The local labour market effects of immigration in the UK

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Executive summary

This report, commissioned by the UK Home Office, is concerned with an empirical analysis of the impact of immigration on outcomes of currently resident workers in local labour markets. Until now, no such analysis has been undertaken for the UK. Our investigation is therefore the first to consider this important issue for the UK. The report attempts to provide a comprehensive analysis of the mechanisms by which immigration may have an effect on labour market outcomes of workers. This involves careful analysis of relevant theoretical economic models. Based on these considerations, an empirical analysis is attempted, drawing together several UK data sources which are appropriate for this purpose. The report carefully examines the empirical problems that may arise, and discusses implementable remedies. The analysis concentrates on employment effects and on wage effects of immigration. Distinctions are made, where possible and meaningful, between different demographic groups, and different skill groups.

Our results show consistency across different data sources. The main finding is that if there is an impact of immigration on unemployment then it is statistically poorly determined and probably small in size. The estimation of effects of immigration on wages is based on fewer years' data. Higher immigration appears to be associated with higher wage growth in the currently resident population.

We draw attention to many weaknesses in the available data and conceptual problems in the empirical analysis all of which should urge caution before drawing strong conclusions. Nonetheless it seems to be fair to conclude that on current evidence fear of large and negative employment and wage effects on the resident population are not easily justifiable. The perception that immigrants take away jobs from the existing population, thus contributing to large increases in unemployment, or that immigrants depress wages of existing workers, do not find confirmation in the analysis of data laid out in this report.

Chapter 2 briefly discusses economic theory regarding the effects of immigration on eco-

nomic outcomes. We show that usual theoretical models do not establish a presumption for or against the existence of long run employment or wage effects. On a theoretical level, the effects of immigration on labour market outcomes depend crucially on assumptions regarding the flexibility of the economy in other respects and the tradability of its output on world markets. More specifically, if the economy is characterised by a large and heterogenous traded goods sector, employment and wages may be insensitive to immigration, at least in the long run. In such a case, the long run effect of immigration is absorbed by changes in the output mix. If, on the other hand, there is little flexibility in the output mix of traded goods, then it may in fact seem more reasonable to expect long run effects of immigration on both wages and employment.

It is therefore quite compatible with standard economic theory for immigration to have no long run wage or employment effects. Even within such models, however, short run effects are typically to be expected as the economy adjusts, provided that the skill composition of the immigrant inflows differs from that of the resident population.

Chapter 2 reviews briefly the findings of literature on the impact of immigration on wages and employment. The basic message of nearly all studies for the US and for European countries is clear: adverse employment and wage effects of immigration are, if they exist at all, very small.

The chapter also explains briefly the several sources of data used for the analysis in this report.

Chapter 3 discusses the problems that may arise in empirical estimations, suggests ways to address these problems, and explains in more detail the extent to which these solutions are implementable using the data sources available for the UK. The main conclusions to be drawn from this discussion are:

- simple correlations between the level of the immigrant / non-immigrant ratio and economic outcomes are likely to give misleading indications about the effect of immigration,

since persistent differences in the stock of immigrants across regions may be correlated with persistent differences in economic prosperity.

- Correlation between the inflow of immigrants and the change in economic outcomes between two points in time, and across local areas, may likewise lead to misleading estimates of immigration impacts, as shocks to the economic success of a particular region may lead to increased immigration.

- Out-migration of existing residents as a response to economic effects of immigration may again compromise the accuracy of the estimated impact of immigration.

We explain in detail how these problems can be addressed, and how possible solutions are implemented in later sections.

Chapter 4 analyses data from the Censuses of 1971-1991 and the New Earnings Surveys of 1980-1990. These data sources have serious weaknesses in the current context, particularly in that they do not allow a distinction to be drawn between unemployment and wage levels of those already resident and those of immigrants. The basic results from the most robust estimators indicate an association between higher immigration inflows, lower employment growth and higher wage growth. However it is impossible, given the nature of the data, to infer any effects on employment or wages of existing residents.

Chapter 5 analyses data from the Labour Force Survey. Access to the microdata on individual outcomes allows considerably more robust conclusions to be drawn. There is some weak evidence that immigration affects employment prospects of existing residents negatively but estimated effects are typically small and statistical precision is weak. Wages seem to be, if anything, positively affected by immigration inflows but again statistical reliability of these estimates is sometimes weak. Future research needs to address this point in more detail using better data.

Chapter 6 discusses the results of our analysis, draws some tentative conclusions, and gives

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some recommendations. The basic finding is that there is no strong evidence that immigration has any large adverse effects on employment prospects or wages of existing residents.

1 Introduction

Motivation: the possible negative effects of immigration on wages and employment outcomes of already resident workers is one of the core concerns in the public debate on immigration. The possibility that changes in the size or composition of the labour force resulting from immigration could harm the labour market prospects of some such workers is compatible with simple theoretical models. Not surprisingly, therefore, research on wage and employment effects of immigration is one of the core areas of migration research in economics. There are, as we explain below, a considerable number of papers addressing the labour market impact of immigration for the US, and some papers for other European countries. The common conclusion of this work, apart from a small number of exceptions, is that immigration has only very small or no effect on employment and wages of workers already resident. No work exists for the UK. The purpose of the current research is to fill this gap, and to conduct such an exploration.

Aims and Objectives: the objective of this report is to use suitable data sources for the UK to estimate models that help to assess the effect of immigration on employment and wages of already resident workers. Where possible and meaningful, we will distinguish between different groups in the existing population, like males and females, and different skill groups. To achieve this objective, we need to address a large array of issues both on the theoretical as well as the empirical level. The report aims to provide a comprehensive picture of the way immigration affects labour market outcomes of already resident workers, embedded into an exhaustive discussion of underlying theoretical mechanisms discussed in the literature, and under the constraints given by the availability of data sources; to point out directions of future research necessary to answer more detailed questions; to point out the shortcomings of data sources currently available, and how they may compromise the reliability of the results.

Methodology: the analysis of labour market effects of immigration requires methodological work both on a theoretical level as well as on the empirical level. In a first step, we develop the appropriate economic theory. We will seek to be thorough, as different assumptions

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about the structure of the economy may lead to differences in the (long run) effects that immigration may have on labour market outcomes of already resident workers. We explicitly acknowledge the multiplicity of dimensions in which the economy can adjust to immigration and the openness of the economy to trade in final output.

Our empirical model is directly derived from the theoretical work, and allows, therefore, a straightforward interpretation of parameters within the framework set out by the theory. The dominant methodology, followed also in this report, is to seek to infer labour market effects from spatial correlations between local immigrant inflows and local changes in the labour market outcomes of those already resident. At the stage of empirical implementation, this methodology raises a number of important issues. Most of these relate to a clear isolation of the effect of immigration on labour market outcomes of workers already resident from other associated phenomena, particularly in a context where immigrant inflows are themselves the outcome of economic decisions. Much of the empirical literature is concerned with addressing these problems. We shall discuss the appropriate empirical strategies to solve these problems, and implement them as far as available data allows.

Key limitations of the data analysis: one problem with studies of the impact of immigration on labour market outcomes is that spatial information is necessary to construct measures of regional concentration of immigrants. Many survey data sets do not include detailed spatial information - for instance, the Labour Force Survey (LFS) includes spatial information only at regional level. A further problem is that surveys contain only small numbers of immigrants, so that the concentrations of immigrants in small spatial units may be mismeasured. Also, sample size may be an obstacle to any impact analysis that is intended to distinguish between different groups in the existing population (for instance, groups defined by gender or skills).

Administrative data sets like the Census solve the problem of small sample size, and, in principle, allow also to use a finer spatial allocation. On the other hand, Census data is available only once every decade. Furthermore, limited information in these data sets on

background characteristics restricts possibilities for a detailed impact analysis for specific skill and demographic groups. In this report, we will use data from three sources: the LFS, the NES, and the Census. Where appropriate, we will combine these data sources. The data are complementary both in the time period they cover, and in the groups they allow us to analyse. Where they overlap, they allow us to check the robustness of our results.

Policy relevance: the main objective of this report is to inform the government and the public about the effects of immigration on wages and employment of the existing population. This has arisen partly as a result of concerns over the potential negative effects of migration. The research may help in forming a picture of the effects of immigration based on data rather than opinion. The work included in this report is particularly valuable as it is the first empirical study for the UK. The study identifies a number of areas where more precise statements require more detailed analysis based on additional data sources, some of which may become available in the future.

Structure of report: we commence in the next chapter with a detailed account of the background to this literature. This includes the relevant economic theory that underlies the subsequent empirical work, and a discussion of the problems which occur on the empirical level. Next we explain the data sources we use. We then report results of our empirical analysis, first for employment effects, and then for wage effects. Finally, we draw conclusions and suggest avenues for future work.

2 Background

Theory

The theoretical analysis of the labour market effects of immigration sees effects as arising from the changes it introduces in supply of skills and consequent change in labour market equilibrium. Typically a distinction is drawn between skilled and unskilled labour. Immigration inflows affect the skill composition of the labour force if the skill composition of immigrants does not match the already existing skill composition. This change in skill composition leads to disequilibrium between supply and demand of different labour types at existing wages, prices and output levels. Restoration of equilibrium will almost certainly involve short run changes in wages and employment levels of different skill types and may or may not require long run changes[1].

The literature includes different approaches to theoretical modelling of these processes and different conclusions about the nature of long run effects. The main differences in assumptions made involve

- differences in the number of goods produced and therefore in the flexibility of the economy to adapt through changes in mix of outputs

- differences in openness of the goods sector to trade and therefore in the extent to which output prices are set locally or on world markets.

Models assuming limited flexibility of output mix or closedness to international trade tend to predict that immigration will have long run wage and employment effects. Such

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[1]Another less common approach (see for example Lalonde and Topel 1991) treats immigrant and nonimmigrant labour as different labour types. In such a model the effect of immigration depends on substitutability between immigrant labour and nonimmigrant labour of different skill levels. The form of equations arising for estimation are nonetheless not dissimilar to those under the more common approach.

features are typical of the underlying framework used as a motivation for empirical work in this literature (see for example the models of Borjas 1999 or Card 2001).[2].

On the other hand, models assuming a sufficiently high degree of flexibility in output mix and openness to trade predict an absence of long run effects on labour market outcomes, at least to small scale immigration. Leamer and Levinsohn (1995) refer to this as the hypothesis of *factor price insensitivity*[3]. In the context of discussion of immigration this is sometimes referred to as the *structural hypothesis*. Although it is not often a feature of the models favoured in the empirical literature on the impact of immigration, this fact is sometimes mentioned [4] (see, for example, Borjas 1999, Card 2001 or Pischke and Velling 1997, Chiswick 1993). Several recent contributions lay more stress on the need for models with multiple goods and openness to trade (see, for example, Kuhn and Wooton 1991, Scheve and Slaughter 2001, Hanson and Slaughter 1999, 2001, Gaston and Nelson 2000, 2001).

In associated technical research (reported in Dustmann, Fabbri and Preston 2001) we lay out a comprehensive equilibrium model of the effects of immigration on the labour market. This model is intended to subsume the range of models in the literature and to provide a guide to specifications used in estimation. The basic model has the following features:

- the economy produces several goods using several labour types;

- some of these goods are traded internationally at prices fixed on world markets;

- the number of workers of each labour type is determined by immigration and their labour is flexibly supplied depending on the wage; and

- in the long run, there is free entry of firms into profitable sectors.

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[2]In this, these models share the features of standard models used in the broader literature on wage determination. See, for example, the influential papers of Katz and Murphy 1992 or Murphy and Welch 1992.

