

**“Can a framework for the economic
cost-benefit analysis of various immigration policies
be developed to inform decision making and, if so,
what data are required?”**

Report prepared for the Migration Advisory Committee

by

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“Can a framework for the economic cost-benefit analysis of various immigration policies be developed to inform decision making and, if so, what data are required?”

Executive Summary

This report provides a comprehensive assessment of the costs and benefits of immigration for the UK. It explains the possible mechanisms by which immigration may impact the UK economy and the methodologies and empirical implementations by which such impact may be measured. It provides a comprehensive review of the existing literature, and explains the data sets available that allow analysis in the UK context. It summarises some of the existing work that provides investigation into the costs and benefits of immigration to the UK. While no simple unifying framework exists that allows the assessments of all consequences of immigration, economic research has developed many tools to analyse the impact of immigration on many specific areas. Each of these is presented in this report, and links across areas, where they exist, are made explicit.

The report is structured in different chapters. Chapter 2 explains carefully the economic theory and the concepts behind such analysis. It presents the theoretical models about the way immigration may impact the labour market, and discusses the different adjustment mechanisms that we may expect. This part of the second chapter lays the foundations of the literature review, as well as the description of analyses for the UK. The second part of the chapter provides a conceptual discussion as to how immigration may affect the welfare system, through tax receipts and welfare claims. This part of the chapter lays the foundations for the possible implementation of cost and benefit analyses for the UK.

Chapter 3 is a comprehensive review of the literature that analyses the effect of immigration on the labour market. It discusses the challenges of empirical analyses, and how the current literature is addressing the key problems. It reviews the different approaches that can be found in the literature, and briefly discusses their advantages and disadvantages.

Chapter 4 highlights the possible effects immigration may have on the industry structure and technology adjustment, prices, growth, and crime, and – again – discusses the challenges for empirical measurement.

Chapter 5 discusses the literature that assesses the fiscal effects of immigration, and debates the advantages and disadvantages of the different approaches.

Chapter 6 gives a detailed account of the existing data sources that can be used to analyse the various ways immigration affects the British labour market, prices, housing, and crime. Finally, chapter 7 explains how these data sources can be used to implement some of the approaches in the literature to measure the impact of immigration on the labour market, crime, prices, and the housing market. The chapter also provides a very detailed account of the way to implement a fiscal cost and benefit analysis of immigration in the UK context.

Below we list some of the key insights of this report.

- Standard economic models of the type used to study the impact of immigration on wages suggest that immigration will only have an impact on the host country labour market if immigrants differ from natives in some dimension, e.g. their skill composition or capital possession. If immigrants are replicating the native workforce, no effects should be expected.
- Wages are not the only channel by which the receiving economy may react to an inflow of immigrants who change the skill structure of the receiving economy. Other channels are technology or the structure of the industry. Technological changes have been found to be a relevant adjustment channel in some recent empirical work for the US and for Germany.

- If immigrants resemble the native population in both their skill structure and their demand for welfare services, then simple economic models would predict immigration to be neutral to the tax- and benefit system.
- Immigration can affect the tax- and benefit system in essentially two ways: first, by changing the wage structure and, therefore, the taxable income (which requires immigrants to be different from natives in their skill structure). Secondly, by immigrants being different in their demand for welfare services.
- While the literature on the effects of immigration on the labour market and the receiving economy at large has made recognisable progress over the last decade, there are many areas where more research is required. One of these areas, which is hardly developed, is to identify the different types of surpluses immigration may create for the receiving country.
- One of the largest obstacles to analysis of the effects of immigration on the receiving country is the availability of appropriate data. For the UK, there are a number of data sets that allow to analyse various aspects of immigrants' impact on the economy
- Some of the data sources could be significantly improved for the analysis of issues relating to immigration.

1 Introduction

A comprehensive assessment of the cost and benefit of migration is complex. Although there has been remarkable progress over the last 1 ½ decades, the academic literature has not yet fully explored all channels by which migration can induce costs and benefits. This is related to a number of issues. First, the complexity and ever-changing features of migrations:¹ modern technologies, decreasing costs of travel, global product competition, and internationalisation of education, among others, have had a dramatic impact on the way migrations are conducted today. Consequently, much of the literature on migration that dates back some 20 years is investigating migratory phenomena that are distinct from those we observe today. The notion that the changing patterns of migration should affect the way we analyse its costs and benefits is only slowly realised. One example is the assumption of the permanence of migration that underlies much of the empirical work on migration. While the assumption of “permanence” is convenient in a research setting, and has probably been plausible for migration movements to the US in the 1950s and 1960s, it is implausible (and contradicted by the evidence – see e.g. Dustmann and Weiss 2007) for modern migrations to the UK. Thus, the changing patterns of migration require a new thinking both on conceptual level, as well as on the level of empirical implementation. As said, the academic profession has only recently started to address some of these issues.

A second consideration is the fact that the way migration affects receiving and sending economies is far more complex than mirrored in models that consider migrants simply as “factor labour”, and that still constitute the backbone of conceptual and empirical research on the impact, cost and benefit of migrations. To give just some examples: the benefit of migration is related to the surplus migration generates through efficiency gains, as we discuss

¹ We refer here to an “immigrant” as an individual who is born outside the UK, and resides in the UK for reasons other than short-term holidays. We refer to “migration” as the movement of people across national borders for reasons other than short-term vacation. Immigration into the UK is the inflow of foreign born individuals into the UK from the EU27 countries, as well as from outside the EU 27, for reasons other than short-term holidays, and usually work related.

below in more detail. However, standard equilibrium type models (like for instance discussed in Dustmann, Glitz and Frattini 2008) are only able to identify some of the possible surplus mechanisms (i.e. those generated through changes in factor prices). These may not reflect all the relevant channels of surplus generation. For instance, efficiency gains through externalities and productivity spill-over are so far little explored (see Dustmann, Frattini and Preston (2008) for a discussion).

Despite these shortcomings, the standard economic models that are used to analyse migratory phenomena are helpful to systemise our thinking about the costs and benefits migrations bring to the receiving country, and go a long way to structure and support empirical analysis. In this report we review the literature on the quantitative measurement of the effects immigration has on the labour market, prices, industry structure, technology productivity, as well as the literature that investigates the fiscal consequences of immigration. We also report on research findings in these areas for the UK.

We should emphasise however that these are not all aspects of the effects immigration has on the receiving country. Migration is a multi-faceted and complex phenomenon and not all of its consequences can be determined and assessed within an economic framework. Migration may impact on areas of civic society, on culture, cuisine, and some of these effects may be important. However, they are extremely hard to measure and quantify, and we will not look at them in this report.

We commence in section 2 with a systematic discussion and review of existing conceptual work that addresses the various aspects of costs and benefits of migration, from the perspective of the receiving country. We will conclude this section with considerations of aspects that are so far unexplored, but that we consider as important to keep in mind when assessing the existing frameworks.

We will then consider the empirical literature. In section 3 we will discuss the estimation strategies that have been developed to assess the impact of immigration on the labour market,

and present the most important results obtained in the literature. Section 4 will offer an overview of the empirical studies of the effects of immigration on output mix and technological choices of firms, inflation, housing prices, economic growth and crime. Most of these studies use the same toolbox employed for the analysis of labour market effects. In section 5 we discuss the challenges in estimating the fiscal effects of immigration. Studies of the fiscal effects of immigration are treated in isolation from the analysis on other outcomes because the methodologies used are quite different. All of this review will carefully distinguish between static and dynamic considerations, and interpret the usefulness of existing work for the UK context. We will provide an assessment of existing research in the UK context, and suggest possible and doable extensions to provide an extensive cost-benefit analysis in the UK context.

In section 6 we will discuss and describe the data sources that are available to implement these estimation techniques for the UK. Finally, in section 7, we will show how the methodologies described in the review section can be operationalised in the UK context to provide an overall assessment of the costs and benefits of migration on different outcomes.

2 Concepts and Theory

A useful way to think about migrations in the context of this particular call is to distinguish between the following effects of migration movements, from the perspective of the receiving country: migration creates a *surplus*, it leads to *re-distribution*, and it interacts with existing re-distributive mechanisms in the country of destination.

Surplus: migration creates an economic surplus. An important part of any cost-benefit analysis is an assessment of the magnitude of this surplus. This will help assessing the overall benefit of migration for the receiving country. A related question is who the beneficiaries of that surplus are. As we discussed above, not all the mechanisms that generate a surplus through migrations are well understood.

Re-distribution: although migration creates a surplus, this surplus is not evenly distributed among individuals in the receiving country. Further, migration will lead to additional re-distribution. Re-distribution means that migration leads to a change in the distribution of resources, in the sense that some individuals may lose something that they had before migration took place, and some individuals will gain. From a policy perspective, these distributional aspects of migration are important for any cost-benefit analysis and need to be carefully addressed, as they explain among other things, opposition to immigration, even if immigration should increase welfare on average. These considerations emphasise one important insight: it is not sufficient to investigate costs and benefits on average, as the politically important issues are not raised by surplus alone but by re-distribution.

Interaction with existing re-distributive mechanisms: a third important aspect for an analysis of the costs and benefits of migration is the way migration interacts with existing tax- and benefit systems. Immigrants pay taxes, but they also receive benefits. Thus, one question is whether – on average – immigrants pay more in taxes than they receive in benefits. Clearly, this depends in turn on the characteristics of the immigrant population that is considered: on

demographic features, like age and education, on the transferability of their skills and their human capital, on the structure of their families and dependents. Of course, it also depends on the features of the re-distributive system: who pays how much tax, who receives which type of benefit, and who has which entitlements. And finally, for a more dynamic perspective, it depends on the permanence of migrations, and the type of selection of returning migrants (see Dustmann, Fadlon and Weiss (2010) for discussion).

But - as before – not everybody in the receiving country is affected by the impact of migration on the benefit system in the same way. Any re-distributive system leads to unequal contributions and receipts across the population. Migration may change the magnitude of contributions and receipts. For instance, if immigration is low skilled, and immigrants contribute less in taxes than they receive in benefits, then those who bear the largest part of the tax burden per capita may have to contribute more. Thus, although these individuals may benefit from migration through changes in the skill structure, they may also be adversely affected by additional tax contributions. Again, this suggests that – from the policy viewpoint – not just the average contribution of immigrants to the tax- and benefit system is important, but the impact it has on different groups of individuals in the receiving country (see Dustmann and Preston (2006) for a formal discussion of these points, and for empirical analysis of the attitudes towards the economic impact of immigration, distinguishing between labour market and welfare aspects).

2.1 The impact of migration on the labour market

One of the key questions on migration concerns its benefits and costs for the receiving economies. Fears that migration may, at least in the short run, have adverse effects on labour market opportunities of the resident working population are a main reason for opposition to more liberal migration policies. In the next section, we will explain some of the mechanisms, which may lead to negative employment and wage effects of migration, and the circumstances under which adverse effects may not occur.

The first question that arises is how to model immigration and immigrants. Some early papers assume a closed economy, with only one skill type, and capital complementary to labour. In these papers, immigrants are considered as a distinct factor of labour (see e.g. Grossman 1982). Such models give valuable insights into the effects of immigration on wages and returns to capital. However, much of the debate on immigration is about whether immigrants are skilled or unskilled, and how the inflow of immigrants of particular skill endowments affects economic outcomes of skill groups in the resident population. It seems therefore natural to distinguish between different skill groups when modelling the impact of immigration.

Much of the later literature has taken this into account, by distinguishing between different types of labour. However, Grossman's idea that immigrants and natives may be different factors of production has been taken up again in the latest literature, which assumes that immigrants and natives are imperfect substitutes within skill groups (see e.g. Borjas 2003 and Ottaviano and Peri 2008). We will come back to that later.

We will start by discussing a simple model framework and extend it in directions that seem important for studying the possible labour market effects of immigration. We distinguish between skilled and unskilled workers who may be natives (born in the destination economy) or immigrants (born in a country other than the destination economy). We commence by assuming that immigrants and natives within a particular skill group are perfect substitutes, i.e. they are exchangeable. Finally, we assume throughout that capital supply is perfectly elastic. This means that firms obtain capital at a fixed interest rate, which could be thought of as being set on an international market. We thus exclude from our consideration possible redistributive effects of migration from workers to capital owners (see Borjas 1995 for discussion), but concentrate on possible redistribution between skilled and unskilled labour.

Suppose now that such an economy experiences immigration. Immigrants could be either skilled, or unskilled, or both. A first key observation is that immigration only affects

economic outcomes of resident workers if it changes the skill mix of the economy. Suppose further the economy is in labour market equilibrium before immigration in the sense that all workers are fully employed at equilibrium wages, which may differ for the skilled and the unskilled. If now immigration occurs, and immigrants differ in their skill composition from native workers, any change in the skill composition as a result of immigration will lead to disequilibrium between supply of and cost-minimizing demand for different labour types at existing wages and output levels. If for example all immigrants are unskilled, there will be an excess supply of unskilled workers at the going wage rate. Absorption of these new workers into the economy, and restoration of equilibrium will therefore almost certainly involve short-run changes in wages and employment levels of different skill types. Whether effects on wages and employment are permanent or only temporary depends on the different possibilities of the economy to adjust to the labour supply shock induced by immigration and the consequent changes in relative supply of skilled and unskilled workers. In the simplest case the economy produces one good only, and any adjustment to a change in the skill composition of the labour force through immigration will be through wages. In more realistic cases, where the economy consists of multiple sectors, adjustment can also take place by changing the output mix.

For illustration, we compare below the effects of immigration on an economy with only one output good with that on an economy with multiple traded output goods. Technical details can be found in Dustmann, Fabbri and Preston (2005), Dustmann, Frattini and Preston (2008), Dustmann, Glitz and Frattini (2009) or Dustmann and Preston (2006). See also Altonji and Card (1991), Borjas (1995), Friedberg and Hunt (1995), Borjas (1999), Gaston and Nelson (2000), Card (2001) and Glitz (2007) for related discussions.

2.1.1 One output, skilled and unskilled labour

The discussion that follows draws on Dustmann, Glitz and Frattini (2008) who also provide more detail. See also Dustmann, Fabbri and Preston (2005) for a detailed exposition.

We consider first the simplest case, which is one where the economy produces only one output good with a constant returns to scale technology. A constant return to scale technology is a technology where output is doubled if all factors of production are doubled. The three factors of production used in our economy are capital, skilled labour, and unskilled labour. Assume that the rate of return to capital (the interest rate) is set by the world market, and supply of capital is therefore perfectly elastic. Furthermore, assume that labour supply of both skill groups is completely inelastic. This means that workers are willing to work at whatever wage is offered to them. We will relax this assumption later. Finally, assume that the skill composition of immigrants differs from that of native workers. For illustration, we will consider the extreme case where all immigrants are low-skilled. Immigration will now lead to an excess supply of unskilled labour at the pre-immigration wages. Because unskilled labour is in excess supply, firms will therefore be able to satisfy their demand for labour even at lower wages. This leads to a decrease in wages of unskilled workers, which, in turn, increases demand, until all unskilled workers (immigrants and natives) are employed, but at a lower wage than the pre-migration wage.

Accordingly, low-skilled native workers lose as a consequence of immigration. However, a supply shock of unskilled workers leads to relative scarcity of skilled workers in our economy, driving up their wages. Skilled workers therefore enjoy a surplus from immigration. While wages of unskilled workers fall, wages of skilled workers will rise. In our simple economy, the surplus accruing to skilled workers will be higher than the loss to unskilled workers (with the difference often referred to as “immigration surplus”).² We have demonstrated this in figure 1, concentrating on unskilled workers only.

² Note that the owners of capital will neither lose nor win, as the interest rate is assumed to be set on international markets and, thus, capital will be supplied perfectly elastically.

