

How Does Immigration Impact Output, Employment and Wages? Evidence from United Kingdom

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This study investigates the impact of immigration on the UK economy using time-series data from 1975 to 2006 and panel data of 12 regions from 2002 to 2006. This study was conducted in 2008 when there was a national debate going on whether the immigration impacted the economy positively or negatively. A rigorous econometric exercise has been done in both time-series and panel models. Results found from various estimation techniques predominantly show immigrants to be contributing to increasing GDP, reducing unemployment and increasing wages. Granger non-causality test confirms immigrants' role in causing economic growth of this country to rise. Tests do not show any long-run relationship between GDP and immigration share. No significant impulse is created in GDP, wage rate or unemployment rate in response to any shock taking place in the immigration share of this country according to the datasets used in this study.

Keywords: Immigration, Impact, GDP, Unemployment, Wages, UK

INTRODUCTION

Migration is closely linked with the process of globalization while globalization, according to Chumakov (2008), is an objective process of the flows of ideas, products and labour, that has been inevitable with the developments of communication system. In other words, globalization is “widening, deepening and speeding up of worldwide interconnectedness in all aspects of contemporary social life” (Held *et al.*, 2000), which is further expedited by political and ideological shifts such as Washington Consensus on laissez-faire economic policies, market liberalization, privatization, deregulation from 1980s (Gore, 2000; Stiglitz, 2003) and then by the fall of the Soviet Union and Berlin Wall. Globalization, at the same time, should be seen as a technological process because technological revolutions have radically reduced the costs of travel and communication (Castells, 2011; Alfano *et al.*, 2016), which in turn led to a surge of cross-border migration in recent decades.

According to the underlying philosophy of globalization, humans should be as mobile as capital and goods (Stiglitz, 2003). A worker from Somalia or India should easily be able to enter into the USA, the UK or France and stand on supply side of those labour markets but the governments of these rich countries do not allow such an easy entrance of the workers from developing countries (Stiglitz, 2003) because they are sceptical about the impact of such inflows of foreign citizens on their economies. But the fact is, migration is an integral part of the history of world population. There are many states in the world, which have been formed solely by immigrants. Immigration has been a more common phenomenon in the last and present century in the age of globalization. The share of immigrants in the total population over

the past two decades has increased in most industrialized countries as well as the UK (Alfano *et al.*, 2016). Borjas (1999) and Friedberg & Hunt (1995), in this regard, provide us two pictures respectively: 'At the end of the 20th Century, about 140 million persons— or roughly 2 percent of the world's population— reside in a country where they were not born. Nearly 6 percent of the population in Austria, 17 percent in Canada, 11 percent in France, 17 percent in Switzerland, and 9 percent in the United States is foreign-born' (Borjas 1999, p.1) and 'Approximately 100 million people in the world live in a country other than their own. Between 1975 and 1980, approximately 5 million people migrated from one country to another. Two-thirds of immigration in that period was concentrated to a handful of host countries: The United States, Canada and Australia' (Friedberg & Hunt, 1995, p.23-44).

UK immigration policy was made too restrictive in the late 1950s to limit the new and unexpected rise of immigration from new Commonwealth countries. The labour government after coming to power, has brought remarkably big changes in the British immigration policy in 1997 on the perception that immigration is beneficial for the country's economy and therefore, measures were taken to increase immigration in large scale. The benefits claimed include fiscal advantages, increased GDP per head, a ready supply of labour and improvements in the age structure. The Labour governments ruled out the fears that large-scale immigration might damage the interests of unskilled native workers, rather considered immigration as an economic, social, cultural and demographic asset, and thus can play a positive role in the economy, and took a policy of welcoming and promoting immigration. Government's official statement was, 'immigrants...are more resourceful, entrepreneurial and ambitious than the norm,' and that 'the contribution immigrants have made to the country is clear,' with the added bonus that 'immigration could help ease the economic impact of population ageing' (Coleman & Rowthorn, 2004). Labour government's view on immigration is supported by Ruhs & Vargas-Silva (2018) which clearly observes that the inflow of immigrants over the past two decades is seen to have no severely harmful effect on native workers' wages and employment possibilities.

The UK Treasury's estimate of 2.5% trend growth in the economy, consisted of 2.0% coming from productivity increases and 0.6% from increases in the population of working age. Of the latter, two-thirds was from immigration in 2001–02. Thus 0.4% points, or about 16 percent of the GDP growth of 2.5%, can be attributed to immigration given the Treasury assumptions; the net fiscal contribution of the immigrants lies between –£0.4 billion and £2.6 billion. The latter is less than 0.3% of GDP, 0.4% of individual consumption. The fiscal contribution of the immigrants is not significant. Past immigration into the UK as a whole has not exerted a significant fiscal burden on the rest of the society, nor has it provided a significant surplus. It has been broadly neutral (Coleman & Rowthorn, 2004). A Home Office report stated, foreign-born population contributes around 10 per cent more to government revenues than they receive in government expenditure. Migrants are likely to lead to a substantial net fiscal gain (Vickers & Bekhradnia, 2007). A government's response (on 11 June, 2008) to the House of Lords Committee's report on the economic impacts of migration came out as an applause and has put their argument again that the main reason of UK's increased GDP growth rates in comparison to other G7 countries, is the contribution of immigrants. As the report says, the government has put evidence for immigrants' positive contribution to the GDP per capita of people born in the UK. According to government estimate, new immigration added 0.5 per cent per annum to trend output growth between mid-2001 and mid-2006, equivalent to £6bn in 2006. The Labour government reiterates immigrants' contribution in terms of meeting labour and skill shortages, disseminating new skills to residents and fiscal contribution. The report also mentions that the government and independent research continues to find no significant evidence of negative employment effects from immigration. On the other hand, the Conservative Party, UK Independence Party and a few others argue that increasing immigration has exerted a detrimental effect on the UK economy, and thus have taken their stand for restricting immigration.

The studies of the impact of immigration on labour market and GDP growth in the UK show mixed, ambiguous, even conflicting results. Some types of immigration are seen to raise GDP per capita while others are not. For example, Ottaviano *et al.* (2018) finds evidence of immigrants' contribution in reducing costs and increasing productivity of firms and thus increasing output in the UK. Alfano *et al.* (2016) also finds immigrants to increase firms' productivity as they rapidly move into occupations that

correspond to their skills. The net effect of immigration depends on the mix of the various types of skills brought in by immigrants (Ruhs & Vargas-Silva, 2018). The number of immigrants— particularly, educated workers, has risen significantly in the UK during the labour governments prior to 2010 when the Conservatives came to power and as such has raised labour supply. In the election of 2010, the Conservatives brought the immigration issue to the fore and made a strong case against immigration and won the election. On the other hand, the Labour continued advocating the benefits of immigration. Immigration has, therefore, remained as a much-debated issue, and politicians, economists and the members of the public are divided on the issue of the impact of immigration on the UK economy.

On these perspectives, this study was done in 2008 using the most recent data available. Data have been analysed in both time-series and panel models. Results from both time-series and panel data analyses predominantly show that net flows of immigrants increase GDP, reduce unemployment and increase wages in the UK. These positive effects came about probably because immigrants brought in new skills and capital, built entrepreneurship, paid taxes, contributed in national insurance, and above all, spent substantially on consumption increasing aggregate demand. It is also found from econometric tests that growth of the British economy does not play any role in the inflows of immigrants into this country.

The article develops in this way: the following section reviews the relevant literature; section that follows, discusses the data and explains the estimation techniques. Then I present the results, discuss them and explain their implications. In the last section I conclude and put policy suggestions.

EXISTING LITERATURE ON THE IMPACT OF IMMIGRATION

To consider immigrants as a sheer burden on the expenditure side of the host country may be a wrong notion because it is a one-sided view of the fact. The people who hold this notion fail to realize the positive impact created by immigrants in different forms and in different phases in the host economy. Greig (1971) explains this issue in terms of multiplier effects. Immigrants and their dependants add permanently to the demand for services in the area. Since immigration requires the provision of additional social capital, there will be a corresponding increase in current expenditure on employment, mainly in the social services and in local governments. This process would add to the value of the regional multiplier. Given that, each succeeding immigrant will add to the demand for public services, this interaction of the income and employment multipliers will add to the overall regional multiplier impact of the income generating project.

The magnitude and pattern of the real impact of immigration on the host economy, depends much on how it is measured or from which perspective it is investigated. Borjas (1994) finds two ways of examining the effect of immigration on labour-market outcomes: exploiting the fact that immigration is geographically concentrated, area analyses make a contrast between the level or change in immigration by area and the level or change in the earnings (or employment) of non-immigrant workers. Factor-proportions analyses take a general-equilibrium perspective, treat immigrants as a source of increased national supply of workers of the relevant skill, consider trade as a source of changes in the supply of skills, and apply an elasticity of substitution to estimate the effect of these changes in labour supply on relative wages. Borjas (1994), on the conclusion of his investigation on the existing literature, constructs the following theoretical aspects of immigration: immigrants who have high levels of productivity and who adapt rapidly to conditions in the host country's labour market, can make a significant contribution to economic growth. Such immigrants will not increase government's expenditures on social assistance. But if immigrants do not possess the skills that employers require, then immigration will put pressure on such government expenditures; moreover, it will exacerbate wage differentials. The prediction of the impact of immigration is not straight-forward, it depends on a number of factors. In this regard, Card (2001) puts three theoretical aspects in the cross-market approach: first, an increase in the share of immigrants in an area does not necessarily raise the supply of labour, since natives may flow out in response to immigrant inflows; second, the cross-sectional correlation between immigration flows and native wages may be upward-biased by local demand shocks that raise wages and attract immigrants; third, in the long run, an immigration-induced increase in the supply of labour to a particular area may be diffused across the

economy by inter-regional exchange. The views of Borjas (1994) and Card (2001) are supported by the empirical findings of Ruhs *et al.* (2018).

The fact that immigrants add to the demand side in the labour market, is often neglected while assessing their impact. Addison & Worswick (2002) from their study, develop the theoretical insight that immigrants add to both the aggregate supply of and the aggregate demand for labour. If immigration adds more to aggregate supply than to aggregate demand, then a combination of reduced wages and increased unemployment is likely to result. On the other hand, if it adds more to aggregate demand, it will lead to higher real wages and lower unemployment. The same theoretical findings have been put forward by Blanchflower *et al.* (2007).

Rather than taking them as burden or excess labour in the market, if immigrants are employed, they can make net positive contribution to the economy. Gott & Johnston (2002) find that an individual's direct fiscal impact i.e. how much he will pay in taxes and receive on benefits depend on his economic activities of being employed and earnings. Those who are economically more active and have higher earnings, are supposed to make a net fiscal contribution, by paying more in taxes and national insurance contributions than they receive in the forms of services and benefits provided by the host government. Individuals with higher qualifications and being fluent in English perform better economically and therefore, contribute more fiscally (Chiswick & Miller, 2002). Dustmann *et al.* (2003) supports these findings.

