

# The Impacts of Immigration on Wages and Unemployment in England: An Empirical Investigation

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The economic effects of immigration have become increasingly important within the UK over recent decades but there is no general consensus on the impact of immigration on unemployment and wages. Within the existing literature, a number of authors have attempted to empirically measure the impacts of immigration on labour market outcomes within the UK at a national level. However, my study aims to use regional level data from England across the period 2005 to 2012 to analyse the impacts of immigration on unemployment and wages. My results show that immigration has no significant effects on either unemployment or wages at a regional level.

## 1. Introduction

The impact of immigration on a host country's labour market has been a much-discussed issue, especially in recent decades. Although global migration levels have remained fairly constant over the past fifty years, the economic impact of migration has become of increasing importance politically to receiving countries (Castles *et al.*, 2014, p. 1). Furthermore, despite a significant wealth of contradictory evidence, public perception of the impacts of immigration on labour market outcomes seems to be largely negative. This is especially the case for the United Kingdom, where the majority of respondents to a survey conducted by the European Social Survey (2002, p. 28) agreed that wage levels were reduced by immigration (Card *et al.*, 2012). This is despite most studies finding that immigration has only had a small impact on wages and unemployment (Dustmann *et al.*, 2003b; Manacorda *et al.*, 2012; Ottaviano and Peri, 2012).

In order to analyse the impacts of migration, we must first consider how to define immigration. Definitions of who is considered to be a migrant vary greatly between sources and this can have significant consequences when analysing migration flows empirically (Anderson and Blinder, 2014). This empirical analysis will use data on long-term international migration. A long-term international migrant can be defined as an individual "who moves to a country other than that of his or her usual residence for a period of at least a year" with the destination country becoming their new country of residence (United Nations, 1998, p. 97).

This study aims to add to the literature by taking a fresh approach to empirically analysing the impacts of immigration on unemployment and wages. Previous studies have used theoretical models or census data to analyse labour market impacts of immigration. However, there is a gap within the literature in terms of analysing immigration impacts at a regional level. My aim is to use aggregate data on immigrant inflows to each region of England between 2005 and 2012 to explore the labour market impacts of immigration. Specifically, I aim to empirically investigate whether immigration has had any significant impacts on the dependent variables wages and unemployment by running two separate instrumental variable regression models.

The paper will be structured as follows. Firstly, a review of the current literature will be carried out, in order to draw comparisons from similar studies that have already been conducted in other contexts. Then, a theoretical framework will be established to allow me to formulate hypotheses for my own empirical work. Next, my methodology will be outlined, including presenting my regression models

and explaining my choice of variables. Finally, my regression results will be analysed and limitations of my methodology will be outlined to show areas for future research.

My results suggest that immigration has had no significant impact on either wages or unemployment at a regional level, even after allowing for a number of potential problems with the model specification. This may be because immigration tends to have very localised impacts on labour market outcomes, with no systematic effects even at a regional level.

## **2. Literature Review**

### *2.1 Early Evidence*

The economic impact of immigration has been of growing importance to academics and politicians alike, especially due to the large increase in migration to developed countries since 1975 (Lowell, 2007). However, most of the early literature is centred around immigration into the USA, with a lack of available data preventing studies on immigration into the UK until recent years (Dustmann *et al.*, 2003b).

Early theoretical research has proved useful in highlighting two of the recurring themes that much of the current literature has to consider: the negative impact of immigration on the earnings of low-income native workers (Reder, 1963) and the problem of the endogeneity of immigrant inflows, in which unemployment may depend on immigration, but immigration rates may also depend negatively on unemployment (Fleisher, 1963).

In the early 1980s, the first attempts were made to construct theoretical models to analyse the impact of immigration on the US labour market (Gerking and Mutti, 1980; Johnson, 1980). Both papers' models suggest that immigration has a negative impact on the wage rate of low-skilled native workers, but a positive effect on the earnings of high-skilled natives. This is consistent with the findings of Briggs (1975), who found that the vast majority of immigrants entering the US were competing with natives for low-skilled, low-paid jobs with high employee turnover rates.

Grossman (1982) highlights an important factor for further research, the extent to which native labour and immigrant labour can be seen as substitute inputs. If native and immigrant labour are seen as substitutes, then an increase in immigration will have a negative impact on the employment rates and wages of native workers. However, although Grossman (1982) finds that immigrant and native labour

are substitutes for each other, the impact of immigration on native wages and short run employment rates is fairly small.

## *2.2 First Empirical Work*

Most of the early research into the impacts of immigration on the labour market had been largely theoretical and there had been little empirical work done to determine the impact of immigration on the U.S. labour market (Borjas, 1987). Although basic empirical approaches had been used to analyse the relationship between native and foreign-born workers (Borjas, 1986; Grossman, 1982), these studies had limited value for determining the extent of substitutability between the two groups, because they aggregated different immigrant groups into one population. Borjas (1987) provides one of the first empirical studies in which the impacts of immigrants on labour market competition are estimated where the immigrant population is disaggregated by country of origin. He agrees with Grossman (1982) that immigrant labour is a substitute for certain native demographics, but argues that immigrants are actually complements for other labour groups. Furthermore, a decrease in low-skilled native US workers' earnings in the 1980s could be partly attributed to a weak negative correlation between the numbers of immigrants within a local labour market and the earnings of natives (Borjas, 1994).

More recently, Borjas (2003) has argued that workers with similar education standards but different experience levels are not perfect substitutes. As a result, he claims that immigration has lowered the wage of the average U.S native worker by 3 to 4 per cent, although the accuracy of these figures could be improved by reducing sampling errors in U.S. census data (Aydemir and Borjas, 2011).

Although Card (2001) also found that immigrant inflows had reduced the wages of low skilled workers in some U.S. cities, he argued that the overall impact of immigration on native wages and employment is negligible (Card, 2005). Similarly, Ottaviano and Peri (2012) have also challenged the previous assumptions about the impacts of immigration on wages. They suggest that immigration actually has a positive impact on the long run wages of the average native worker, with a slightly larger change in the wages of low-skilled native workers. Furthermore, the authors argue that the only negative labour market impact of immigration is a high negative effect (-6.7%) on the wages of previous immigrants (Ottaviano and Peri, 2012, p. 191).