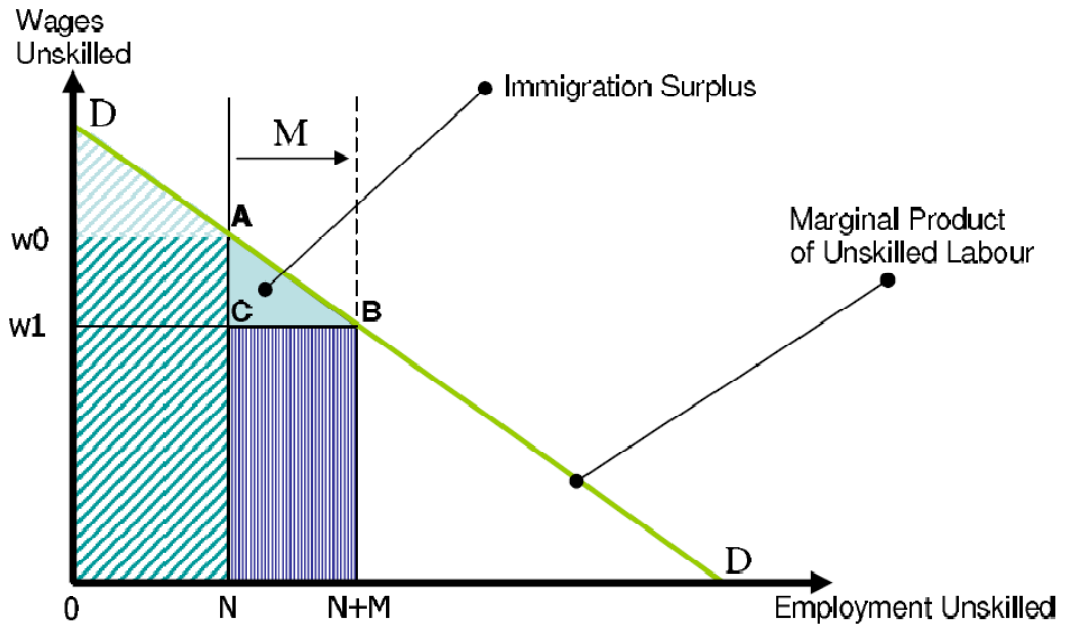


Figure 1: Effects of unskilled immigration

On the vertical axis we have wages, and on the horizontal axis employment. In the pre-migration period, all native workers (N) are employed at wages w_0 , and the pre-migration equilibrium is in point A. Immigration of size M leads to a shift in the (perfectly inelastic) labour supply schedule.

As skilled labour remains constant, this leads to a relative excess supply of unskilled labour, thus driving wages down the marginal product curve. The new equilibrium is in point B, where wages have decreased to w_1 . In this new situation, the total output share that goes to unskilled workers has decreased by an amount reflected by the area of the rectangle ($w_0 - w_1 - A - C$). This share of output falls now to skilled labour. As all unskilled workers including immigrants work at a wage that is equal to the marginal product of the last immigrant, immigrants create an additional surplus, which is given by the area ($A - B - C$) and which also falls to skilled native workers.

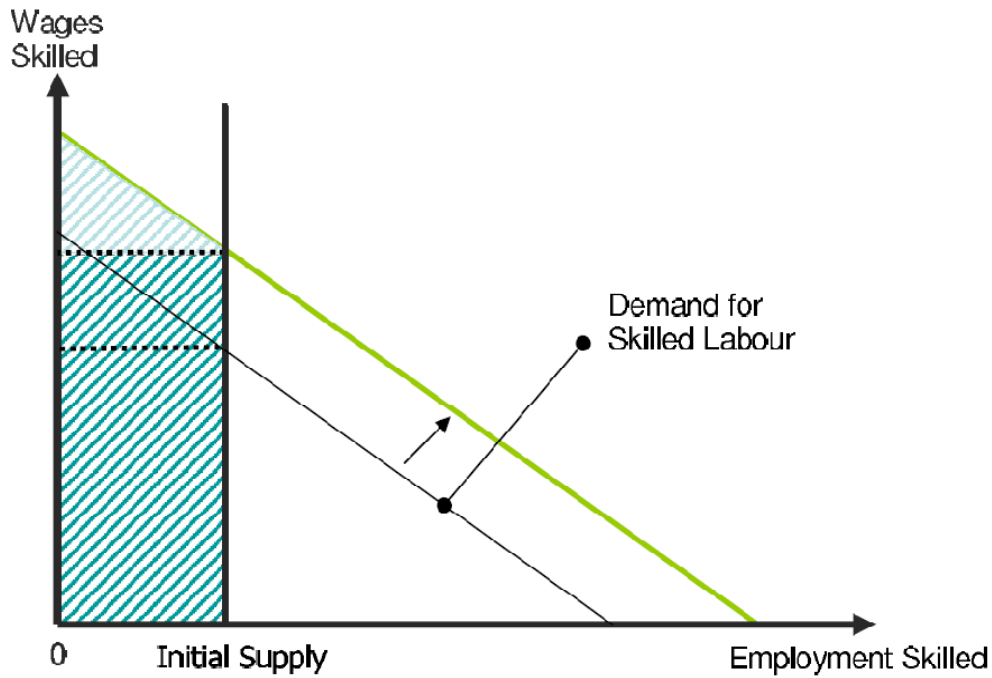


Figure 2: Effects of unskilled immigration on skilled native wages

There is therefore not only an aggregate gain but also redistribution, with one labour type losing whereas the other gains. However, skilled workers gain more than unskilled workers lose, leaving the receiving economy with a surplus. This is shown in figure 2: the demand curve for skilled labour shifts outwards, and the wage for skilled workers increases.

More generally, in such an economy, and if immigrants differ in their skill composition from natives, per capita income of the native population will increase as a consequence of migration, but the gains of migration are unequally distributed. Notice that in this economy therefore, *average* wages will increase due to the surplus, but wages of workers that compete with immigrants will decrease. Notice further that this result depends on the assumption that capital is perfectly elastic in supply. If on the other hand capital is constant, part of the surplus will go to capital owners, and average wage effects may be negative. Therefore, within this setting immigration may have on average positive or negative wage effects, depending on the elasticity of capital supply. The quicker capital supply adjusts to

immigration, the smaller will be its effect on average wages in the economy. The growth and real business cycle literature has typically estimated the speed with which capital supply responds to deviations from its long-run growth path at around 10% per year (for an overview see Ottaviano and Peri 2008). Dustmann, Frattini and Preston (2008) provide a detailed theoretical and empirical analysis for the UK.

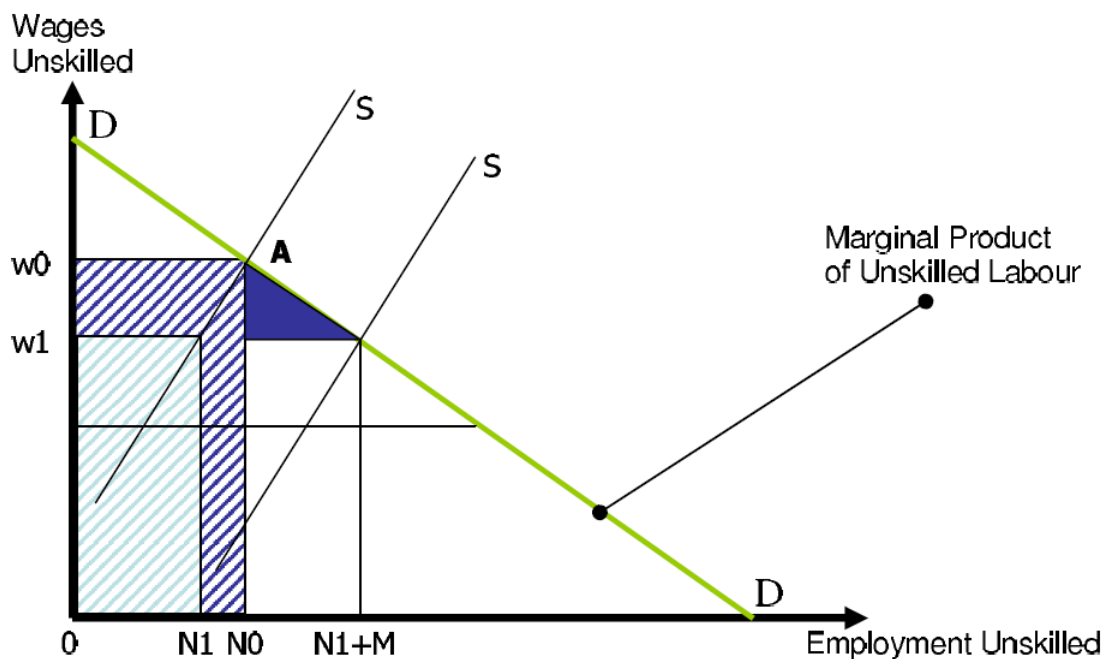


Figure 3: Employment effects of immigration

One strong assumption we made above was that workers supply labour whatever the wage – we referred to that situation as one where labour supply is completely inelastic. We now relax this assumption and assume that labour supply is somewhat elastic. This means that some workers will not want to work any longer if wages are decreasing, and rather choose unemployment. In this situation, there are equilibrium employment effects. Immigration may cause (voluntary) unemployment among those native workers whose wages fall.

We illustrate this in figure 3. Here the labour supply curve is upward sloping, and an increase in labour supply through migration leads to some native workers not being prepared any more to work at the new, lower equilibrium wage. These workers (N0-N1 in figure 3) remain therefore *voluntarily* unemployed.

Our example focused on the case where all immigration is unskilled, thus changing the skill composition towards unskilled labour. Of course, if we assume the other extreme case (namely that all immigrants are skilled), it will be unskilled wages that rise, and skilled wages that fall, creating a redistribution and a surplus that favours unskilled rather than skilled labour. More generally, in this simple setting, the beneficiary of immigration will always be that skill group whose relative supply has decreased as a consequence of immigration. As we stress above, no effects are to be expected if the skill composition of immigrants resembles that of the native population.

The model we have outlined above is the basis for much of the empirical work in the area. It is attractive because of its simplicity and clear-cut implications. However, it does not capture all the aspects of adjustment of the receiving economy to an inflow of immigrants, and we will discuss a simple extension below.

2.1.2 Multiple outputs, skilled and unskilled labour

The economy we have characterized above is a one-sector economy, where only one output good is produced. Such an economy can only react to a change in the composition of its workforce (by e.g. immigration) through changes in the wage structure. Now assume a multi-sector economy, where each sector produces one output good. Assume also that all output goods can be traded, with output prices fixed on world markets. Such an economy has an additional way to adjust to changes in the skill composition of its workforce, namely by adjusting the mix of output goods it is producing. We discuss in the next paragraph how that works.

To focus ideas, we will again assume that labour supply is inelastic, i.e. that all workers will supply their labour whatever the wage level is. Again, we will relax this assumption below. We assume also that there are only two sectors, one being intensive in the use of unskilled labour, and one being intensive in the use of skilled labour. These two sectors produce two output goods, both traded on world markets. Furthermore, assume, as above, that all immigration is unskilled. Holding the output ratio fixed, immigration would, as before, drive down wages of unskilled workers (and increase wages of skilled workers). This however drives up profits in that sector which uses unskilled labour more intensively. As a consequence, this sector will expand production, which, in turn, pushes up demand for unskilled labour. This will then again increase unskilled wages. Accordingly, while the immediate impact of immigration is to lower wages of unskilled workers, in the longer run wages will increase again. Assuming the eventual equilibrium continues to involve positive production in all traded goods sectors, wages should return to the initial pre-immigration equilibrium. Leamer and Levinsohn (1995) refer to this as the hypothesis of factor price insensitivity. In the context of the discussion on immigration, this is sometimes referred to as the structural hypothesis – meaning that immigration changes the industry structure, rather than the wage structure.³

What is different in this economy that leads to different effects of immigration compared to an economy with only one output good? Remember that there are multiple goods produced in this extended economy, as compared to one good only in the economy we discussed above. Rather than impacting on wages, long-run effects of immigration are felt in the output mix with production of output goods expanding that use unskilled labour relatively intensively. In other words, the economy reacts to an inflow of unskilled workers by expanding production in that sector that uses unskilled workers more intensively.

³ In the extreme case, and for sufficiently large scale immigration of unskilled labour, the economy may specialize in producing only the good that uses the immigrating factor more intensively (see Bhagwati and Srinivasan, 1983). Obviously, in such a case there will be factor price effects, that is effects on skill-specific wages, for the obvious reason that once one good ceases production, the economy (for our example) behaves like a one-sector economy.

Again, and as before, if labour supply is elastic, there may be both employment and wage effects in the short run, before the output mix can fully adjust. As in the one output case, no effects of migration on wages and employment are to be expected (neither in the short- nor in the long run) if the composition of migrant labour resembles that of the resident pre-migration population.

These results can be generalised to multiple factors and multiple outputs, and they can be extended to the case of non-traded goods, with the relevant algebra being detailed in trade theory models (see for example Ethier 1984 and Woodland 1982). Important is that there are more traded goods in the economy than factors of production, to allow the economy to react through flexibility in its output mix.

A further adjustment mechanism is through technology. While above the economy adjusts to changes in the skill composition (induced through immigration) by adjusting the output mix, adjustment could also take place through technology changes, in the way that technology adjusts so that the relatively more abundant type of labour is used more intensively. Lewis (2004a) emphasises this possible way of adjustment and provides empirical evidence for his hypothesis for the US. We will discuss his study below.

2.2 Wages, taxes, and general welfare effects

The discussion above helps to understand the effects immigration has on wages. We now extend this simple equilibrium model to understand the way immigration affects both the labour market and the welfare system. Our discussion is based on a more formal exposition in Dustmann and Preston (2007).

As before, we consider an economy with two types of workers (skilled and unskilled), earning different wages. Capital is assumed elastically supplied at a return to capital that is fixed on world markets. As before, we consider two cases differing in the number of goods produced by the economy: the economy produces one good, or two goods. In the two good

case, the goods are assumed traded and the economy is small so that goods prices are set on world markets. This distinction allows us to differentiate between the case where the economy adjusts to immigration through the output mix, and where the only channel of adjustment is through factor prices. As we explain above, in such a model, wages and outputs are determined by two equilibrium conditions. Firstly, labour market equilibrium requires equality of demand and supply of labour. Secondly, firms earn zero profits.

We now introduce the government constraint. Both immigrants and those currently resident consume government services. However, since immigrants differ from current residents in their age, health, number of children and so on we should expect them to consume different amounts of government services than residents. We allow therefore that each current resident and each immigrant consumes *possibly* different amounts of public services. Government spending is financed by a proportional tax on labour income at a rate that is determined to secure government budget balance.

The welfare of currently resident workers depends therefore on their after tax wages, where the effect of migration on after-tax wages works through two channels: by affecting before-tax wages (as discussed in the previous section), and by affecting the tax rate.

We consider first the case where the economy is not able to react to immigration that differs in skill composition from the current labour force by adjusting the output mix. The simplest model to reflect insufficient flexibility is the one output model which we discussed above, and often used in the labour literature to motivate the way immigration may affect employment and wages (see, for example, Altonji and Card 1991 and Borjas 1994). In this model there will be employment- and wage effects whenever the immigrant population differs in skill mix from the current population (and if the labour supply curve is not vertical, see discussion in the previous section).

In the one output case, we obtain a system of equations determining output, unskilled and skilled wage changes in response to immigration. As discussed above, this model implies that

in the case where immigrants resemble in their skill composition the resident labour force, we should expect no wage effects. Thus, in this case, the effect of immigration on the welfare of current workers of both types is dependent solely on the change in the tax rate required by government budget balance. One can show that immigration is beneficial to current workers if and only if immigrants contribute more in labour taxes than they take out in consumption of government services (see Dustmann and Preston (2007) for technical details). Note that if immigrants are identical to the current population in both skill composition and public service consumption then the effect of immigration on taxes is equal to zero.

However if immigrants differ from the current population in either respect then, for a given public service consumption, the perceived gain or loss for a particular group of natives (here skilled or unskilled) depends on the allocation of immigrants to skill groups. If immigration is mainly skilled, contributions to the welfare system will be larger and immigration more favourable. Also, if the skill mix differs then we should expect changes in wages. For example, unskilled immigration depresses unskilled wages and raises skilled wages. There are wage effects but they are not uniform and therefore raise distributional issues.

Returning to the government budget constraint, effects on the tax rate now require that we recognise the consequences of changes in the wage structure of current workers for tax receipts. Effects on welfare of the workers of the two types then weigh up labour market and government budget effects. Immigration can increase or alleviate tax burdens if immigrants are expected to differ from the current population either in skill mix or in propensity to consume public services. In particular, if immigrants are expected to consume more out of public services than residents, then this may be perceived as a possible disadvantage of the overall effects of migration. To the extent that the implied additional tax burdens fall more heavily on the rich then this may again be a source of difference in opinion across skill groups and income classes. Furthermore, any expected impact on unemployment may also be expected to feed through into concerns about public tax and welfare burdens: if immigration

creates unemployment, it will increase the tax burden, thus harming the economically active in the resident workforce.

2.2.1 Generalisations

The nature of the solution in general depends upon a comparison between the numbers of goods produced and of labour types. The observations above can be generalised beyond the case of only two labour types and can also be extended to allow for non-traded goods (see Ethier (1984) and Woodland (1982)). What is at issue is the ability of the economy to respond to immigration through flexibility in its output mix. With sufficient number of traded goods there is no need for immigration to induce factor price changes - whatever the skill mix of immigrating labour - and welfare effects on current workers follow simply from a comparison of immigrants' tax contributions and consumption of public services.

The same is true, even with fewer output goods, if the skill mix in immigrant labour exactly matches that of the current workforce. However, if the skill mix of immigrant labour does differ, then a smaller number of traded goods means that there are insufficient degrees of freedom to accommodate changes in the skill mix through changes in the output mix and wage changes are therefore nonzero even in the long run. In this case workers of different types are likely to feel differently about the economic effects of immigration and a full evaluation of welfare effects on current workers of any labour type require that we weigh up tax and wage effects.