One of the main factors in ascertaining the impact of immigrants is their age. According to Rowthorn (2004), immigrants, if belong to the working age group, add to the number of people working in the host country, and thus contribute to the increase in the GDP provided they are employed. They also fill the gaps created by retiring or emigrating British workers and retiring immigrants, and sustain the GDP growth. When immigrants have special talents, they contribute more than proportionately in raising the growth rate. Although unskilled workers lose out when they have to compete with immigrants, but benefit from the demand for their labour created by the immigration of entrepreneurs and highly educated workers. The overall impact of immigration depends on the relative strength of these opposing effects.

Dustmann *et al.* (2005) from their empirical investigation on the way how immigration affects labour market outcomes of native-born workers extract the following theoretical aspects: effects of immigration on the labour market depend mostly on two phenomena: first, the structure of the receiving economy and second, the skill mix of the immigrants relative to the resident population. The theoretical analysis on the effects of immigration on the labour market considers effects to be arising from the changes it introduces in the supply of skills and subsequent changes in labour market equilibrium. Immigration flows are likely to bring a change in skill composition of the labour force, which leads to disequilibrium in the labour market. Restoration of equilibrium usually brings short run changes in wages and employment, which may not persist in the long run when the economy's output mix is allowed to adjust. Models assuming limited flexibility of output mix or absence of openness to international trade tend to predict that immigration will have long run effects in wage and employment; on the other hand, models assuming a high degree of flexibility in the output mix, rules out any long run effects of immigration on labour market outcomes.

The degree of substitution or complementarity between immigrants and native workers, is one of the important determinants of the impact of immigration flows on natives' wages. According to the theory established by Orrenius & Zavodny (2007), if capital and returns to scale are assumed constant, an increase in labour supply due to immigration, will lower wages if immigrants and natives are substitutes and labour supply is not perfectly elastic, and if immigrants are a complement for natives in production, in contrast, immigration will boost natives' wages. The elasticity of labour supply with respect to wages is another determinant of the impact of immigration on wages. Natives and previous immigrants might respond to immigration-induced changes in wages by altering their labour supply, moving to a different area, or changing their skills according to needs. Such changes would reduce any negative effect of immigration on wages. Immigration may change output mix of the host area, which, in turn, may increase demand for labour following an increase in demand for goods and services. Moreover, this increase in output will give rise to economies of scale. All these together reduce, if not fully offset, the negative

impact of immigration on the unskilled labour. Friedberg (2000)'s findings on Israel are exactly in line with this view.

Bodvarsson *et al.* (2008) from their study construct the following theoretical fundamentals on immigration: an immigration shock induces three responses: first, a substitution of immigrants for natives; second, out-migration; and third, stimulation of labour demand. According to the third, native wages can fall, stay the same or rise, depending upon the strength of the shock and various product and factor market elasticities. The fundamental reasons why the effect of immigration on native employment outcomes is found to be weak are: first, immigration flows and host area's economic conditions could be simultaneously determined; second, the observed benign effects of immigration could reflect adjustments of a flexible, competitive market to an immigration shock— these adjustment processes could include: inflows of capital to the receiving area, out-migration of natives and previous immigrants in the area, adjustment of inter-regional trade and the adoption of more immigrant-intensive technologies and economies of scale.

Impact of immigration found from empirical works is also mixed: some have found positive, some negative, some ambiguous and some have found even conflicting results. Several studies found results with moderate effects of immigrants on native employment but which are insignificant (Ruhs *et al.*, 2018; Dustman *et al.*, 2003; Dustmann *et al.*, 2005; Lucchino *et al.*, 2012). On the other hand, some studies have been statistically significant but have found negligible effects (Migration Advisory Committee, 2012; Nickell & Saleheen, 2008; Reed & Latorre, 2009). Ottaviano *et al.* (2018) confirm that increased number of immigrants in the UK local labour market, is associated with a significant increase in labour productivity— precisely, a two to three percent rise in labour productivity occurs due to an immigrant inflow equal to one percentage point of the local employment. On the recent debate about the impact of Brexit on the UK economy Wadsworth *et al.* (2016) have conducted an empirical study and have found neither a negative nor positive effects of EU immigration on average employment, wages, inequality or public services at the local level for the UK-born. At the national level, reduction in EU immigration is likely to lead to lower living standards for the UK-born (Wadsworth *et al.*, 2016).

Although the general wisdom underlying this study is that wages in the local labour market rise as a result of an expansion of the output market at the arrival of immigrants and subsequent increases in demand for labour, whether growth rate of the host country will increase or decrease following the flows of immigrants, depends on which role the immigrants will play or how the host economy will utilize this new workforce. Studies on the effect of immigration on wages carried out by Altonji & Card (1991), Butcher & Card (1991), LaLonde & Topel (1991) and Schoeni (1997), using a cross-area approach that compares the number of immigrants in an area with wages in that area, conclude that immigration has little or no significant negative effect on natives' wages. John & Zimmermann (1994) estimate that a 1 per cent increase in the share of foreign labour caused a 4.1 per cent fall in the average hourly wage of all German workers. Other similar studies such as Card (1990) on migration of Cubans to Miami, and Hunt (1992) for the repatriation of Algerians to France, find the same impact on native wages and employment. However, Addison & Worswick (2002) assuming that labour is heterogeneous and that immigrant-associated demand varies by sector, found no aggregate impact on the real wages, although it affected particular groups of native workers slightly. In particular, the wages of the young and low-skilled were not affected. They also found no evidence that immigration causes native unemployment, rather their aggregate analysis for the period of 1982-1996, shows that the presence of recent immigrants reduces the probability of job loss of natives. Wages and labour productivity are inter-related, and labour productivity is an important factor for Macroeconomic growth. Blattner & Sheldon (1989) estimate that foreign labour accounted for around 0.3 percentage points of the 2.7 per cent of Switzerland's average growth rates between 1961 and 1982. Similarly, focusing solely on Argentina over the period 1870-1914, Taylor (1997) discovers immigration as causing a 19% increase in GDP. To examine the causality between economic growth and immigration Morley (2006) adopts an ARDL bounds testing approach using the annual data from Australia, Canada and USA over the time period from 1930 to 2002, and finds little support to the view that immigration has an important causal effect on per capita economic growth, rather finds economic growth to cause immigration.

Borjas (1994), after the investigation of all recent studies on the impact of immigration, presents the following findings: within a decade or two after arrival, immigrant earnings are seen to overtake the earnings of natives of the same background. There is little evidence suggesting any adverse effect on employment and earnings for the natives. Immigration might have slightly contributed to some decline in the earnings of unskilled native workers in 1980s in America. Borjas (1995) brings a very important point to the fore that even if costs involved in providing immigrants with social goods and services outweigh the visible benefits coming from them, it cannot be concluded that these costs are really greater than the benefits if invisible benefits are added because this increased public expenditure in social programs can be considered as a social investment which would have a very high rate of return. The author has explained the aggregate gains for the host country from immigration through the concept of 'immigration surplus' defined as part of the increase in national income due to immigrants accruing to natives, has found that natives lose in terms of wages because of immigration but this loss is more than offset by the total gains by the whole economy as it experiences substantial growth at the presence of immigrants.

Friedberg and Hunt (1995) look into the benefits of immigration for the host country by considering complementarities between migrants and native factors, and by investigating the effects of immigration on growth in a Heckscher-Ohlin framework and find, for the USA and Germany, no significant detrimental effects of immigrants on employment and wages. Their spatial correlation analysis indicates that a 10 percent increase in the share of a locality's immigrant population reduces native-born wages by no more than 1 percent. They also find that the impact on the economic growth depends on whether immigrants bring enough human capital to offset their dilution of physical capital in the receiving economy. Entrance of human capital had been emphasised also by Barro & Sala-i-Martin (1992).

Steineck (1996) investigates how migration impacts on the welfare of the host economy measuring the aggregated and distributional effects among the natives. The author, through a comparative-static factor market analysis including a dynamic analysis at the same time, under the assumption that immigrants are paid according to their marginal contribution, labour is homogeneous and that there are increasing returns, concludes in favour of the positive effects of immigration on native capital owners and native workers. Sachs & Warner (1997) include 'the growth of the economically active population minus the population growth rate' as an explanatory variable in the growth regressions and find a positive impact with almost 5% significance level. Using the Lucas Model of human capital accumulation Durkin (1998) examines the welfare impact of immigration and increasing ethnic diversity. The study shows that immigration, by increasing diversity in the society, can raise welfare even for the majority provided it increases the average level of human capital. The author discovers two preconditions for the improvement of welfare: first, the host country must be sufficiently diverse in ethnic groups and second, the immigrants must be of low time preferences.

Chapman & COBB-CLARK (1999) in their study analysed the short-run implications of immigration and discover that: immigration improves the employment opportunities for unemployed residents, and the amount of this improvement is greater when the labour market is in recession. Card (2001) in his study re-assesses the effect of immigration on the local labour market opportunities of native workers in some American cities over the period of 1985–90. Three distinct findings stand out from the study: his first two findings imply that, in the short run at least, inflows of new immigrants in the period of 1985–90 reduced the relative employment rates of natives and resident immigrants and low-skilled service occupations by up to 1% point. Third, immigrants over the late 1980s have been seen to reduce the relative wages of labourers and less-skilled services by no more than 3%. Dustmann *et al.* (2003) find that immigration does not harm local workers. The authors find immigration leading to higher monetary wages for local workers. Dustmann *et al.* (2005) carry out an empirical investigation on the way how immigration affects labour market outcomes of native-born workers in the UK. According to their estimates, 1% rise in the immigration share decreases native employment rate by 0.07% point; there exist a positive association between immigration and unemployment, and a negative association between immigration and participation, although the associations are very weak. In Coleman and Rowthorn (2004) the mass importation of unskilled workers is found harmful to those native workers who compete with them maybe because such natives usually come from certain ethnic minorities, and these people are to lose out from

mass immigration. The immigration of skilled workers or talented entrepreneurs is advantageous to unskilled locals because it stimulates demand for their labour. In this regard, Cortes (2008) presents an interesting findings that low-skilled immigrants benefit the native population in terms of lowering the cost of living by contributing (offering labour at lower wages) to the production of low-cost non-traded goods. He has shown that a 10 percent increase in the share of immigrants decreases the price of immigrant-intensive services by 1.3%, wages of low-skilled natives by 0.6% and low-skilled immigrants by 8%. Cortes (2008) also found low-skilled immigrants contributing to the redistribution of wealth and raising the real income of high-skilled natives.

Ennew (2003) while highlighting the contribution of immigrants, explains that the initial expenditure by immigrants can have significant additional effects throughout the rest of the economy, resulting in increased income and expenditure by a range of different groups, many of whom are not directly connected with the production of goods and services consumed by migrants; this process of spending and re-spending, commonly described as the multiplier effect, has to be taken into account to measure the true impact of immigration, that is, it is not only the actual expenditure done by immigrants that has to be estimated but also the final impact that this expenditure exerts on the economy. The author further observes that if all the multipliers namely output multiplier, employment multipliers etc. created by migrants are calculated, then the contribution of immigrants will definitely appear to be much greater than what is generally found in most of the studies neglecting these multiplier effects.