Altonji and Card (1991) found that immigrant inflows have small and unsystematic effects on the employment levels of less-skilled native workers. The authors use an instrumental variable to correct

for the endogeneity of immigrant inflows, which increases the accuracy and reliability of their findings. Furthermore, immigrants and native workers can be seen as imperfect substitutes, which lowers the competitive pressure that immigrants place on the labour market and explains their lack of impact on employment levels (Ottaviano and Peri, 2008).

As discussed above, the evidence from the U.S. does not reach a consensus about the impact of immigration on wages, with estimates ranging from small positive to fairly significant negative effects. However, most of the literature agrees that the impact of immigration on unemployment in the U.S. is likely to be negligible, with the greatest impacts on low-skilled native employment levels (Altonji and Card, 1991; Ottaviano and Peri, 2008). This is supported by evidence from a number of other countries, which suggests that it is unlikely there is a negative long run impact of immigration on either wages or unemployment and any effects are usually fairly insignificant (Edo and Toubal, 2015; Friedberg, 2001; Friedberg and Hunt, 1995; Jean and Jiménez, 2011; Winter-Ebmer and Zweimüller, 1996)

### 2.3 UK Context

Research into the impacts of immigration on wages and unemployment in the UK has been a relatively recent phenomenon, with research only being conducted following the increase in immigration of working age adults in the late 1990s (Dustmann *et al.*, 2003a, p. 19).

Dustmann *et al.* (2003b) conduct one of the first empirical studies into the impacts of immigration on the UK labour market, by analysing data across multiple sources. The authors use the instrumental variable of lagged immigrant concentrations to mitigate for the simultaneity problems of immigrants being attracted to areas with favourable labour market conditions. As was observed in the U.S. literature, immigration to the UK has a small, statistically insignificant impact on unemployment (Dustmann *et al.*, 2003b). Furthermore, immigration appears to be positively associated with higher wage growth for native workers, although these findings may not be entirely accurate due to limitations in the available data and conceptual problems during the empirical analysis (Dustmann *et al.*, 2003b). Similarly, Dustmann *et al.* (2005) analyse the impacts of immigration on UK wages and unemployment through looking at differences in immigration to various geographic areas, instrumented by variation in historical immigration patterns. The authors again find little evidence of adverse labour market effects arising from immigration at an aggregate level, although there may be negative effects for the employment of native workers with an intermediate education level (Dustmann *et al.*, 2005). Indeed, a later study by Dustman *et al.* (2008a) also observes that immigration

has a positive effect on average native wages, with a negative impact on the lower end of the native wage distribution, but a positive impact on the higher end of the distribution.

Manacorda *et al.* (2012) adopt an approach similar to Ottaviano and Peri's (2008) by suggesting that immigrants and native workers are imperfect substitutes in the UK labour market. As a result, the authors suggest that the only significant negative impact of increased immigration is to lower the wages of immigrants already in the country.

In 2004, the UK granted free movement to eight Eastern and Central European countries (A8 nations) that had joined the European Union, leading to a significant rise in immigration (Blanchflower *et al.*, 2007). The potential negative impacts of increased immigration from A8 countries on the UK labour market has been a much discussed phenomenon (Lemos and Portes, 2008). However, there has been little empirical evidence of any negative impacts associated with A8 migration, although Portes and French (2005) reported small sectoral increases in agricultural claimant unemployment associated with higher migration post accession. Despite this, a number of studies have found that immigration from A8 countries to the UK has had no statistically significant impacts on the unemployment rate or wage level of any native workers (Gilpin *et al.*, 2006; Lemos and Portes, 2008).

Furthermore, it has been proposed that A8 migration has actually helped to reduce the NAIRU through increasing aggregate supply (Blanchflower *et al.*, 2007). This is because migrant workers are considered to be more hardworking and productive than many native workers, meaning that immigrants generally have a low propensity to be unemployed (Dench *et al.*, 2006). As a result of being more productive, migrant labour has the potential to lower the natural rate of unemployment through filling skills gaps in the UK labour market or reducing wage demands, as wage bargainers become more easily replaceable (Saleheen and Shadforth, 2006). This suggests that increased immigration may have a positive impact on long term unemployment rates, although there is little empirical evidence to suggest any statistically significant impacts as yet.

Very few studies have used regional aggregate data to analyse the impact of immigration on unemployment and wages. However, Hatton and Tani (2005) used regional level data to investigate the possibility that an influx of immigrants to a region causes an increase in inter-region migration amongst the non-immigrant population of the UK. The authors found that there were no statistically significant results to suggest that immigration caused negative displacement effects on native

populations, although the main focus of the paper was on migration flows not labour market outcomes.

As we have discussed, the literature from the UK suggests that immigration has no significant impacts on unemployment, but some impacts on the wage distribution and earnings of certain skill groups (Dustmann *et al.*, 2008a). This study attempts to add to the literature by taking a different approach in analysing net immigration inflows to specific regions of the UK, by analysing regional data to see if immigration has any major effects on unemployment and wages.

### **3. Theoretical Framework**

Many early studies have argued that migrant and native workers are two separate components of labour and as such are not perfectly substitutable (Grossman, 1982). However, this framework will take a similar approach to Dustmann *et al.* (2008b) in splitting up different groups of labour input by skill level instead of differentiating between native and immigrant labour.

For this analysis, I have constructed a simplified model, which assumes that an economy produces only one output good, using a mixture of the inputs labour and capital. Within labour, workers are either skilled or unskilled with both categories being made up from a combination of native and immigrant labour. For now the model assumes that immigrants and native workers are perfectly substitutable and that all labour is perfectly inelastic, meaning that workers will work at any wage rate. Finally, the model assumes that capital supply is perfectly elastic, with a fixed interest rate.