2.2.2 Elastic labour supply

In the analysis above, we have assumed that labour is completely inelastic. Hence, workers will supply labour at any wage, and immigration will not have employment effects. This, of course, can be extended by assuming that labour supply is elastic, so that some current workers will not be willing to work after immigration as wages fall below their reservation wages. By this mechanism reasoning about wage effects of migration can be supplemented

with an analysis of voluntary employment responses in the already resident workforce. If unemployed workers can claim from the state then this might open up another mechanism through which tax rates could be affected by immigration.

2.2.3 Disequilibrium

The analysis offered so far has been based on assumptions of labour market equilibrium. If we allow for mechanisms preventing factor prices from reaching equilibrium (through e.g. minimum wages) then the effects of immigration will clearly differ. In such cases immigration may act as an alternative means of equilibration by increasing the relative supply of factors in excess demand (though it could also aggravate disequilibrium if tending to bring in factors in excess supply). Arguments about the benefits of migration as a means of, say, alleviating skill shortages could be conceptualised in this way.

3 Measuring the Effects of Migration on the Labour Market

How can the effect of immigration on native employment and wages be estimated, what are the problems of empirical assessment, and what is the empirical evidence on the effects of immigration on wages and employment of resident workers? In this section we discuss the problems that may arise in the empirical analysis, and the methods that are used to address them.

3.1 The spatial correlation approach

The usual approach in the literature is motivated by the following thought experiment. Consider an economy that can be divided into two regional labour markets R1 and R2, both identical to each other. Now suppose immigration takes place, and all immigrants are sent to labour market R1. The effect of immigration on wages and employment could now be measured by comparing wages (and employment) between labour market R1 and labour market R2, and relate it to the relative magnitude of immigration. In this example, labour market R2 serves as the *counterfactual*: it represents labour market R1 in the absence of immigration.

Following this thought experiment, and extending it to more than 2 regions, an empirical implementation would then regress a measure of employment or wages of resident workers in a given area on the relative quantities of immigrants in that particular locality and appropriate controls. This approach is often referred to as the *spatial correlation approach*. Spatial units are intended to correspond to geographical labour markets. In the U.S. context, the spatial units usually used for empirical analysis are standard metropolitan statistical areas. Work by Dustmann, Fabbri and Preston (2005) and Dustmann, Frattini and Preston (2008) for the UK for example uses UK regions.

3.1.1 Permanent effects

If implementing this approach, however, the analyst makes a number of assumptions (see e.g. Dustmann, Glitz and Frattini 2008). Most importantly, it is assumed that the allocation of immigrants is random and independent of permanent labour market conditions in the respective region. However, pre-migration conditions in local labour markets are usually not identical (e.g. Greater London is economically more successful than the South-West of the UK), and the allocation of immigrants to local labour markets is a choice of immigrants. Typically, immigrants will choose the local labour market that provides the best economic prospects. Immigrant populations may also be concentrated in areas of enduring low or high economic prosperity as a consequence of historic settlement patterns and policies. This may lead to a positive or negative statistical correlation between immigrant concentration and economic outcomes (depending on whether immigrants tend to settle in areas with persistently low or high economic performance), even in the absence of any genuine effects of immigration on outcomes of native workers. In other words, the levels of immigrant shares and levels of labour market outcomes may be spatially correlated because of common fixed influences.

The way to deal with this problem is to estimate models that remove 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. Following our example above, we would relate the *change* in economic outcomes of the resident population (such as employment or wages) to the *change* in the concentration of immigrants in R1 relative to R2. A similar approach, known as *within groups estimation*, is equivalent to including a full set of dummy variables for the relevant spatial units.

The idea of this approach is that the additional variation within regions (by observing outcomes as well as immigrant ratios at two points in time) allows for conditioning on region

specific fixed effects. In the absence of longitudinal data, other approaches are possible to eliminate such permanent region specific effects if additional variation within regions is available. Card (2001) for example allocates immigrants and natives to six different skill groups, assuming that within each skill group, immigrants and natives are perfect substitutes. His data is based on the 1990 census and he distinguishes 175 local labour markets. As he observes in each of these labour markets six different occupation groups, he can condition on region specific fixed effects. We will discuss Card's study in more detail below.

3.1.2 Simultaneity

However, this within groups and difference approach is problematic, too. Suppose that there are two periods, and economic conditions are identical in both regions at the start of period 1. At the end of period 1, a positive shock hits region R2. Immigrants enter the economy at the start of period 2. They are free to choose the region of residence, and they observe the shock before they decide about where to settle. Obviously, it is likely that they will choose region R2 over region R1.

The direction of causality between immigrant inflows and labour market outcomes is therefore not necessarily clear-cut, even if we relate differences in economic outcomes to differences in the immigrant concentration. Immigrants may be attracted to those areas that are enjoying current economic success. In this case not only may immigrant inflows drive labour market changes, but 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.

One way to address this problem empirically is based on the following thought experiment. Suppose the decision of immigrants about where to settle is based on two factors. First, immigrants may take the relative economic prosperity of an area, induced by transitory

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. Ann Bartel (1989) was the first to empirically show this tendency of new immigrants to move to enclaves established by older immigrant cohorts of the same origin or ethnicity. In fact, her analysis suggests that the existing ethnic concentration in a locality is the most important factor in the locational choice of new immigrants. Pre-existing immigrant concentrations are now unlikely to be correlated with current economic shocks if measured with a sufficient time lag. Therefore, historic settlement patterns may help to solve the simultaneity problem and identify the effects of the inflow of immigrants on economic outcomes. A number of empirical studies follow this approach (see, for instance, Altonji and Card 1991, Hunt 1992, Card 2001, Card and Lewis 2007, Dustmann, Fabbri and Preston 2005, Dustmann, Frattini and Preston 2008). The idea of estimation in this case is to utilise the variation in the regional allocation of immigrants that can be solely explained by variation in existing networks (which is uncorrelated with current economic shocks) to estimate the effect of migration after differencing out permanent regional differences. This technique is called *instrumental variables regression* and historic settlement patterns are in this case the *instrument*. The approach amounts to regressing *differences* in regional economic outcomes on *differences* in immigrant/resident ratios, using past immigrant densities as an instrument for the latter.

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 the data and can therefore be assessed.

3.1.3 Measurement error

A further problem is directly related to the poor data quality often encountered by researchers, in particular for countries where estimation depends on survey information. Measures of immigrant concentrations may suffer from measurement error due to small sample sizes.⁴ 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 (see Aydemir and Borjas (2006) for a discussion).

One solution to this problem is the same as to simultaneity – instrumental variable estimation. As long as the effect of immigrant concentration on economic outcomes of the resident population is linear, the instrumental variable estimator discussed in the previous section will remedy both problems. Other 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.

⁴ 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.

3.1.4 Out-migration of natives

A further problem arises from the fact that local labour markets are not 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 of immigration on wages or employment of workers currently resident in local labour markets that are not as negative as the effects which one would obtain without internal migration responses. This point has been stressed in numerous contributions. The U.S. literature contains conflicting opinions on the seriousness of the problem. Filer (1992), Frey (1995, 1996), and Borjas (1999, 2003) for example, regard it as more serious than Card and DiNardo (2000) or Card (2001).

There are several ways the literature has responded to this problem. One is to address it in two stages. If one could establish in a first step that out-migration of native workers as a reaction to immigration into a particular spatial unit is unimportant, then the problem can in principle be ignored when estimating the effects of immigration on employment and wages. As mentioned, there is dispute in the literature whether out-migration is in fact modest or not. In a number of recent papers Card and co-authors finds little to no evidence of this for U.S. data (Card and DiNardo 2000, Card 2001). However, others (such as Borjas, Freeman and Katz 1997 and Borjas 2003) consider out-migration of natives as a result of wage-depressing effects of immigrants a far more important factor, leading to a bias towards zero when estimating the effects using the spatial correlation approach.

Another way to remedy this problem is to consider the econometric problem arising as one of an omitted term in the estimated equation. One obvious solution to this is to measure outflows of residents and incorporate them directly into the estimation. 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; lags are one option. This approach has been taken by Dustmann, Fabbri and Preston (2005).

Finally, the problem may be more severe when using small spatial units, like (in the UK context) wards. Using larger spatial units may lead to internalisation of possible native migration responses. For example, if natives react to immigration for instance to South London, it is likely that they will not move to Manchester, but to say North London instead.

3.2 Simulation based (factor proportions) approaches

Simulation based approaches are aimed at avoiding identification of the effects of immigration from local labour market information only. The counterfactual – the labour market conditions in the absence of immigration – is constructed by simulation (see Borjas, Freeman and Katz 1997). The basic idea of what these authors call the *aggregate factor proportions approach* is a comparison of the actual supplies of workers in particular skill groups to those that would prevail in the absence of immigration. These changed factor proportions due to immigration will lead to different wages and employment situations for native skilled and unskilled workers.

This approach is creating the counterfactual situation based on a structural economic model and pre-estimated parameters rather than on direct estimation. Therefore, it creates estimates that are sensitive to the chosen model structure, as well as these underlying parameters that are used for simulation. A key parameter is the responsiveness of relative wages to relative skill supplies, the elasticity of substitution. An advantage is that it allows additional insight into the way immigration relates to e.g. trade (see Borjas, Freeman and Katz 1997). The model excludes factor price equalisation, which we have discussed above, and which may lead to adjustment through output mix rather than factor prices.

The simulation approach relies on a few crucial assumptions.⁵ Most importantly, it is not clear what the counterfactual situation looks like, for instance what the trend in relative demand for different skill groups during the period of analysis has been. This uncertainty is reflected in the choice of the elasticity of substitution between skilled and unskilled labour, which translates the changes in relative labour supply into wage and employment effects, and which is very much driving the results for the immigrant impact on native outcomes. Also, as Rachel Friedberg and Jennifer Hunt (1995) point out, the increase in relative supply of unskilled workers on wages is by construction constrained to be the same independent of whether the increase occurred due to immigrants or natives. For that reason an important assumption for obtaining unbiased results is that natives and immigrants are perfect substitutes within each skill group.

3.3 The skill cell correlation approach

George Borjas (2003) suggests an alternative estimation method to retrieve possible wage- and employment effects. Arguing that the spatial correlation approach may lead to an underestimation of wage- and employment effects, he suggests using an analysis that is based on the national level and therefore robust to the problem of out-migration or, for that matter, other ways of adjustment of local labour markets. Borjas argues that workers are not necessarily perfect substitutes within education groups, as labour market experience is adding another important component of human capital, thus leading workers to become distinct even in the same education group according to the human capital they have accumulated. Following this argument he defines skill groups as education-experience cells and assumes that workers within education-experience groups are perfect substitutes. Consequently, immigrants in the lowest education group compete only with workers in their experience cell.

⁵ Simulation of a model means that the model parameters (like e.g. the elasticity of substitution between capital and labour) are chosen from some econometric studies, so that the model allows the analyst to derive quantitative assessments of the changes in variables determined by the model change when variables outside the model change. For instance, how does the relative wage of unskilled workers change when the supply of unskilled workers increases.

The impact of immigration on native employment and wages is then estimated by regressing the cell-specific native outcomes on the immigrant share in the respective education-experience group. A study by Sarit Cohen-Goldner and Daniele Paserman (2004) uses similar cell definitions in an analysis for Israel.

This cell correlation approach is not dissimilar to the idea in Card (2001) who distinguishes between six skill groups, in that it creates additional variation that can be used for estimation. For a sufficiently large number of cells, and additional time variation, estimation does not need to rely on variation obtained from spatial segregation.

In his study Borjas (2003) uses data over four decades. He has therefore variation over time, and across education- and experience groups. While the key identification assumption in the spatial approach that uses data over time and conditions on region- and time effects is that the impact of migration can be identified from changes within spatial units over time, Borjas' identifying assumption in this approach is that the impact of immigration can be identified from changes within education-experience cells over time. In particular, it excludes the possibility that immigrants select into those skill cells where economic conditions are better, or that immigrants are for some reasons forced into particular cells, that is "downgraded" in the host economy's labour market.

An important assumption underlying the skill cell correlation approach is the perfect substitutability between natives and immigrants within skill cells. Two recent studies by Manacorda, Manning, and Wadsworth (2006) and Ottaviano and Peri (2008) analyse in how far this assumption is valid for the UK and the U.S., respectively. Both studies find that immigrants are not perfect substitutes for natives even within narrowly defined skill groups but partly complement their skills, so that their effect on native wages is substantially smaller than previously estimated. With imperfect substitutability of natives and immigrants within skill cell, the group most affected by new immigrant inflows are according to both studies previous immigrants.

An additional important prerequisite of the skill cell correlation approach is that immigrants can be allocated to skill groups based on their observable characteristics. This, however, may be very difficult, as immigrants downgrade just after arrival, and improve their economic position in the years after arrival. That may therefore make pre-allocation difficult. Dustmann, Frattini and Preston (2008) provide evidence for the UK that downgrading is substantial.

3.4 Summary of empirical results

What are the results of the empirical literature that has estimated the effects of immigration on the labour market? Table 1 provides an overview of the main studies in the field, broken down by methodology used and presented in chronological order. The last column of the table summarises the main findings of each paper⁶. We review here only the seminal papers in each strand, and those focussing on the UK.

3.4.1 Estimating production functions

Some of the first papers in the literature trying to empirically assess the impact of immigration on wages and employment in the host economy were guided by neoclassical input demand theory, estimating production functions and distinguishing between different labour inputs and capital. The estimated parameters from these models inform about the substitutability or complementarity between the different factors and thus allow assessing which effects changes in their relative supply might have.

Grossman (1982) was among the first to estimate such models. In her study she estimates a translog production function for the U.S. to obtain elasticities of factor complementarity between natives, second generation natives, foreign-born workers and capital.⁷ Estimations are based on 19 SMSAs (Standard Metropolitan Statistical Areas), using data from the

⁶ Friedberg and Hunt (1995), Gaston and Nelson (2002) and Okkerse (2008) are three papers that survey this literature in great detail.

⁷ For a detailed discussion of factor substitutability and complementarity in production see Hamermesh (1993).

National Origin and Language Subject Report, the County and City Data Book, U.S. Census 1970, the Census of Manufacturing, and the Annual Survey of Manufacturing. She finds small but non-negligible effects on employment and (absolute) wages of natives and other immigrants which vary with the maintained assumption on wage flexibility in the economy.

Borjas (1987) argues that Grossman's analysis may mask important channels by which immigration can affect wages and employment in that it neglects race-specific differences. He extends the analysis, by choosing a generalised Leontief technology and distinguishing between immigrants' race and ethnic origins. Based on 1980 U.S. Census data and data on the capital stock for 84 SMSAs from the Census of Manufactures and the Annual Survey of Manufactures, he finds that immigrants are substitutes for some labour market groups (e.g. native white men) and complements for others (black native-born men). Furthermore, all numerical effects of an increase in immigrant supply on the (absolute) earnings of native-born men are small. His analysis also confirms non-trivial effects on wages of resident immigrants, leading to the conclusion that immigrants' main competitors in the labour market are other immigrants.

In contrast to the previous two studies, Ira Gang and Francisco Rivera-Batiz (1994) do not consider immigrants and natives as different factors in production, but distinguish between education, unskilled labour and experience inputs. In a first step they estimate a translog production function from which they obtain factor price elasticities between these three inputs. Both for the U.S. and Europe, their results imply that education, unskilled labour and experience are complementary inputs. They then proceed by calculating composite elasticities of complementarity between natives and immigrants using their average human capital characteristics. Based on these results, the simulated impact of immigration on native residents is found to be very small.

3.4.2 Spatial correlation approach

Most of the literature has adopted the “spatial correlation” approach. One of the most influential studies using spatial variation to identify the effects of immigration on the labour market is Card (1990). Card uses the natural experiment provided by the sudden and large inflow of Cuban immigrants in Miami between May and September 1980, following the so-called “Mariel boatlift”, to study the consequences of immigration on the Miami labour market. He compares the changes in labour market outcomes in Miami to those of other comparable US cities, and finds no adverse effects of immigration on wages or unemployment⁸. Altonji and Card (1991) adopt for the first time the “spatial correlation” approach in the format we have presented above. They study the effects of immigration between 1970 and 1980 on the labour market outcomes of less skilled natives in 120 Standard Metropolitan Statistical Areas, and account for the endogeneity in immigrants’ location choices using the stock of immigrants in 1970 as an instrument for the change in the fraction of immigrants in each area between 1970 and 1980. Their results show that wages of low skilled workers would decrease by about 1.2% as a consequence of an inflow of immigrants of the size of 1% of the population, but they do not find any significant effects on the labour force participation and employment rate.