Sriskandarajah *et al.* (2005) have attempted to measure the actual impact of immigration on public finances, by estimating the contributions made by immigrants to government revenue and expenditure. Their analysis reveals that total revenue from immigrants grew in real terms from £33.8 billion in 1999-00 to £41.2 billion in 2003-04. Their analysis also suggests that the relative net fiscal contribution of immigrants is stronger than that of the UK-born, and has been getting even stronger in recent years.

Blanchflower *et al.* (2007) and Gilpin *et al.* (2006) estimated the impacts of the immigrants on the UK economy and both of them conclude that the inflow was mostly beneficial; they found no harmful effect of immigration on the economy. Blanchflower *et al.* (2007) showed that immigrants to the UK from the A8 countries (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia.) increased supply within the economy more than they had increased demand. In effect, the migratory flow contributed to dampening inflationary pressures. None of Gilpin *et al.* (2006) and Blanchflower *et al.* (2007) found indication of any increase in unemployment due to the inflows of migrants.

Fixation of tuition fees for foreign students should be a part of UK government policy on the immigration issue. There is a huge gap between the tuition fees between local (and EU) and non-EU students. If foreign students staying back after graduation benefit the economy, then it is logical to charge the same fees for them as locals. It is, therefore, important to measure the costs and benefits involved by foreign students. Vickers and Bekhradnia (2007) have sought to identify the main costs and benefits of international students in UK in terms of the impact of their spending on tuition fees and living costs and also endeavour to quantify the impact when these students remain in the UK each year to work after graduation. The authors estimate that the effect of EU students who consume half the value of the tax they pay in the form of government-provided goods and services, will be a net fiscal gain of over £142 million per year. For non-EU students remaining in the UK following graduation net fiscal gain is more than £210 million per year.

Barrett & McGuinness (2008) in their study on the impact of immigration in the Irish economy have found that for natives, average hourly earnings are €19.86, compared to €15.63 for immigrants, English speaking workers from outside the EU earn 6 % more than their Irish counterparts. Immigrants with second level qualifications and postgraduate qualifications experience earnings disadvantages of 6 to 14 % indicating that location-specific human capital is of greater importance at the upper level of the education.

DATA AND ESTIMATION TECHNIQUES

Data

Data used in this study have been taken from Labour Force Survey, New Earnings Survey, Office of National Statistics, UK Data Archive, ESDS government and UK population Census.

The Labour Force Survey (LFS) conducted by the Office for National Statistics (ONS) has been carried out in UK since 1973 but has adopted the present format from 1992 spring. The British LFS contains spatial information only at regional level, except for a brief interval between 1997 and 1999.

As it is suspected that ILO definition might overstate the number unemployed to see the impact of immigration on the unemployment rates of the resident population claimant count definition of unemployment has been followed i.e. the number of people seeking Job Seeker's Allowance (JSA) and National Insurance Credits. The size of active population has been used as a proxy for the resident skill groups (ONS Annual Population Survey). In this study hourly wages of full-time employees on adult rates produced by The New Earnings Survey (NES), have been used; the only period of data on wage rates for this variable available is from 2002 to 2006. This is why, we have used unit cost as a proxy for wage rate in the time series analysis from 1975 to 2006 but in the panel model we used exact wage rates from 2002 to 2006 from NES. The Census of Population of the UK has provided us information on total population, active population. Population is not available from 1972 to 1980; we calculated total population dividing GDP by GDP per head for this period. Share of immigrants in the total population has been calculated by dividing the number of immigrants by the total population of a GOR (Government Office Region).

A great problem was faced while using data; different surveys and different organizations have presented data in different types of classification of regions. We had to combine data from different sources. Therefore, the number of common regions has been smaller.

Estimation in Time-Series Data

I run simple OLS regression of *GDP*, *wage rate* and *unemployment rate* on *immigration share* of the total population in the whole economy on time series data from 1975 to 2006. Before that, I test the short run and long run relationship between GDP and immigration share of the total population (*IMSHARE*), and use the following regression equation:

$$GDP_t = \alpha_0 + \alpha_1 t + \alpha_2 IMSHARE_t + \varepsilon_t \quad (1)$$

where, GDP_t = Gross Domestic Product; t = time trend; $IMSHARE_t$ = immigration share; and ε_t = error term.

When unit root in variables is established, I estimate the long run relationship under bounds testing technique, using the following equation:

$$\Delta GDP_t = \alpha_0 + \alpha_1 t + \alpha_2 GDP_{t-1} + \alpha_3 IMSHARE_{t-1} + \alpha_4 \sum_{j=1}^{p-1} \Delta GDP_{t-j} + \alpha_5 \sum_{j=0}^{p-1} \Delta IMSHARE_{t-j} + \varepsilon_t \quad (2)$$

I estimate the long run coefficient from the same equation and I expect a positive coefficient, meaning that increasing immigration in the UK economy increases the GDP. In this case, the null hypothesis of no level long run relationship between *GDP* and *IMSHARE* is:

$$H_0 : \alpha_2 = \alpha_3 = 0$$

To carry out an F-test, I apply Variable deletion test in Microfit. To test the hypothesis, I delete GDP (-1) and IMSHARE (-1) from the regression, which is tantamount to imposing zero on their coefficients — α_2 and α_3 . I then compute the long run coefficient of *IMSHARE* and its standard error. Suppose, the long run coefficient is β ; in the model β would be equal to $-\alpha_3/\alpha_2$, where α_2 and α_3 are the coefficients of GDP(-1) and IMSHARE(-1) respectively.

An unrestricted Error Correction Model (ECM) as constructed by Pesaran, Shin, Smith (2001) takes the following form in this present context:

$$\Delta GDP_t = \alpha_0 + \alpha_1 t + \alpha_2 \Delta IMSHARE + \alpha_3 EC_{t-1} + \varepsilon_t \quad (3)$$

where t = time trend; EC = error correction term. Expected signs of the coefficients are as follows: $\alpha_1, \alpha_2 > 0$; $\alpha_3 < 0$.

The sign of the error correction term is supposed to be negative because when the variables are in deviations from the equilibrium, they often stay above the equilibrium and they are supposed to come down to be equilibrium. The coefficient in the ECM provides us the short run coefficient.

Although my hypothesis is that immigrants cause economic growth of UK to rise, but at the same time, it is important to check if UK's growth rate causes immigrants to come to UK because immigrants from all countries tend to migrate to those countries where per capita income is high, which causes the demand in the markets to be high, thus goods market expand increasing demand for labour. In brief, macroeconomic performances of countries might attract immigrants. To investigate whether causality runs from immigration to growth or from growth to immigration or both, I perform Granger non-causality test which can be defined, in the present context, as *immigration share* is said to Granger-cause *UK growth rate* if the present growth rate can be predicted by using past values of immigration share. I use the following OLS regression for the Granger non-causality test:

$$Growth_t = \alpha_1 Growth_{t-1} + \alpha_2 Growth_{t-2} + \dots + \alpha_p Growth_{t-p} + \beta_1 IMSHARE_{t-1} + \beta_2 IMSHARE_{t-2} + \beta_p IMSHARE_{t-p} + u_t \quad (4)$$

Conducting an F-test of the null hypothesis,

$$H_0 : \beta_1 = \beta_2 = \dots = \beta_p = 0$$

I select the order of VAR on the basis of LR statistic.

It is quite likely that shocks to one macroeconomic variable are transmitted to other related variables. In the present case, a shock in *immigration share* of the total population may be transmitted to *GDP*, *wage* and *unemployment rate*, and likewise, a shock in any one of these variables might transmit to the rest of variables. Using VAR model, impulse response function is applied in this purpose i.e. I intend to see and evaluate the impulse responses of the effect of unit shock (equal to one standard error) to the *immigration* in UK on its *GDP*, *wage rate* and *unemployment rate*. I have also used this function to examine the impulse responses of the effect of unit shock to the GDP on immigration.

In my model I prefer to use generalized impulse response approach to orthogonalized approach because the former does not depend on the re-ordering of variable in the system unlike the latter; and generalized impulse responses are unique and take complete account of historical patterns of correlations observed among different shocks.

I estimate the following VAR (1) model:

$$Z_t = \alpha + \Phi Z_{t-1} + \varepsilon_t, \quad (5)$$

where $Z_t = GDP_t, IMSHARE_t, WAGE_t, UNEMPLOYMENT_t$ and $\alpha =$ vector of constants and $\Phi =$ matrix of the coefficients of $GDP_{t-1}, IMSHARE_{t-1}, WAGE_{t-1}, UNEMPLOYMENT_{t-1}$ and $\varepsilon_t =$ error terms. I have selected the forecast horizon to be 12 and the lag order of VAR on the basis of LR-statistic.

I conduct unit root tests to examine if *GDP* and *immigration share (IMSHARE)* have non-stationarity. A random walk time series often turns stationary if it is differenced once or twice because differencing detrends the series. Moreover, regression of lagged variables can capture the effect of the changes in the independent variables on the dependent variable. Therefore, I apply unit root tests on these variables also at their first-differences.

In stochastic process a variable may be influenced by the lagged values of its own and the lagged values of the explanatory variables as well as the current values of the explanatory variables; for example, in the analysis of the impact of immigration on *GDP* might be influenced by lagged values of *GDP* and the lagged values of *immigration share* at the same time. In such a case, the model should be autoregressive and distributed-lag (of explanatory variables) which is known as ARDL (p, q).

I use ARDL bounds testing cointegration approach advanced by Pesaran, Shin, Smith (2001) to examine the existence of long run relationship between immigration share and *GDP*, and construct an error correction model (ECM). This model, unlike the existing ones, can be applied in the cases of the regressors both I (1) and I (0). It also overcomes the problem of endogeneity and small sample bias and is capable to estimate long run and short run parameters simultaneously.

In order to determine the order of integration I apply Advanced Dicky Fuller test advanced by Dicky and Fuller (1979). The general rule is that if the ADF-statistic is greater than the critical value, we reject the null of unit root; if smaller, we do not reject the null.

After carrying out the unit root tests and finding the presence of unit root in the variables, I examine the existence of long run relationship between dependent and independent variables using ARDL bounds testing technique by means of F-test. Pesaran, Shin and Smith (2001) provide upper bound and lower bound of the critical value and set the rule that if the computed F-test statistic is greater than the upper bound, then we reject the null of no cointegration, if smaller than the lower bound, then do not reject the null and if the value falls between these two bounds, then we cannot conclude on the existence of cointegration.

Once the long run relationship is found, the long run estimates have to be determined using Schwartz Bayesian Criterion (SBC). The use of SBC is preferable because it is more parsimonious.

I examine the short run dynamics of the variables using Error Correction Model (ECM). This model determines the speed of adjustment of variables in restoring equilibriums. The coefficient of ECM shows how fast or how slowly the adjustments take place. The ECM term is also used to measure the degree of cointegration among variables in the model.

Estimation in Panel Data

After finding the estimates in the analysis of time series aggregates, I examine the impact of immigration using panel data since it is capable of overcoming the limitations of the former analysis. According to Baltagi (2005), a panel model can overcome the problems of heterogeneity, multicollinearity and biases resulting from aggregation over firms or individuals. It is expected to help us make inferences on the issue with greater confidence.

I examine the impact of immigration in different regions in UK over a time period from 2002 to 2006 using panel data. In this case the approach that will be adopted in estimating the mentioned impact is 'spatial correlations' approach introduced by Borjas (1999) where effects of immigration are identified from the spatial correlation between immigrant labour inflows and changes in labour market outcomes (or between immigrant population shares and levels of these outcomes). Spatial units are intended to correspond to geographical labour markets.

In particular, I follow the model specification and estimation strategy adopted by Dustmann *et al.* (2006) because this model seems to have been able to control the simultaneity and endogeneity problems using appropriate control variables. It takes the following form:

$$y_{it} = \beta'X_{it} + \gamma'Z_t + \varepsilon_{it} \quad (6)$$

where $i = 1, \dots, N; t = 1, \dots, T$,

With one-way error components, $\varepsilon_{it} = \alpha_i + u_{it}$, where α_i is region-specific effects. In the above equation: $y_{it} = \{\text{wage, unemployment}\}$; $X_{it} = \{\text{immigration share, skill-group population, average age, outflows}\}$; $Z_t = \{\text{dummies— year1, year2, year3, year4}\}$.

I regress a measure of employment of workers already resident in a given area on relative quantities of immigrants in that particular locality with appropriate controls; and a measure of wages of workers already resident in a given area on relative quantities of immigrants in that particular locality and appropriate controls. In particular, the following forms of equations are used:

$$lw_{it} = \alpha_0 + \alpha_1 r_{it} + \alpha_2 \ln p_{it} + \alpha_3 a_{it} + \alpha_4 f_{it} + \lambda_t^w + \mu_i^w + u_{it}^w \quad (7)$$

$$U_{it} = \beta_0 + \beta_1 r_{it} + \beta_2 \ln p_{it} + \beta_3 a_{it} + \alpha_4 f_{it} + \lambda_t^U + \mu_i^U + u_{it}^U \quad (8)$$

w_{it} = wage; U_{it} = unemployment rate; r_{it} = vector of ratios of immigrant to resident population; p_{it} = a vector of skill-group local populations; a_{it} = a vector of average ages of immigrants, f_{it} = vector outflows of residents— all in the i th region in the t th period. λ_t^w, λ_t^U are year effects; μ_i^w, μ_i^U are region effects; and u_{it}^w, u_{it}^U are disturbance terms.

General problems faced in capturing the desired effects and the ways to address them are as follows: Levels of immigrant shares and levels of labour market outcomes are quite likely to be spatially correlated because of common fixed influences like historic settlement patterns and policies of particular regions on which the economic conditions of those regions depend, and which, in turn, might determine the inflows of immigrants. In such a case, there already exists negative or positive correlation between immigrant concentration and economic outcomes even if there are no effects of immigration at all. To solve this problem one must either estimate the relationship using differences or the deviations from means; in both cases, persistent effects present in all periods will be eliminated. Accordingly, I estimate fixed effect (FE), random effect (RE) and between effect (BE) estimators. Causality between immigrant inflows and labour market outcomes may be two-way i.e. not only that immigrant inflows cause labour market changes, but also that labour market changes attract or repel inflows. This simultaneity problem makes the effects of immigration on labour market upward-biased. If currently resident workers having the same skill type as immigrants move elsewhere following a reduction in their wages, it will disperse the impact of immigration over the whole economy and prevent us from identifying the impact within localities. As a solution to these problems of so-called 'omitted variable problem' I incorporate outflows from regions into the regression equation. In all specifications I include a full set of year effects by putting *year dummies* so that aggregate time series variation is completely absorbed, that is, to allow labour market outcomes in all spatial units to differ over time by common year-on-year effects. I also include controls for *average age of immigrants, size of resident skill groups* to capture the appropriate impact.

RESULTS

Descriptive Statistics from Time-Series Data

The sample period of the annual data used in this analysis is 1975-2006. In this period the largest number of immigrants entered into UK in 2006 which is 5,91,000 and the smallest number is 1,52,800 in 1981, mean of which is 3,12,084 i.e. on average 3,12,084 immigrants entered into UK. In terms of net flows maximum is 2, 22, 600 (in 2004); minimum -79500 in 1981 i.e. in this year outflows exceeded

inflows and mean of net flow is 54, 868 i.e. on average 54, 868 foreign people net of out-migrations entered into UK.

UK has experienced maximum GDP of £12,10,288 million and minimum of £ 5,78,338 million respectively in 2006 and 1975, and maximum growth of 5.8% in 1975, minimum growth of .83% in 1992; on average this country has experienced a growth of 2.13% over the whole period. In terms of GDP per head it has reached the peak of £19,627 in 2006 and the lowest of £10270 in 1975. Interestingly, UK has achieved both the highest GDP and highest GDP per head in the year, 2006 when the largest number of immigrants came in and the lowest growth in the following year (1982) of the smallest number of immigration flows (1981).

Unemployment rate in UK was highest in 1986 (10.5%). It significantly fell around 2004, 2005, 2006 (2.7%, 2.7% 2.9% respectively), when immigration flows significantly reached the highest levels. Comments cannot be appropriately made on the wage rates because wage shown in the table is unit wage cost used as a proxy for wage rate.

TABLE 1
ESTIMATED CORRELATION MATRIX

	inflow	outflow	netflow	imshare	gdp	growth	gdphead	unrate	wage
inflow	1	0.9	0.95	0.95	0.97	-0.59	0.96	-0.55	0.88
outflow	0.9	1	0.73	0.72	0.88	-0.5	0.86	-0.56	0.8
netflow	0.95	0.73	1	0.99	0.92	-0.59	0.92	-0.48	0.84
imshare	0.95	0.72	0.99	1	0.92	-0.59	0.92	-0.47	0.84
gdp	0.97	0.88	0.92	0.92	1	-0.68	0.99	-0.46	0.95
growth	-0.59	-0.5	-0.59	-0.59	-0.68	1	-0.69	-0.17	-0.83
gdphead	0.96	0.86	0.92	0.92	0.99	-0.69	1	-0.45	0.96
unrate	-0.55	-0.56	-0.48	-0.47	-0.46	-0.17	-0.45	1	-0.23
wage	0.88	0.8	0.84	0.84	0.95	-0.83	0.96	-0.23	1

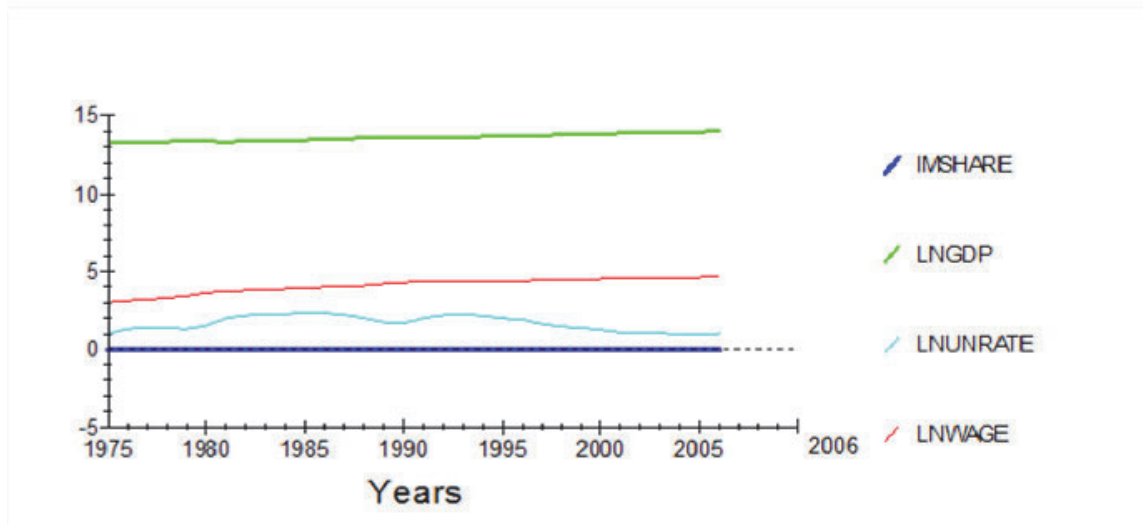
Sources of data: Labour force survey, New Earnings Survey, Office of National Statistics, UK Data Archive, ESDS government and UK population Census.

Note: inflow = inflow immigrants; outflow = outflow of migrants; netflow = algebraic summation of inflows and outflows; imshare = share of immigration in the total population; gdp = GDP; growth= GDP growth; gdphead = GDP per head; unrate = unemployment; wage = wages.

There is a strong positive correlation between GDP and inflow, net flow, immigration share (0.97, 0.92, 0.92), a strong positive correlation between wage and inflow, net flow, immigration share (0.88, 0.84, 0.84), and a fairly strong negative correlation between unemployment rate and inflow, net flow, immigration share (-0.55, -0.48, -0.47) meaning that immigration flows are likely to increase GDP and wage significantly, and decrease unemployment moderately. With net inflows of immigration, GDP is seen to have a strong positive correlation (0.92) meaning that immigration has a positive impact on GDP or GDP has an influence on immigration flows while correlation between growth and immigration flows appears to be negative. While unemployment is seen to have a moderate negative correlation (-0.47846) with net flows, wage rate is seen to have a strong positive correlation (0.83947) i.e. both wage and employment level in UK labour market have been positively impacted by immigrants (table 1).

Plots of *log of immigration share*, *log of inflow*, *log of GDP*, *log of unemployment rate*, *log of wage rate* and *log of growth* over the period of 1975-2006 in figure 1 & 2 reveal that wage has an upward trend all through, and unemployment rate shows a downward trend except in mid-80's and early 90's with increasing inflows of immigration. Both the *log of immigration flow* and *log of GDP* also have kept rising, although *log of growth* falls from positive in 1975 to zero in 2005 but rises abruptly in 2006.