[3]This result is related to the well known factor price equalisation result of trade theory - see, for example, Woodland 1982, Samuelson 1948 - although it is a weaker result.

[4]Maybe because most applications are to the US, which is less plausibly viewed as a small open economy than, say, the UK.

We assume conventionally that in such an economy, wages, prices and output levels vary in the long run

- to maintain equilibrium between supply and demand in labour markets

- to maintain equilibrium between supply and demand in product markets

- to maintain no incentive to further entry of firms by keeping zero profits in goods markets.

The nature of the labour market impact of immigration depends crucially on the scope for absorbing the impact through changes in the mix of output in the traded goods sector. Compare, for example, different scenarios.

- Firstly, consider an economy with a small and homogeneous traded goods sector (and, therefore, relatively little flexibility in the output mix of traded goods). In this case, long run responses do involve long run changes in the wage and employment structure as well as output structure. The lack of flexibility in output mix means that there are insufficient degrees of freedom to accommodate changes in the skill mix through changes in the output mix. Wage changes are therefore not zero even in the long run. Immigration will lead to falling wages for certain skill types but can also lead to rises in wages for skill groups complementary to immigrating labour. This is the sort of case typically presented as theoretical background literature to empirical studies.

- Secondly, consider an economy with a large and heterogeneous traded goods sector (and, therefore, relatively high flexibility in the output mix of traded goods). In such an economy, long run wages and employment levels are insensitive to immigration. This is the Leamer and Levinsohn (1995) *long run factor price insensitivity* result already discussed. Wages are determined by world prices and technology. Rather than impacting on wages, long run effects of immigration are felt in the output mix.

However, wages can be affected in the short run. The mechanism by which the economy adjusts is as follows. Any depressive effects on wages lead to positive profits being earned in sectors using intensively labour types which become cheaper. As a consequence, output in such sectors expands, driving back up wages. In the long run, equilibrium will be restored with wages driven back to their initial levels.

To clarify these points, consider a number of simple examples. (In all of these we assume output of all goods to be traded at fixed world prices.)

- First suppose that the economy consists of *one good and one labour type* only. Immigration leads to an excess supply of labour at the going wage rate and therefore depresses the wage in the short run. However, this causes positive profits to be made. As a result, output expands, which leads to the wage increasing again. In the long run, restoration of zero profits requires that the equilibrium wage is the same and output is higher. Factor price insensitivity holds.

- Now consider the case of *one good and two labour types*. If immigration raises the share of one skill group, then that skill group suffers short and long run wage falls. Suppose for example that immigration is skilled, thus raising the economy's endowment of skilled labour. This leads, at existing wage rates, to an excess supply of skilled labour and consequent downward pressure on wages of skilled workers. In order to restore labour market equilibrium, wages of skilled workers fall and this may lead these workers to reduce their supply of labour, thus leading also to an employment effect. Equilibrium wages of unskilled workers will also change. Output may change in the long run but such changes will not restore the initial wages. Factor price insensitivity does not hold.

- Finally, suppose that there are *two goods and two labour types*. If immigration raises the share of one skill group, then that skill group suffers short run wage falls relative to the other skill group. The sector using that skill group intensively will become relatively profitable. Accordingly, it expands, bidding the wages of that skill group

back up relative to the other skill group. Adjustments are now no longer a matter simply of technical substitution in production of a single output. In the long run wages return to their initial level and the output mix shifts towards the sector using relatively intensively the labour type which dominates in immigration. This is an application of the well known *Rybczinski theorem* (see Rybczinski 1955). Factor price insensitivity holds.

Models of this sort are plainly an abstraction intended to point to pertinent considerations in assessing the likely effect. This exposition (which we formulate in much detail in the associated technical paper) shows that a variety of possible outcomes are compatible with economic theory. Immigration may depress wages and employment of some existing residents and possibly raise those of others. However, it is by no means inconsistent with economic theory to think that long run responses to immigration may involve no effect. What matters is the openness of the economy to trade[5] and the flexibility of the economy to adjust in respects other than wages and in particular through the mix of output produced.

In the short run, disequilibria can exist, allowing excess demand or supply of labour and positive or negative profits in particular markets. Out of equilibrium, unfilled vacancies and spare capacity can exist so that immigrants might fill jobs without immediate displacement of existing workers. However one might expect such immigration to affect the speed and nature of processes driving the economy back towards equilibrium.

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[5]It should be noted that the empirical analysis below applies to regions within the UK. These are certainly open to trade with each other for much of their production.

Previous literature

An extensive empirical literature exists on the impact of immigrants on the labour markets of host countries (see Borjas 1994, 1999, or Friedberg and Hunt 1995 for an overview). Most of these studies relate to the US (see for example, Altonji and Card 1991; Borjas, Freeman and Katz 1996; Card 1990, Card 2001; Kuhn and Wooton 1991; Lalonde and Topel 1991) and typically use microdata from the US census. The common consensus of most of this work is that the impact of immigration on wages and employment in local labour markets is, if at all, modest. Much less work exists for countries outside the US. Pischke and Velling (1994) and de New and Zimmermann (1994) and Haisken-de New and Zimmermann (1999) analyse data for Germany, Hunt (1992) analyses data for France, Carrington and Lima (1996) analyse data for Portugal, Winter-Ebmer and Zweimüller (1996, 1999) analyse Austria and Angrist and Kugler 2001 analyse data for Western Europe in general. Findings of these studies are typically in line with the US evidence, establishing only small effects of immigration on local labour markets. To our knowledge no comparable work exists for the UK.

We illustrate the consensus in the literature with a number of quotes. Representative for the US literature are the following statements:

Lalonde and Topel 1991:"... increased immigration reduces the wages and earnings of immigrants and their close substitutes, though in our view the effects are not large ... Labor market effects on non-immigrants appear to be quantitatively unimportant."

Altonji and Card 1991: "Our empirical findings indicate a modest degree of competition between immigrants and less skilled natives ... We find little evidence that inflows of immigrants are associated with large or systematic effects on the employment or unemployment rates of less skilled natives."

Card 2001: "The conclusion that immigrant inflows affect native employment rates is new. However, the implied effects for natives as a whole are very small. Even for workers in the bottom of the skill distribution, I find relatively modest employment effects of recent

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immigrant inflows in all but a few high - immigrant cities."

Conclusions of studies for Europe are very similar:

de New and Zimmermann 1994: "Immigration ... appears to have an overall negative effect on German wages. ... However ... the estimated effects are far from being dramatic and are well in line with economic theory."

Pischke and Velling 1997: "there is little evidence for displacement effects due to immigration."

Winter-Ebmer and Zweimüller 1999: "The results indicate only a modest impact of immigration on the unemployment risk for native employees."

Data used for the analysis

The Labour Force Survey (LFS) is a continuous household survey, conducted by the Office for National Statistics (ONS) which provides a wide range of data on labour market statistics and related topics such as training, qualifications, income and disability. The data from the survey are used extensively both within and outside government. The LFS has been running since spring 1992 in its present form although an LFS has been carried out in the UK since 1973. Between 1973 and 1983 a biennial survey was carried out during the Spring. Between 1983 and 1991, the LFS was undertaken annually in the Spring of each year and before that every two years, beginning in 1973, originally to derive comparable labour market statistics that were required for the UK's accession to the European Union in 1975. The sample size was around 60,000 households in each survey, around 0.5 percent of the population. In Spring 1992, for the first time, the data were made available quarterly, with a quarterly sample size approximately equivalent to that of the previous annual data, thus becoming the Quarterly Labour Force Survey. Each quarter interviews are achieved at about 59,000 addresses with about 138,000 respondents. A core of questions covering household, family structure, basic housing information and demographic details of individuals in the households is included in every survey, together with non-core questions which vary from quarter to quarter. The British LFS contains spatial information only at regional level, except for a brief interval between 1997 and 1999 when data was made available at county level.

The New Earnings Survey (NES) is an annual survey of the weekly earnings and hours worked of individual employees in England, Scotland and Wales. (Northern Ireland conducts its own, separate survey.) Carried out every April by the Office for National Statistics, it is based on a 1 per cent random sample of employees in Pay As You Earn (PAYE) schemes. NES has been in operation since 1970, and uses an average of 170,000 records each year. NES data normally refer to full-time employees on adult rates whose pay for the survey period was not affected by absence. The information is available at county level.

The Census of Population data sets is a questionnaire survey of the UK population held

every ten years. The aim of the Census is to obtain a picture of the socio-economic state of the country. The three years used for this study are 1971, 1981 and 1991 (these are also the only ones available electronically). They contain information on total population, gender, age, marital status, country of birth, economic activity, employment status and various household characteristics. Additional information can be found in the more detailed 1991 version, like ethnic group, qualifications and weekly hours worked.

The information is available only in selected tables of aggregate data for geographical areas of the UK which broadly correspond to administrative areas. This implies a limited use of the data if further disaggregation is required in the analysis. In our case, for instance, we cannot obtain information on number of immigrants by qualification, gender or employment status.

The Technical Annex contains further details on the creation of the data set used for this analysis.

3   Empirical implementation

The dominant approach to estimation of such a model in the literature is that referred to by Borjas (1999) as the "spatial correlations" approach. 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 the US context, the spatial units usually used for empirical analysis are standard metropolitan statistical areas.

Problems in estimation

The typical empirical study regresses a measure of employment or wages of workers already resident in a given area on relative quantities of immigrants in that particular locality and appropriate controls. At the stage of empirical implementation, a number of issues arise, and much of the recent literature has been concerned with addressing these. We discuss these problems and the way they may be solved below.

Fixed effects

- *Problem:* levels of immigrant shares and levels of labour market outcomes may be spatially correlated because of common fixed influences. The fact that, for example, immigrant populations may be concentrated in areas of enduring low or high economic prosperity may be a consequence of historic settlement patterns and policies. This may lead to a positive or negative statistical correlation between immigrant concentration and economic outcomes, even in the absence of any genuine effects of immigration.

- *Response:* the statistical solution to this problem is to estimate models in a way that removes any such "fixed effects." Two approaches to this are common. One is to estimate the relationship using *differences*, which is to say to relate the *changes* in immigrant concentration between two points in time to *changes* in economic outcomes.

Taking differences eliminates any persistent effects present in all periods. A second approach, known as *within groups estimation*, relates deviations from mean immigrant concentration for the spatial unit to deviations from mean economic outcome. This second approach is equivalent to including a full set of dummy variables for the relevant spatial units. We use both techniques below.

Measurement error

- *Problem:* measures of immigrant concentrations may suffer from measurement error due to small sample size[6]. Furthermore, the consequences of any measurement error in measures of regional concentration of immigrants are aggravated when using methods proposed above for eliminating the problem of fixed effects, since these tend to magnify the importance of the measurement error relative to the informative variation in the data. Measurement error leads to a tendency towards finding no effect even when one is present in reality. The mismeasured inflows will be less strongly associated with labour market outcomes than the true inflows, and the estimated effects may therefore be biased towards zero. This is known as attenuation bias. It will typically be a minor problem where sample sizes used to derive measures of immigrant inflows are large (for instance when large sub-samples from national censuses are used), but may be more serious where smaller data sources are employed (as in part of our analysis).

- *Response:* suppose that there exist other measured variables believed to be correlated with the true inflows and not otherwise associated with labour market outcomes. Any association in data between these variables and labour market outcomes can reflect only the influence of the true inflows on labour market outcomes. Variables of this sort are known as *instruments* and offer a solution to the problem of measurement error. The

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[6]Measurement error due to sampling imprecision will be zero on average. It is therefore not to be thought of as similar to the sort of systematic measurement error which could arise through misreporting, poor data definition and so on.

technique of *instrumental variables regression* uses the additional information that they provide to obtain unbiased estimates of the effects.