In another influential paper, Card (2001) examines the impact of immigration on the relative labour market outcomes of individuals in specific skill groups in 175 metropolitan statistical areas (MSAs), using U.S. Census data from 1990. In the underlying theoretical model, six different labour inputs are defined according to occupational groups, within which immigrants and natives are perfect substitutes. In this model the effect of immigration then arises through the induced changes in the relative supply of different labour inputs, in particular an increase in the supply of workers in low-skill occupation groups. Unobserved demand and productivity shocks which would render the immigrant inflows into a specific region-occupation group endogenous are instrumented with the so called supply-push

⁸Other papers using natural experiments are Hunt (1992) for France and Carrington and de Lima (1996) for Portugal.

component, which is the expected inflow rate into an occupation on the basis of earlier immigrant settlement patterns. The results of the empirical analysis show again that the effects on native relative wages and employment are small: a 1 % increase in the population share of a particular skill group through immigration reduces the employment/population rate of that group by 0.1 – 0.15 percentage points and the relative wage of that group by around 0.15 %. Furthermore Card does not find evidence that inflows of new immigrants lead to offsetting mobility flows of natives or earlier immigrants which would lead to an underestimation of the effect of immigration on wages and employment.

The first study of the labour market effects of migration in the UK is a paper by Dustmann, Fabbri, and Preston (2005). They examine how the immigrant share and changes thereof in 17 regions affect native wages (for 1992-2000), employment, participation, and unemployment (1983-2000), using panel data taken from the Labour Force Surveys between 1983 and 2000. Their empirical results show no evidence of significant overall adverse effects of immigration on native outcomes, but suggest that effects are different for different educational groups. A more recent work by Dustmann, Frattini and Preston (2008) uses 1997-2005 LFS data to study the impact of immigration on natives' average wages and across the wage distribution in the UK. They first present a theoretical model where they show that if capital is supplied at a price fixed on international markets, immigration will have on average a positive wage effect, as long as immigrants differ from natives in their skill composition. This is a direct consequence of the immigration surplus being allocated to native workers in this case. However, along the distribution of wages, some workers will lose, while others will gain. They propose an estimation method along the distribution of wages that does not necessitate pre-allocation of immigrants to particular skill groups. In accordance with the implications of their theory, they find evidence of an overall positive wage effect of immigration over the period of study. Their estimates suggest a magnitude that would associate an increase in the immigrant population by 1% of the native population with an increase in (absolute) native wages of between 0.3 and 0.4%. Their investigation of the effects of immigration along the

distribution of wages of non-immigrant workers suggests that there are clear and significant differences. Non-immigrants in the middle of the wage distribution gain from immigration, while individuals at the bottom of the distribution lose in terms of wages. This is compatible with evidence on the relative location of recent immigrants in the non-immigrant wage distribution. Over the period 1997 to 2005, immigrants tended to be more concentrated than natives below the first quartile of the native wage distribution, exactly where the authors find evidence that wages were held back, and less concentrated from there on upwards, where they find positive wage effects.

Nickell and Saleheen (2008) take an approach similar to Card (2001) by looking at the changes in occupational wages in the UK over the period 1992-2006. They use data from the LFS as well as from the ASHE/NES and segment the labour market into 11 U.K. Government Office Regions and 25 2-digit SOC 2000 occupations. Their estimates indicate a very small effect on average occupational wages. Their analysis on specific occupational groups indicate instead that the only groups suffering a wage decrease are skilled production sector, the semi/unskilled production sector and semi/unskilled service sector workers.

The effect of the recent immigration to the UK from the countries that joined the EU in 2004 is the focus of a paper by Lemos and Portes (2008). Combining data on claimant unemployment and wage data from the ASHE with data from the WRS for the years 2004-2006, the authors estimate a comprehensive set of regression models, where the labour market is stratified along a number of alternative dimensions. Their results show little evidence that the WRS migration inflow adversely affected wages or claimant unemployment in the UK between 2004 and 2006.

3.4.3 Native migratory responses

The overwhelmingly small estimated effects of immigration on native labour market outcomes in spatial correlation studies have led to the question of how local labour markets are able to absorb the in some cases very significant immigrant inflows. One possibility is

that natives respond with out-migration to the immigrant inflows. If this is the case, then the relevant observational unit for assessing the labour market effects of immigration is the whole country, rather than the local region, as the local increase in supply is effectively dispersed over the whole economy. Several papers have tried to assess to what extent do natives out-migrate as a reaction to immigrant inflows, but the results are quite mixed and depend on the country considered, the time period, and the empirical approach chosen.

For instance, Filer (1992), Frey (1995, 1996), Walker, Ellis and Barff (1992) find evidence of natives' migratory responses to immigrant inflows for the U.S., while Hatton and Tani (2003) using data for the 12 UK government office regions find a correlation between immigrant inflow and native outflows in particular for the Southern UK regions.

However, the conclusion that immigrant inflows lead to net native outflows is controversial. Wright, Ellis and Reibel (1997), Card and DiNardo (2000), and Card (2001) for instance do not find any effect of native outflows counterbalancing immigrant inflows. Quite the contrary, their results indicate that, even after controlling for endogeneity, increases in the immigrant population in a skill group seem to lead to a slight increase in the native-born population.

The mixed findings on native mobility in response to immigration have led some authors to argue that the effects of immigration have to be studied at the country, rather than regional, level. One approach that is not based on local labour markets is the simulation or factor proportions approach.

3.4.4 The factor proportions approach

The factor proportion approach was first proposed by Borjas, Freeman, and Katz (1992), who analyse how immigration and trade have affected the aggregate supply of workers in particular skill groups in the US between 1980 and 1988. They then compare the prevailing wages and employment outcomes to those that would have occurred in the absence of migration or trade using an economy-wide elasticity of substitution to simulate the

counterfactual outcomes. Their results show that immigration had only a small effect on the college/high school wage differential, but contributed largely to the worsening of the relative earnings of high school dropouts. In two later papers Borjas, Freeman and Katz (1996, 1997) extend their work to a wider time period, and compare their results to those they would obtain from a spatial correlation approach. Both papers confirm their earlier results, and point to the instability of the results from spatial correlations in different time periods.

3.4.5 The skill cell correlation approach

Another estimation approach that does not rely on regional variation to identify the effects of immigration is the “skill cell correlation” approach, first proposed and implemented by Borjas (2003). He uses U.S. Census data for the years 1960-1990 and CPS data for 1998-2001 and exploits variation in immigration across education-experience groups in the economy. The underlying assumption is that individuals with similar education but different experience are not perfect substitutes but separate labour inputs (as in Card and Lemieux 2001). Skill groups are then defined in terms of education and work experience. Changes in relative supplies of these skill groups are observed on the national level, hence avoiding the problem of migratory responses of natives. By incorporating these assumptions into a three level CES production function, Borjas then proceeds to estimate both own and cross factor price elasticities which are subsequently used to calculate the wage impact of the actual immigrant inflow into the U.S. between 1980 and 2000. His empirical results imply that a 1% increase in the immigrant share reduces the wages of competing native workers by 0.3-0.4%.

Two recent studies have questioned the assumption implicit in the skill correlation approach of perfect substitutability between immigrants and natives within experience-education cells.

Ottaviano and Peri (2008) set up a general equilibrium framework in which they allow for imperfect substitutability between natives and immigrants within skill cells as well as short- and long-run responses of physical capital. They then use US Census data for the period 1960 to 2000 and the American Community Survey sample for 2006, to estimate the elasticity of

substitution between workers with high school degree and without one, and between immigrants and natives in the same cell. Their estimates show that the elasticity of substitution between workers with and without a high school degree is rather large, while the immigrants and natives within each cell are not perfect substitutes (their elasticity of substitution is around 20). They then use the estimated elasticities and estimates on the speed of capital adjustments from the literature to calibrate their model and recover the effect of immigration on wages. Their results show that immigration to the US between 1990 and 2006 had very small effects on wages of natives with no degree, -0.5% and +0.7%. Even in the short run (i.e., as of 2007) accounting for the sluggish adjustment of capital, the negative impact of immigrants on wages of native workers with no degree was only -0.7%. Moreover, immigration had a positive effect on wages of worker with higher education and on average wages. The only group who suffered a reduction in wages as a result of immigration were earlier immigrants.

A similar conclusion is reached in the study of Manacorda, Manning and Wadsworth (2006), which also follows the skill cell correlation approach and allows for imperfect substitutability between immigrants and natives within the same skill group. Their work investigates the extent to which the immigrant inflows over the period 1975 to 2005 have affected both native and immigrant relative wages in the UK. Using data from the Labour Force Survey (LFS) as well as the General Household Survey (GHS) and starting from a multi-level CES production function, they first estimate elasticities of substitution between immigrants and natives and between workers in different age and education groups. They then proceed by simulating the effect of immigration to the UK between 1975 and 2005 on the return to education among natives and the overall native-migrant wage differential. They also find evidence that natives and immigrants are imperfect substitutes within the same age-education cell. Their empirical findings then show that immigration has raised the return to education for natives by a very modest 0.4% but has increased the native-migrant wage differential by 5.5%. They conclude that the immigrant impact on the wage distribution of the native population is small and that

immigration in the UK primarily impacts the wages of immigrants who are already in the country.

An earlier paper by Friedberg (2001), although not directly adopting a skill cell correlation approach, uses national variation across sectors to identify the effects of the mass migration of Russian immigrants to Israel in the years 1990-1994. She uses data from three different sources - the Israeli Immigrant Employment Survey (IES), the Israeli Income Surveys (IS), and the Labor Force Surveys (LFS) 1989 and 1994 – and at both the individual and aggregate level. In a first result based on OLS estimations, Friedberg finds that natives in occupations which received more immigrants experienced lower wage growth. However, controlling for the endogeneity of the occupational choice, the hypothesis that the Russian immigration did not affect the earnings or employment of native Israelis cannot be rejected. At the individual level the effect of immigration on wage growth of natives is significantly positive which could indicate complementarity between immigrants and native workers. The effects on employment are not significantly different from zero. The IV results imply that the negative effects which are initially found in the OLS specification are due to the fact that immigrants enter occupations with low wages, low wage growth and contracting employment as opposed to a genuine causal effect of immigration on native labour market outcomes.

Finally, a paper by Longhi, Nijkamp and Poot (2004) makes use of the various studies that look at the effect of immigration on the labour market by performing a meta-analysis using a sample of eighteen papers. They relate the estimated coefficient of the immigrant share of those studies, 344 overall, to various parameters of the research design such as approach chosen (factor proportions approach, spatial correlation approach), country, size of the labour market, affected group, type of immigrants, definition of wages etc. They also explicitly account for study quality and publication bias which arises due to the tendency of authors and editors to favour the publication of statistically significant results. Their finding suggests an overall small effect of the proportion of immigrants in the labour force on wages: a 1 percentage point increase of the former lowers wages across the investigated studies by

0.12%. More specifically, the negative impact seems to be larger in EU countries than in the US and immigrants appear to be more in competition with each other than with natives. Their overall finding seems to confirm the broad conclusion in the literature: that the impact of immigration on wages is, if statistically significant, quantitatively small.

4 The Effects of Immigration on Other Outcomes

Although most of the empirical literature has so far focussed on the labour market effects of immigration, a growing number of studies are considering other areas where immigration may have an effect on host countries. Most of the empirical strategies used in these studies are adapted from the literature on labour market consequences.

4.1 Industry and technology adjustments

In a multi-sector economy, the industry structure and the output mix could adjust to changes in the skill composition of its labour force. For instance, in the case of unskilled immigration, this would mean an expansion of production in those sectors that use more intensively unskilled labour, or the adoption of more unskilled-labour intensive technologies to produce the same output – see our theoretical discussion in section 2.

Gandal, Hanson and Slaughter (2004) study the mechanisms through which the Israeli economy absorbed the mass inflow of Russian immigrants in 1990. Earlier papers (like Friedberg 2001) demonstrated that such inflow did not adversely affect wages or employment of Israeli residents. They therefore examine two alternative channels through which Israel may have absorbed such a change in labour supply: the adoption of global changes in production technology, and national changes in the mix of traded goods produced. The authors use the Israeli Labour Force Survey for years 1980-1996 and corresponding CPS data for the U.S., to decompose total changes in factor supplies into changes in output, changes in “global” production techniques (proxied by U.S. changes in production techniques), and changes in industry production techniques that are specific to Israel. Their results show that global skill biased technology changes have more than offset the increase in the relative supply of high skilled workers in Israel induced by Russian immigration and by demographic changes. In contrast, changes in the output of traded goods added little to factor absorption in Israel. Overall, Gandall, Hanson and Slaughter conclude that Israel has accommodated the

labour supply shock brought about by Russian immigrants largely through global changes in production technologies.

The potential adjustment to immigrant-induced changes in the labour supply in a local labour market through adjustments of the industry structure has been thoroughly investigated by Ethan Lewis (2004a). In his original analysis he evaluates two possible explanations for the surprisingly small effects of immigration on relative labour market outcomes in the literature: 1. interregional trade that mitigates the impact of supply shocks through immigration, and 2. production technology that rapidly adapts to the new mix of labour inputs. He estimates the effect of increases in relative supplies of skill groups on the relative growth of different industries (between industry changes) and their relative utilisation of those labour inputs (within industry changes). Similar to the analysis of Card (2001) he uses the supply-push component of immigration, which is the predicted immigrant inflow to a local labour market based on the historical settlement pattern of older immigrants of the same nationality, to instrument for the endogeneity of the locational choice of immigrants. To assess whether the adoption of skill-complementary technologies in response to changes in the local worker mix can explain the lack of impact on wages and employment, Lewis then examines in a case study whether changes in the share of high-skilled workers have induced industries to take-up computers more quickly, indicating skill-biased technological change. The data sources for his work are the PUMS for 1970, 1980, and 1990, and, for the establishment-level data on output and employment, the Annual Survey of Manufactures (ASM). In a first step he repeats the common spatial correlation estimations for 179 metropolitan areas, finding that a 10% increase in the population share of a particular skill group (defined by education) reduces the mean wage by 0.9% and the employment/labour force rate by 0.4%. He then focuses his analysis on the industry adjustments. The empirical results show that changes in the relative supply of skill groups have only little effect on the local industry mix but lead to increases in the relative factor intensity of the now more abundant skill group. The relative wages within a locale remain more or less unchanged. Hence the adjustment to immigrant-induced local

labour supply takes place within industries (74%) rather than between industries (4%). Lewis concludes that the standard Heckscher-Ohlin model is not a very good description of how local labour markets adjust to changes in the labour supply mix. Instead of an expansion of those industries that use low-skilled labour more intensively, industries seem to adjust their production technology to complement the local factor supply mix they are facing. This finding is supported by the fact that on the job computer use expanded most rapidly in those areas where the relative supply of skilled labour grew fastest.

Lewis (2004b) assesses the importance of industry adjustments in the absorption of immigrant inflows in the well-known case of the Mariel boatlift (see Card 1990) using confidential data from the ASM. Again distinguishing within and between industry effects, he shows that after the boatlift the relative output of manufacturing industries in Miami trended similarly to the output in comparable cities, thus ruling out industry mix adjustments as an explanation of how Miami was able to absorb the Marielitos without major effects on the labour market outcomes of natives. On the other hand, Lewis finds that the utilisation of Cuban labour in Miami's industries grew proportionately to the increase in its supply while at the same time computer use at work in Miami was lower than in cities that had similar levels of computer use before the boatlift. These results imply that Miami's industries reacted to the shock in relative local labour supply by employing more unskilled-intensive production technologies, which explains the apparent insensitivity of native wages in Miami to the substantial inflow of Cuban immigrants.

Having identified changes in production technology as the main channel of adjustment to shifts in local labour supply, Lewis (2005) uses plant-level data from the 1988 and 1993 Surveys of Manufacturing Technology (SMTs) and U.S. Census data to investigate more directly in how far the skill mix of the local workforce in a manufacturing plant's MSA affects its use of a number of automation techniques. The empirical findings show that in areas with a larger relative supply of unskilled workers, comparable plants operating in the same narrow industry use substantially less automation. A 10 percentage point increase in the

supply of low-skilled workers accordingly reduces the number of technologies in use at a typical worker's plant by about 8%. The observed relationship between skill supplies and automation use points towards an endogenous adoption of production technologies by firms as suggested by Paul Beaudry and David Green (2003, 2005). Such technology adoption could then explain why in many impact analyses relative wages do not respond negatively to labour supply shocks caused by immigration.

Paul Beaudry, Mark Doms and Ethan Lewis (2006) take up this last point in more detail and specifically examine cross-city differences in PC-adoption, relative wages and changes in relative wages over the period 1980 to 2000 using U.S. Census data and establishment-level data which include information on the use of technologies. Within the framework of a neoclassical model of endogenous technological adoption, which links the supply of skill, the returns to skill, technology adoption, and changes in the return to skill, the authors derive a set of predictions which they then test empirically on a sample of 230 U.S. cities. Consistent with these predictions, in regions with a relatively large and thus cheap skilled workforce, the adoption of PCs took place more aggressively than in regions with a relatively small and expensive skilled workforce. As a result, the returns to skills increased the most in those regions in which PCs were most intensively implemented, however, not so much as to create a positive association between the relative supply of skills (or the PC intensity) and the return to skill. Overall, their results support the existence of endogenous technology adoption of firms in response to local factor supply conditions.

4.2 Productivity and innovation

One related important issue, hard to identify and therefore often overlooked by the literature, is the contribution of immigrants to productivity growth and innovation in the host country. The relative scarcity of studies in these areas are largely due to the lack of suitable data to study these issues, as well as to a lack of understanding of the exact mechanisms through which immigration might impact on productivity and innovation within a clearly defined

theoretical setting. Detailed analyses of the effect of immigration on productivity require rich firm-level datasets, which is rarely available. Similarly, the measurement of innovation is difficult. For instance, the most commonly used measure of innovative activity is patents. However, this measure hides differences in quality and value, and may therefore only imperfectly measure the degree of innovation.

Paserman (2008) analyses the effect of high skilled immigration on labour productivity and TFP in Israeli manufacturing firms. Israel experienced a rapid productivity growth in the second half of the 1990s, and Paserman's study aims at testing whether this was, at least partly, due to the inflow of high skilled Russian immigrants who came to Israel since the beginning of the 1990s. His empirical study is based on firm-level data from the 1990-1999 Israeli Industrial Surveys, and tests directly whether firms and industries that employed more immigrants had a higher productivity growth. Paserman's results do not show any positive effects of immigration on productivity. His OLS regressions show no correlation between the share of immigrants in a firm's employment and its productivity. When he removes firms' unobserved heterogeneity by estimating the regression in first differences, he finds some evidence of a negative correlation between immigrants' employment and productivity for part of the sampling period, although the results are not robust to changes in the sample definition. He then goes on to study whether the effect of immigration on productivity exhibits non-linearities, and whether it varies between firms of different size or in different industrial sectors. Interestingly, he shows that immigrant concentration was negatively correlated to productivity in low-tech industries, while there is some (less robust) evidence of a positive effect on productivity in high-tech industries. A key limitation of Paserman's study however is that the estimated parameters cannot be given a causal interpretation, as no IV strategy is adopted.

Peri (2009) looks at the effect of immigration on capital intensity, TFP, and its skill bias in the US over the period 1960-2006. His estimating approach is essentially a spatial correlation approach, but his IV is based, rather than on past immigrants' location choices only, on

geographic factors as well (distance from the Mexican border and from the main ports of entries in the US). He uses IPUMS for data on aggregate employment and hours worked, time series available from the Bureau of Economic Analysis for aggregate data on Gross State Product, and the National Economic Accounts for data on physical capital by state. Productivity and skill-bias of the technology are instead measured only indirectly, based on economic theory and calibration of a CES production function. Differently from Paserman, Peri's results show that immigration to the US over the last half a century had a positive effect on TFP, and a negative effect on the skill-bias of technology. Peri argues that these results may be explained by the efficient specialization of immigrants and natives in different tasks, a point first noted by Peri and Sparber (2009). In their study, the authors use information on task-intensity of occupations from the O*NET dataset as well as IPUMS data to show that, over the period 1960-2000 immigrants to the US have specialised in occupations requiring manual and physical skills, while natives have been pushed to specialise in language-intensive occupations. This is consistent with a theory that predicts individuals to exploit their comparative advantages. Immigrants and natives would have therefore specialised in those types of occupation where they had a comparative advantage, leading to an overall efficiency gain for the US economy.

In a very recent paper Hunt and Gauthier-Loiselle (2010) investigate the effect of immigration on innovation, measured through patenting activity. Their analysis for the US is based on two different data sources and methodology. First, they use individual cross-sectional data from the 2003 National Survey of College Graduates to show that skilled immigrants patent at twice the native rate. The higher number of immigrants' patents is explained by immigrants having disproportionately more degrees in science and engineering. Then they use state-level data from the US Patent and Trademark Office and the Census for years 1940-2000 to study whether immigrants' patenting activity crowds out natives' patenting. On the contrary, their empirical results show positive spillovers of immigration on a state's innovation activity. Their causal estimates imply in fact that a one percentage point

increase in the share of immigrant college graduates in the population would increase patents per capita by 9-18 percent.

4.3 Inflation

There is a general perception that immigration helps keeping inflation low in an economy by restraining wage growth which would otherwise have been passed on by employers to consumers. The empirical evidence on this issue, however, is scarce. In a recent paper, Cortes (2008) uses PUMS data for 1980, 1990 and 2000 and exploits regional variation in immigrant concentrations in the U.S. to analyse the impact of immigration on the prices of goods and services. Her results show that a 1% increase in the share of low-skilled immigrants in the labour force reduces the prices of immigrant-intensive services such as housekeeping, babysitting, dry cleaning and gardening by 0.2%. The effects are smaller in magnitude and in significance as she considers sectors that use progressively less intensively low skilled immigrant labour. She does not find any effect on the price of traded goods, which is attributed to the equalizing effect of trade on prices. The main channel through which these price changes come about is through a negative effect of low-skilled immigration on the wages of low-skilled workers, in particular of low-skilled immigrant workers. These wage reductions are then passed on to the consumer in the form of lower prices of non-traded goods and services. The different impact of immigration on other immigrants compared to natives supports the recently promoted view that even within the same skill group, immigrants and natives are imperfect substitutes (see Ottaviano and Peri (2008) and Manacorda et al. (2006)).

Lach (2007) investigates the effect of the mass migration of Russian immigrants to Israel in 1990 on prices of traded goods. His study uses cross-city monthly store-level prices variation to identify the impact of immigration on prices, and shows that a one percentage-point increase in the ratio of immigrants to natives decreases prices by 0.5 percentage point. Lach explains this result, which goes against the predictions of a standard perfectly competitive model, with the higher price elasticity and lower search costs of the population of recently

arrived Russian immigrants which led retailers to lower their mark-up. The effect in this case is therefore due to an increase in competition across stores brought about by immigrants. It is worth stressing that the type of immigration considered is quite peculiar in that 81% of the immigrants who arrived in Israel during 1990 were *not* part of the labour force in that year; and among those in the labour force, 53% were unemployed.

A recent paper by Frattini (2008) looks at the effects of immigration in the UK over the years 1995-2006 on prices of traded and non-traded goods. Using CPI and RPI data for over 300 items and LFS data for measuring migration, he exploits variation in prices and immigrant inflows across the UK Government Office Regions over time to estimate the impact of migration on prices. His results show that immigration kept down average prices of nontraded goods and services, with the strongest effects on restaurants, take-away food shops, bars and pubs, washing and dry cleaning and hair dressing and beauty parlours. The estimates imply that an increase of 1 percentage point in the immigrant-native ratio would lead to a 0.3% decrease in average prices in these sectors. Interestingly, these sectors are those that use more intensively low-wage workers. Immigration does not exert any effect on prices of goods and services produced in sectors that are not intensive users of low-wage labour. The author argues that the price effects are caused by pass-through effect of wage reductions for low-wage workers (demonstrated in Dustmann et al. 2008) on prices. The data reject the alternative explanation that the reduction in prices is due to an increase in competition brought about by immigrants starting up new businesses. Frattini also looks at the effects on prices of traded goods, showing that immigration had a small but statistically significant effect on some low-value grocery items. These effects are probably due to an increase in demand⁹ that is not matched by an immediate increase in supply.

⁹ Bodvarsson et al. (2008) and Mazzolari and Neumark (2009) also examine the effects of immigration on consumption demands in the US.

An additional and very important mechanism through which immigration can affect inflation is through its effect on house prices and we will summarise a few studies that have tried to address this issue in the next section.

4.4 Housing

Exploiting the immigration shock to Miami in the aftermath of the Mariel boatlift in 1980 (compare Card 1990) which increased Miami's renter population by 9%, Saiz (2003) analyses the short-run response of the housing market to a large immigration shock. He examines the change in rental prices in Miami and compares these to three comparison metropolitan areas. His empirical findings show that the rents in Miami increased by 8% to 11% more than those in the comparison groups between 1979 and 1981 and large parts of this rent differential persisted in subsequent years. While rental units of higher quality were not affected by the immigration shock, those occupied by low-income Hispanic residents before the immigration occurred experienced an extra 8% hike relative to other low-income units. This implies a distributional effect of immigration arising indirectly from its impact on housing prices with a larger negative impact on real consumption wages of unskilled workers since these are more likely to live in low-income rental housing units. The positive effect of immigration on rental prices could also be one of the reasons why some studies (for instance Filer (1992)) find that native workers seem to avoid and migrate out of areas with high levels of immigration. The author also finds evidence for a decrease in housing prices in response to the immigrant inflows which could be explained by immigration being perceived as a negative amenity by higher income residents which decided to move out of the Miami metropolitan area. The resulting decrease in demand for higher-quality rental units will lead to vacant units of higher quality which in turn puts downward pressure on the prices of all housing units.

In a related study, Saiz (2007) moves away from Miami and investigates the short- and long-run impact of immigration on housing rents as well as housing prices at the metropolitan area level throughout all of the U.S. The advantage of this study is that the results are general in

the U.S. context and not limited to specific time periods of immigration. As in his earlier study, he finds a positive effect of immigration on housing rents. Accordingly, a 1% immigrant inflow is associated with an increase in rents by 1%. In this study, the author also finds a positive effect on housing prices of about 1%. The fact that rents and prices increase due to immigration is consistent with the idea that immigrants do not displace natives one-for-one, since in that case housing demand would remain unchanged and so should prices. The authors show theoretically that the impact of immigration is lower in the long run than in the short run due to new supply of housing and the potential out-migration of natives. Generally, the impact is higher in cities with inelastic housing supply and lower in cities with high price elasticity of housing demand or a mobile native population.

The findings of Saiz are supported by a study carried out by Ottaviano and Peri (2007) who also find a strong positive association between immigration and house prices of native individuals across the U.S. Because immigrants have lower house ownership rates than natives across all skill levels, the house price increases caused by immigration act, on average, as an income transfer from immigrants to natives both in the short and in the long run. In all reasonable simulations the authors find that the overall wage plus housing income effect of immigration is positive for natives of all skill levels. In particular even for the average native low-skilled worker, the small negative wage effect from immigration is more than offset by the positive effect on housing prices which they can reap due to their higher house ownership rates. Those most negatively affected from immigration are thus low-skilled natives that are renting and do not own any equities in housing, since for them wages fall while rental rates increase.

4.5 Growth

There is a relatively broad theoretical literature that investigates the impact of immigration on the economic growth of the host country. Drinkwater et al. (2003) survey the different models that are being used and identify three broad approaches which in turn emphasise one of three

engines of economic growth that are affected by migration: capital accumulation (e.g. Pietro Reichlin and Aldo Rustichini (1998)), human capital accumulation (e.g. Uwe Walz (1996) or Nadeem U. Haque and Se-Jik Kim (1995)) or innovation and technology (e.g. Per Lundborg and Paul S. Segerstrom (2000, 2002) or Lucas Bretschger (2001)). The predictions from these models are mixed and depend on a variety of assumptions about, for example, the skill composition of migrants, capital mobility and the existence of economies of scale in the host economy. There is, however, some general agreement in the literature that there is probably a small positive effect on GDP per capita from immigration. For instance, a general equilibrium study by Jacques Poot, Ganesh Nana and Bryan Philpott (1988) for New Zealand found that a net inflow of 15,000 people increases GDP per capita by 0.2 percent per year and GDP per worker by 0.15 percent per year. Similarly for the U.S., George Borjas (1995) estimates the economic gains of immigration accruing to natives to be relatively small, of the order of 0.1 percent of GDP while Robert Barro and Xavier Sala-i-Martin's (1992) results suggest that a 1 percentage point higher net migration rate in the U.S. is associated with a 0.1% higher growth rate.

4.6 Crime

One concern that is often present among policy makers and public opinions in immigrant receiving countries is that immigration may increase the crime rate.

One of the first economics papers to investigate this issue is Butcher and Piehl (1998a). The authors use US data from the CPS and the Uniform Crime Reports for the 1980s, and correlate the crime rate with immigration in 43 Metropolitan Statistical Areas. Their results show a positive cross-sectional correlation of crime rate with the stock of immigrants in a city, but the correlation disappears when the authors control for a number of city-level demographic characteristics. The authors then perform a first differenced panel analysis which allows controlling for all time-invariant city characteristics, and correlate the inflow of immigrants in a city with changes in its crime rate. No significant effects of immigration on

crime are detected in this specification. Finally, they use the 1980 wave of the National Longitudinal Survey of Youth, which contains direct questions about the engagement in criminal activity, to estimate a probit model to investigate the differential probability of engaging in crime activities among native and immigrant youths aged 15-23. Their results show in this case that immigrants are significantly less likely than natives to commit crime.

In a related paper, Butcher and Piehl (1998b) study the incarceration rates of 18-40 year old immigrant men in the U.S. Their study, based on the 1980 and 1990 Census uses institutionalisation rate as a proxy for incarceration rate. They first show that, even after controlling for their socio-demographic characteristics, immigrants are much less likely to be institutionalised than natives. The authors then look at the institutionalisation rates of different cohorts of immigrants, and show that earlier immigrants are more likely than recent immigrants of being institutionalised. What is more, they also show that this is likely to be due to the lower propensity to engage in criminal activity of more recent cohorts relative to earlier cohorts. In fact, the incarceration rates of more recent cohorts increases only slightly over time, and by less than it increased for earlier cohorts. In a subsequent paper, Butcher and Piehl (2007) investigate this issue further, and for years 1980-2000. They examine different explanations for the lowest incarceration rates of more recent immigrant cohorts: mechanical effects of increased deportations, immigrant self-selection or deterrence. Their results show that the two factors driving the results are the more favourable self-selection of immigrants in the US in recent years and the higher responsiveness of immigrants to criminal punishment than the average native, due to the specific penalties (deportation after serving one's sentence) that apply to immigrants only.

Borjas, Grogger and Hanson (2006) use data from the 1960-2000 US Census and an identification strategy based on skill correlation approach to study the effect of immigration on blacks' incarceration rates. They show that immigration to the US had a strong negative effect on black men wages and employment, and a positive effect on black men's

incarceration rate. The authors argue therefore that the displacement effect of immigrants on black natives on the labour market led them to engage more frequently in criminal activities.

Other papers have focussed on European countries. A recent paper by Bianchi, Buonanno and Pinotti (2008) assesses the causal effect of immigration on crime in Italy. Their analysis is based on police administrative records of reported crime in the 95 Italian provinces over the period 1990-2003. The paper shows that there is a positive correlation in OLS between provincial crime rate and immigration (and changes thereof) over the period considered. However, their IV estimates that focus on different crime types show that immigration had a positive causal effect on robberies only. Since robberies represent only 1.5% of total crime, the effect on the overall crime rate is therefore negligible.

The relationship between immigration and crime in Spain is the focus of an analysis by Alonso et al. (2008), which is based on annual data at the provincial level for years 1999-2006 on convictions (from the Spanish Ministry of Home Affairs) and on committed crimes (from the Spanish National Statistics). Data on the foreign population and on demographic and labour market characteristics come from the Spanish Labour Force Survey. Their IV results show that immigration had a positive, though not very large, effect on total crime rate.

Aoki and Todo (2009) study the cross sectional correlation between immigrant concentration and crime in the 96 French departments in 1999. In their analysis they account for potential endogeneity of immigration using the first and second lag of the immigration share as an instrument. Their results show the existence of a positive correlation between immigration and crime, but this correlation disappears when the economic circumstances of immigrants are controlled for.

Two recent papers have specifically focused on England and Wales. Papadopoulos (2009) uses the 2003 Offending, Crime, and Justice Survey (OCJS) to study the relationship between property crime and immigration in England and Wales. The OCJS is a nationally representative survey which asks people in England and Wales about their experience and

attitudes to criminal activity, and allows therefore direct assessment of the question of whether immigrants commit more or less crime than natives. One key limitation of this survey, however, is that immigrants are not directly identifiable and therefore in the paper immigrants are defined as individuals who declare they have not lived all their life in the UK. Papadopolous estimates a number of models, which also account for differential misreporting of crime activity and sample selection. The results are fairly robust across specifications and show that immigrants are less likely than natives to commit crime. However, once gender, age, region of residence, and ethnicity are controlled for, immigrants and natives do not display any differential probability of engaging in crime activities.

Finally, Bell, Machin and Fasani (2010) examine the relationship between immigration and crime for two different waves of immigrants in the UK: the late 1990s/early 2000s wave of asylum seekers, and the post-2004 wave of workers from new EU member states, the so called A8 immigrants. They use administrative data on notified offences recorded by police at the Local Authority (LA) level since 1999, where offences are split into violent and property offences. The information on asylum seekers come from the Home Office Asylum Statistics, where data at the LA level are available because of a dispersal policy that allocates approximately 80% of asylum seekers to pre-determined locations within the UK explicitly excluding London. Data on A8 immigrants come from the Worker Registration Scheme. Consistently with theoretical predictions, their results show that property crime rates are significantly higher in areas where asylum seekers are located, while no effect is detected for A8 immigration. The authors argue that this is because the asylum seekers wave is characterized by low labour force participation, high unemployment, and low wage, while A8 immigrants have very high participation rates. In contrast, there is no significant relationship between either migration wave and growth in violent crimes. The results are robust to an IV strategy that accounts for potentially endogenous location of immigrants in LAs. Their results are supported by the time series evolution of incarceration rates which suggests a rise in the

rate of incarceration of foreigners from asylum seekers countries as the asylum wave arrived in the UK, but no such rise for A8 immigrants as that wave arrived.

5 The Fiscal Effects of Migration

Estimating the net fiscal effect of immigration is quite involved. Studies assessing the overall fiscal impact of immigration by comparing the difference between benefits received and taxes paid by immigrant can be classified as either static or dynamic analyses. For any given year, static analyses calculate the annual net fiscal contribution of immigrants as the difference between the value of taxes paid and the value of government transfers received. Dynamic studies instead compute the net present value of the lifetime net fiscal contribution of immigrants, and (in some cases) that of their descendants.

The main strength of the static approach is its simplicity and straightforwardness; no strong assumptions are required about the future behaviour of immigrants or the evolution of fiscal policies. Static analysis addresses the question “What is the net contribution of a particular group of immigrants to the tax and welfare system?”. Static analysis is backward looking, it allows assessment of how particular cohorts of immigrants have contributed to the tax- and welfare system over a period for which data is available. However, it does not provide a projection into the future. For example it does not address the question “What is the discounted net contribution of a particular group of immigrants over their life cycle to the tax and benefit system of the host country?”. Dynamic models allow for such assessment (see e.g. Storesletten 2000) but require strong modelling assumptions regarding immigrant fertility, propensity to return to the country of origin, labour market participation, and future government spending and tax policies. These assumptions can substantially influence the final result, and may lead to predictions being unreliable.

Most static studies (e.g. Huddle (1993) and Borjas (1994) for the US) amount to computing the difference in a given year between the average tax payments and receipts of government transfers of immigrants and natives. An exception is Card (2007) who follows the suggestion in Edmonston and Lee (1996) and compares measures of local spending and local tax

revenues across cities with different immigrant concentration, with a methodology that is similar to the “spatial correlation” approach.

We will review below some of the key studies in the literature, and the most recent analyses for the UK and the EU (Rowthorn (2008) offers a comprehensive review).

Using the methodology of generational accounting (see Auerbach, Gokhale and Kotlikoff, 1994) in which the discounted net tax contribution (taxes net of transfer payments received) of a representative individual in his/her lifetime is calculated, a number of studies have assessed the dynamic effects of immigration on the fiscal balance in a variety of countries.

Based on a calibrated general equilibrium overlapping generations model, Storesletten’s (2000) findings for the U.S. show that the discounted net government gain from immigration varies substantially across age and skill levels of new immigrants. For all groups, the net present value of new immigrants’ contribution is found to be hump-shaped over their life cycle and peaking between the ages 35 and 44. Using the composition of current new immigrants in the U.S., the net gain of a representative legal immigrant is calculated at \$7,400. Distinguishing by skill level, the corresponding gains of a representative high-, medium-, and low-skilled immigrant are calculated to be \$96,000, -\$2,000, and -\$36,000, respectively. The discounted government cost of new illegal immigrants can be as large as \$54,000 per immigrant, compared to \$36,000 for legal low-skilled immigrants. If immigrants bring existing children with them when immigrating, these net contributions are reduced due to the associated government transfers to these children. The author thus concludes that if the aim was to maximise the public coffer contribution per immigrant, the government should target high-skilled immigrants, preferably without children and aged between 40 and 44 years.

Consistent with these findings, Alan Auerbach and Philip Oreopoulos (1999) find very small fiscal effects of current immigration relative to the size of the overall fiscal imbalance in the U.S., so that, in their view, immigration should be viewed as neither a source nor a solution to

the existing imbalance in the U.S. Following an approach similar to Storesletten (2000), Ronald Lee and Timothy Miller (2000) find a larger net present value of immigrants' contributions to the fiscal system of around \$99,000. Their results suggest that a policy of admitting only highly-skilled immigrants could be particularly beneficial. However, they also conclude that overall the fiscal impact of immigration is quite small.

Most European studies have taken a static approach (an exception is the paper of Storesletten (2003) for Sweden). In a study for Germany, Holger Bonin (2006) calculates the net contribution of foreigners to the public coffers in Germany in the fiscal year 2004. His findings show that in that year tax revenues exceeded transfer payments by 2,000 euros per foreigner. This contribution stays positive even after accounting for demographic aging in the future with an expected rest-of-life net government gain of 11,600 euros per capita in present value terms.

Collado, Iturbe-Ormaetxe and Valera (2004) use data from the European Community Household Panel Survey (ECHP) to analyse the impact of immigration on the Spanish welfare state. Employing the generational accounting approach, they simulate the effects of a number of different immigration policies. Their calculations reveal a positive net contribution of immigrants with a present value of around 98,000 euros for a representative male immigrant and a corresponding 43,000 euros for a female immigrant in 2000.

Boeri (2009) uses the information on receipts of public transfers and on taxes and social security contributions in the EU-Silc dataset to directly assess the current net fiscal contribution of migrants in several EU countries in years 2004-2007. He first demonstrates that immigrants tend to contribute proportionately less to tax revenues than their share of the population, due to their disadvantaged labour market position. However, they also receive on average less in public transfers so that in many countries they are net fiscal contributors, while there are no countries where immigrants receive on average more in public transfers than they contribute with tax payments. The author warns, however, that his estimate of the

net fiscal contribution may be biased upward because the analysis does not capture in-kind transfers like schooling and medical services. Finally, Boeri evaluates whether immigrants are, *ceteris paribus*, more or less likely than natives to receive social transfers. Results in this case vary across countries: in Belgium, Finland, France, Germany, Luxembourg and the Netherlands immigrants are more likely than natives to receive non-contributory transfers, while the opposite is true in Greece, Portugal, Spain and the UK. Most countries show a low take-up of contributory transfers of migrants, the exception being in this case Denmark and Germany.

The first assessment of the net fiscal effects of immigration to the UK is a home office report by Gott and Johnston (2002). They estimated a net direct fiscal contribution (taxes and contributions paid minus benefits received and public services consumed) of first generation immigrants in the UK in 1999/2000 of £2.5 billion. The authors emphasise that immigrants are heterogeneous and that those who are economically particularly successful are the biggest contributors by paying more taxes and national insurance contributions and receiving less publicly provided services and benefits. Economic outcomes in turn are influenced by characteristics such as age, skills, qualifications and English language proficiency so that policies designed to improve these characteristics are likely to improve fiscal outcomes. The period of analysis chosen by Gott and Johnston, 1999/2000, was a particularly good year in terms of macroeconomic conditions so that the estimated contribution from immigrants is likely to be an upper bound of their actual annual contribution. Sriskandarajah, Cooley, and Reed (2005) extend the analysis of Gott and Johnston until 2003/2004 and show that the net fiscal contribution of immigrants is increasing over time.

In a very recent paper Dustmann, Frattini and Halls (2010) assess the net fiscal impact of migration to the UK from the countries that joined the European Union in May 2004, (A8 countries). They first use the LFS for years 2005-2009 and show that A8 immigrants who have been in the UK for more than a year, and therefore legally eligible to claim benefits, are about 60% less likely than natives to receive state benefits or tax credits, or to leave in social

housing. What is more, even if they were identical to natives in terms of their gender composition, age, education and number of dependent children they would still be 13% less likely to receive benefits and 28% less likely to live in social housing. They then go on to assess, for each fiscal year between 2005-06 and 2008-09 the net fiscal contribution of A8 immigrants and natives. They take a static approach, which does not require a high number of assumptions, and show that irrespective of the way the net fiscal contribution is defined, A8 immigrants made a positive contribution to public finances, despite the UK running a budget deficit in all years considered. This is because they have a higher labour force participation rate, are likely to pay proportionately more in indirect taxes, and make much less use of benefits and public services than natives.

6 Data and Information Sources for Cost-Benefit Analysis of Immigration to the UK

In the previous sections, we have explained in some detail the challenges and problems when estimating the impact immigration has on various sectors of the UK economy. In this section, we discuss and describe the data sources that are available to implement these estimation techniques for the UK.

Data is almost always the limiting factor in analysis. Data for the UK for the purpose of studying many issues related to migration is less good than data for e.g. the Scandinavian countries. However, much can be learned from the existing data sources. Below, besides giving a brief overview of each data set, we also point out the advantages and disadvantages for empirical analysis. All this is based on our long-standing experience with these various data sources.

The key for identification of economically interesting parameters is variation in variables we measure. Without variation, no statistical analysis is possible. For instance, if everybody had the same education and earned the same wage, no meaningful assertion could be made about what happens to the wage if education increased. Economists hypothesise then about the sources of variation in data; they build *models* to explain why e.g. education is not the same for everybody. These models are then used as framework for the specification and meaningful identification of relationships, based on exploiting information in data.

For instance, when analysing the effect of immigration on wages, the analyst tries to recover and identify relationships that have been generated by the “real world” or – in the words of the econometrician – by a “data generating process” (DGP). As this term implies, the world here is understood as something that generates data – data that we collect in terms of administrative statistics, surveys, or in other forms. The challenge for the analyst is now to recover the underlying process that generated this data. This process can be expressed in a

simplified form as a mathematical or econometric model. Such a model is typically characterised by three things: functional form, parameter, and variables. For instance, the relationship between immigrants' earnings w , and their time in Britain x could be expressed as $w=a+bx$. We call this a *model* for the relationship between x and w . Here the functional form we have chosen is linear. The parameters that characterise this relationship are a and b . The variables involved are w and x . Suppose now that wages of immigrants are generated by exactly such a relationship, where some (pre-determined) variable "time in Britain" generates wages at any point in time. However, it would be implausible to assume that only time in Britain affects wages, and we can extend the relationship by some summary measure of all other factors affecting wages, which we call u . This extended relationship is given by $w=a+bx+u$, where u summarises all the other variables that affect w . Now suppose that x and u are independent, which means that – although u affects w – it does not influence the relationship between x and w . If the true DGP is given by such a relationship, for given parameters a and b , then draws of u and x will generate wages w . The analyst observes w and x , in form of data of the sort we describe below, but does not observe the functional form, nor the parameters a and b . Typically the analyst will make assumptions (which are often testable) about the functional form, and then use the data to estimate the parameters a and b . If the functional form is correct then these estimates will allow – together with the model – to infer on wages based on information about x . It will for instance allow in our particular example to understand the impact of immigrants' prolonged residency in the UK on their wages. Understanding such a relationship may matter for estimating for instance the longer-term contributions of immigrants to the UK tax system – something we will discuss below.

Of course our model is overly simplistic, in various ways. First of all, it is unlikely that the collection of variables in u and x are independent. It is more likely that factors in u affect x and w alike – for instance, if better educated immigrants stay longer in the UK, and at the same time earn higher wages, then this assumption is violated. The consequence is that the estimated model describes now a relationship between w and x , but it cannot be used any

more to answer any policy relevant questions. For instance, a prolonged duration in the UK may now be related to wages not because it has some real effect on wages, but because those who stay longer may be better educated. Not many meaningful policy implications can be drawn from such a model.

One way to deal with this problem is to include education as an additional part into our model. In that case, and if education is the only variable in u that is correlated with y and x alike, we obtain again a relationship which can be used for meaningful policy analysis. Of course we can only include education into our regression if we observe education in the data. While for our simple example, the problem is easily addressed as education is in fact observed in almost all surveys, it highlights the problems and challenges that face the analyst. To make powerful and policy relevant statements about relationships of the sort we have described above requires good data. Of course, not all descriptive relationships are meaningless – quite the opposite. To know that those immigrants who stay longer in the UK have higher earnings is still interesting information, even if we cannot claim that longer residence in the UK *causes* the earnings of immigrants to be higher. For some analysis, including perhaps cost-benefit analyses of the type we describe in the previous sections, that information may still be extremely valuable.

Thus, while we would always like to have better data, important lessons can be learned from the data that is available, and this is certainly true for the UK. Below we list the micro-dataset currently available in the UK for researchers to address each of the issues raised in the literature review on the costs and benefits of migration. We also discuss advantages, and disadvantages in the light of the considerations above, and under the objective to estimate the various ways immigration induces costs and benefits to the UK economy. Table 2 lists all the datasets, and summarises the type of analyses they may be used for as well as each dataset's strengths and weaknesses.

6.1 The British Labour Force Survey

The main dataset to be used for any study of the consequences of immigration in the UK is the British Labour Force Survey. The Labour Force Survey (LFS) is a sample survey of households living at private addresses in Great Britain/UK. Its purpose is to provide information on the UK labour market that can then be used to develop, manage, evaluate and report on labour market policies. It is conducted by the Office for National Statistics. Other than the Census, the LFS is the only comprehensive source of information about all aspects of the labour market. As from 1992 the LFS data are collected and published quarterly. Between 1984 and 1991 the survey was carried out yearly. Between 1973 and 1983 it was carried out biannually. The 1973 data are not publicly available. Also, the 1975 and 1977 waves did not collect data on ethnicity, which may be a limitation if studying immigration. The current quarterly LFS has been running in Northern Ireland since December 1994. From 1984 to 1994 the Northern Ireland LFS was carried out annually and from 1973 to 1983 bi-annually. The ethnicity question was introduced in the Northern Ireland LFS in 1997. Since 1992 the sample size is about 60,000 household in GB in every quarter, representing about 0.2% of the population. The LFS collects information on respondents' personal circumstances (including ethnicity, nationality, country of birth, and year of arrival in the UK if applicable) and their labour market status during a reference period of one to four weeks immediately prior to the interview.

The key strengths of the LFS are that it is a large, nationally representative survey, which has run continuously for many years and thus allows intertemporal comparison. Further, it provides a comprehensive range of information on e.g. on ethnicity, nationality, country of birth, year of arrival in the UK.

One of the main weaknesses of the LFS, in particular when studying the effects of immigration, is that the number of sampled immigrants is relatively small when broken down

into fine groups. For instance, when applying the “spatial correlation” or “skill cell” correlation approach (described earlier) to study the labour market effects of immigration, the researcher needs to calculate the share of immigrants in each region or education-experience group. However, since the LFS is a nationally representative survey, and immigrants are not evenly distributed across regions or skill groups, the number of immigrants in the sample in particular units of analysis may end up being quite small, and thus lead to substantial measurement error. Similarly, the small sample size makes it difficult to perform an analysis where immigrants are grouped into occupation groups or in groups based on time spent in the UK.

Further, another issue with the LFS is the construction of population weights. The LFS contains population weights, attributing to each individual a “weight” which indicates her/his representativeness of the total population. Weights are necessary to compensate for differential non-response across different sectors of the population, and they also allow producing tables giving population estimates. However, the construction of population weights does not take into account the nationality or country of birth of individuals. This greatly limits the extent to which the LFS can be used to provide estimates of the size of the immigrant population.

Finally, the LFS has no information on parents’ nationality or country of birth, thus it cannot be used for e.g. studying second generation immigrants.

One way to improve the LFS as a base for research on immigrant populations would be to add a boost sample of immigrants to the LFS. Further, it would be desirable if nationality or country of birth were taken into account when constructing the population weights. Finally, information on parents’ country of birth would allow for a range of interesting analyses.

6.2 Annual Population Survey (APS)

The APS is a dataset available since 2004 which combines results from the LFS and the English, Welsh and Scottish Labour Force Survey boosts (during 2004 and 2005 the APS also comprised of an additional boost for England (APS(B)). APS datasets are produced quarterly with each dataset containing 12 months of data. There are approximately 170,000 households and 360,000 persons per dataset. More robust local area labour market estimates are available from the APS than from the main LFS. The APS aims to provide enhanced annual data for England, covering a target sample of at least 510 economically active persons for each Unitary Authority (UA)/Local Authority District (LAD) and at least 450 economically active persons in each Greater London Borough. In combination with local LFS boost samples from Wales (WLFS) and Scotland (SLFS) the survey provides estimates for a range of indicators down to Local Education Authority (LEA) level across the UK. Like the LFS, the APS has information on respondents' country of birth and nationality, but it does not have information on parents' country of birth.

A strength of the APS is that it allows better analysis of local labour markets because of its boost samples for local areas. The weaknesses are the same as those of the LFS. In addition it has a much shorter time dimension, as it only started in 2004.

6.3 The Annual Survey of Hours and Earnings (ASHE)

The Annual Survey of Hours and Earnings (ASHE) is a dataset collected by the ONS with information about the levels, distribution and make-up of earnings and hours worked for employees. The sample size is about 160,000 employees in every year, a one per cent sample of employees in all industries and occupations. Information on wages is obtained directly from employers, so it provides a very reliable source of wage data. The ASHE was introduced in 2004 to replace the previously used New Earnings Survey (NES). The ASHE improves on the NES in a number of ways: it provides calibration weights (based on the LFS) to adjust for sample selection, its sample has been increased to include employees in

businesses outside of the PAYE system and employees who changed or started new jobs after sample identification, and it imputes for item non-response. The NES data for years 1998-2003 have been revised by the ONS to take into account the weights and imputation used in the ASHE, and the revised NES is now part of the ASHE dataset, and referred to as ASHE without supplementary information. The ASHE with extended coverage, imputation, and weighting is available from 2004, and it is referred to as ASHE with supplementary information. For 2004 only, both versions (with and without supplementary information) are available.

The most important strengths of the ASHE data are that it contains very precise and reliable wage information, as well as detailed geographic information. A weakness for analysis of immigrant populations is that it does not provide any information on country of birth or nationality, and therefore it does not allow distinguishing between immigrants' and natives' wages.

6.4 Census of Population

The Census is a decennial survey of all people and households in the country. The most recent Census is available in 2001. The Census provides information on a wide range of issues for the whole population but has no information on wages.

For 1991 and 2001, the Centre for Census and Survey Research of the University of Manchester produced two datasets called Sample of Anonymised Records (SARs). The SARs are samples of individual level data drawn from the 1991 and 2001 Census that cover the full range of Census topics. The 1991 SAR is a 2% sample, and the 2001 SAR is a 3% sample. The level of geographic detail is different in the two SARs: the 1991 SAR provides information down to large local authority districts, while the 2001 SAR just identifies Government Office Regions. For 2001 the Small Area Microdata (SAM) file has geography at local authority level but less individual detail. The Census and its microdata subsamples provide information on individuals' country of birth, but not on their nationality.

The key strength of the Census is its sample size. A weakness is that it is available only every ten years. Further, the microdata is not directly available to the researcher, except for small subsamples with limited variable detail. Another problem is comparability across Census years, which is problematic for some variables that change classifications over time. For instance, the classification of industry, occupation, social class and education changed between 1991 and 2001. Also, the population base has slightly changed between the two latest Census years.

6.5 Other data sources

There are a number of other data sources with information on the immigrant population in the UK. Although these would not necessarily be used in a cost-benefit analysis along the lines we have detailed in the literature review, they may be useful for analysis of other aspects of immigration to the UK.

6.5.1 The International Passenger Survey (IPS)

The IPS is a survey of a random sample of passengers entering and leaving the UK by air, sea or the Channel Tunnel. The data collected include nationality, country of residence and region of the UK visited, expenditure, purpose of visit, length of stay, age group, gender, occupation, mode of transport, port, year and quarter of visit (most questions are focused on tourism). The survey operates continuously. The main use of the IPS is to provide information about flows of international immigrants into and out of the UK. This is at the same time its main strength: in principle, the IPS is the most important data source to map inflows into, and outflows out of the UK. Its main weakness is its small sample size, which makes any analysis that is based on the IPS, and that breaks groups down by characteristics, like country of origin, highly unreliable.

6.5.2 The Citizenship Survey (CS)

The CS is a household survey of adults (aged 16 and over) in England and Wales. It asks for views on a range of topics, including participation in voluntary activity and charitable giving. It was originally called the Home Office Citizenship Survey, and carried out biannually in 2001, 2003 and 2005. Since 2007, the survey has moved to a continuous design, and changed its name to Citizenship Survey. Each wave surveys 10,000 adults, with an additional boost sample of 5,000 people from minority ethnic groups. The Citizenship Survey provides information about identity and social networks, views about the local area, participation in local decision-making, feelings of trust and influence, participation in volunteering and civic activities, perceptions of racial and religious prejudice. It also has demographic (including country of birth of both parents and ethnicity) and employment information. A key strength of the survey is its boost sample of ethnic minorities, and the detailed questions on parents' country of origin. This makes the CS a very useful dataset for studies of the social characteristics of the UK immigrant population. However, it is not a data source that provides much information that can be used for analysis of costs and benefits of immigration.

6.5.3 National Insurance Number (NINOs) Registrations

New National Insurance Number registrations may provide information about the flows of immigrants, defined in terms of their nationality, across local areas. Although this is a useful data source as it has very detailed information on a local level, it also has key limitations. First, people leaving the country are not recorded, so it can only be used a measure of inflows. Second, people are counted in the Local Authority where they are living when they apply for a NINO which may be different to where they work. Third, it only includes people in work, looking for work or claiming benefits. Dependants and students are excluded. NINOs registration data are accessible through the DWP Tabulation tool at <http://research.dwp.gov.uk/asd/tabtool.asp>.

6.5.4 The National Health Service Central Register (NHSCR)

The NHSCR compiles and maintains for the Department of Health a record of all individuals registered with an NHS GP in England and Wales. The NHSCR has information on date of birth, sex and the health authority to which a person is registered, as well as on the health authority where the person was previously registered. It is therefore especially useful in studies of internal migration. International immigrants can be identified through their country of birth. Its main drawbacks when used to study international migration are: the potential lag between an immigrant's arrival in the UK and her registration with the NHS, and the lack of de-registrations when people leave the country.

6.5.5 The Workers Registration Scheme registrations (WRS)

The WRS provides information on citizens of the eight Central and Eastern European countries that joined the EU in May 2004 (so called A8 countries) who take up an employee job in the UK. It does not contain information on self employed individuals, nor on citizens of other countries. Its main strength is that it provides basic demographic information, including nationality, age, and dependents, as well as information on employment (industry and occupation) at a very detailed local level, down to employer's postcode address. However, it suffers from the usual problem of no obligation to de-register when leaving the country. Moreover, as only citizens of Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia or Slovenia have an obligation to register with the WRS, it has information only on a small sub-sample of the whole immigrant population.

6.5.6 The National Pupil Data Base (NPD)

The NPD covers all pupils in all state primary and secondary schools in England, and is available from 1996 to 2007. The data are collected by the Department for Education and Skills, which uses the data to construct the annual school league tables. Pupils can be followed from year to year and across schools through a pupil identifier. For each key stage, the NPD contains, among other achievement outcomes, English and mathematics test scores.

This data can be merged with information from the Pupil Level Annual Schools Census (PLASC) to obtain pupil-level background characteristics like ethnicity, whether or not English is the mother tongue, as well as an indicator for family poverty. No information on nationality or country of birth is available.

6.5.7 The Millennium Cohort Study (MCS)

The MCS is a longitudinal survey that follows a random sample of about 20,000 children who were born in the United Kingdom between September 2000 and August 2001. Blacks and Asians (with the exceptions of Chinese) are over-sampled. Since the start of the survey, children have been followed four times: at age nine months, three, five (just before starting school) and seven years. Since age 5, MCS members are tested on three achievement outcomes, the Picture Similarity Assessment, the Naming Vocabulary Assessment, and the Pattern Construction Assessment. The next MCS sweep is planned for 2012.

7 Analysis of Costs and Benefits of Immigration in the Context of the UK

In the previous sections we have discussed the state of the conceptual literature on the cost and benefits of immigration. We have reviewed the key theoretical concepts, and we have carefully discussed the existing empirical evidences, as well as the ways analysts have addressed key problems in the recovery of causal relationships in this area. We have also outlined the still existing shortcomings, and where we believe the future literature will add to our understanding through opening new avenues of research. Finally, we discussed in the last section the vital importance of data availability for any such analysis, and we have given a comprehensive overview of the different data sources that exist in the UK.

In this section we describe how the methodologies described in the review section can be operationalised in the UK context to provide an overall assessment of the costs and benefits of migration on different outcomes. For subjects where studies for the UK do exist, we draw on those works. For yet unexplored areas we describe how, using existing datasets and state-of-the-art methodologies, analyses for the UK could be conducted.

7.1 The labour market

As we point out in the review section, the study of the labour market effects of immigration is the most frequently investigated area in the literature, and the one for which most estimation strategies have been developed.

7.1.1 Spatial correlation

One approach that can be followed to estimate the labour market effects of immigration in the UK is the “spatial correlation approach”. This approach has been adopted in the first study on the labour market impact of immigration in the UK (Dustmann, Fabbri, and Preston 2005)

and – in extended and developed forms - also in a number subsequent studies (like e.g. Dustmann, Frattini and Preston 2008).

The typical equation for estimation in this setting has a form similar to (7.1) (drawing on Dustmann, Fabbri and Preston 2005):

$$(7.1) \quad y_{it} = \beta m_{it} + \gamma X_{it} + \theta_t + \phi_i + u_{it}$$

where y_{it} is the labour market outcome of interest for natives in region i at time t , m_{it} is the ratio of immigrants to natives in region i at time t , X_{it} is a vector of control variables, θ_t are time-specific dummy variables, ϕ_i are region-specific fixed effects. The parameter of interest is β , which relates immigration in a region to the regional labour market outcome of interest. Permanent differences between regions are captured by the region fixed effects ϕ_i . This parameter accounts, for instance, for the fact that wages in London are permanently higher than in Scotland. Inclusion of this parameter allows the analyst to consider as additional control variables in the X_{it} vector only time-varying variables. For instance X_{it} may include the educational composition of the native and foreign workforce, the regional employment rate or GDP. Finally θ_t captures all time-varying factors that affect the whole country homogeneously.

Estimation in this framework arises therefore from variation within spatial units over time. An equivalent way of estimating β accounting for region fixed effects is to estimate (7.1) in first differences, which directly removes all time invariant regional differences.

$$(7.1-a) \quad \Delta y_{it} = \beta \Delta m_{it} + \gamma \Delta X_{it} + \Delta \theta_t + \Delta u_{it}$$

Of course, β would measure the causal effect of immigration on y only if the allocation of immigrants across countries was random. Formally, this would require $E(u_{it} / X_{it}, \theta_t, \phi_i) = 0$. As we explain in the theoretical discussion above, this is likely not to

be the case. If immigrants respond to economic incentives, they may decide to settle in regions that are for instance experiencing a positive shock to labour demand. This would determine a positive correlation between immigrant inflows and wage or employment growth, which would bias the estimate of β upwards. The solution to this problem is to use an instrumental variable (IV) strategy. A suitable instrument in this case is the distribution of immigrants across UK regions in the past. Many studies (e.g. Bartel 1989, Munshi 2003) have shown that one of the main determinants of immigrants' location choices are the location choices of previous immigrants, and the location choices of immigrants in the past are arguably not driven by economic shocks at time t (untestable identifying assumption). Then, past immigrants' settlement choices provide a source of exogenous variation that can be used to identify the causal effect of immigration on local outcomes. A popular way to exploit information on past settlements, which also accounts for differences in the countries of origin of immigrants is to construct what Card (2001) calls the “*supply push component*”.

Formally, the supply push component is defined as:

$$(7.2) \quad SP_{it} = \sum_{j=1}^N \lambda_{ij}^0 M_{jt}$$

where $j=1, \dots, N$ indexes the countries of origin of immigrants, M_{jt} is the number of immigrants from country j entering the UK in year t and λ_{ij}^0 is the share of immigrants from country j living in region i in a base year 0 (which can be chosen by the analyst depending on data availability).

A crucial issue in implementing an analysis based on the “spatial correlation” approach is to choose the appropriate size of the regions. On the one hand, considering many regions increases the number of observations used in the estimate, making them more efficient. On the other hand, considering small regional units has two drawbacks. First, if using survey data with a relatively small sample size, breaking down the sample in many local units increases the error in the measurement of immigrant inflows. As discussed before (see section 3.1.3),

this leads to an *attenuation bias* in the estimated coefficient. Second, considering small regional units increases the possibility that natives out-migrate as a response to immigrant inflows. If this happens, then the local effects of immigration are counterbalanced by the out-migration of natives, and the chosen estimation strategy would fail to measure the full extent of the effect of immigration on the outcome of interest. In practice, the choice of the size of the region is often data-driven.

UK Implementation: the LFS provides most of the data needed to implement the spatial correlation approach in the UK context. In its End User Licence version the LFS identifies 20 regions within the UK in the variable *URES_MC* – “*Region of usual residence*”. The analyst can compute at this level summary wage measures (like average wages, different wage percentiles, average wages for particular skill groups) or other summary measures of labour market success (like employment, unemployment, and participation rate) that are then used as dependent variables in the analysis. Immigrant concentration and inflows can be constructed using the LFS variable on country of birth. Finer geographical identifiers are available in the Special Licence Version of the LFS for more recent years only, but the sample size reduces considerably when considering sub-regional samples and this exacerbates the errors in measuring immigrant inflows. Moreover, as discussed above, considering small regional units also intensifies the problem of potential native out-migration. The LFS also provides a rich set of control variables on the characteristics of the local labour market.

The NES/ASHE can also be used for obtaining local wage information in implementing the spatial correlation approach. However, while it certainly provides higher quality wage data than the LFS, it does not allow distinguishing between immigrants and natives.

The historical location choices of immigrants (λ_{ij}^0 in our notation) can be computed either from the LFS, or from the Census. Census data have the distinct advantage of providing a more accurate measurement of immigrant locations. However, having to rely on published tables implies that the researcher has to group countries of origins according to the grouping

used in Census tables, rather than autonomously choosing the preferred level of disaggregation across origin countries.

7.1.2 Skill cell correlation

As we explain in the review section, another popular estimation strategy to assess the impact of immigration on the labour market is the so-called “skill cell correlation” approach. In this approach, the analyst refrains from identifying local labour markets, but rather slices the national labour market into smaller entities based on the education and experience of individuals.

The regression equation in this case is the following:

$$(7.3) \quad y_{ijt} = \beta m_{ijt} + \theta_i + \zeta_j + \xi_t + (\theta_i \times \zeta_j) + (\theta_i \times \xi_t) + (\zeta_j \times \xi_t) + u_{ijt}$$

where y_{ijt} is the mean value of the labour market outcome of interest for individuals with education i and potential work experience j in period t ; m_{ijt} is the share of immigrants among all individuals with education i and experience j period t ; θ_i is a vector of education fixed effects, ζ_j is a vector of experience fixed effects, and ξ_t is a vector of time fixed effects.

The interaction term $\theta_i \times \zeta_j$ accounts for all time-invariant education-experience cell characteristics, while $\theta_i \times \xi_t$ controls for all education group-specific shocks in every year, and $\zeta_j \times \xi_t$ captures all time-varying factors affecting workers with the same level of experience. Therefore this approach exploits variation in immigration intensity across skill cells defined as education-experience groups to identify the effect of immigration on the outcome of interest.

UK Implementation: in principle the LFS allows the implementation of analysis based on the skill-cell correlation approach to the UK. Potential experience can be constructed from the

AGE variable. Educational achievements are measured in two different ways in the LFS: EDAGE reports the age at which individuals left full time education, while HIQUAL the highest qualification achieved. The problem with the latter measure is that it is defined on the British education system and classifies all foreign classifications as “other qualification” (see the discussion in the appendix of Manacorda, Manning and Wadsworth, 2006). Therefore any analysis involving the measurement of educational achievements of immigrants has to rely on the age at which individuals left full time education.

However, a characteristic feature of the UK labour market is the serious occupational downgrading immigrants sustain upon arrival, as is shown by Dustmann et al. (2008). The downgrading incurred by recent immigrants on the British labour market means that it is misleading to assume that similarly skilled immigrants and natives are perfect substitutes in production, and compete for the same type of jobs, which is the assumption at the core of the skill cell correlation approach. Such an approach is therefore problematic to implement in the UK setting.

The imperfect substitutability of immigrants and natives within the same skill cell is shown in a paper by Manacorda, Manning and Wadsworth (2006). The authors show that immigrants and natives are far from being perfect substitutes in production, even within narrowly defined skill groups. Rather, immigrants have a higher substitutability with earlier immigrants, that end up being the group whose wages are most negatively affected by immigration.

7.2 Price changes and inflation

The impact of immigration on output prices can be estimated using a spatial correlation approach, in a similar fashion to the approach used for the estimation of labour market effects. However, when looking at regional prices some considerations are in order, and it is important to clarify the extent to which such an estimation strategy allows the identification of an effect on traded goods. While the price of non-traded goods and services is set on local markets, and thus reflects local production costs and local demand conditions, trade arbitrages

(in the long run at least) the price of traded goods across different regions, net of transport costs. An identification strategy based on comparison of different regional price levels may therefore fail to capture any supply side-effects (i.e. any effects on prices arising from changes in production costs) for traded goods, and can only potentially identify effects arising from changes in local demand (see Frattini (2008) for a wider discussion of these issues). Since the channels through which local prices of tradable and non-tradable goods may be affected by immigration are substantially different, it is important to consider separately services and non-tradable goods in the empirical analysis.

The basic regression equation is the same of (7.1) or (7.1-a) and the same IV strategy discussed in the section on labour market effects can be applied. The crucial difference is that in this setting the dependent variable y_{it} will be alternatively the average regional price of traded or non-traded goods, or of relevant sub-categories within the two broad groups. For instance, one may be interested in distinguishing the effects of immigration on capital-intensive and labour-intensive goods and services.

UK Implementation: the main challenge in the empirical analysis of the effects of immigration on prices is to find sub-national price indices. In the UK, the ONS produces two price indices, CPI and RPI, but they are only published at the national level. However, the ONS computes, as an intermediate step in the production of the national CPI and RPI item-specific regional CPI and RPI indices¹⁰ for several hundred items on a monthly frequency for each of the 12 Government Office Regions, although they are not normally published. Frattini (2008) obtained the data under the Freedom of Information Act and used them to perform an analysis of the impact of immigration on prices of goods and services.

The main reason why the ONS does not publicly distribute these indices is that the sample size underpinning them is often very small and they can therefore be subject to considerable measurement error. In order to increase the sample size and thus alleviate the problems

¹⁰ The item-specific price indices are in fact the so-called RPI "*elementary aggregates*" for items that are stratified by region.

arising from measurement error, it is therefore advisable to pool together indices for several items in performing the empirical analysis. In this way even if some measurement error persists it is more likely that the error is not systematic. Since the price index is the dependent variable, if the error is not systematic then this will go against finding any effect, but will not bias the estimated coefficients.

Although price indices are available with a monthly frequency, there are at least two reasons why it would be advisable to average their values over a longer time period, such as years or quarters. First, the LFS is a quarterly survey, and its design does not allow producing figures of monthly immigration inflows. Second, it is reasonable to expect that immigration takes some time to affect the price structure, so a longer time interval between observations may be required.

The geographic detail at which the analysis can be conducted is dictated by the availability of price data at the Government Office Region Level (GOR) only. GOR identifiers are available in the LFS since 1992, so that immigrant inflows can be calculated for all the years for which price data are available (1995-onwards). However, the construction of the instrumental variable is constrained by data limitations. Pre-1991 Census tabulations do not report enough details on immigrants' countries of origin to construct the IV in (7.2), and pre-1992 the LFS does not allow identifying GORs, so the furthest base year that can be chosen is 1991.

As said, the researcher may be interested in distinguishing between the effects of immigration on goods and services produced in different industries, according to the technology used in each industrial sector. In particular, it is relevant to distinguish industries according to their labour intensiveness (ratio of labour costs to total input costs) and to the prevailing type of labour employed (see Frattini 2008 for a discussion).

The tables obtained by standard extracts of the Annual Business Inquiry (ABI) produced by the ONS provide financial information at the industry level, and in particular allow computing the ratio of employment costs to other input costs. The ABI is a survey of

employment and accounting information from businesses and other establishments in most industry sectors of the economy conducted annually by the ONS since 1998. It replaces the Annual Employment Survey (AES) which ran from 1995 to 1998 and the Annual Census of Production and Construction (1970-1997) and the Distribution and Services Inquiries (1976-1997). The ONS produces tables based on the ABI and its predecessors with employment and financial information by industrial sector since 1995. The New Earnings Survey (NES) and the Annual Survey of Hours and Earnings (ASHE) provide instead information on wage structure at a detailed sectoral level which can be used to classify sectors according to the type of labour they prevalingly employ.

7.3 Housing

The spatial correlation approach can also be used to the study of the impact of immigration on housing prices. In the case of housing prices, however, the choice of the unit of observation is more crucial. It is in fact important to look at fairly small regional units; those that constitute the relevant housing market. Otherwise, the estimation techniques discussed above carry on in the same way.

UK Implementation: there are several possible data sources on housing prices available in the UK, at a fairly disaggregated geographical detail.

Historical housing price information can be recovered at the local level, down to post code detail, from the Halifax House Price Index. The Halifax House Price Index is derived from the agreed sale price of the property transactions for which Halifax provides mortgages. The index at the national and Government Office Region level covers different categories of houses (all, new and existing) and buyers (all, first-time buyers and home-movers). These indices are also adjusted to allow for seasonal variations and are standardised to represent the price of a typically transacted house. However, at the post-code level the index merely represents a simple average of the sale price of properties in the area. Therefore when the study is conducted at a sub-regional level, if the overall quality or mix of housing types sold

in a given local authority changes over time, then the house prices in each year will not be directly comparable with each other. If there is a correlation between any changes in the mix of housing sold and immigration, however, then this will be a factor in the estimates of the impact of immigration on house prices. For example, if in any given local authority the presence of more immigrants in more recent years leads to higher sales of flats or lower quality housing, then there will be a negative effect of immigration on the price of the average house that is sold, but not necessarily a negative effect on the price of the average house overall i.e. including those which are not sold. The study would thus report the former effect, of immigration on the average price of the houses that are sold, but not the latter, the effect of immigration on the average price of all houses.

The Department for Communities and Local Government also produces a monthly house price index, which is obtained as the weighted average of prices for a standard mix of dwellings. Data for the construction of this index come from the *Regulated Mortgage Survey (RMS)*. The RMS sample size was quite limited (26/36 thousand cases per year) from 1993 to 2002. However, since 2003 the sample size has increased and a new monthly series with about 25 thousand cases per month has been launched. The DCLG estimates that in 2007 they obtained data for 60 per cent of all UK mortgages for house purchase. The questionnaire on which the survey is based has been revised from time to time, notably in 1982 when the question on the previous tenure of borrowers was extended to identify sitting tenants. The method of analysis was introduced in the second quarter of 1968 and most of the detailed series now published have their origins in this period. From 1969 to 1992 the index reflected dwellings mortgaged by building societies only. However in the early 1990s many of the larger building societies converted to banks and an index limited to building society mortgages would have no longer been representative of all house purchases. So from 1993 the index was extended to include both banks and building societies and was re-named the *All Lenders Index*. Since then the survey has been revised occasionally with the current version, the RMS, starting in August 2005. Data are available at the district level.

Nationwide also provides a house price index constructed in a similar fashion to Halifax. House price information is derived from Nationwide mortgage data. The Nationwide mix-adjusted index starts from 1952, on a quarterly basis, and since 1991 it is available on a monthly basis. Every quarter Nationwide also publishes a more detailed breakdown of house prices. These include both UK and 13 regional estimates for four types of house (detached, semi-detached, terraced and flats), two types of buyer (first time buyer and former owner occupiers) and three property ages (new, modern and older - pre World War II). No information is available at the sub-regional level.

Another house price index has been provided by the Land Registry since 1995. The Land Registry Index provides on a monthly basis the average house prices at the national, regional, county and London borough level, for England and Wales. It is calculated using Land Registry's own "Price Paid Dataset". This is a record of all residential property transactions made, whether for cash or with a mortgage, in England and Wales since January 1995. The Land Registry House Price Index is based upon the Repeat Sales Regression (RSR) Method. Under the RSR method, house price growth is measured by looking at houses which have been bought or sold more than once. The use of repeat transactions controls for differences in the quality of the houses comprising the monthly sample – thereby offering a more constant quality comparison

Having data on housing prices at a very fine geographical level is optimal because this is likely to be the most relevant unit of observation, as explained above. However, as we have already discussed, there is no robust and frequent source of information on historical immigration at the sub-regional level. One possibility is therefore to rely on Census information and conduct a long-run analysis, having to rely on ten year intervals. The Census provides information on the size of the foreign and native-born population at the LA level, which can be used to construct m_{it} . However, information on country of birth, as opposed to simply foreign born or UK born, is important for construction of the supply-push instrumental variables, and the categorisation of country of births is more problematic. The country of

birth categories are different in each year of the census. In 1981, the information is most detailed for countries of the Commonwealth and categories such as ‘New Commonwealth – East Africa’ are used. This categorisation is not followed in the 1991 and 2001 census. As a result the overlap between the three Censuses is very imperfect and a rather arbitrary grouping approach has to be used if one wants to instrument the change in immigration between 1991 and 2001 with the supply-push component calculated with 1981 as base year. This lack of precision may result in the 1981-based supply push component not being a good predictor of the 1991-2001 immigrant inflow. Using Census data is therefore extremely problematic. It is however worth noting that some of these limitations could be overcome once the 2011 Census becomes available.

Alternative data sources of potential information on immigration at the LA level are the Special Licence LFS and APS, although the number of sampled immigrants in each LA can be quite small and data are available only for the most recent years. Alternatively, the analysis can be conducted on the GOR level, and information on immigration at this level is available from the LFS since 1992.

When long differences are used, as is the case when using the ten year intervals between Census years, it also becomes important to include in the regression the changes in a number of local characteristics which may affect housing supply and demand. For instance, the proportion of owner occupiers in a local authority and the proportion of households without central heating, capture average local housing quality, and are both available in the Census. The Census also provides some variables that allow to control for changes in housing demand: the proportion of overcrowded households (more than one person per habitable room); the proportion of people in the key house buying age group, 25-44; the proportions of the population aged 16-74 in employment and unemployed; and the proportion of the population with higher education qualifications (though the latter variable has some comparability issues across Census years).

Finally, a crucial variable to determine housing demand is local income. The most accurate source of income at the local level is the NES/ASHE.

7.4 Crime

As we show in the literature review, there are very few studies investigating the impact of immigration on crime. All of them use variations across spatial units over time of both migration and crime to identify the link between migration and criminality. This approach is also taken by Bell, Machin and Fasani (2010) for their analysis of the UK. They have however to limit their attention to two specific migrant populations, as currently UK data does not allow an assessment of the impact of migration on crime rates. We now discuss what data are available, and would be needed to implement an analysis for the whole immigrant population.

UK Implementation: the most reliable and consistent source of information on crime in England and Wales are notified offences recorded by the 43 police forces across the country. Since 1999, this data can be disaggregated to the LA level. Notified offences are split into two categories: violent offences and property offences (the sum of burglary, robbery, theft of a motor vehicle and theft from a motor vehicle). These data can be used to construct crime rates for each crime type at the local level, dividing the number of offences by the size of the local population. These crime rates constitute the dependent variables in the regression analysis. The distinction between property and violent offences is particularly relevant in an economic context, since property crimes are more likely to be economically motivated than violent crimes.

The problem with data at such a high level of geographical detail is that there are no reliable information on immigration over this period at the same level of geographical disaggregation. Since crime data start in 1991, the Census is not an option if the analyst wants to exploit (as it should be done) the panel nature of the information. However, once the 2011 Census

becomes available, the use of 2001 and 2011 Censuses, with the 1991 Census used for constructing the IV will become a viable option.

Bell et al. (2010) analyse the relationship between the inflow of asylum seekers and crime. This focus has the advantage of making them able to exploit the features of a dispersal policy of asylum seekers over the UK operated by the National Asylum Support Service (NASS). Asylum seekers are forbidden from working in the UK while their asylum request is pending. Therefore, if they do not have own resources to use, they have to rely on social assistance for housing and living expenses. NASS provided subsistence payments and housing to asylum seekers, and operated a dispersal policy aimed at locating asylum seekers across the country and explicitly excluded London. Asylum seekers did not have choice as to their destination, but were forced to abide to where they are allocated if they do not want to lose the subsidy. On average around 80 percent of asylum seekers do request assistance. The data is available from 2001 in the Home Office publication *Asylum Statistics*. The dispersal of asylum seekers across the country provides the exogenous variation in the location of immigrants needed to identify the causal effect on crime. However, as an exogenous allocation of immigrants is not in place for non-asylum seekers, this is not a viable instrument for assessing the overall effect of migration on crime.

Bell et al. (2010) also consider the effect of immigration from the eight Central and Eastern European countries that joined the EU in 2004 (so called “A8 countries”) on crime rate in the UK. In this case, no exogenous allocation of A8 immigrants was in place, so they need an instrument for A8 immigrants’ location choices. They choose to use an instrumental variable approach similar to Lemos and Portes (2008) who, among other instruments, suggest an IV based on the availability of flights from the A8 countries to the UK. The intuition is that areas close to airports with frequent and varied connections to the A8 countries are more likely to attract the A8 flow. They use data from the Civil Aviation Authority that reports the number of A8 destinations flown to from every UK airport on annual basis, and then calculate for each LA the log of the number of A8 destinations flown to from all airports within 50 miles

the year before. Although not very strong, the instrument is correlated to immigrants' location choices, and allows them to identify the causal effect of A8 migration on crime rate. It is not clear however to what extent such an instrument would work for immigrants from other countries.

7.5 The fiscal effects of migration

The probably most important single issue about the cost and benefits of migration is the effect immigration has on welfare receipts and tax payments of natives. As we discuss in section 5, studies of the fiscal effects of immigration can be either static or dynamic. Dynamic studies are forward-looking and allow, in principle, to compute the net fiscal effects of immigrants who have not entered in the country. However, they require very strong modelling assumptions about the size and characteristics of future immigration, the return migration decisions of immigrants, the government fiscal policy and the business cycle. Static studies are more limited in scope. They take a backward-looking approach, asking for instance “what has been the net fiscal contribution of a particular group of immigrants in year t ?”. However, they require weaker modelling assumptions, and this makes it also easier to assess how changes in the assumptions would modify the final results. Several scenarios, corresponding to different assumptions, can be computed and their results comparatively assessed. The complexity of dynamic studies and their high dependency on untestable hypothesis makes them in practice often less useful for policy purposes than more straightforward static analyses.

We now turn to describing how a static analysis of the fiscal costs and benefits of immigration could be performed in the UK, along the lines of the studies reviewed in the literature review section. Our exposition relates to, and builds on, previous work by Dustmann, Hall and Frattini (2010).

7.5.1 The underlying model

Essentially, such analysis amounts to computing, for every year, the difference between the transfers made to immigrants to the amount immigrants paid in taxes. The analysis can distinguish between various subpopulations, for instance between different “types of immigrants”, like immigrants from different countries of origin, or from different arrival cohorts.

The basic setup of the analysis is described below: every year the government runs a surplus or deficit (GSUR), which is given by the difference between revenues (REV) and expenditures (EXP). Total revenues can be decomposed in to the sum of all taxes levied by the government. We indicate with N_R the total number of taxes levied by the government, while rev_i , indicates each of the government sources of revenues, and it is obviously $i=1, \dots, N_R$. Similarly total expenditures are given by the sum of all N_E different government expenditures, which we denote as exp_j , and $j=1, \dots, N_E$.

The total government surplus can then be written as:

$$(7.4) \quad GSUR = REV - EXP = \sum_{i=1}^{N_R} rev_i - \sum_{j=1}^{N_E} exp_j$$

The resulting figure can be decomposed into the net contributions of various populations in the UK at a particular point in time. The definition of the UK sub-populations depends on the focus of the research. In our case, sub-populations of interest may be immigrants and natives, or immigrants from different countries of origin and natives, or again immigrants from different immigrant cohorts and natives.

If we have M sub-populations to analyse, we can then re-write equation (7.4) as:

$$(7.5) \quad GSUR = \sum_{k=1}^M \left(\sum_{i=1}^{N_R} \alpha_i^k rev_i - \sum_{j=1}^{N_E} \beta_j^k exp_j \right)$$

where α_i^k , $k=1, \dots, M$ denotes the share of group k 's payments of tax i and β_j^k denotes the share of group k 's receipts of government expenditures j , so that $\sum_{k=1}^M \alpha_i^k = 1$ for every i and

$$\sum_{k=1}^M \beta_j^k = 1 \text{ for every } j.$$

Defining the share of total revenues and of total expenditures, respectively, pertaining to each

group k as $\tilde{\alpha}^k = \sum_{i=1}^{N_R} \frac{\alpha_i^k \text{rev}_i}{REV}$ and $\tilde{\beta}^k = \sum_{j=1}^{N_E} \frac{\beta_j^k \text{exp}_j}{EXP}$, (7.5) can be rewritten as:

$$(7.6) \quad GSUR = \sum_{k=1}^M (\tilde{\alpha}^k REV - \tilde{\beta}^k EXP)$$

One can then assess, for instance, whether the sub-population k contributes in taxes proportionately more or less than another sub-population k' comparing the ratio of share of

total revenues to share of total population $T_k = \frac{\tilde{\alpha}^k}{s^k}$ for each group. If T_k is greater than one,

this means that group k contributes more than proportionately to the government revenue, while if T_k is smaller than one, this indicates that group k contributes less than proportionately to its population share to total revenues. Similarly, one can assess the extent to which each

group contributes to public expenditure by computing the ratio $E_k = \frac{\tilde{\beta}^k}{s^k}$. The net fiscal

contribution of each group k can also be computed as $NFC_k = \tilde{\alpha}^k REV - \tilde{\beta}^k EXP$, so that

we will say that the sub-population makes a positive net fiscal contribution to public finances if $NFC_k > 0$.

The challenge for the researcher is then to appropriately compute the α_i^k and β_j^k . