}$	0.186	0.046
	(0.149)	(0.124)
Married		0.152***
		(0.013)
Full-time		0.343***
		(0.031)
Age		0.010***
		(0.001)
Weekly Hours Worked		0.01***
		(0.002)
A level		-0.203***
		(0.036)
CSE		-0.301***
		(0.032)
Higher Degree		0.062
		(0.040)
HND/C		-0.087**
		(0.037)
Other		-0.375***
		(0.033)
Professional Occ.		-0.053**
		(0.018)
Professional and Technical		-0.149***
		(0.027)
Administrative and Secretarial		-0.344***
		(0.057)
Region Fixed Effects and $year$	Yes	Yes
Observations	4 419	4 419
R-squared	0.039	0.322
Adjusted R-squared	0.036	0.318

Note: Standard errors are clustered by region.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05 p<0.1

C. Robustness Tests

Table 10 OLS Estimates with monthly labour income as dependent variable

	$\ln(w_{i,t,r})$			
	(1)		(2)	
A. Full Sample				
T_t	-0.019		-0.006	
	(0.019)		(0.015)	
$m_{t,r}$	0.589		0.445	
	(1.156)		(1.023)	
$T_t * m_{t,r}$	-0.091		-0.128	
	(0.103)		(0.094)	
Control Variables	No		Yes	
Region Fixed Effects and $year$	Yes		Yes	
Observations	8 467		8 467	
R-Squared	0.040		0.408	
Adjusted R-Squares	0.038		0.406	
C. Low-Skilled Sample				
T_t	-0.019	-0.010	-0.006	-0.002
	(0.019)	(0.033)	(0.015)	(0.033)
$m_{t,r}$	0.589	-1.237	0.445	-1.163
	(1.156)	(2.111)	(1.023)	(2.246)
$T_t * m_{t,r}$	-0.091	-0.032	-0.128	-0.072
	(0.103)	(0.189)	(0.094)	(0.188)
Control Variables	No	No	Yes	Yes
Region Fixed Effects and $year$	Yes	Yes	YEs	Yes
Observations	8 467	3 981	8 467	3 981
R-Squared	0.040	0.020	0.408	0.227
Adjusted R-Squares	0.038	0.016	0.406	0.221
B. High-Skilled Sample				
T_t		-0.029		-0.010
		(0.023)		(0.020)
$m_{t,r}$		0.453		0.974
		(1.488)		(1.346)
$T_t * m_{t,r}$		-0.075		-0.167
		(0.145)		(0.131)
Control Variables		No		Yes
Region Fixed Effects and $year$		Yes		Yes
Observations		4 486		4 486
R-Squared		0.043		0.334
Adjusted R-Squares		0.040		0.330

Note: Standard errors are clustered by region.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 11 OLS Estimates, Low- and High-Skilled Sample defined according to education

	$\ln(w_{i,t,r})$	
	(1)	(2)
A. Low-Skilled Sample		
T_t	-0.007	0.013
	(0.011)	(0.014)
$m_{t,r}$	0.132	0.238
	(0.779)	(0.996)
$T_t * m_{t,r}$	0.020	-0.089
	(0.068)	(0.083)
Control Variables	No	Yes
Region Fixed Effects and $year$	Yes	Yes
Observations	5 705	5 705
R-squared	0.034	0.304
Adjusted R-squared	0.031	0.300
B. High-Skilled Sample		
T_t	-0.021	-0.012
	(0.022)	(0.018)
$m_{t,r}$	2.140	0.999
	(1.856)	(1.266)
$T_t * m_{t,r}$	0.031	0.051
	(0.016)	(0.097)
Control Variables	No	Yes
Region Fixed Effects and $year$	Yes	Yes
Observations	2 533	2 533
R-squared	0.044	0.353
Adjusted R-squared	0.038	0.345

Note: Standard errors are clustered by region.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 12 OLS Estimates, New Independent variable

	$\ln(w_{i,t,r})$	
	(1)	(2)
A. Full Sample		
$A8m_{t,r}$	0.520	0.292
	(1.627)	(2.973)
$nonA8m_{t,r}$	1.299***	0.554*
	(0.308)	(0.270)
Control Variables	No	Yes
Region and Year Fixed Effects	Yes	Yes
Observations	8 238	8 238
R-squared	0.037	0.375
Adjusted R-squared	0.035	0.372
B. Low-Skilled Sample		
$A8m_{t,r}$	5.193**	3.568
	(2.288)	(2.169)
$nonA8_{t,r}$	0.026	-0.122
	(0.577)	(0.587)
Control Variables	No	Yes
Region and Year Fixed Effects	Yes	Yes
Observations	3 819	3 819
R-squared	0.015	0.197
Adjusted R-squared	0.012	0.192
C. High-Skilled Sample		
$A8m_{t,r}$	-7.988	-2.827
	(6.985)	(5.943)
$nonA8_{t,r}$	1.535**	0.727
	(0.670)	(0.513)
Control Variables	No	Yes
Region and Year Fixed Effects	Yes	Yes
Observations	4 419	4 419
R-squared	0.037	0.305
Adjusted R-squared	0.034	0.301

Note: Standard errors are clustered by region.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

D. Discussion and suggestions for further research

Table 13 OLS Estimates for the internal migration rate

	$\frac{internal\ migration_{r,t}}{resident\ pop_{r,t}}$			
	(1)	(2)	(3)	(4)
$m_{t,r}$	0.060**	0.075**	0.066**	0.093***
	(0.022)	(0.027)	(0.030)	(0.016)
$ln(wage_{t,r})$		-0.111***	-0.102**	
		(0.018)	(0.043)	
$\%jobs_{t,r}$			-0.021	0.151***
			(0.154)	(0.047)
$ln(houseprices_{t,r})$				-0.101***
				(0.011)
Year dummies	Yes	Yes	No	No
Observations	36	36	36	36
R-squared	0.144	0.327	0.322	0.904
Adjusted R-squared	0.06	0.241	0.215	0.895

Note: Standard errors are clustered by region.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1
Annual wages and house prices variables are averages for each region and year.
The variable %jobs is the ratio of the number of jobs in region r to the total number of jobs in the country.
Source: ONS