Examples of instruments in the context of measurement error would be alternative measures of immigrant flows from other surveys, or variables believed to exert a causal influence on the true immigrant flows, and which are measured with uncorrelated measurement error. Such variables are discussed further below when discussing solutions to simultaneity problems. [7]

Simultaneity

- *Problem:* the direction of causality between immigrant inflows and labour market outcomes is not necessarily clear-cut. Immigrants may be attracted to those areas that are enjoying current economic success. In this case it is not only that immigrant inflows are driving labour market changes, but that labour market changes are driving inflows. This selective settlement would lead to an upwardly biased estimate of the effects of immigrants' concentration on labour market outcomes. Specifically, any depressive impact of immigration on wages could be masked by the fact that the inflows of immigrants occur most strongly in regions where the effect is offset by positive economic shocks.

- *Response:* a possible solution to this problem uses the technique of *instrumental variables regression* already discussed above. Suppose there is some observed variable that is unrelated to current economic shocks to a particular area, but that is related to inflows of immigrants. Using the terminology we introduced above, this variable would be an instrument and would offer a means to derive unbiased estimates of effects.

  What could qualify as an instrument? Consider the factors that determine the decision of immigrants to settle in a particular area. Immigrants may take the relative economic

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[7]The technique of *errors-in-variables regression* offers an alternative or complementary method if the size of the sampling error on spatial observations can be estimated and used to correct estimated effects. We do not pursue this possibility in this report.

prosperity of an area, induced by current economic shocks, as one reason for settlement - this is what creates the problem. They may however also take account of other aspects of an area, such as existing networks and the presence of individuals with the same culture and language as themselves. Thus, besides possibly choosing areas that were subject to favourable recent economic shocks, immigrants may tend to settle in areas with already high immigrant concentrations. Pre-existing immigrant concentrations are unlikely to be correlated with current economic shocks if measured with a sufficient time lag, since existing concentrations are determined not by current economic conditions, but by historic settlement patterns of previous immigrants. Therefore, historic settlement patterns may help to solve the simultaneity problem. Using this information may then help to identify the effects of the inflow of immigrants on economic outcomes[8].

It has to be stressed that the assumption that lagged values of immigrant stocks are correlated with employment changes only through their relation with immigrant inflows is an identifying assumption that is not testable. It could be problematic if local economic shocks were persistent and instruments were insufficiently lagged. The strength of correlation between lagged concentrations and current inflows is observable in data and can therefore be assessed.

Flows of currently resident workers

- *Problem:* local labour markets are not in fact closed economies and workers are free to move in or out. If immigration does drive down local wages for certain skill groups then one would expect there to be pressure for currently resident workers of that skill type to move elsewhere to gain high wages. This will tend to disperse the wage impact of immigration through the national economy and undermine the ability to identify the wage impact from looking at effects within localities. This leads to estimates of the effect

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[8]Work following this approach has been influenced by the findings of Bartel (1989) who argued that immigrants in the US tend to settle in areas where immigrant settlement is already strong.

of immigration on wages or employment of workers currently resident in local labour markets that are not as negative as the effects which would obtain without internal migration responses. This point has been stressed in numerous contributions. The US literature contains conflicting opinions on the seriousness of the problem. Borjas (1999), Frey (1995, 1996) and Filer (1992), for example, regard it as more serious than, say, Card and di Nardo (2000) or Card (2001).

- *Response:* the econometric problem identified here is one of an omitted term in the estimated equation. The most attractive resolution to this problem is available if outflows of those already resident are observable and therefore amenable to incorporation directly into the estimation, as is the case in one of our data sources. However such outflows are likely to be correlated with shocks to local economic conditions for the same reasons as immigrant flows, discussed above, creating a further simultaneity issue. These outflows therefore also need instrumenting and it is theoretically less clear what would serve as a suitable instrument. In practice we rely on lagged values.

Estimation strategy

Bearing in mind the prior discussion, we provide estimates using a range of econometric techniques. While several of these have obvious drawbacks they nonetheless offer a useful point of comparison to results of more robust methodologies and also to comparable results in the empirical literatures for other countries.

We estimate an equation regressing labour market outcomes on immigrant population shares, either in levels or in differenced form. In all estimated specifications we include a full set of year effects so that aggregate time series variation is completely absorbed. In other words we allow labour market outcomes in all spatial units to differ over time by common year-on-year effects. Immigration may certainly have an important impact at the level of the whole economy but we do not think it wise to attempt to disentangle this from the effects of cyclical variation empirically. We are aware of no study which does this. In all estimations

based on the LFS, we also include controls for average age of immigrants and non-immigrants. These are taken as given in subsequent discussion. Size of non-immigrant skill groups are also entered as controls in order to allow for the effect of outflows of existing workers.[9]

We usually report results using the following three estimation techniques:

Ordinary Least Squares Regression in Levels: in this case the effect of immigration on economic outcomes is being identified from the period-by-period cross sectional correlation between relative immigrant stocks and employment levels. This offers a basic and straightforward point of comparison. However it is clearly subject to a number of serious problems, which we have discussed above. Firstly, it produces biased estimates if there are fixed sources of correlation between immigrant shares and employment, which do not reflect the causal effect of interest. Secondly, it is vulnerable to measurement error in the immigrant shares. And finally, it is vulnerable to simultaneity problems if booming areas attract immigrant settlement.

Within Groups Regression, Ordinary Least Squares Regression in Differences: adding region-specific effects to a levels regression or estimating a relationship between differences over time in immigrant shares and differences over time in employment will absorb any fixed element in the cross-sectional variation. Identification of the effect is now from changes over time in the pattern of cross-sectional variation. Either of these is significantly more robust than simple OLS. However both still have problems with measurement error and simultaneity.

Instrumental Variables Regression in Differences: combining estimation in differences with use of instrumental variables also addresses the issues of measurement error and simultaneity. In many ways this is the most attractive approach. However it is crucially reliant on auxiliary assumptions about the appropriateness of the chosen instrumental variables.

As we have discussed above, an instrumental variable (i) needs to be correlated with the changes in the immigrant shares and (ii) must not be correlated with changes in employment for any other reason. For our work with the LFS, we take two- and three-period lagged values

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[9]We impose the standard assumption that equiproportionate changes in all skill groups will have no effect.

of immigrant shares and of non-immigrant skill supplies as instruments. For our work with Census data or NES data, we take immigrant shares at the beginning of the previous decade as instruments.

4 Analysis of Census and NES data

We commence our analysis with data from the 1971, 1981, and 1991 Censuses (for estimating employment effects of immigration), and a combination of Census data with the 1980 and 1990 New Earnings Survey data (for estimating wage effects of immigration). The Census provides very accurate data on immigrant concentration and unemployment rates at a variety of spatial levels. We concentrate attention on the data at county level. Information is available in the form of selected published cross tabulations. The frequency of data collection is relatively low and the most recent available information is for 1991.[10]

The New Earnings Survey provides data on wages at a relatively disaggregated spatial level and can be combined with the Census data for 1981 and 1991. This is the only long run source of wage data available.

Based on these data sources, we have constructed variables that measure the concentration of immigrants in each census year in a particular county. We have also constructed measures of county level unemployment rates, again for each available census year. The choice of spatial unit is intended to correspond in some approximate sense to a local labour market. Choosing county gives us considerably more observations than choosing, say, region but it is arguably too small a spatial unit for the purpose. Results reported below using LFS are based on region as the spatial unit and offer an interesting point of comparison.

Information in the Census does not allow for a breakdown across UK-born and foreign-born individuals; the information we use is thus an average, including all groups[11]. This is a serious weakness since we cannot tell to what extent, if at all, any employment or wage effects found reflect effects on those already resident. The best we can do is to conduct a simple analysis of the impact of immigration on unemployment. The information available allows

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[10]Further tabulations for a large subsample of records are available from the Longitudinal Survey. These will be used in future work.

[11]Raw census data does, of course, distinguish individuals by country of birth but the published cross-tabulations used for our analysis do not make the necessary distinctions

Table 4.1: Effect of immigration on total unemployment

		Levels		Differences	
		OLS	Within groups	OLS	IV
Census 1971-1991	Coefficient	-0.046	0.177	0.226	0.605
	t value	(1.28)	(2.64)	(2.29)	(2.74)
	Sample size	192	192	128	64

further to estimate models using each of the above estimation strategies, therefore enhancing the robustness of our results towards possible contamination due to the problems we have discussed above.

Unemployment

We commence by analysing the impact of immigration on unemployment. Table 4.1 reports various estimates of the relationship between immigrant concentration and unemployment based on county level census data. In all cases the reported effect is that of an increase in the ratio of immigrant to non-immigrant population on unemployment rate in the population as a whole. The fact that our dependent variable includes non-immigrant and immigrant unemployment is a serious shortcoming - it means, for example, that we cannot distinguish between the possibilities that immigrants themselves fail to find work and that immigration leads to unemployment among those already resident.

The first column reports an estimate based on simple OLS regression. This is an estimate based on the correlations between levels of unemployment and immigrant concentration in the three census cross sections. Since this is a simple two dimensional correlation, we can use also a graphical representation for illustration. We have done this in Figure 4.1. The estimate is small and negative though statistically insignificant and accords with the impression from the Figure that - particularly in the later two years - unemployment rates are negatively associated with immigrant concentration.