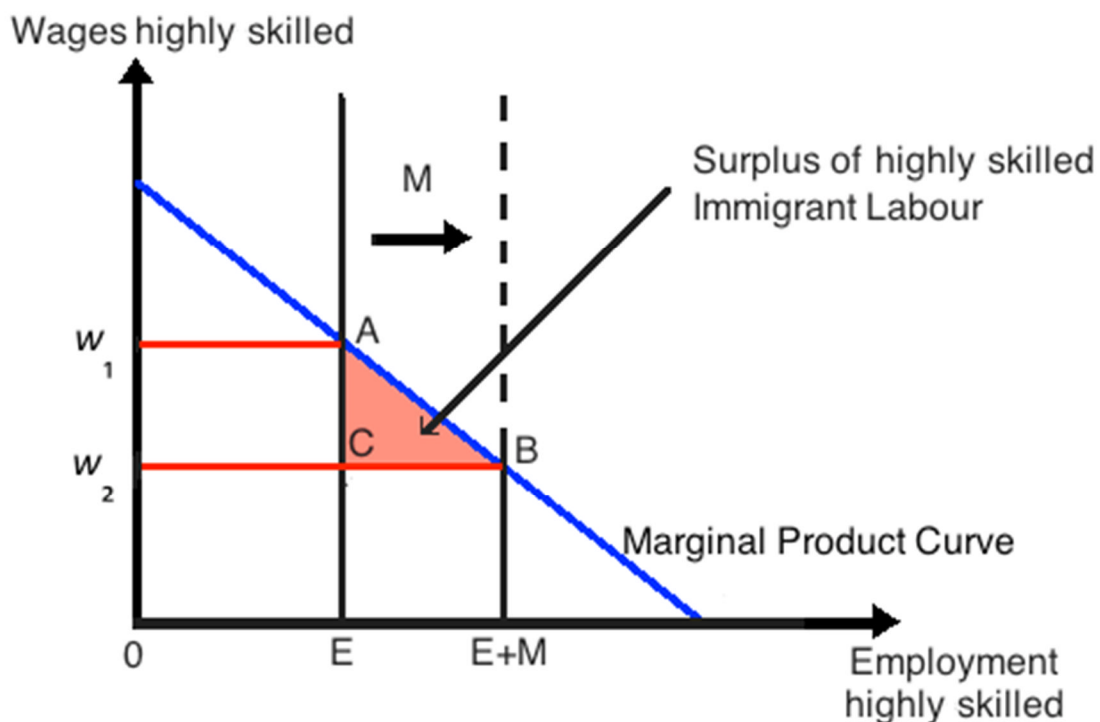
Firstly, we imagine a situation in which the labour market is in equilibrium, with equal levels of highly skilled and unskilled labour. All workers are employed at equilibrium wage rates, with higher wages for more highly skilled workers. If incoming migrants have different skill levels to the current population, then the skill composition of the economy will change and wages and employment will have to adjust in the short run to absorb the immigrant labour. It is important to note that immigration will only affect wages and unemployment if the influx of migrant labour changes the skill composition of the economy (Dustmann *et al.*, 2008b). This can be illustrated by the following scenario.

Suppose an extreme case, where the entire incoming immigrant workforce is highly skilled. This will create a surplus of highly skilled labour, which allows firms to lower the wage rate they offer for highly skilled labour. This increases demand until the point where all highly skilled labour is employed,

including both the native and immigrant populations. Therefore, highly skilled natives will lose out due to immigration in the form of lower wage rates.

This can be illustrated by figure 3.1, which concentrates on the labour market impacts for highly skilled labour. The vertical axis displays wages, whilst the horizontal axis shows employment levels. The pre-migration equilibrium is represented by point A where all native highly skilled workers are employed (E) at wage rate  $w_1$ . Immigration of highly skilled labour of magnitude M then occurs. Because supply of unskilled labour remains constant and labour supply is perfectly inelastic, this drives wages down the marginal product curve. This results in a new equilibrium at point B, with highly skilled wages at a lower equilibrium level of  $w_2$ .

**Figure 3.1: Impact of Migration on Highly Skilled Wage Rates** (adapted from Dustman *et al.*, 2008b, p. 480)

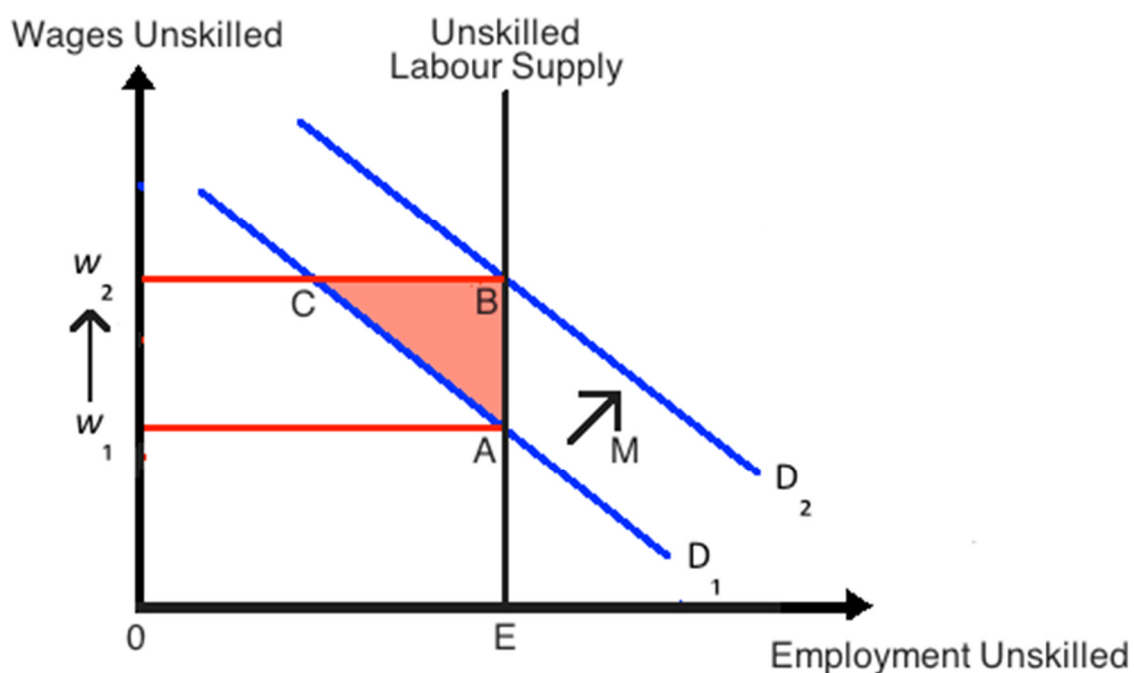


However, the increase in highly skilled labour causes an increase in demand which creates a relative shortage in unskilled labour. This shortage increases the wage rate for unskilled labour. This can be represented in figure 3.1 by the triangle A-B-C which shows the additional surplus created by highly skilled immigration, which is then absorbed by unskilled labour. This is because all highly skilled workers work at a wage equal to the marginal product of the last immigrant (Dustmann *et al.*, 2008b).