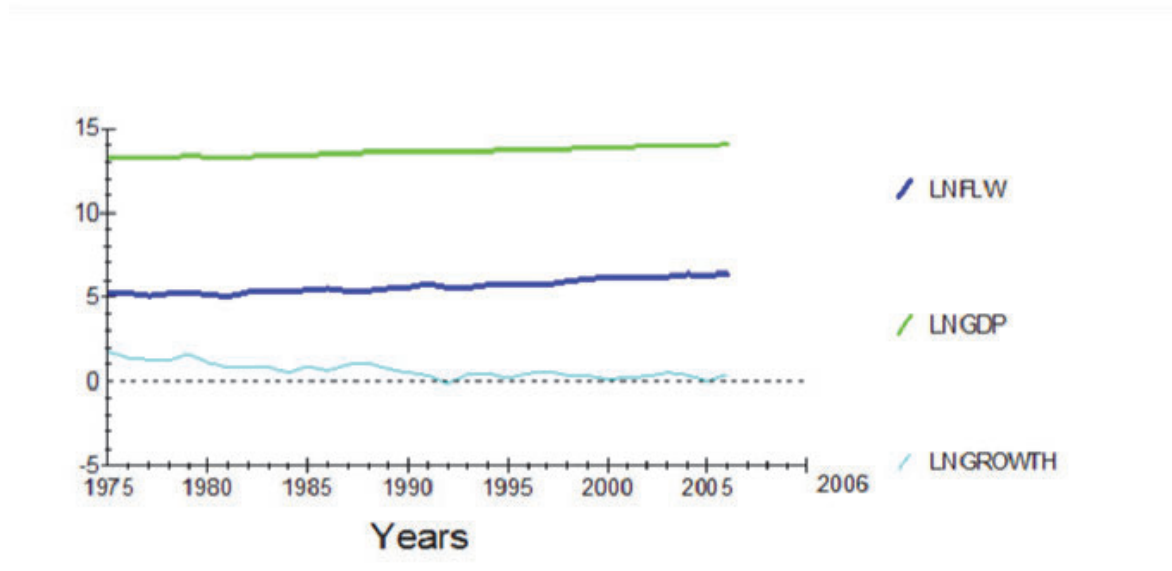
FIGURE 1
TRENDS IN IMMIGRATION, GDP, UNEMPLOYMENT AND WAGES OVER TIME



Note: IMSHARE = log of share of immigrants in the total population; LNGDP = log of GDP; LNUNRATE = log of unemployment rate; LNWAGE = log of wages.

As figure 3 shows, net flows have been negative in some years; and with net flows, wage rate shows a clear upward trend and unemployment rate slopes downward finally around the beginning of the millennium.

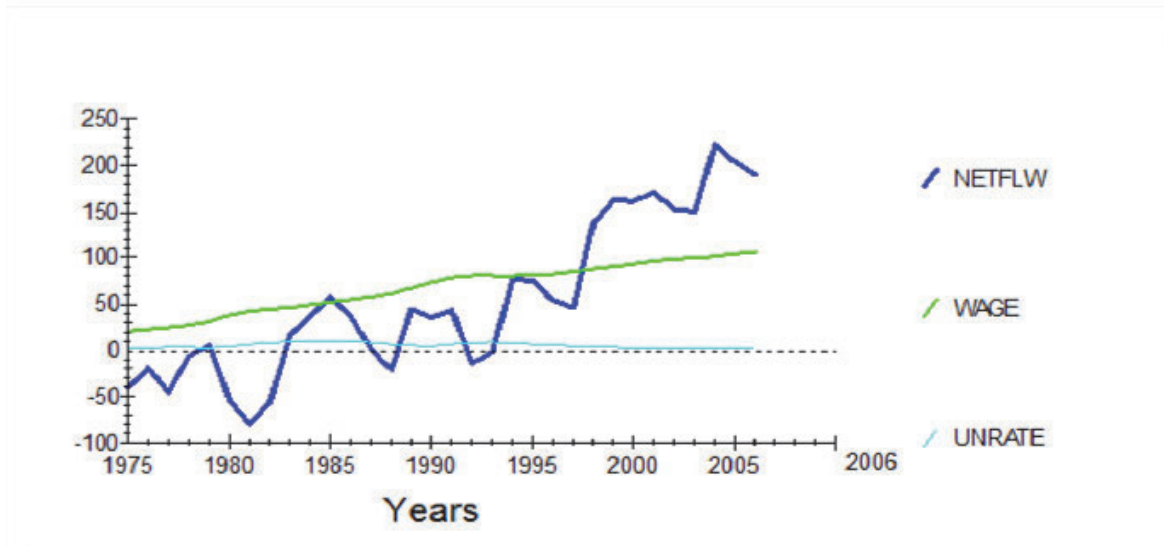
FIGURE 2
TRENDS IN INFLOW OF IMMIGRANTS, GDP AND GROWTH



Note: LNFLW = log of inflow of immigrants, LNGDP = log of GDP, LNGROWTH = log of growth

Scatter plot of *log of inflow* over *log of GDP* (figure 4) is upward sloping indicating a clear positive correlation between them, meaning that with increasing rate of GDP, rate of immigration flow rises.

FIGURE 3
TRENDS IN NET FLOW, WAGES AND UNEMPLOYMENT OVER TIME



In the scatter plot of *log of unemployment rate* over *log of inflow* the slope is downward, which means unemployment rate falls as the rate of inflow rises (Figure 5) while, according to figure 6, wage rate rises as inflow increases.

FIGURE 4
SCATTER PLOT OF LOG IMMIGRATION OVER LOG GDP

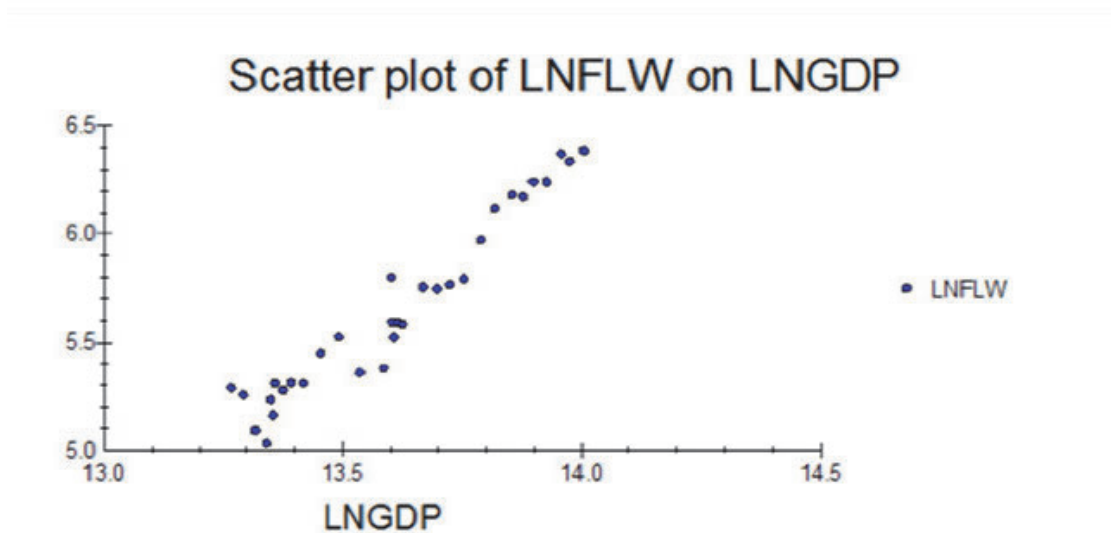


FIGURE 5
SCATTER PLOT OF LOG UNEMPLOYMENT OVER LOG INFLOW

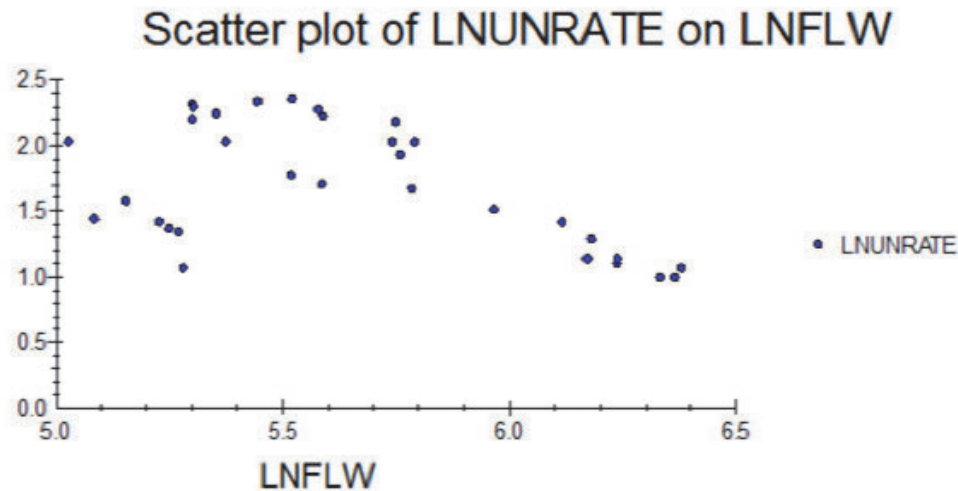
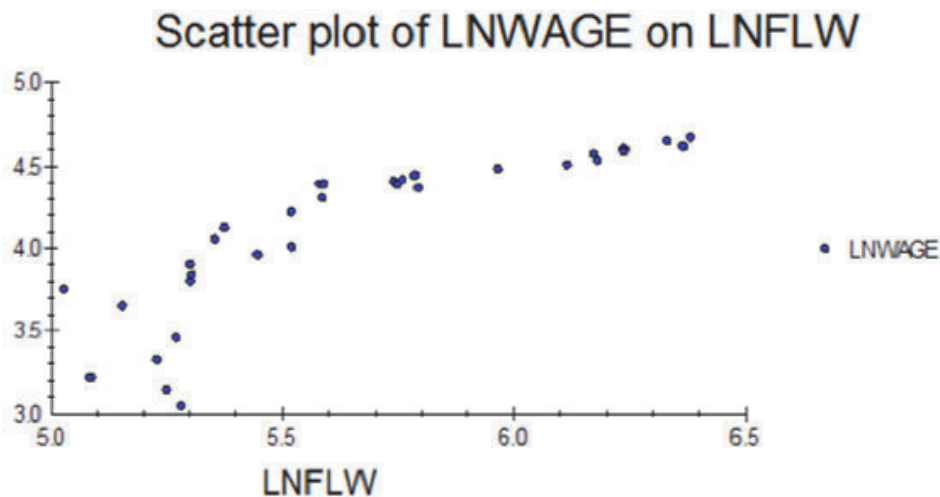


FIGURE 6
SCATTER PLOT OF LOG WAGES OVER LOG INFLOW



Descriptive Statistics from Panel Data

Minimum number of net flows of immigrants (-7000) was in Scotland in 2002 meaning that in this year outflows exceeded inflows in this region while the maximum i.e. 244000 was in Great Britain in 2004; on average net flows over this period was a little more than 31150. Maximum number of outflows of migrants was 397000 in 2006 and it was in Great Britain while the minimum has turned out to be 60000, here the region is North East and the year is 2004. Immigration share was the highest (.0133) in London in 2004 and the lowest (.0014) was in Scotland in 2002; the average of this variable was .0029 over this period. Unemployment rate was the highest (5.025%) in North East in 2002 and the lowest

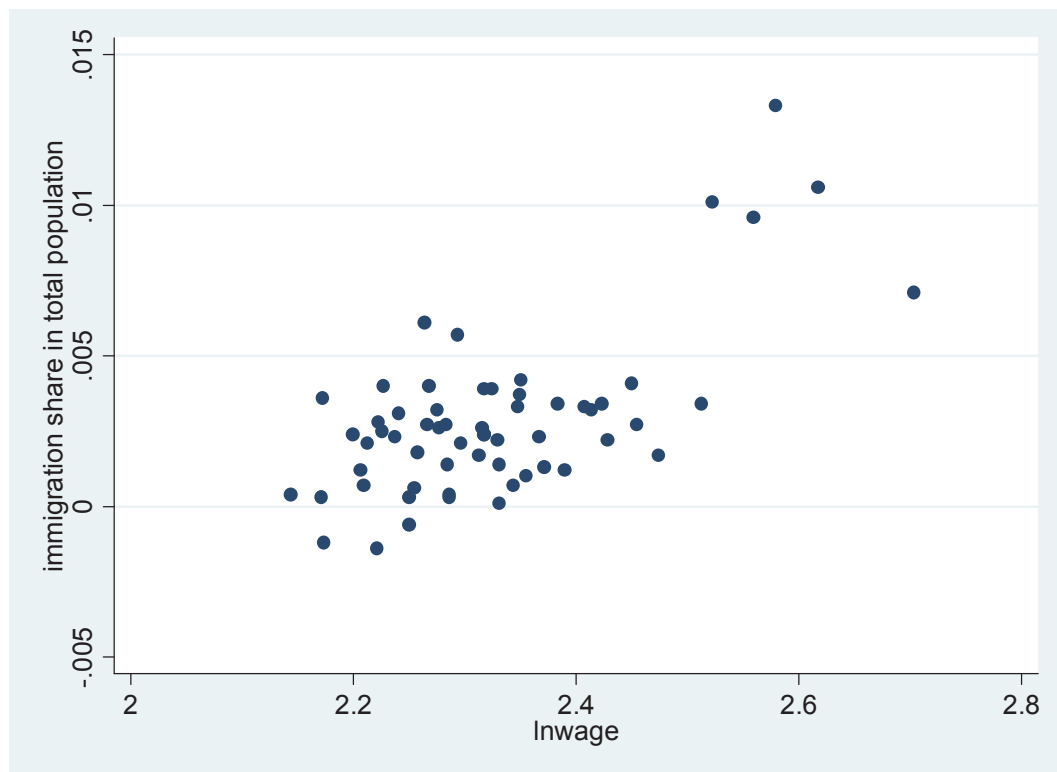
(1.575%) was in Yorkshire and Humber in 2002; on average unemployment rate was 2.93%. Highest and lowest wage rates were respectively 14.93 in London in 2006 and 8.53% in North East in 2002 and average wage was £10.32 per hour over this 5-year period. Skill group population for which the size of active population has been used as a proxy in the regions under study was highest (29,894) in GB in 2006 and the smallest (11,580) was in North East in 2002. Average age of immigrants over all these regions and whole of this time period was 40.82 years. Standard deviations of net immigration flow, immigration share, outflow of migrants, unemployment rate, wage rate, skill-group population and average age are 52274.32, .0027238, 94.53786, .8038312, 1.271411, 7451.661 and 8.70228 respectively (table A10 in the appendix).

Correlation between immigration share and unemployment rate is found to be negative (-0.0007) i.e. any increase in immigration share reduces the unemployment in the regions of UK. Correlation between wage rate and immigration share is positive and pretty high (0.6821), which means arrival of immigrants raises wages (table 2).

TABLE 2
CORRELATION MATRIX OF PANEL DATA

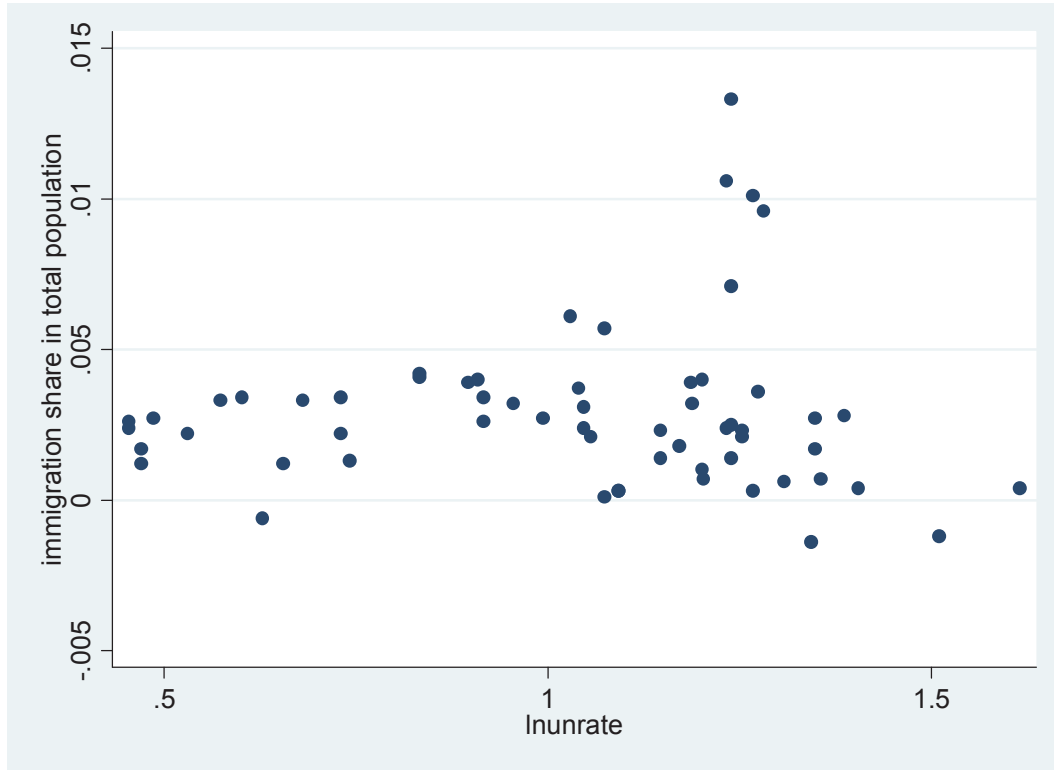
	immigration share	unemployment rate	wages
immigration share	1.0000		
unemployment rate	-0.0007	1.0000	
wages	0.6821	-0.2393	1.0000

FIGURE 7
SCATTER PLOT OF IMMIGRATION SHARE AND LOG WAGE



Note: *lnwage* is log of wage.

FIGURE 8
SCATTER PLOT IF IMMIGRATION SHARE AND LOG UNEMPLOYMENT RATE



Note: *lnunrate* is log of unemployment rate.

Scatter diagram of *immigration share* and *log of wage* indicates a positive correlation showing a clear upward trend. Scatter diagram of *immigration share* and *log of unemployment* shows a slight downward slope around the end of the period (figure 7 & 8).

Regression Output from Time-Series Data

OLS regression of GDP on net flow of immigrants, provides a highly significant positive coefficient of *net flow* meaning that immigration positively influences GDP in the UK. Precisely, 1000 new immigrants net of outflows of UK citizens, contributes by adding £2084.1 to its GDP in a year (table 3).

TABLE 3
RESULTS OF OLS ON TIME SERIES DATA DEPENDENT VARIABLE: GDP

Regressor	Coefficient	P-value	Serial Correlation (LM)	Heteroscedasticity (LM)	R ²
Net flow	2084.1	.000	7.29(.007)	1.72(.189)	.85

Note: Net flow = net flow of immigrants.

OLS regression of *unemployment rate* on net flows of immigration (*net flow*) provides a highly significant negative coefficient of *net flow*, which means arrival of immigrants reduces unemployment, in particular, arrival of 1000 immigrants, creates jobs for 17 residents in the UK (since unit of net flow is thousand) (table 4).

TABLE 4
RESULTS OF OLS ON TIME SERIES DATA DEPENDENT VARIABLE:
UNEMPLOYMENT RATE

Regressor	Coefficient	P-value	Serial Correlation (LM)	Heteroscedasticity (LM)	R ²
Net flow	-.017	.001	21.77(.000)	4.88(.027)	.30

Note: Net flow = net flow of immigrants.

OLS applied on *wages* and net flows of immigration (*net flow*) when *wage rate* is the dependent variable, provides a highly significant positive coefficient of *net flow*, implying that arrival of immigrants increases wages in the UK, in particular, arrival of 1000 immigrant increases wage rate in local labour market by £0.25 (table 5).

TABLE 5
RESULTS OF OLS ON TIME SERIES DATA
DEPENDENT VARIABLE: WAGES

Regressor	Coefficient	P-value	Serial Correlation (LM)	Heteroscedasticity (LM)	R ²
Net flow	.25	.000	14.88(.000)	6.35(.012)	.7

Note: Net flow = net flow of immigrants.

I have tested if the time-series of immigration share and GDP in the UK are non-stationary and applied Dickey-Fuller unit root test. The test finds them nonstationary at levels but they become stationary at their first difference i.e. both of them are I (1) (table A1 in the appendix). To check the existence of long run relationship between *GDP* and *immigration share* I conducted bounds test. The test does not indicate long run relationship between *GDP* and *immigration share* in the UK (table A2 in the appendix).

The share of immigration in the total UK population has been seen to have both long-run and short-run impact on its GDP (see the positive value of long run coefficient in the analysis of Functions of Parameter (f_1) obtained from normalized ARDL function in table A3 in the appendix and the statistically significant positive coefficient of the differenced *immigration share* estimated by Error Correction Model (ECM) presented in table A4 in the appendix. The coefficient of ECM also indicates that deviation of immigration share will be adjusted at the rate of 12 percent per annum.

UK GDP growth is not seen to be causing immigrants to come, in other words, economic growth of this country does not attract immigrants, but immigrants play roles in increasing economic growth of UK (see the LR Test of Block Granger Non-Causality in VAR in table A5 in the appendix).

A unit shock to the equation for GDP of the UK is seen to have negligible impact on the *immigration share* in this country. The relevant impulse response function reveals that in the first horizon, impulse is the highest from which it gradually falls and becomes negative in the fourth horizon (figure 9 below) and again rises and keeps rising irregularly (see the estimated Unrestricted Vector Autoregressive Model (table A6 in the appendix). On the other hand, a unit shock to the equation for *immigration share* creates significant impulse in GDP (table A7 in the appendix). It can be seen from the graph (figure 10 below) that impulse response function of GDP increases over horizons where the peak was in the 5th horizon.

FIGURE 9
IMPULSE RESPONSE IN IMMIGRATION SHARE IN THE EQUATION FOR GDP

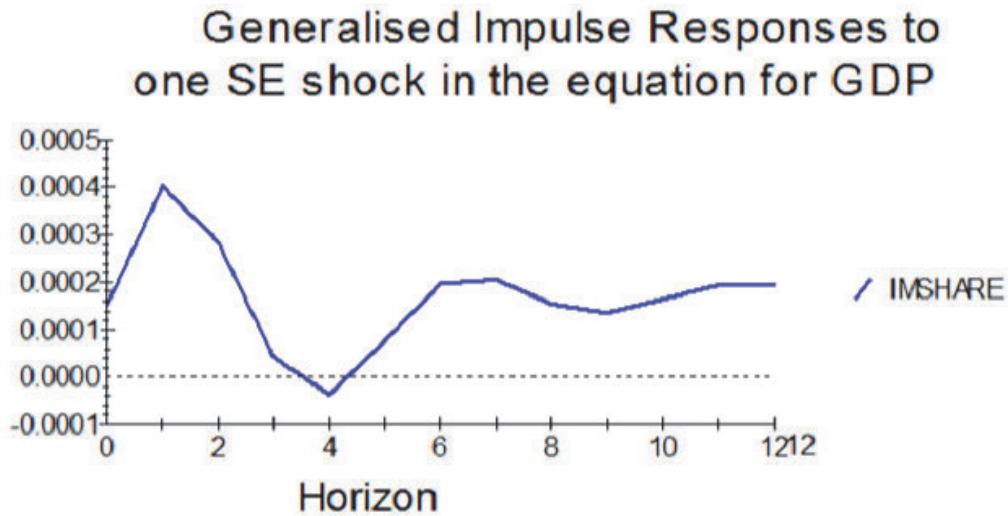
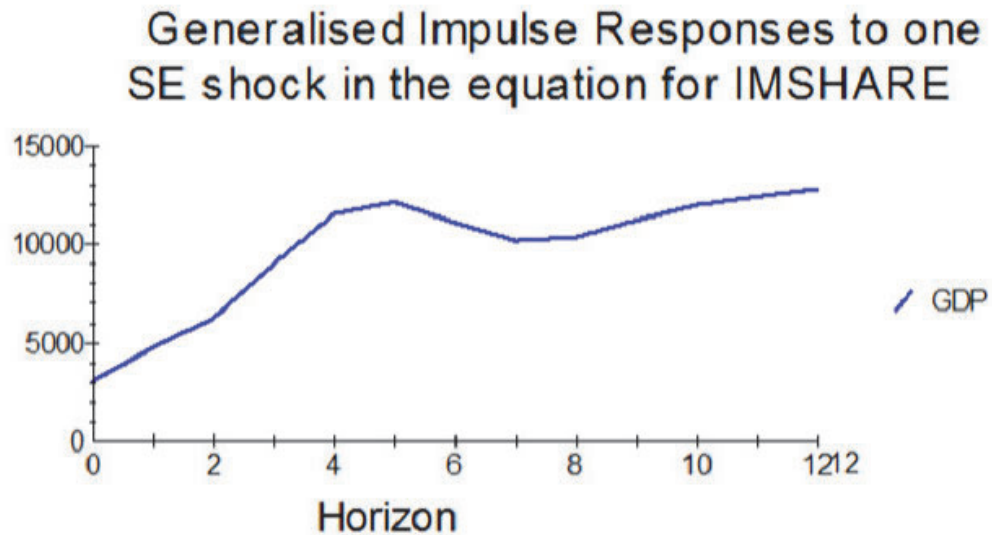
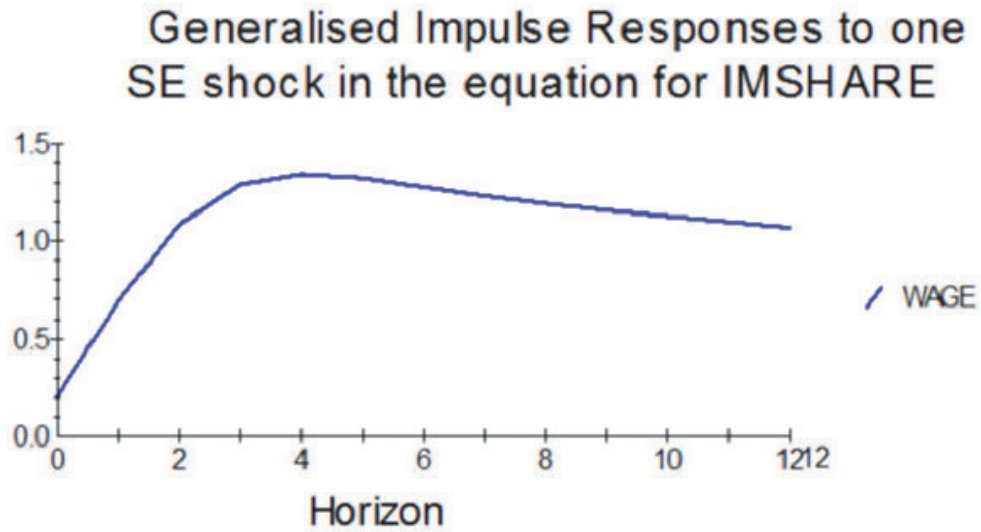


FIGURE 10
IMPULSE RESPONSE IN GDP IN THE EQUATION FOR IMMIGRATION SHARE



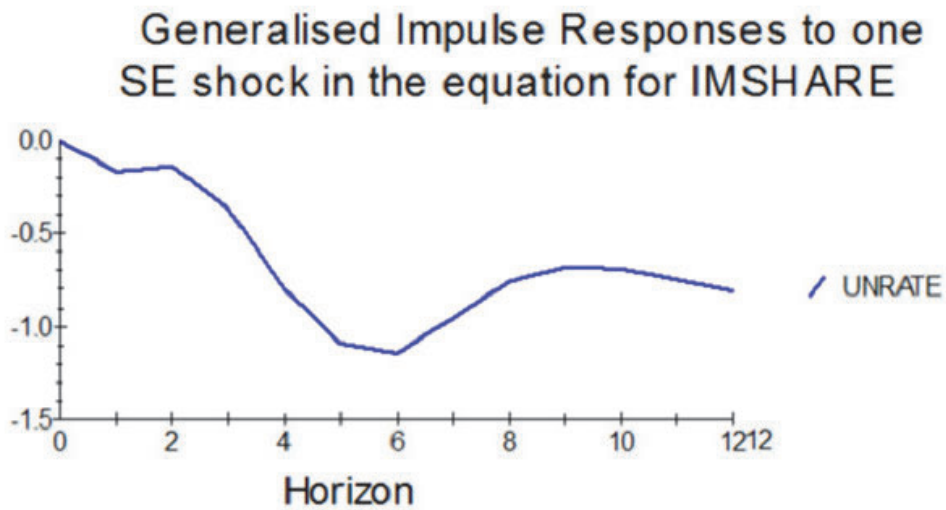
A unit shock of one-standard error to the *immigration share* equation is seen to have a significant positive impact on wages. According to the graph, the impact rises almost sharply and reaches the peak in the 4th horizon from where it shows a downward trend (table A8 in appendix and figure 11 below).

FIGURE 11
IMPULSE RESPONSE IN WAGES IN THE EQUATION FOR IMMIGRATION SHARE



A unit shock to the *immigration share* equation has negative impact on unemployment rate, magnitude of which decreases in the first horizon but increases in the second and then keeps falling up to the sixth and then keep rising but from the 11th horizon starts falling again (table A9 in appendix and figure 12 below).

FIGURE 12
IMPULSE RESPONSE IN UNEMPLOYMENT RATE IN THE EQUATION FOR IMMIGRATION SHARE



Regression Output from Panel Data

Ordinary Least Square regression of *log of wage rate* on *immigration share*, *outflows* from the regions, *size* of the skill-group population and average *age* of immigrants provides the following coefficients of these regressors: 24.07, -.00086, .1224 and -.0026 which are all significant (table 6). Thus, I can make inferences as follows: *immigration share* in the local population of a region, increases wage rates to a good extent, outflows have a slight negative impact on wages, an increase of one unit of skill-group population is seen to increase wages by 12%, and *average age* of immigrants lowers the wages negligibly.

TABLE 6
RESULTS OF OLS ESTIMATOR

Dependent variable: <i>log wage</i>				Dependent variable: <i>unemployment rate</i>			
Regressor	Coefficient	P-value	R ²	Regressor	Coefficient	P-value	R ²
imshare	24.07	.000	0.68	imshare	32.12	.336	0.44
outflow	-.00086	.010		outflow	.009	.004	
lnskilpop	.1224	.002		lnskilpop	-1.534	.000	
average	-.0026	.04		average	-.021	.085	

Note: imshare = share of immigration in the total population; outflow = outflow of migrants; lnskilpop = log of skilled population; average = *average age* of immigrants

Regression of *unemployment rate* on *immigration share*, *outflows*, *size of the skill-group population* and *average age* of immigrants, provides the following coefficients of these regressors: 32.12, .009, -1.534 and -.021 respectively. Of these, coefficient of *immigration share* is highly insignificant. We can thus conclude that *immigration share* is not seen to affect *unemployment rate*, *outflows* raise *unemployment rate* very slightly, and both *skilled group population* and *average age of immigrants* lower *unemployment rate* (table 6 above).

To check the robustness of the results found above, in the panel data model, I conduct Fixed Effect (FE), Random Effect (RE) and Between Effect (BE) estimators. The effect of *immigration share* on *unemployment rate* in FE, RE and BE estimators all came in with insignificant coefficients. The effect of *immigration share* on *wage rate* came in with insignificant coefficients in FE, RE estimators but significant in BE estimator, which is positive (see table A11, A12, A13 in the appendix). Therefore, the positive effect of immigration on wage rate has appeared to be further robust in the investigation done in this study.

DISCUSSION OF RESULTS

OLS regressions on time series data on the whole economy show that net flows of immigrants increase GDP, reduce unemployment and increase wages in the UK. The reason why immigration exerts these positive outcomes is that immigrants fill the skill gaps, they are complementary to the local workers and thus increase productivity of firms, they create multiplier effects (expenditure and employment), increase AD which expands goods market and increases the demand for labour, and that immigrants bring capital with them and build enterprises and thus contribute to the growth of the economy.

GDP and *immigration share* are seen to have nonstationarity in levels and become stationary in first-differences in unit root tests, which is quite likely because they have an increasing trend all through the period of 1975-2006 and differencing have detrended them.

GDP and *immigration share* are not seen to be cointegrated i.e. they do not show any long run relationship. The reason for not finding a long run relationship is that the test has been conducted on the data of a pretty small period which is probably not long enough to develop a cointegration.

Both long run and short run coefficients of *immigration share* indicate a positive impact on GDP, which is also factual because in the last few decades immigrants constituted increasingly a very

significant portion of UK population, who have contributed to the total output by providing new skills, capital, entrepreneurship, payments in taxes and national insurance, and above all, by spending. Deviations of these Variables adjust with a speed of 12% per annum; it says that the coherence of macroeconomic variables and the structural strength of the British economy is pretty good.

That economic growth of the UK does not cause immigration flows and that net inflows of immigrants do cause the growth to increase, are not surprising because when immigrants decide to migrate, they do not look at the year-to-year growth rates of the target country meaning that there is no strong correlation between the economic growth of the host country; rather immigrants make their migration decision on a pre-conceived idea that 'UK is a good place to live in and there are plenty of job opportunities' and on the basis of the fact that it is easy to enter into UK and the British government is not too harsh to illegal immigrants. Why immigrants spur growth has already been discussed above.