OLS is a method, however, with serious weaknesses, as discussed in earlier sections. Firstly
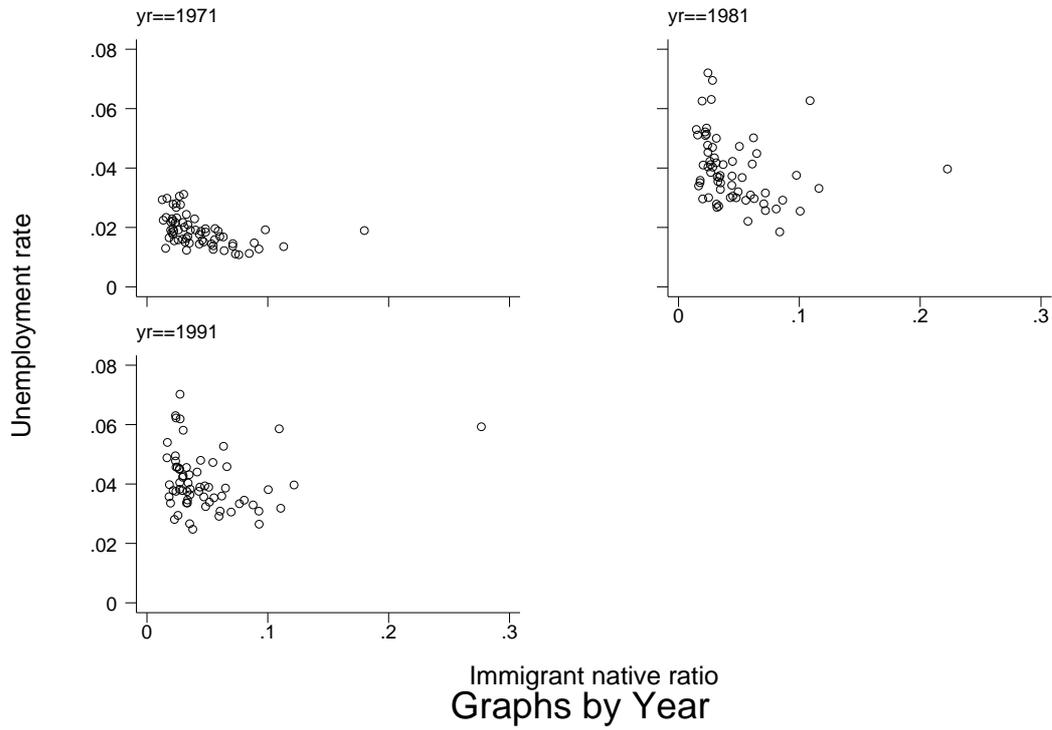
Figure 4.1: Level of unemployment and immigrant concentration: Census
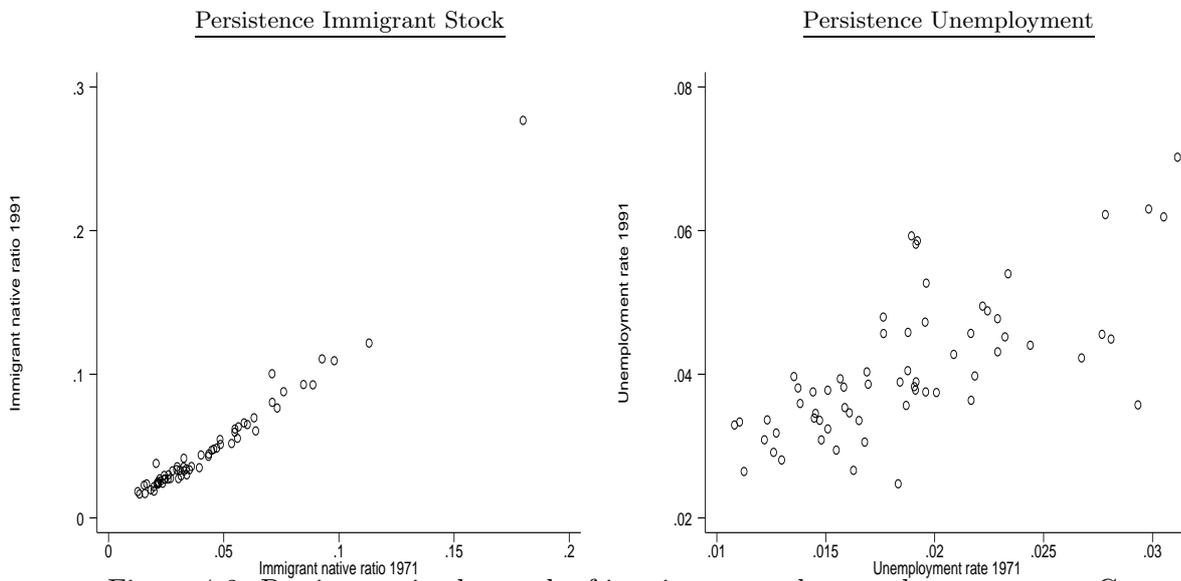
Figure 4.2: Persistence in the stock of immigrants and unemployment rates: Census

it may give seriously biased estimates of the effect if there are persistent and correlated county level effects in the variables under consideration. This is best illustrated in Figure 4.2, where we use census data for the years 1971 and 1991. In the figure, we plot the concentration of immigrants (left panel) and the unemployment rate (right panel) in 1971 against the concentration of immigrants and the unemployment rate in 1991. Each point refers to a pair of one county at two points in time. The visual impression is of strong persistence in both the immigrant-non-immigrant population ratio and the rate of unemployment.

Accordingly, a simple correlation between, say, the unemployment rate and immigrant concentration could reflect this persistence, rather than genuine effects of immigration on employment. Whether this leads to positive or negative bias in estimated effects depends on whether immigrants settle predominantly in regions with high or low unemployment. Whichever is the case, the figures suggest the potential importance of using estimation approaches which eliminate the persistence in both the stock of immigrants and economic conditions.

The second and third columns of Table 4.1 report a within groups estimate and an OLS estimate in differences. These should both be robust to persistent correlated effects of this sort. Both estimates are positive and significant and of comparable magnitude. Figure 4.3 shows the relationship between changes in unemployment and changes in immigrant concentration. Although counties of high immigrant concentration have low unemployment, counties where immigrant concentrations increased - particularly between 1981 and 1991 - tended to be those where unemployment also increased. The estimated coefficients suggest a very mild effect of immigration on unemployment. According to these estimates, an increase in the immigrant population by one percent of the existing population is associated with an increase in the percentage of the population unemployed of about 0.17 (for the within groups estimator) or 0.22 (for the difference estimator).

It is apparent from the figure that the relationship in the two decades may differ. Across both decades, it is also clear from the figure that one county, Greater London, enjoyed a

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yr==1981   yr==1991

Change in Unemployment rate
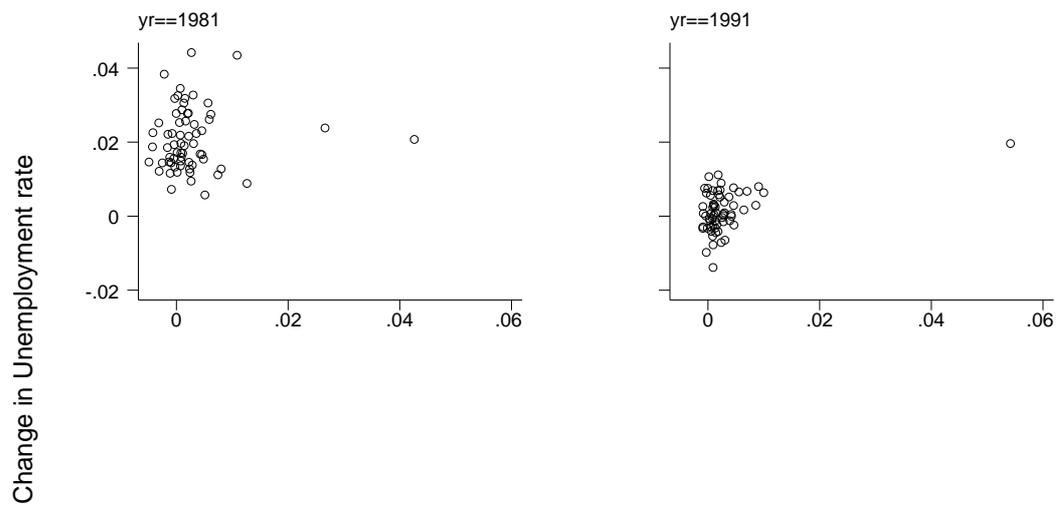
Change in Immigrant native ratio

Graphs by Year

Figure 4.3: Changes in unemployment and immigrant inflow: Census

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Table 4.2: Effect of immigration on total unemployment
Census 1971-1991

	OLS, Differences		
	All counties	London excluded	London excluded
	1981-1991	1971-1991	1981-1991
Coefficient	0.380	0.184	0.568
t value	(10.41)	(0.66)	(3.02)
Sample size	126	64	63

substantially higher influx of immigrants than any other. To address concerns that this particular observation may be driving the results or that the decades may differ, we report also results based on selected samples in Table 4.2. We see firstly that the association between the changes is much stronger if we restrict attention to the more recent decade - the impact of immigration seems to double, and it is highly significant. Secondly, if we retain all census years for estimation, we see that the estimated effect does indeed fall and become statistically insignificant (though it remains positive) if we exclude London. However, if we take only the latter decade, excluding London strengthens the estimated effect.[12]

The estimates based on difference estimation suffer from possible bias, as we have discussed above. Most particularly, they may be biased if positive (or negative) shocks to local economic conditions influence immigrants' location decisions. This is a problem of simultaneity as discussed in previous sections. To address this issue we use instrumental variables techniques to arrive at the estimate in the final column of Table 4.1. This estimate is based on the correlation between changes in unemployment between 1981 and 1991 and that part of the change in immigrant concentration over that period that we can predict from immigrant concentration in 1971. Since the immigrant concentration in 1971 is unlikely to be correlated

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[12]The special role of the capital is something deserving greater attention and we intend to pursue it in future work. Since there is no question of mismeasurement involved in the outlying London observations, it could be persuasively argued that removing them amounts to ignoring the most informative data in the sample and is not therefore desirable. At a deeper level, any difference in experience within London is something which it would be desirable to model.

with temporary aspects of economic conditions over the period from 1981 to 1991, this estimate should not suffer from any simultaneity problem and may be regarded as the most technically robust of the estimates based on Census data[13].

The IV estimate of the effect of immigration on unemployment is positive and statistically significant. Furthermore it is larger than the OLS estimate in differences. This is in line with what we would expect: if immigrants respond to positive shocks to local economic conditions, then the difference estimator should lead to an overly optimistic picture of the effect of immigration on unemployment.

This estimate, although being the most robust to be obtained from Census data, has a number of remaining problems that may compromise its reliability. Firstly, the dependent variable is unemployment in the whole population. Even if an association has been indicated between immigrant inflows and growth in unemployment, it is impossible on the basis of these results alone to say whether that is because the immigrants themselves are failing to find work or because employment in the existing population is declining as a consequence. Secondly, no controls have been included in the regression to capture nonimmigrant outflows or changes in nonimmigrant characteristics. If the economic effects of immigration were to lead to outflows of more employable workers in the existing population then this could show up as an effect of this sort even if no jobs were being lost in the existing population. For these reasons we regard these results as indicative at best. Such issues are better addressed using Labour Force Survey data, as is done below.

Notice finally that it is essential to the reliability of the IV estimator that the earlier year's immigrant concentration be strongly correlated with the change in the later decade. We have discussed in previous chapters reasons why we might expect this to be so but this is an issue which we can check in our data. Figure 4.4 illustrates the correlation between stock of immigrants in 1971 and the change in the immigrant population between 1981 and

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[13]The reduction in sample size reflects the fact that the changes from 1971-1981 are no longer used since there is no instrument available.
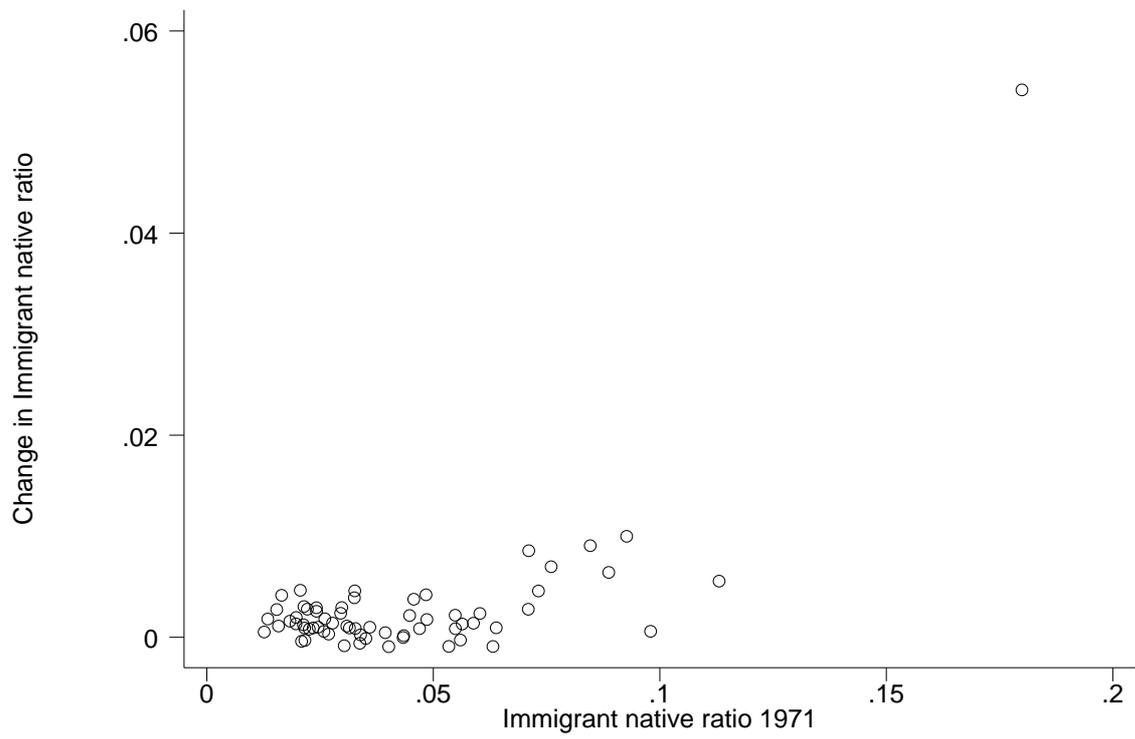
Figure 4.4: Stock of immigrants 1971 and change in immigrant population 1981-1991: Census

1991. There is certainly a strong positive association driven by the outlying observation for London. Moreover the positive association remains and is statistically strong even if we exclude London.

Wages

For an analysis of effects on wages we turn to the New Earnings Survey. Again we rely on published tabulations and are unable to distinguish between non-immigrant and immigrant wages. NES data is not available for 1970 and results therefore rely on even smaller sample sizes than the employment regressions on census data. The NES however does allow us to distinguish between average wages at county level for males and females, and for manual and non-manual workers. We will use this information in our estimations.

We report results for effects on manual and non-manual workers of different sex separately in Table 4.3. The upper two panels in the table report results for males, and the lower two panels for females. The two panels on the left refer to manual workers, and the two panels on the right to non-manual workers. We report for each of these groups results obtained from simple OLS estimation, estimation in differences, and IV estimation.

Immigrants tend to be settled in areas of high wages. The OLS estimates demonstrate a statistically strong association. To an extent this has to do with high immigrant concentrations in London and the South East, though this is not alone responsible. The four left panels of Figure 4.5, which shows the data for 1991, provides graphical evidence. The horizontal axes carry the immigrant-non-immigrant ratio at county level, and the vertical axes the average wages for manual and non-manual workers (left and right panels), and for males and females (upper and lower panels). All figures clearly show a positive relationship between immigrant ratios and wages.

In the second columns of the table, we estimate models where we use differences in both immigrant concentration, and wages over the 1980's. Estimating the relationship in differences strengthens the size of the estimated effect. This suggest that immigrant settlement

Table 4.3: Effect of immigration on wages
Census and NES 1981-1991

Male	Manual			Non-manual		
	Levels	Differences		Levels	Differences	
	OLS	OLS	IV	OLS	OLS	IV
Coefficient	0.590	1.707	5.132	1.116	3.260	6.997
t value	(5.82)	(3.46)	(1.53)	(7.31)	(4.20)	(1.84)
Sample size	121	121	60	119	59	59
Female	Manual			Non-manual		
	Levels	Differences		Levels	Differences	
	OLS	OLS	IV	OLS	OLS	IV
Coefficient	0.808	2.466	5.780	1.079	3.377	8.818
t value	(7.49)	(2.52)	(1.56)	(6.37)	(3.12)	(1.59)
Sample size	114	54	54	118	58	58

takes place predominantly in areas which exhibited positive wage shocks over this period.

We illustrate this relationship in the right hand side panels of Figure 4.5. The horizontal axes carry the change in immigrant-non-immigrant ratios at county level, and the vertical axes the change in average wages for manual and non-manual workers (left and right panels), and for males and females (upper and lower panels). It is obvious from the graphs that there is a positive relationship between the two. Again, high wage increases in London contribute to the finding, as can be seen in Figure 4.5, but removing London from the estimation would not weaken the estimated effect.

The most robust estimates are based on instrumental variables estimation of the differenced equation, where, as in the last chapter, we use levels of immigrant concentration in 1971 as instruments for changes between 1981 and 1991. Our estimates continue to show a positive relationship, with an even larger coefficient estimate than that obtained from the simple difference estimator. This is true for all skill groups and although these estimates never do better than approach the margin of individual statistical significance, their consistency across groups is impressive.[14]

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[14]It should be noted that far from reducing the estimated effect, excluding London from these regressions
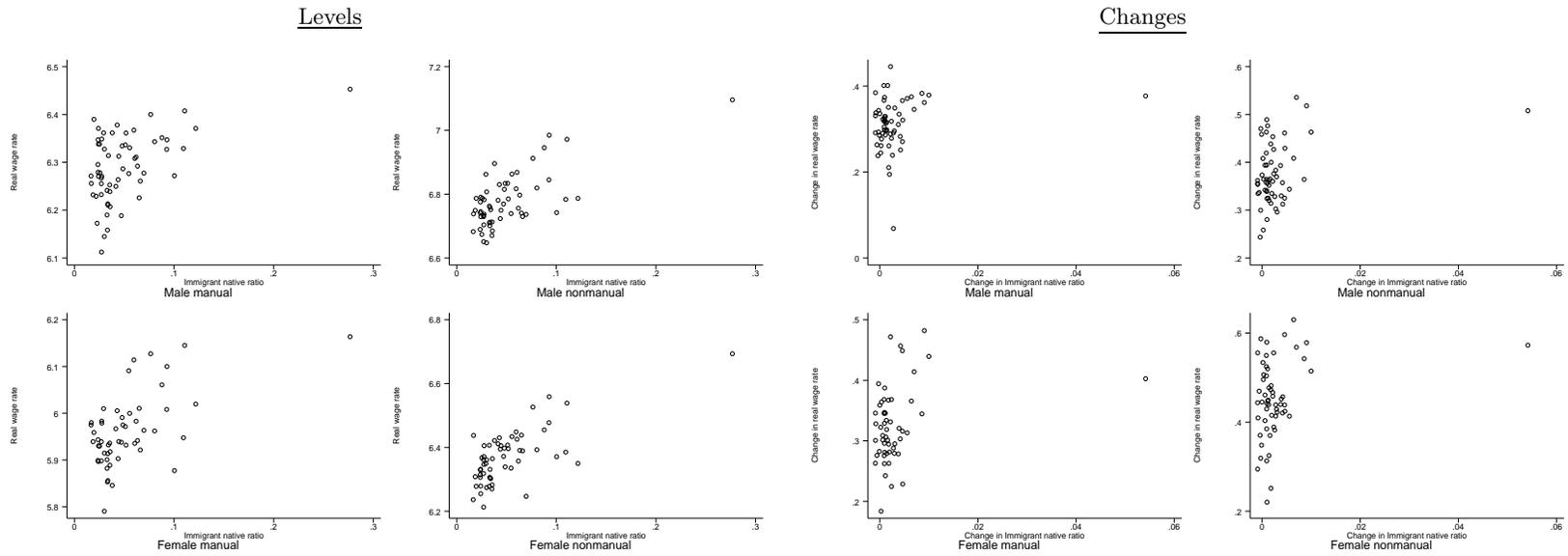
Figure 4.5: Immigrant/non-immigrant ratio and wages: Census and NES

Positive effects on wages of all skill groups are difficult to interpret in terms of the standard theory, which would suggest that if there are any effects at all then at least the group most intensely represented among immigrants should suffer. However, such a finding could be intelligible if immigrants enter the country bringing with them stocks of another factor complementary to all resident labour types. Given that immigration is by its nature an action showing economic initiative, it may be, for example, that immigrants enhance the stock of economic entrepreneurship in localities where they settle. Alternatively immigrants may be prepared to work in very low skilled or onerous occupations which the existing population avoid but which are complementary to the labour of the existing population.

The estimates we have presented in this chapter require the same caveats to be made as were entered at the end of the preceding chapter. The averages calculated for wages cover immigrants as well as the existing population and no allowance is made for out-migration of existing workers. In the next chapter, we will provide results from analysing an alternative data set - the LFS. This data source allows us for more detailed analysis, as the underlying survey data is much richer in information than the census and NES data. The LFS allows us to calculate unemployment rates and wages for non-immigrants alone. It also allows us to address the problem of out-migration in the existing population, as a reaction to the economic impact of immigrant in-migration. On the other side, and as discussed above, the sample sizes for computing regional concentrations of immigrants are small, thus introducing additional problems of measurement error in the analysis.

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typically leads to unreasonably large estimated effects.

5   Analysis of LFS data

Data from the Labour Force Survey is available at a much higher frequency providing substantially more points in the time series dimension. It also allows an analysis of changes in the 1990s (although not the 1970s). Data on employment are available from 1979 onwards and available at yearly frequency from 1983 onwards. Data on wages are available only after 1992.

Because raw microdata is available there is much greater scope to construct variables in ways corresponding to objects of theoretical interest. For example, unemployment rates among non-immigrants can be distinguished from overall unemployment rates allowing a more effective isolation of the economic effect of immigration on the existing population. The presence of relatively rich information on non-immigrant skills also permits estimation of separate equations for different skill types as well as control for outflows of existing workers by skill type.

However sample sizes within years are much smaller and measurement errors therefore more pronounced, particularly as regards the key variable, inflows of immigrants. Spatial information is also weaker with only region distinguished in most years although, as argued above, that need not be disadvantageous.

Unemployment

As before, we commence with an analysis of the impact of immigration on unemployment. Tables 5.2 to 5.8 in the appendix report a full set of a variety of regression estimates of the employment effects of immigration using LFS data. In all of these regressions, unlike those of the previous chapter using Census data, the estimates control for the effect of flows of non-immigrant workers and for changes in the age of non-immigrant workers. This is potentially important, as the demographic structure across spatial units and across time may differ, and

outflows of non-immigrant workers may be correlated with inflows of immigrants[15].
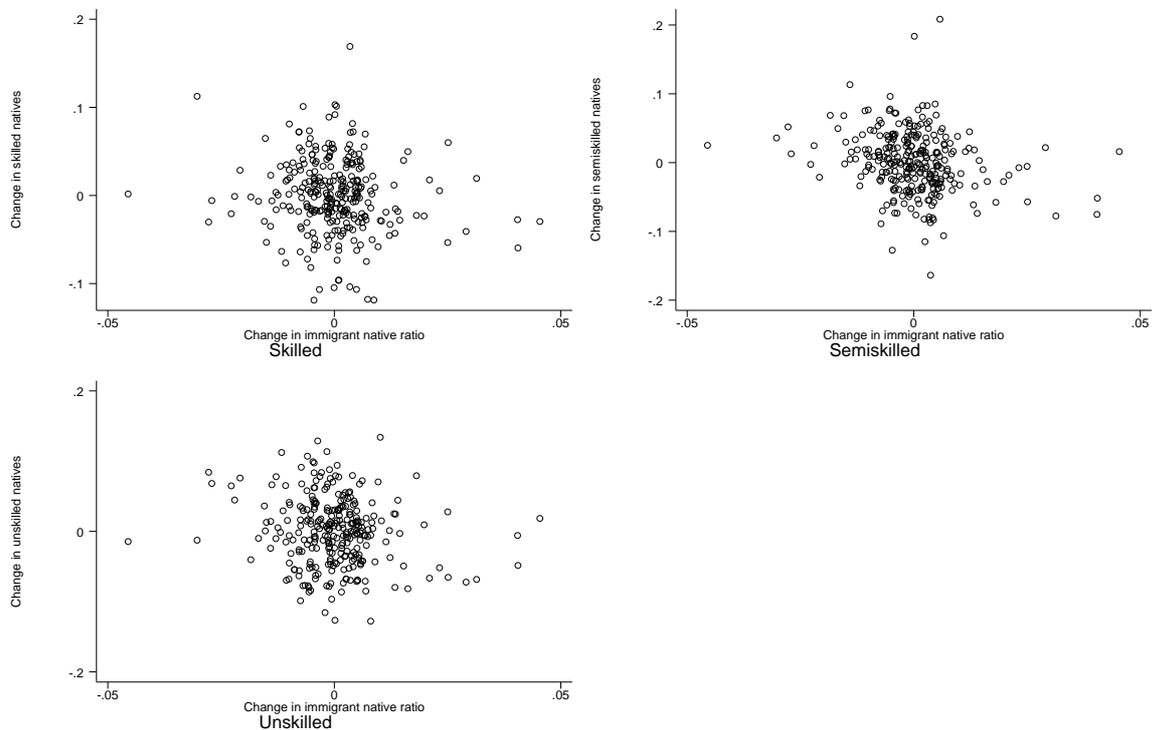
Figure 5.1: Changes in non-immigrant workforce and changes in immigrant concentration: LFS

In Figure 5.1 we present a plot of changes in non-immigrant workforce by skill type against changes in immigrant concentration. Though not visually striking there is some evidence here that high outflows of some labour types may be associated, for economic reasons, with growth of immigrant concentration.