Figure 3.2 shows the impacts of highly skilled immigration on the wages of unskilled labour. The vertical axis shows the wages of unskilled workers, whilst the horizontal axis shows unskilled employment levels. Before immigration, the equilibrium lies at point A, where all unskilled labour is fully employed (point E) at wage rate  $w_1$ . However, the migration of highly skilled labour (M) causes an increase in demand for unskilled labour, shown by the outward shift in the labour demand curve from  $D_1$  to  $D_2$ . Because unskilled labour supply remains constant at point E, post-migration, the increase in demand drives the wage rate up for unskilled labour to point  $w_2$ . The new equilibrium is point B. The triangle A-B-C represents the wage gains for unskilled labour as a result of the surplus created by highly skilled immigrant labour (see triangle A-B-C in figure 3.1). Thus, from the influx of immigration, the wages of highly skilled labour increases, but the wages of unskilled labour falls. The overall effect on average wages of immigration is zero.

**Figure 3.2: Impact of Highly Skilled Migration on Unskilled Wage Rates** (adapted from Dustman *et al.*, 2008b, p. 480)



The above implications are based on the assumption that capital supply is elastic. If we give up this assumption, then immigration will redistribute wages from highly skilled labour to unskilled labour, but also to capital. Therefore, average wages may actually decrease as a consequence of immigration under these circumstances. The impact on average wages depends on the rate at which capital can adjust to immigrant inflows, with faster adjustment rates associated with smaller wage effects (Dustmann *et al.*, 2008b). However, the authors argue that there is currently a lack of empirical

evidence that links capital flows to immigration. Therefore, it is not unreasonable to retain the assumption of perfectly elastic capital supply for the purposes of this investigation.

Another assumption that was initially made in the model is that of completely inelastic labour supply. In the initial example above, full employment is retained after the immigration influx, because highly skilled native workers are still willing to work at the new reduced wage rate. However, in reality, labour supply is likely to be elastic to some degree, with some workers willing to choose unemployment rather than accept a lower wage rate. Thus, in our example, immigration may cause voluntary unemployment amongst some of the highly skilled native workers, who are unwilling to work at the new equilibrium wage rate ( $w_2$  in figure 3.1). Under these circumstances immigration may have negative employment effects.

A further assumption that has been challenged is that natives and immigrants are substitutes within a given skill group. If natives and immigrants are seen as imperfect substitutes, immigration will only significantly affect immigrants who are already in the economy (Manacorda *et al.*, 2012; Ottaviano and Peri, 2012).

Therefore, the theoretical impacts of immigration on wages and unemployment are dependent on the key assumptions holding. Under this model, immigration only impacts wages and unemployment if the influx changes the skills makeup of the receiving economy. Furthermore, the impacts of immigration will be felt differently by native workers across the distribution of wages. In reality, the theoretical impacts of immigration are less easily discernible, especially because economies do not produce one single output good (Dustmann *et al.*, 2008b). However, most labour economists prefer a model as described above because it offers a strong structure for empirical work compared to more complex models with multiple final goods (Gaston and Nelson, 2000). Nevertheless, it must be kept in mind when analysing empirical results that the model used in this study is a vast simplification.

## **4. Data and Methodology**

### *4.1 The Dataset*

The empirical investigation will involve the analysis of a panel data sample consisting of observations for each region of England across the sample period from 2005 to 2012. A region is defined as having the same boundaries as former government offices for the region (GORs) (Office for National Statistics, 2015c). There are nine regions in England that will be used in the empirical analysis. The

sample period 2005 to 2012 has been selected because it is large enough to give a significant number of observations for each variable. The dataset has been formulated from a variety of sources published by the Office for National Statistics (ONS) and the Department for Education. Table 4.1 shows the variables that will be used in the investigation and the summary statistics for each.

**Table 4.1: Variable Summary Statistics**

<b>Variable Name</b>	<b>Mean</b>	<b>Variable Name</b>	<b>Mean</b>
Net migration inflows	22.938 (24.550)	Gross value added	96.876 (17.121)
Unemployment rate	6.740 (1.848)	High qualifications (%)	28.593 (5.399)
Wages	508.568 (72.955)	House prices	216.435 (65.221)
Education	68.382 (10.538)	Low pay (%)	1.104 (0.247)
No qualifications (%)	12.444 (2.779)	National unemployment	6.625 (1.369)
EU migration regulations	0.750 (0.463)		
Number of Observations		72	

Note: Standard deviations reported in brackets. The variable 'net migration inflows' is reported in thousands of people. The variable 'house prices' is reported in thousands of pounds.

#### *4.2 Dependent Variables*

The study will analyse the impact of immigration on the dependent variable unemployment using the International Labour Organisation's (ILO) measure of unemployment, with data sourced from the Labour Market Statistics Dataset (Office for National Statistics, 2015f and 2015g). The ILO measure of unemployment has been used for this analysis because it gives a more realistic representation of the true extent of unemployment, whereas the claimant count measure excludes certain individuals who are unemployed but ineligible to claim Job Seekers Allowance (Clegg, 2011). The dependent variable 'wages' is also included in the form of average gross weekly earnings of full-time employees by region

(Office for National Statistics, 2015b). This gives an indication of variations in general wage levels, which can easily be compared between regions.

#### *4.3 Independent Variables*

The main independent variable being examined in this empirical investigation is long-term international migration flows into the UK. Statistics on regional migration to the UK were produced as part of the ONS's Local Area Migration Indicators (2014b). Net migration inflows were then calculated for each region from this data by subtracting long-term international migration outflows from long-term international migration inflows.

The analysis also includes a number of other explanatory variables that are likely to determine wages and unemployment. The purpose of this is to reduce the likelihood of omitted variable bias, which may impact the accuracy of any coefficients estimated by the model (Clarke, 2005). The variable Gross Value Added (GVA) has been included to give some indication of the economic output of each region of England, which is likely to be an explanatory factor for variations in wages and unemployment. The data was sourced from the labour productivity dataset (Office for National Statistics, 2015e) and gives the GVA per filled job for each region as an index, where the UK average is equal to 100. This allows for comparison between regions to assess which areas contribute more heavily to economic output.

The variable 'education' was included in the study as indicated by the number of pupils attaining 5 or more GCSEs or equivalent qualifications graded between A\* and C (Department for Education, 2015). Regions with higher average levels of education may be more attractive to migrant labour and higher education may also be an explanatory variable for lower unemployment and higher wages within a region.

The explanatory variable of 'low pay' is included in the form of the percentage of jobs paid below the National Minimum Wage for each region (Office for National Statistics, 2014a). As many of the impacts of migration affect low-income workers more heavily, it is important to include an indication of the regional extent of low paid jobs.

It is also important to include variables that account for differences in the average qualification levels of employees within regions because this is likely to impact heavily on wages and unemployment. Therefore, the percentage of people aged 16 to 64 who have no qualifications and the percentage of

people aged 16 to 64 who have qualifications level NVQ4 and above (highly skilled) have been included as explanatory variables (Office for National Statistics, 2015a).

House prices within a region may also be an important factor to consider, because migrant labour may be attracted to areas where house prices are lowest. The average annual price of all dwellings within a region (Office for National Statistics, 2015d) is therefore included as an explanatory variable.

The national unemployment rate (Office for National Statistics, 2015g) has also been included as an explanatory variable, as this will be a major determinant of annual variations in regional unemployment rates. The average annual unemployment rate for each year within the sample has been repeated for each region within England.

#### *4.4 Instrumental Variable*

As discussed above, one of the major issues with this investigation is that the direction of causality between immigration and changes in labour market outcomes is not completely clear (Altonji and Card, 1991; Fleisher, 1963). This is because immigrants are likely to be attracted to more economically successful regions (Migration Advisory Committee, 2008, p. 38), meaning that immigrant inflows are dependent on wages and unemployment, as well as wages and unemployment being dependent on immigrant inflows (Dustmann *et al.*, 2003b). As a result of this, any estimates of the impacts of immigration on unemployment and wages are likely to be biased.

In order to correct for this, an instrumental variable regression can be used. This involves finding an instrument that is correlated with the independent variable, but not correlated with the error term of the regression (Cameron and Trivedi, 2005, p. 97). For this investigation, an instrument would be a variable that is correlated with immigrant inflows but not related to any of the labour market outcomes. An instrumental variables regression can then be performed that uses the information the instrument provides to find unbiased estimates of the effects of immigration (Dustmann *et al.*, 2003b).

This investigation uses the instrumental variable of changes to immigration legislation in the UK following the accession of Romania and Bulgaria (A2 nations) to the European Union in 2007. The legislation allowed increased access to the UK labour market for agricultural workers, highly skilled labour, students and self-employed workers from A2 nations (Migration Advisory Committee, 2008). This therefore represents a suitable instrumental variable, as it is an exogenous change that is likely to be positively correlated with immigrant inflows, but is unlikely to be correlated with labour market

outcomes. This is shown by a more than proportional increase in the number of A2 nationals residing in the UK from pre-accession to post-accession (Migration Advisory Committee, 2008, p. 61).

The exogenous change of immigration regulations in 2007 has been included as an instrument, in the form of a dummy variable where 0 represents pre-accession immigration regulations in 2005 and 2006 and 1 is equal to post-accession regulations for the remainder of the sample period. The inclusion of this instrumental variable should help to correct for biased estimates associated with the endogeneity problems described above.

#### 4.5 The Model

For the empirical investigation, two separate regression models will be run which are as follows:

$$(1) \text{Unemployment}_{it} = \beta_1 \text{Migration Inflows}_{it} + \beta_2 \text{Wages}_{it} + \beta_3 \text{Gross Value Added}_{it} + \beta_4 \text{Education}_{it} + \beta_5 \text{No Qualifications}_{it} + \beta_6 \text{Highly Qualified}_{it} + \beta_7 \text{House Prices}_{it} + \beta_8 \text{Low Pay}_{it} + \beta_9 \text{National Unemployment}_{it} + \beta_{10} \text{EU Migration Laws}_{it} + \mu$$

$$(2) \text{Wages}_{it} = \beta_1 \text{Migration Inflows}_{it} + \beta_2 \text{Unemployment}_{it} + \beta_3 \text{Gross Value Added}_{it} + \beta_4 \text{Education}_{it} + \beta_5 \text{No Qualifications}_{it} + \beta_6 \text{Highly Qualified}_{it} + \beta_7 \text{House Prices}_{it} + \beta_8 \text{Low Pay}_{it} + \beta_9 \text{National Unemployment}_{it} + \beta_{10} \text{EU Migration Laws}_{it} + \mu$$

Where  $i$  denotes each region of England,  $t$  each year within the sample period, and  $\mu$  the error term. All variables within the model are as defined above, where EU Migration Law is an instrument for migration inflows, in the form of a dummy variable as explained above. Both models follow a standard normal distribution.

Since the model uses panel data, ordinary least squares (OLS) regression estimators cannot be used. Instead, fixed effects models or random effects models are used to analyse panel data. This model will use a fixed effects estimator to remove the influence of common effects that may be present when assessing the impacts of immigration on labour market outcomes. Fixed effects may occur in the form of immigrant concentrations and labour market outcomes being spatially correlated due to historical settlement patterns or government policies (Dustmann *et al.*, 2003b). This means that any positive or negative correlations that are found may not be attributed to genuine effects of immigration. The presence of these effects allows us to use the fixed effects estimator because the study aims to compute the magnitude of common effects within a population and not extrapolate those results to other populations (Borenstein *et al.*, 2009).

As discussed in the literature review, there is no definite conclusion on the effects of immigration on wages and unemployment, although most authors agree that the impacts on unemployment are generally small in magnitude. I expect to find that immigration will not have a hugely significant impact on either wages or unemployment levels, although any effects on wages are likely to be positive.

## 5. Results

### 5.1 Unemployment

Table 5.1 shows the results of the regressions run using model 1 for the dependent variable unemployment. The table also shows the summary statistics, which indicate the reliability and usefulness of the model. As the model follows a standard normal distribution, the Z-values and P-values will be used to analyse the statistical significance of each coefficient, with the P-values reported in Table 5.1.

The R-squared value is a measure of the overall fit of the model and indicates the percentage of variance in the dependent variable that can be explained by the variance in the independent variables (Floyd, 2010, p. 203). The overall R-squared value for the unemployment model is 0.4908, which implies that the model has a fairly high goodness of fit. The value indicates that the independent variables are effective at explaining 49.08% of the overall variance in regional unemployment.

Furthermore, the F-statistic and associated probability indicate that at least one of the independent variables is a determinant of unemployment. The F-statistic is used to evaluate the null hypothesis that all the coefficients in the model are simultaneously equal to zero (Floyd, 2010, p. 239). The probability of obtaining an F-statistic test statistic that is greater than or equal to the null hypothesis value is 0.0230. This means that we can reject the null hypothesis at the 5% significance level and as such we can assume with a fairly high degree of certainty that at least one of the independent variables has a coefficient that is not equal to zero.

However, it is clear from the model that net migration inflows have no significant impact on unemployment levels when analysing regional level data. This is illustrated by the high P-value for the net migration inflow coefficient. The P-value indicates the support or lack of support provided by the sample for the null hypothesis that the coefficient is equal to zero (Anderson *et al.*, 2010, p. 916). The P-value for net migration inflows is 0.724, which means that we cannot reject the null hypothesis that the net migration inflows coefficient is equal to zero. As such, we can deduce that the impact of

immigration on unemployment is small in magnitude and statistically insignificant. These results tend to support the findings of Dustmann *et al.* (2003b), Gilpin *et al.* (2006) and Lemos and Portes (2008), who also observed insignificant impacts of immigration on unemployment.

One potential explanation for this is that the vast majority of the variance in unemployment can be explained by regional variance. This is indicated by the fact that 89.8% of the variance within the model is regional variance, with none of the other independent variables accounting for a high proportion of the variance in unemployment. This would be in keeping with the findings of Dustmann *et al.* (2003b) who stated that variations in immigrant concentrations are very localised and often follow historic settlement patterns. As such, immigration effects on unemployment are likely to be insignificant on a regional level, with only certain very localised impacts occurring in smaller localities within regions.

Furthermore, the high P-values for all the other independent variables shows that none of the effects predicted are statistically significant at any level. This would reinforce the argument that much of the variance in unemployment is due to differences between regions as opposed to impacts of any of the independent variables over time.

The high magnitude of the standard error (0.265) of net migration inflows compared to the coefficient value (0.093) indicates the high degree of uncertainty of the impacts of immigration on unemployment predicted by the model. One possible explanation for this could be the relatively small sample size used to carry out the analysis, with only 72 observations for each variable. Nevertheless, it is clear from the model that there is no statistically significant impact of immigration on unemployment when analysing regional level data.

## 5.2 Wages

Table 5.2 shows the results of the regressions run for model 2 for the dependent variable 'wages'. The table also shows the summary statistics for the model as well as an indication of the statistical significance of the results in terms of the standard errors and P-values for each variable.

The R-squared value for the wages model is 0.6186. This is higher than the value for the unemployment model and shows that the wages model has a relatively good level of fit. The value implies that the independent variables are effective at explaining 61.86% of the overall variance in regional wage levels.



However, the probability of obtaining an F-statistic test statistic that is greater than or equal to the null hypothesis value is 1.000. This means that we cannot reject the null hypothesis that all the coefficients in the model are equal to zero at any significance level. This implies that any one of the independent variables is not necessarily a significant determinant of wages.

Furthermore, it is clear from the model that net migration inflows has no statistically significant impact on wages. This is illustrated by the high P-value of 0.881 for the migration coefficient. This means that we cannot reject the null hypothesis that the migration coefficient is equal to zero at any significance level. There is therefore no statistically significant impact of immigration on wages at a regional level. These results tend to support the findings of Manacorda *et al.* (2012) and Ottaviano and Peri (2008) who also found that immigration had no adverse effects on wage rates of the population as a whole.

One of the main reasons for this could be the high fraction of the variance that is attributed to regional variations. The variable 'region' accounts for 97.5% of the total variance in wages, which indicates that none of the independent variables are likely to have significant effects on wages over time. This would tend to support the theory that immigration only has very localised effects on the wages of certain communities within regions, with no significant effects across regions as a whole.

As with the unemployment model, the high P-values for all the independent variables in the model indicate that none of them have a statistically significant impact on wages. This is likely to be because much of the variations in wages are due to specific regional factors instead of specific independent variables over time.

The net migration inflows coefficient has a high standard error of 213.475, which shows the high level of uncertainty regarding the coefficient predicted by the model. This could be explained by the relatively small sample size used in the analysis. Even accounting for this, it is clear that immigration has no statistically significant impacts on wages at a regional level.

**Table 5.1: Determinants of Regional Unemployment, 2005-2012**

Independent Variable	Dependent Variable: Average Weekly Earnings
Net Migration Inflows (Thousands)	0.093 (0.265) [0.724]
Gross Value Added	0.016 (0.101) [0.876]
Education (Attainment of 5 GCSEs A*-C)	0.120 (0.121) [0.320]
No Qualifications	0.201 (0.493) [0.684]
High Level of Qualifications	-0.001 (0.327) [0.998]
Regional Weekly Earnings	-0.002 (0.017) [0.923]
House Prices (Thousands of Pounds)	-0.002 (0.010) [0.857]
Low Pay (below National Minimum Wage)	-0.036 (0.888) [0.967]
National Unemployment Rate	0.505 (0.837) [0.546]
Overall R- squared	0.4908
F-test Statistic.	2.48
Prob > F	0.0230
Fraction of Variance due to Region	0.898

Note: Standard errors are reported in brackets. Two-tailed p-values are reported in parentheses.

**Table 5.2: Determinants of Regional Weekly Earnings, 2005-2012**

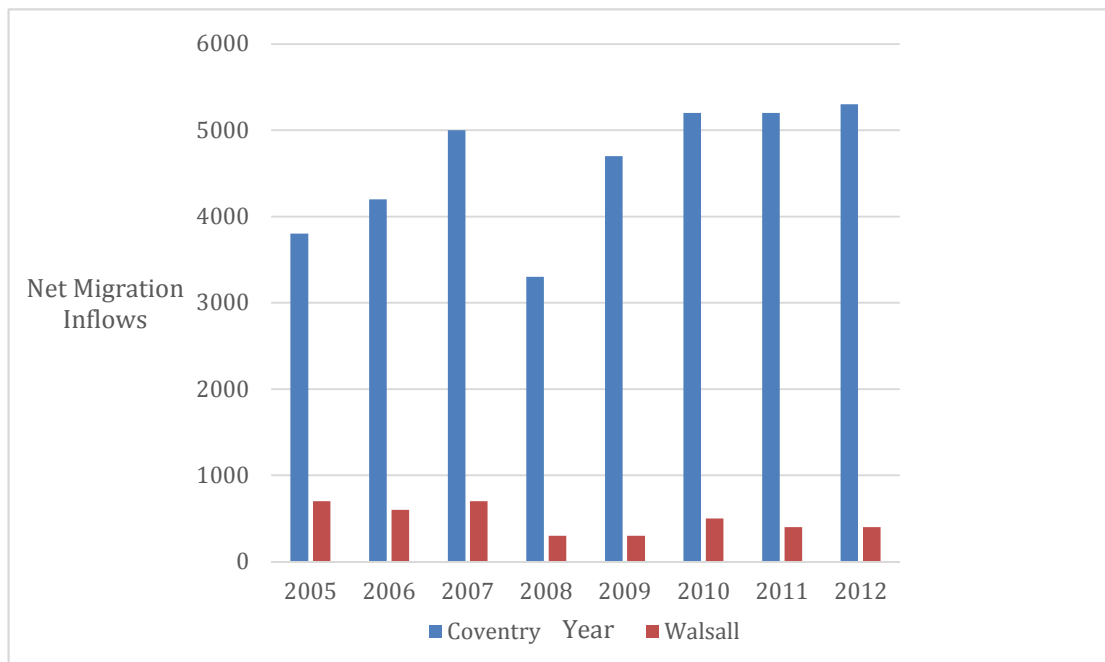
Independent Variable	Dependent Variable: Average Weekly Earnings
Net Migration Inflows (Thousands)	32.042 (213.475) [0.881]
Gross Value Added	12.610 (75.748) [0.868]
Education (Attainment of 5 GCSEs A*-C)	17.400 (106.313) [0.870]
No Qualifications	61.871 (400.116) [0.877]
High Level of Qualifications	44.323 (281.966) [0.875]
Regional Unemployment Rate	0.213 (69.755) [0.998]
House Prices (Thousands of Pounds)	0.605 (2.607) [0.816]
Low Pay (below National Minimum Wage)	3.195 (258.627) [0.990]
National Unemployment Rate	-84.941 (621.686) [0.891]
Overall R- squared	0.6186
F-test Statistic	0.02
Prob > F	1
Fraction of Variance due to Region	0.975

Note: Standard errors are reported in brackets. Two-tailed p-values are reported in parentheses.

One potential explanation for the lack of significant results for both wages and unemployment is that immigration only has very localised labour market impacts. As such, empirical results for regions as a

whole are unlikely to be significant. This can be shown by the large differences in immigration flows of two more localised areas within a region. Figure 5.1 shows the net migration inflows for Coventry and Walsall over the sample period, two areas within the region of the West Midlands. For every year within the sample period net migration inflows were much higher in Coventry than in Walsall. Overall, Coventry saw an average annual inflow of 4587.5 migrants over the sample period compared to an average inflow of 487.5 migrants in Walsall. The large difference in the scale of immigration recorded by the two areas is especially significant because the two areas have similar population sizes, which are shown in Table 5.3. Furthermore, Coventry experienced much greater population growth over the sample period than Walsall, largely due to its increased levels of immigration.

**Figure 5.1: Net Migration Inflows for Coventry and Walsall, 2005-2012**



Source(s): Net migration inflows were calculated from long-term international migration Flows produced by the Office for Nationals Statistics (2014b).

**Table 5.3: Populations of Coventry and Walsall, 2005-2012**

<b>Year</b>	<b>Population of Coventry (Thousands)</b>	<b>Population of Walsall (Thousands)</b>
2005	298.4	258.2
2006	300.1	259.5
2007	301.4	260.9
2008	305.2	263.0
2009	307.4	264.8
2010	311.7	266.8
2011	316.9	269.5
2012	323.1	270.9

Source: Annual mid-year population estimates were sourced from the Office for National Statistics (2014b).

Although this is an extreme example, it nevertheless illustrates the fact that migration is highly localised even within regions. This is largely due to the fact that immigrants tend to be attracted to areas where there are already incumbent immigrant populations from the same country of origin (Dustmann *et al.*, 2003b). Furthermore, factors that affect wages and unemployment are likely to be specific to certain more localised areas within regions, as indicated by the lack of significance of my results. As such, regional data does not allow us to fully analyse the labour market impacts of immigration and a greater disaggregation to smaller localities may yield more significant results (Hatton and Tani, 2005).

Overall the empirical work suggests that immigration does not have a significant impact on either wages or unemployment at a regional level. This reflects the predictions of the theoretical model outlined in chapter 3, in which immigration would only have significant effects on the labour market outcomes of certain skill groups within the economy.

## 6. Limitations

Despite controlling for many potential problems within my models, the empirical work conducted in this investigation has a number of limitations, which may detract from the conclusions that can be inferred.

One of the main limitations of the study is the potential presence of heteroscedasticity within the data. Heteroscedasticity occurs when the variance of the error term is not constant over the whole range of values (Floyd, 2010). This can cause an issue when creating regression models because heteroskedastic data can produce inefficient coefficient estimates (White, 1980). In terms of my model, heteroscedasticity may occur because the variance of the error term in the regression is unlikely to be constant across the entire sample period. This means that many of the tests for statistical significance may be invalid.

Furthermore, separating my model into two separate regressions for wages and unemployment respectively may have been an oversimplification. This is due to the fact that both nominal and real wages have a complex interdependent relationship with unemployment (Malinvaud, 1982). My unemployment model included wages as an independent variable to attempt to account for this relationship. Similarly, unemployment was included as an independent variable within the wages model. However, this is unlikely to have fully addressed the simultaneity problem between the two variables and as such this limits the conclusions that can be drawn from the estimates observed in this data.

Developing a model that uses a more complex method of estimation such as Hansen's (1982) generalized method of moments (GMM) estimators may help to address some of these issues. Whilst GMM estimators can yield more efficient and consistent results, they led to lower R-squared values when used with my models and were therefore not used in my final results. However, future studies could work towards developing a more complicated model that uses GMM estimators to account for heteroscedasticity and simultaneity.

Whilst I attempted to reduce bias within my investigation, there may still be limitations within the data sources themselves. Observations for labour outcomes were sourced from the Office for National Statistics' Annual Labour Force Surveys, which are based on surveys sent to a proportion of the UK population. As such, there is the potential for sampling bias within the dataset, as well as other limitations including a potential lack of adequate coverage of any industrial sector (Office for National

Statistics, 2011, p. 1). This might mean that the labour market for certain sectors of the economy are unrepresented, although the high sample sizes for the survey mean that overall bias is likely to be low.

Another potential limitation of the investigation is the suitability of the instrumental variable that was selected. The change in immigration legislation following the accession of the A2 nations to the European Union can be considered to be an instrumental variable because it is likely to be associated with slightly higher immigration levels. However, the magnitude of the increase in immigration associated with the legislation is very low due to the fact that the stock of immigrants from A2 nations represents only a small fraction of total immigration in the UK (Migration Advisory Committee, 2008, p. 60). Furthermore, because there were still heavy labour market restrictions on immigrants from A2 nations following the legislation change, there was not a vast increase in immigration following accession. However, the instrumental variable was selected because it represented the only significant change in immigration legislation over the chosen sample period.

Nevertheless, my estimates of the effects of immigration on wages and unemployment are likely to be slightly inaccurate due to the weakness of my instrumental variable. In order to improve my study, it would be better to analyse a different sample period in which there was a more significant change in immigration legislation that could be used as an instrumental variable. However, the most obvious immigration legislation change could not be selected as an instrumental variable due to problems sourcing regional level data. The introduction of the Worker's Registration Scheme in 2004 following the accession of eight nations (A8) to the European Union was an important piece of legislation that led to increased immigration to the UK (McCollom *et al.*, 2012). This legislation would have been a more effective instrumental variable to use because the scale of the increase in immigration following the A8 accession was much greater than the increase that followed the A2 accession. However, regional data for many of the independent variables that I used in my empirical work was not available before 2005 and this prevented the use of the A8 immigration legislation change.

Another potential choice of instrumental variable is the 2014 complete relaxation of labour market restrictions on A2 nationals, which gave Romanian and Bulgarian immigrants the same working rights as migrants from other EU member states (Gower and Hawkins, 2013). As a result of this legislation change, the Migration Advisory Committee (2008) predicted that immigration would increase significantly, which would therefore mean that the legislation change would make a suitable instrumental variable. However, regional immigration data is currently not available post 2013, which has prevented the use of the 2014 immigration legislation change as a variable for this investigation.

Nevertheless, when more years of data are available, this may prove to be a useful instrumental variable that could yield more significant results.

## 7. Conclusion

The aim of my investigation was to analyse the impacts of immigration on unemployment and wages using aggregate regional level data for all regions within England between 2005 and 2012. Firstly, this investigation assessed the relevant literature, before analysing the theoretical foundations that underpin the subject. This allowed me to construct a suitable methodology, which consisted of running two separate regressions for my dependent variables 'wages' and 'unemployment'. I collected a dataset consisting of my two dependent variables, my main independent variable 'net long-term international migration' and seven other explanatory variables. For each variable, I used a panel dataset, which included observations for each of the nine regions of England for the years 2005 to 2012 inclusive. I decided to run my models as instrumental variable regressions in order to correct for endogeneity within my study.

My results suggest that there is no significant impact of immigration on either unemployment or wages at a regional level. This is largely because a high fraction of the variance in both dependent variables was due to regional factors. As a result, my migration coefficient and all of the other explanatory variables had no statistically significant impact on wages or unemployment. The results support the findings of Dustmann *et al.* (2003b) who also found that immigration has no impact on unemployment. The UK literature is divided on the impact of immigration on wage rates and my work tends to support the findings of Manacorda *et al.* (2012) and Gilpin *et al.* (2006) who found that immigration has negligible impacts on wages.

However, there are a number of limitations to my study that lower the significance of the conclusions that can be drawn from my findings. One of the main problems is that using regional data to analyse immigration impacts is ineffective because immigration is likely to be a much more localised phenomenon. Although my models attempted to correct for the presence of fixed effects and endogeneity, the highly complex relationship between the variables means that my models are still likely to be oversimplified. As a result, there may be some remaining inaccuracies within my estimations.



There is scope for my investigation to be continued using more recent data. This may allow for the selection of a more suitable instrumental variable that may fully correct for endogeneity in my model. Further investigation could also include analysis of the impact of immigration on wages and unemployment at a more disaggregated level by location, such as analysing outcomes within parliamentary constituencies. However, reliable data for all variables is not currently available.

Even allowing for the limitations within my model, it is hard to argue that immigration has any significant impact on either wages or unemployment at a regional level. This is most likely due to the fact that immigration tends to have specific impacts on smaller localities within regions. Despite contradictory empirical evidence that shows no negative impacts of immigration on unemployment and wages, the public perception of immigration appears to be relatively negative within the UK (German Marshall Fund, 2014). Therefore, policy makers need to do further research to determine whether increased immigration is beneficial or detrimental to labour market outcomes within the UK.

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