Although immigrants in UK have increased significantly in recent years, immigration has not yet been a major determining force in its economy. Therefore, it is quite natural that any significant impulse is not created in GDP, wage rate or unemployment rate in response to any shock taking place in the immigration share of this country.

According to OLS, FE, RE and BE estimators estimated in panel data model, *immigration share* in the total population of the UK, does not show any effect on *unemployment rate*. On the panel perspective, wages are increased by immigrants according to OLS and BE estimators. Positive impact of *immigration share* on *wage rate* is, therefore, robust across time-series and panel data while the analysis of the latter is capable of removing endogeneity or simultaneity problems and can capture individual effect of regions and the impact of inter-regional migration. On these perspectives, We may conclude that arrival of immigrants increases wages in the local labour market. Unemployment is seen to decrease according to time-series OLS. According to FE and RE estimators as well, although not significant, direction of changes in unemployment rate is downward, which supports the result of OLS regression of time-series data, which finds immigration to reduce unemployment rate in the UK. The main reason why unemployment decreases seems to be the fact that a good number of immigrants bring in capital with them and build enterprises which create jobs for the people who are already resident in the UK.

CONCLUSION

This study has analysed panel data as well as time-series data to check the robustness of the positive effect of immigration on wages and employment in the United Kingdom. The positive effect of immigration on wage rate is strongly supported by the panel data. Negative effect on unemployment rate likewise the positive impact on employment in the UK labour market is also supported but not strongly in the sense of statistical significance. Besides regressions, many tests have been done in order to check nonstationarity, short-run and long-run relation between the key variables of interest. Impact of immigration on GDP has been clearly positive; from the Granger non-causality test, this impact is further supported when it is seen that immigration causes UK's economic growth to rise. This causality probably would have appeared even stronger if immigration process were easier. Nonstationarity of GDP and immigration share were quite obvious and that differencing has made them stationary is quite logical. Any cointegration or long run relation between immigration share and GDP was not found, which we consider logical (as explained above). From the interpretation of the results of the impulse response function in a VAR model, it is also explained that because of the short length of the period of data any shock in immigration share does not appear to create any significant impulse in GDP, wages and unemployment rates.

It has not been possible to divide the wage rates and unemployment rates between immigrants and residents because censuses and surveys do not provide information on these variables separately about immigrants and residents. It is, therefore, a very big weakness of the analysis because the main purpose of the analysis was to estimate the impact of immigration on the residents. Different agencies use different regions while collecting and publishing data; therefore, I was able to find only 12 common regions for all

variables used in the study. Moreover, data for some variables e.g. wage rate are not available before 2002; that's why, in the panel approach I could not increase the time period.

Since time series data are available only from 1975, the length of the time was not big in 2008 when this study was conducted. 31 years is not a good length of time for a time series analysis. Longer the time, the more efficient the regression is; therefore, the time-series analysis can be made on a much greater length of period now in 2019. The analysis using panel data can also be carried out increasing number of both regions and years, which will provide more reliable results helping correct policy suggestions. Inter-country comparison is another good idea because it will help us to discover the main factors existing in the host economy responsible for determining the impact of immigration on the macroeconomic variables.

As the impact of immigration has been found mostly positive it is advisable that UK government welcome foreigners in migrating here and thus make entry process easier and cheaper in terms of visa fees and others costs. However, the government may be selective in giving visa i.e. it might make the process easier for skilled people and difficult for the unskilled. In this regard, a further recommendation may be put that UK government ask the governments of the densely populated countries (from where a lot of people are willing to migrate) to train their workers so that they may qualify to obtain visas. As mentioned earlier, students are considered as immigrants according to the definition, tuition fees in educational institutes should be reduced because they make remarkable contributions by providing skilled labour and by spending on their tuition fees and living costs in the economy.

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APPENDIX

**TABLE A1
RESULTS OF UNIT ROOT TEST FOR GDP AND IMMIGRATION SHARE**

Variables	Level statistic	ADF	Critical value	Decision	First-differenced ADF statistic	Critical value	Decision
GDP	-1.8464		-3.5671	I(1)	-3.8664	-3.5731	I(0)
IMSHARE	-1.0024		-2.9627	I(1)	-5.48866	-2.9665	I(1)

**TABLE A2
RESULTS OF BOUND TESTING FOR THE EXISTENCE OF COINTEGRATION**

F-statistic	5% level critical value	
	I(0)	I(1)
1.2163	4.05	4.49

**TABLE A3
ESTIMATES OF LONG RUN COEFFICIENT ARDL (1,0)
DEPENDENT VARIABLE: GDP [FROM EQUATION (2)]**

Function	Estimates	p-value
f_1	1.95E+07	.595

**TABLE A4
ESTIMATES OF THE ERROR CORRECTION REPRESENTATION**

Variables	Coefficient	t-ratio	p-value	R ²
Δ IMSHARE	8858010	2.6675	.013	.41385
ECM (-1)	-.12488	-1.8974	.069	

**TABLE A5
LR TEST OF BLOCK GRANGER NON-CASUALTY IN VAR**

Variable to be non-causal: Growth		Variable to be non-causal: Net flow of immigrants	
Value of LR statistic	P-value	Value of LR statistic	P-value
7.3623	.195	10.5908	.06

TABLE A6
GENERALISED IMPULSE RESPONSES TO ONE SE SHOCK IN THE EQUATION FOR GDP
UNRESTRICTED VECTOR AUTOREGRESSIVE MODEL

Based on 29 observations from 1978 to 2006. Order of VAR = 3
List of variables included in the unrestricted VAR:
GDP IMSHARE
List of deterministic and/or exogenous variables:
CONST

Horizon	GDP	IMSHARE
0	10530.6	.1523E-3
1	19091.6	.4022E-3
2	20986.5	.2843E-3
3	19804.6	.4225E-4
4	19768.1	-.3700E-4
5	21086.8	.7717E-4
6	21939.0	.1961E-3
7	21832.9	.2048E-3
8	21872.3	.1538E-3
9	22880.5	.1357E-3
10	24465.3	.1646E-3
11	25820.1	.1939E-3
12	26724.7	.1950E-3

TABLE A7
GENERALISED IMPULSE RESPONSES TO ONE SE SHOCK IN THE EQUATION FOR
IMSHARE UNRESTRICTED VECTOR AUTOREGRESSIVE MODEL

Based on 29 observations from 1978 to 2006. Order of VAR = 3
List of variables included in the unrestricted VAR:
GDP IMSHARE
List of deterministic and/or exogenous variables:
CONST

Horizon	GDP	IMSHARE
0	3092.4	.5186E-3
1	4777.2	.3187E-3
2	6272.3	.5596E-4
3	9005.0	-.6245E-4
4	11550.8	.1578E-4
5	12137.4	.9517E-4
6	11105.2	.8755E-4
7	10187.0	.4706E-4
8	10369.6	.4766E-4
9	11235.6	.8395E-4
10	11986.6	.1074E-3
11	12414.2	.9947E-4
12	12812.9	.8302E-4

TABLE A8
GENERALISED IMPULSE RESPONSES TO ONE SE SHOCK IN THE EQUATION FOR
IMSHARE UNRESTRICTED VECTOR AUTOREGRESSIVE MODEL

Based on 30 observations from 1977 to 2006. Order of VAR = 2
List of variables included in the unrestricted VAR:
IMSHARE WAGE
List of deterministic and/or exogenous variables:
CONST

Horizon	IMSHARE	WAGE
0	.6103E-3	.20461
1	.4324E-3	.69124
2	.1666E-3	1.0861
3	.2196E-4	1.2905
4	-.1011E-4	1.3461
5	.1048E-4	1.3245
6	.3953E-4	1.2778
7	.5879E-4	1.2313
8	.6657E-4	1.1918
9	.6712E-4	1.1582
10	.6472E-4	1.1279
11	.6188E-4	1.0989
12	.5949E-4	1.0703

TABLE A9
GENERALISED IMPULSE RESPONSES TO ONE SE SHOCK IN THE EQUATION FOR
IMSHARE UNRESTRICTED VECTOR AUTOREGRESSIVE MODEL

Based on 27 observations from 1977 to 2006. Order of VAR = 5
List of variables included in the unrestricted VAR:
IMSHARE UNRATE
List of deterministic and/or exogenous variables:
CONST

Horizon	IMSHARE	UNRATE
0	.6548E-3	-.0078483
1	.5839E-3	-.16737
2	.3731E-3	-.13956
3	.2456E-3	-.37001
4	.2631E-3	-.79955
5	.4533E-3	-1.0907
6	.4463E-3	-1.1430
7	.3617E-3	-.95478
8	.3263E-3	-.75922
9	.3562E-3	-.68126
10	.4281E-3	-.69143
11	.4323E-3	-.74845
12	.3887E-3	-.80996

TABLE A10
DESCRIPTIVE STATISTICS OF PANEL DATA (FIGURES IN THOUSANDS)

Variable	Mean	Std. Dev.	Minimum	Maximum
net flow	31150	52274.32	-7000	244000
imshare	.002875	.0027238	-.0014	.0133
outflow	59.98333	94.53786	6	397
unemployment rate	2.93125	.8038312	1.575	5.025
wage	10.32367	1.271411	8.53	14.93
Skilled population	4869.167	7451.661	1158	29894
average	40.81551	8.70228	22.8387	47.5952

Sources of data: Labour force survey, New Earnings Survey, Office of National Statistics, UK Data Archive, ESDS government and UK population Census.

Note: outflow = outflow of migrants; net flow = algebraic summation of inflows and outflows; imshare = share of immigration in the total population.

TABLE A11
RESULTS OF FE ESTIMATOR

Dependent variable: lnwage				Dependent variable: Unrate			
Regressor	Coefficient	P-value	R ²	Regressor	Coefficient	P-value	R ²
imshare	-2.87717	.150	.98	imshare	-23.38	.42	.60
outflow	-.000064	.758		outflow	-.0026	.53	
lnskilpop	.510591	.007		lnskilpop	-8.75	.02	
avage	-.000432	.683		avage	-.025	.24	

TABLE A12
RESULTS OF RE ESTIMATOR (PANEL DATA)

Dependent variable: lnwage				Dependent variable: Unrate			
Regressor	Coefficient	P-value	R ²	Regressor	Coefficient	P-value	R ²
imres	-2.271914	0.157	.97	imres	-10.69	.69	.54
outflow	-.0000407	0.860		outflow	-.00008	.98	
lnskilpop	.0696752	0.094		lnskilpop	-.564	.28	
avage	.0000293	0.979		avage	-.0386	.02	

TABLE A13
RESULTS OF BE ESTIMATOR

Dependent variable: lnwage				Dependent variable: Unrate			
Regressor	Coefficient	P-value	R ²	Regressor	Coefficient	P-value	R ²
imres	28.6149	0.016	.69	imres	34.47	.71	.44
outflow	-.001	0.239		outflow	.0095	.27	
lnskilpop	.1348	0.180		lnskilpop	-1.584	.12	
avage	-.0027	0.402		avage	-.019	.54	