Table 5.1 presents a series of different estimates of effects on total non-immigrant unemployment in a way similar to Table 5.1, but based on LFS data, and adding the additional

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[15]We have run the same regressions excluding the sizes of non-immigrant skill groups from regressors and instruments. The results regarding impact of immigration are not, in fact, qualitatively affected. Although we regard this as a theoretically important issue, our treatment of it is not therefore driving our empirical conclusions.

Table 5.1: Effect of immigration on total unemployment

LFS 1983-2000

	Levels		Differences	
	OLS	Within groups	OLS	IV
Coefficient	-0.050	0.245	0.106	0.178
t value	(1.940)	(5.551)	(1.580)	(1.341)
Sample size	306	306	289	255

Levels   Differences
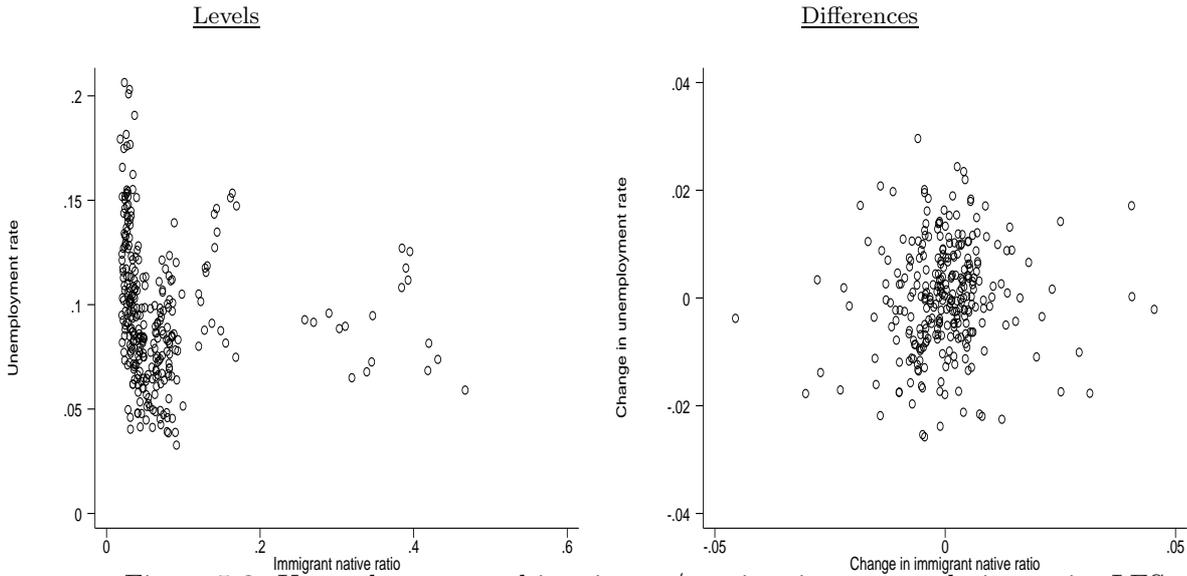
Figure 5.2: Unemployment and immigrant/non-immigrant population ratio: LFS

controls we have just discussed. Although using different data at different frequency over a different period and looking only at unemployment of non-immigrants, the qualitative picture is remarkably similar. OLS regression shows a slight negative relationship between unemployment and immigrant non-immigrant population ratio. We have illustrated this relationship in the left panel of Figure 5.2. Removing persistent correlated effects by within groups estimation or differencing switches the sign of the relationship. Immigration is now associated with a positive increase in unemployment. The relationship between changes in the two variables is shown in the right hand panel of Figure 5.2.[16]

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[16]In this figure, as in all figures in this chapter involving changes, year means of changes are subtracted from the data before plotting to focus attention on the cross sectional pattern of changes which drive the results.

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As before, these estimates may be compromised by the possible simultaneity between immigrant inflows and positive economic shocks, leading to an underestimate of the impact in simple differences. In addition, the possible presence of measurement error in the LFS immigrant flows makes the case for instrumental variables estimation even more convincing than for census data. Using lagged immigrant concentrations as instruments in the differenced equation increases the size of the estimated effect,[17] as we would expect. Nonetheless the final and most robust of these estimates is smaller than the census-based effect and statistically not significant. Therefore, the hypothesis of no effect cannot be rejected. The value of the coefficient is modest and in line with the size of effect typical of studies in other countries such as the US. An increase in immigration amounting to one per cent of the non-immigrant population would lead, according to this result, to an increase of 0.18 percentage points in the non-immigrant unemployment rate.

As already noted, one of the advantages of using LFS data is the ability to analyse effects on different skill groups separately. Table 5.2 reports separate regressions for unemployment among skilled, semiskilled and unskilled workers. The associated data is presented graphically in Figure 5.3. All effects are positive but individually statistically significant only for the semiskilled.[18]

Separating the workforce into demographic groups as in Table 5.3 also reveals estimated effects of similar sign and modest size, though consistently insignificant statistically. There is no strong evidence here that men or women are particularly harmed. Nor is it evident that earlier immigrants - defined here as immigrants arriving before 1981 - suffer specifically.

Table 5.4 separates the population into three age groups and estimates employment effects

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[17]Two- and three-period lags are used as instruments. For full details of specification and full reporting of estimates and associated test statistics consult the Technical annex. The lagged immigrant stocks do prove to be powerful predictors of current immigrant inflows - t values are 3.10 and 3.54. Lagged instruments for changes in non-immigrant skill ratios are however poorer.

[18]Even this is below the critical point for the maximum of three independents t values, suggesting that the evidence for any effect is not strong.
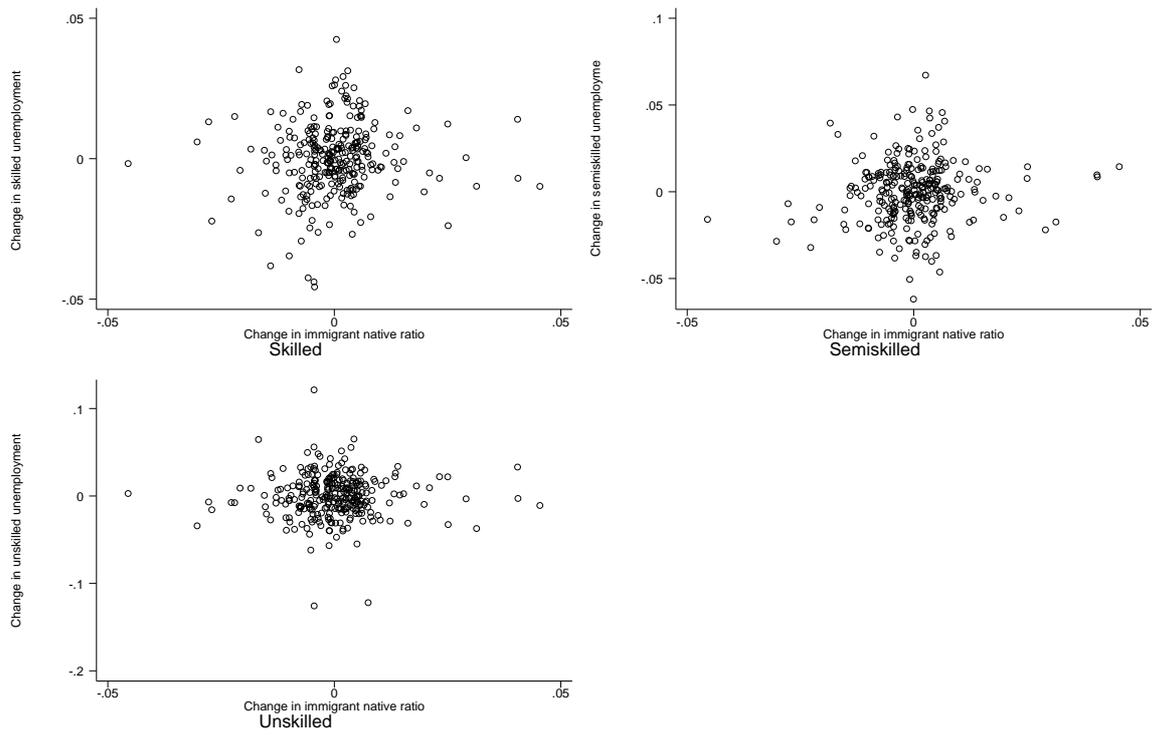
Figure 5.3: Unemployment - immigration, different skill groups

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Table 5.2: Effect of immigration on unemployment by skill group

		IV, Differences		
		Skilled	Semiskilled	Unskilled
LFS 1983-2000	Coefficient	0.104	0.390	0.026
	t value	(0.915)	(2.219)	(0.112)
	Sample size	255	255	255

Table 5.3: Effect of immigration on unemployment by demographic group

		IV, Differences		
		Male	Female	Earlier Immigrant
LFS 1983-2000	Coefficient	0.198	0.154	0.070
	t value	(1.206)	(1.329)	(0.047)
	Sample size	255	255	255

Table 5.4: Effect of immigration on unemployment by age
LFS 1983-2000

	IV, Differences		
	Age 20-35	Age 36-50	Age 51-65
Coefficient	0.206	0.070	0.292
t value	(1.463)	(0.366)	(1.961)
Sample size	255	255	255

for each. The largest effect is for the oldest group but even here the coefficient is only on the margin of conventional statistical significance.

Finally, Table 5.5 returns to effect on total unemployment, but disaggregates the immigrant inflow according to its source and gender. On the whole, these estimates are very imprecise and give no strong indication that immigration from particular source areas or of particular genders have more deleterious effects on non-immigrant employment than do others.

In none of these specifications have the dynamics of the relationship been explored. We

Table 5.5: Effect of immigration on total unemployment by gender and source of immigration

		IV, Differences	
		Coefficient	*t* value
	Gender of immigration		
	Male	-0.207	(0.364)
	Female	0.283	(0.678)
	Sample size	255	
LFS 1983-1999		Coefficient	*t* value
	Source of immigration		
	New Commonwealth	-0.057	(0.155)
	Ireland	2.616	(1.768)
	Other European Union	-0.255	(0.176)
	Other	0.175	(0.683)
	Sample size	255	

have been unable to find statistically reliable and well determined estimates of dynamic specifications and have therefore refrained from commenting on differences between short run and long run effects. We note however that considerations of economic theory suggest that long run adjustments to immigration are likely to lower the magnitude of effects and that the estimates here, as hybrids of long and short run impact, are likely to overestimate long run responses.

Wages

We now turn to analysis of wages. We would like to interpret the results we present here with care, as the data for computing wage averages from the LFS is rather small - wages are firstly only available over the period between 1992 and 2000. Secondly, wage information is available for each individual only at one or at most two interviews during the course of the survey. This reduces considerably the number of observations on which computation of wage averages is based, as well as the number of time periods available for estimation. Nevertheless, we consider the results as interesting, in particular as they exhibit a remarkable similarity to

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those obtained from the Census and the NES over an earlier period.

Table 5.6: Effect of immigration on wages
LFS 1992-2000

	Levels		Differences	
	OLS	Within groups	OLS	IV
Coefficient	0.644	0.863	0.159	1.869
t value	(5.049)	(1.550)	(0.222)	(2.184)
Sample size	153	136	136	102

Table 5.6 reports estimates regarding effects on wages. Figure 5.4 presents the data graphically in levels and differences. The pattern of results bears striking similarities to those using Census and NES data, even though we now concentrate on non-immigrant wages only. Estimates based on OLS show positive wage effects which become even larger when based on instrumental variables techniques. The preferred estimates are smaller in magnitude than those based on the NES. According to the most robust estimate, an increase in immigration amounting to one per cent of the non-immigrant population would lead to just under a two per cent increase in average non-immigrant wages. As with the NES, results lie around the borderline of conventional statistical significance.

Table 5.7: Effect of immigration on wages by skill group
LFS 1992-2000

	IV, Differences		
	Skilled	Semiskilled	Unskilled
Coefficient	2.163	1.145	2.216
t value	(1.921)	(1.014)	(1.655)
Sample size	102	102	102

In table 5.7 we report coefficients for different skill groups. These estimates are less precise but effects are similarly signed in all three groups considered. This suggests that the possibly puzzling results of analysis using census and NES data are not a statistical oddity dependent on the quirks of a particular survey but probably reflect some underlying economic reality
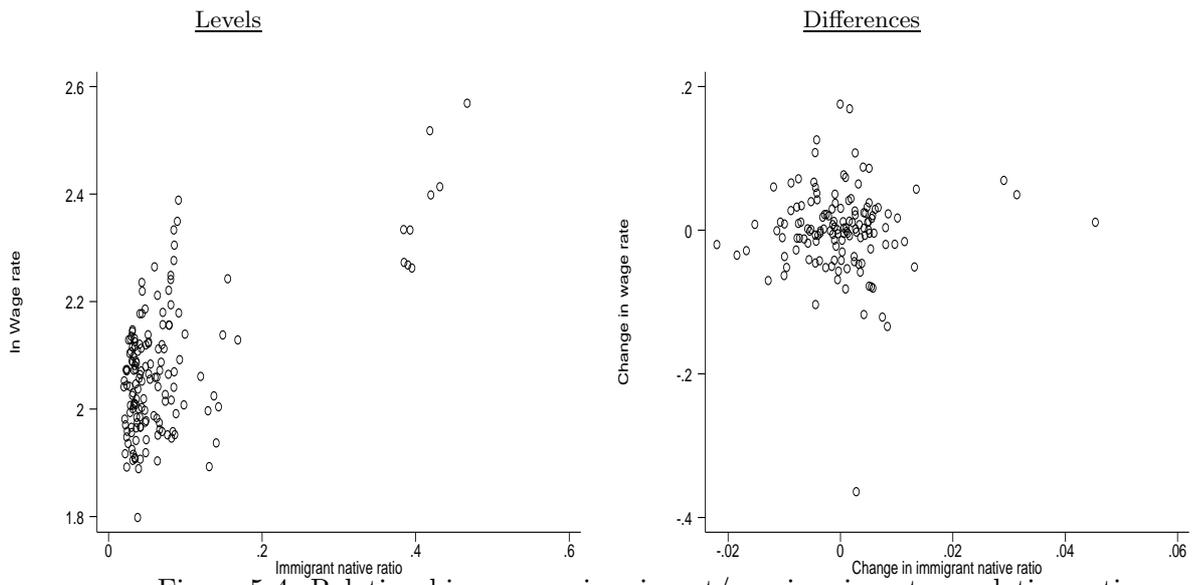
Figure 5.4: Relationship wages - immigrant/non-immigrant population ratio

deserving of further and deeper examination.

6   Discussion and recommendation

Summary of results

In this report, we analyse the impact of immigration on labour market outcomes of already resident workers. A large literature exists for the US, and some studies have explored this issue for other European countries. No analysis has ever attempted to study the UK case. This report is intended to fill this gap. The almost universal conclusion of these studies for other countries is that there is no large discernible impact of immigration on wages or employment of existing workers.

Our discussion of the theoretical background suggests that there are realistic routes by which immigration can affect labour market outcomes but the absence of any long run impact is by no means implausible or inconsistent with theory for the case of an open economy with a large heterogeneous traded goods sector such as the UK. The nature of the impact has to be an empirical question to be resolved through analysis of evidence.

The main result of the empirical analysis is that there is no strong evidence of large adverse effects of immigration on employment or wages of existing workers. In this respect our findings are consistent with empirical results from international research. There is some weak evidence of negative effects on employment but these are small and for most groups of the population it is impossible to reject the absence of any effect with the data used here. Insofar as there is evidence of any effect on wages, it suggests that immigration enhances wage growth.

We have drawn attention to many weaknesses in the available data and conceptual problems in the empirical analysis all of which should urge caution before drawing strong conclusions. Nonetheless it seems to be fair to conclude that on current evidence fear of large and negative employment and wage effects on the resident population are not easily justifiable. The perception that immigrants take away jobs from the existing population, thus contributing to large increases in unemployment, or that immigrants depress wages of existing workers,

do not find confirmation in the analysis of data laid out in this report.

Recommendations for future work

We see our analysis as a first exploration of the available data evidence of the UK. Our analysis has identified a number of problems that are worth study in future research and possibly with future data sources.

In particular, at the stage of empirical implementation, we face a number of problems that partly relate to the data sources we have available, and partly to the specific situation of immigration to the UK. At present the only reliable data source for generating measures of immigrant concentration in different counties of the UK is the census, which is available only at low frequency for a few years and not beyond 1991. The arrival of the 2001 census will constitute a significant improvement of the available data base, allowing additional analysis of migration impact over the last decade. If this analysis can be combined with more detailed Census tabulations - perhaps using Census subsamples - then promising research may result.

The case of London is worth further study. Immigrant concentration in London as a whole far exceeds that elsewhere in any other city of the UK. Concentration and inflows of immigrants into London also differ widely according to area. It is not unlikely that across areas, immigration has had economic effects on the resident population - a possible regularity which is only detectable with data that allows a breakdown according to smaller geographical units within the Greater London area.

The scope for introducing information from other data sources on immigrant flows such as the International Passenger Survey or administrative records, if only as a check on the accuracy of LFS measurement, is something to be investigated.

Another avenue for future research is to investigate directly other dimensions through which immigration can affect the local economy, such as growth and output composition. Furthermore, even staying within the narrow subject matter of the current report, a review of the exact mechanisms through which immigration affects wages of existing workers may

be worthwhile. Results pointing towards positive rather than negative wage effects of immigration - even if not always statistically convincing - also point towards a need for a fuller theoretical understanding. The possibility of positive impacts on the current population by provision of skills currently unavailable or by engagement in entrepreneurial activities that provide opportunities to residents deserves further consideration. Our tentative estimates on wages provide some indication for research in these directions to be rewarding.

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7   Technical annex

Data creation and related problems

The LFS has been carried out yearly from 1983 to 1991 and quarterly from 1992 onwards. To obtain aggregate information at regional level (the smallest geographical unit available), we create population numbers of the quantities of interest summing the (population weighted) number of individuals falling in the specific category for each region and each year. These quantities include number of non-immigrants and immigrants, broken by age, gender, country of origin and skill. This allows to have a set of quantities, reflecting the population composition, with which we can derive the ratios used in the analysis, such as the immigrant/non-immigrant population ratio or the unemployment rate of non-immigrants.

Throughout the empirical analysis reported here, unemployment is defined as the ratio between the unemployed and the total labour force. The definition of who is unemployed follows that favoured by the International Labour Office and requires someone to have looked for work in the previous four weeks[19]. We have investigated sensitivity to our definition of unemployment by also calculating results using the ratio between the unemployed and the total population. These latter results would pick up effects of immigration on economic inactivity which might be missed by our main approach. Results with the alternative definition, though not reported here, are qualitatively very similar to those reported. Skill groups are defined in terms of education. Wages are hourly wages.

As was mentioned in the main chapter, survey data may be characterised by very small sample sizes when analysing specific groups in the population (like immigrants, and when we want to distinguish them by gender and year of arrival). This is due to the fact that immigrants represent a small fraction (9 per cent) of the population (LFS 2000) and that their geographical distribution in the UK appears to be very uneven (about 60 per cent of immigrants of working age are concentrated in the Greater London and South East regions,

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[19]The definition used by the Census is looser.

Table 7.1: Sample size by region
LFS 2000

Region	Total Sample	Immigrants		Ethnic Minority Immigrants	
		All	Less than 35	Before 1981	After 1981
Tyne and Wear	1635	53	31	6	16
Rest North Region	2978	69	32	10	14
S.Yorkshire	1913	66	22	24	16
W.Yorkshire	3129	262	80	104	78
Rest of Yorks & Humbers	2461	77	30	12	6
E.Midlands	5974	337	96	112	56
East Anglia	3138	200	78	14	25
G London	9247	2896	1054	807	919
Rest of SE	15916	1321	434	222	219
S.West	6995	391	127	39	52
W.Midlands	3537	466	134	225	134
Rest of W.Midlands	4057	122	32	25	10
Gt.Manchester	3523	251	94	70	74
Merseyside	1902	47	16	5	11
Rest of North West	3211	135	52	30	29
Wales	4076	129	58	18	34
Scotland	7839	321	147	36	37

against 29 per cent of non-immigrants).

To give an idea of how small the sample size for certain groups and regions can be, we present a summary table from the LFS (second quarter of 2000), containing information by region on the sizes of the total sample and of some sub-samples of immigrants.

In some regions the number of observations relative to immigrants is less than a hundred. If we break the sample further, for instance because we want to focus our research on younger immigrants (column 4) or ethnic minority immigrants who arrived before or after 1981 (column 5 and 6), we further reduce the sample size into numbers that prevent us from obtaining stable estimates.

Analysis of LFS data

The equations estimated have the form

$$\ln w_{it} = \alpha_0 + \alpha_1 \pi_{it} + \alpha_2 \ln \mathbf{n}_{it} + \alpha_3 \mathbf{a}_{it} + \lambda_t^w + \mu_i^w + u_{it}^w \tag{1}$$

$$U_{it} = \beta_0 + \beta_1 \pi_{it} + \beta_2 \ln \mathbf{n}_{it} + \beta_3 \mathbf{a}_{it} + \lambda_t^U + \mu_i^U + u_{it}^U \tag{2}$$

where w_{it} denotes wage, U_{it} denotes unemployment rate, π_{it} denotes the ratio of immigrant to non-immigrant population, $\mathbf{n}_{it}$ denotes a vector of non-immigrant skill group populations and $\mathbf{a}_{it}$ denotes a vector of average ages, all in the ith region in the tth period. Here λ_t^w and λ_t^U are year effects, μ_i^w and μ_i^U are region effects and u_{it}^w and u_{it}^U are disturbance terms.

Homogeneity is imposed on the non-immigrant skill group effects by omitting one skill category and expressing the others as ratios with the size of the omitted skill group.

All estimates are calculated in GAUSS using DPD98 (see Arellano and Bond 1991, 1998). Instrumental variables estimates are calculated by GMM imposing the moment restriction that Δu_{it}^w or Δu_{it}^U is uncorrelated with the chosen instruments, which in each case are two- and three-period lags of the endogenous variables π_{it} and $\mathbf{n}_{it}$. Weighting of restrictions and calculation of standard errors recognises the anticipated first order serial correlation in the differenced residuals.

Tests are reported for first and second order serial correlation of residuals and for the overidentifying restrictions implied by choice of instruments. For all IV estimates reported below there is clear evidence of first order serial correlation, as should be expected given differencing of the residuals, but absence of second order serial correlation cannot be rejected at usual significance levels. The overidentifying restrictions are rejected in none of the specifications reported.

Table 7.2: Effect of immigration on unemployment

LFS 1983-2000

Variable	Levels				Differences			
	OLS		Within groups		OLS		IV	
	Coeff	t value	Coeff	t value	Coeff	t value	Coeff	t value
Immigrant-non-immigrant ratio	-0.050	-1.940	0.245	5.551	0.106	1.580	0.178	1.341
ln skilled/unskilled	-0.046	-6.059	-0.023	-1.928	-0.027	-2.451	-0.228	-1.721
ln semiskilled/unskilled	-0.044	-5.047	0.006	0.534	-0.004	-0.375	0.027	0.505
Mean non-immigrant age / 100	-1.578	-5.178	-0.156	-0.673	-0.082	-0.396	0.739	1.219
Mean immigrant age / 100	-0.033	-0.510	0.177	3.670	0.063	1.392	0.083	1.054
M_1	12.858 p = 0.000		-4.489 p = 0.000		-4.685 p = 0.000		-2.049 p = 0.040	
M_2	11.496 p = 0.000		0.272 p = 0.785		0.515 p = 0.606		0.379 p = 0.705	
W_1	χ_5^2=313.642 p = 0.000		χ_5^2=351.445 p = 0.000		χ_5^2= 14.312 p = 0.014		χ_5^2= 9.853 p = 0.080	
W_2	χ_{17}^2= 234.676 p = 0.000		χ_{17}^2= 356.959 p =0.000		χ_{17}^2=715.994 p = 0.000		χ_{15}^2=220.905 p = 0.000	
S							χ_3^2= 1.833 p = 0.608	
Sample size	306		306		289		255	

Notes:

M_1 is a test for first-order serial correlation, asymptotically distributed as a standard normal

M_2 is a test for second-order serial correlation, asymptotically distributed as a standard normal

W_1 is a Wald test for joint significance of the reported regressors

W_2 is a Wald test for joint significance of the unreported time dummies

S is a χ^2 test of the overidentifying restrictions implied by choice of instruments underlying IV estimates

Table 7.3: Effect of immigration on unemployment by skill group

LFS 1983-2000

| | IV, Differences | | | | | |
| | Skilled | | Semiskilled | | Unskilled | |
Variable	Coeff	t value	Coeff	t value	Coeff	t value
Immigrant-non-immigrant ratio	0.104	0.915	0.390	2.219	0.026	0.112
ln skilled/unskilled	-0.084	-0.768	-0.247	-1.343	-0.233	-0.997
ln semiskilled/unskilled	-0.023	-0.529	0.090	1.269	0.003	0.036
Mean non-immigrant age	0.437	0.869	0.706	1.032	-0.099	-0.086
Mean immigrant age	-0.052	-0.475	0.312	2.953	-0.093	-0.669
Mean skilled non-immigrant age	0.089	0.850				
Mean semiskilled non-immigrant age			0.486	0.642		
Mean unskilled non-immigrant age					0.116	0.238
M_1	-4.968 p = 0.000		-2.141 p = 0.032		-4.240 p = 0.000	
M_2	0.186 p = 0.852		0.944 p = 0.345		-0.632 p = 0.527	
W_1	χ^2_6=6.739 p = 0.346		χ^2_6=14.450 p = 0.025		χ^2_6=5.536 p = 0.477	
W_2	χ^2_{15}= 200.615 p = 0.000		χ^2_{15}= 246.459 p =0.000		χ^2_{15}=60.992 p = 0.000	
S	χ^2_3= 1.187 p = 0.756		χ^2_3= 0.714 p = 0.870		χ^2_3= 0.353 p = 0.950	
Sample size	255		255		255	

Notes:

As for Table 7.2

Table 7.4: Effect of immigration on unemployment by demographic group

LFS 1983-2000

Variable	Male		Female		Earlier Immigrant	
	Coeff	t value	Coeff	t value	Coeff	t value
Immigrant-non-immigrante ratio	0.198	1.206	0.154	1.330	0.071	0.047
ln skilled/unskilled	-0.277	-1.670	-0.154	-1.311	-1.856	-1.234
ln semiskilled/unskilled	0.018	0.273	0.041	0.873	0.250	0.416
Mean non-immigrant age	1.421	1.146	0.346	0.475	7.790	1.131
Mean immigrant age	0.093	0.945	0.073	1.041	-0.772	-0.858
Mean male non-immigrant age	-0.406	-0.486				
Mean female non-immigrant age			0.023	0.039		
M_1	-2.006 p = 0.045		-2.886 p = 0.004		-2.314 p = 0.021	
M_2	0.621 p = 0.534		-0.449 p = 0.654		-1.719 p = 0.086	
W_1	χ^2_5=9.771 p = 0.135		χ^2_6=5.511 p = 0.480		χ^2_6=3.102 p = 0.684	
W_2	χ^2_{15}= 253.392 p = 0.000		χ^2_{15}= 141.670 p =0.000		χ^2_{15}=8.185 p = 0.916	
S	χ^2_3= 1.111 p = 0.774		χ^2_3= 2.259 p = 0.521		χ^2_3= 0.128 p = 0.988	
Sample size	255		255		255	

Notes:

As for Table 7.2

Table 7.5: Effect of immigration on unemployment by age
LFS 1983-1999

	IV, Differences					
	Age 20-35		Age 26-50		Age 51-65	
Variable	Coeff	t value	Coeff	t value	Coeff	t value
Immigrant-non-immigrant ratio	0.207	1.463	0.070	0.366	0.292	1.961
ln skilled/unskilled	-0.134	-0.950	-0.335	-1.766	-0.089	-0.602
ln semiskilled/unskilled	-0.017	-0.302	0.065	0.853	0.032	0.540
Mean non-immigrant age	0.931	1.446	0.940	1.084	-0.350	-0.515
Mean immigrant age	0.160	1.906	-0.026	-0.234	0.009	0.100
M_1	-3.773 p = 0.000		-2.310 p = 0.021		-3.871 p = 0.000	
M_2	1.340 p = 0.180		0.360 p = 0.719		-1.398 p = 0.162	
W_1	χ^2_5=12.392 p = 0.030		χ^2_5=4.527 p = 0.476		χ^2_5=9.836 p = 0.080	
W_2	χ^2_{15}= 297.494 p = 0.000		χ^2_{15}= 48.544 p =0.000		χ^2_{15}=86.942 p = 0.000	
S	χ^2_3= 3.835 p = 0.280		χ^2_3= 1.797 p = 0.616		χ^2_3= 0.234 p = 0.972	
Sample size	255		255		255	

Notes:

As for Table 7.2

Table 7.6: Effect of immigration on total unemployment by gender and source of immigrant flow

Variable	IV, Differences			
	Coeff	t value	Coeff	t value
Male immigrant-non-immigrant ratio	-0.207	-0.364		
Female immigrant-non-immigrant ratio	0.283	0.678		
New Commonwealth			-0.057	-0.155
Ireland			2.616	1.767
Other European Union			-0.255	-0.176
Other			0.175	0.683
ln skilled/unskilled	-0.227	-1.777	-0.196	-1.764
ln semiskilled/unskilled	0.022	0.416	0.050	0.900
Mean non-immigrant age	0.679	1.123	0.546	1.034
Mean immigrant age	0.098	1.134	0.070	0.906
M_1	-2.082 p = 0.037		-2.551 p = 0.011	
M_2	0.208 p = 0.835		0.811 p = 0.417	
W_1	χ^2_6=10.056 p = 0.122		χ^2_8=13.082 p = 0.109	
W_2	χ^2_{15}= 208.664 p = 0.000		χ^2_{15}= 182.752 p =0.000	
S	χ^2_4= 1.873 p = 0.759		χ^2_6= 5.709 p = 0.457	
Sample size	255		255	

Notes:

As for Table 7.2

Table 7.7: Effect of immigration on wages
LFS 1992-2000

	Levels				Differences			
	OLS		Within groups		OLS		IV	
Variable	Coeff	t value	Coeff	t value	Coeff	t value	Coeff	t value
Immigrant-non-immigrant ratio	0.644	5.049	0.863	1.550	0.159663	0.222	1.869	2.184
ln skilled/unskilled	0.189	4.822	0.098	1.020	0.062550	0.558	0.811	1.596
ln semiskilled/unskilled	-0.003	-0.057	-0.015	-0.177	-0.028875	-0.284	-0.848	-0.999
Mean non-immigrant age	-0.604	-0.386	-1.464	-0.748	-1.179443	-0.588	-1.691	-0.625
Mean immigrant age	0.481	1.563	-0.026	-0.072	-0.607462	-1.514	-0.315	-0.658
M_1	3.829 p = 0.000		-2.129 p = 0.033		-1.802 p = 0.072		-1.381 p = 0.167	
M_2	2.858 p = 0.004		-0.855 p = 0.393		-0.755 p = 0.450		-0.843 p = 0.399	
W_1	χ_5^2=272.472 p = 0.000		χ_5^2= 4.513 p = 0.478		χ_5^2=2.970 p = 0.705		χ_5^2=7.558 p = 0.182	
W_2	χ_8^2=26.824 p = 0.001		χ_8^2=33.060 p = 0.000		χ_8^2=41.069 p = 0.000		χ_6^2=15.573 p = 0.016	
S							χ_3^2= 0.589 p = 0.899	
Sample size	153		136		136		102	

Notes:

M_1 is a test for first-order serial correlation, asymptotically distributed as a standard normal

M_2 is a test for second-order serial correlation, asymptotically distributed as a standard normal

W_1 is a Wald test for joint significance of the reported regressors

W_2 is a Wald test for joint significance of the unreported time dummies

S is a χ^2 test of the overidentifying restrictions implied by choice of instruments underlying IV estimates

Table 7.8: Effect of immigration on wages by skill group
LFS 1992-2000

| | IV, Differences | | | | | |
| | Skilled | | Semiskilled | | Unskilled | |
Variable	Coeff	t value	Coeff	t value	Coeff	t value
Immigrant-non-immigrant ratio	2.163	1.921	1.145	1.014	2.216	1.655
ln skilled/unskilled	1.068	1.552	0.074	0.096	0.590	0.792
ln semiskilled/unskilled	-1.336	-1.224	-0.403	-0.294	-0.314	-0.259
Mean non-immigrant age	-3.640	-0.927	-7.535	-2.072	1.161	0.262
Mean immigrant age	-0.214	-0.332	-0.378	-0.590	-1.961	-2.671
Mean skilled non-immigrant age	3.974	1.053				
Mean semiskilled non-immigrant age			6.200	1.745		
Mean unskilled non-immigrant age					-0.981	-0.549
M_1	-1.361 p = 0.174		-1.569 p = 0.117		-3.035 p = 0.002	
M_2	-0.866 p = 0.387		0.046 p = 0.963		-0.692 p = 0.489	
W_1	χ^2_6= 5.813 p = 0.444		χ^2_6= 10.930 p = 0.091		χ^2_6= 9.968 p = 0.126	
W_2	χ^2_6= 11.744 p = 0.068		χ^2_6= 7.261 p = 0.297		χ^2_6= 6.772 p = 0.342	
S	χ^2_3= 0.687 p = 0.876		χ^2_3= 0.850 p = 0.837		χ^2_3= 2.882 p = 0.410	
Sample size	102		102		102	

Notes:

As for Table 7.2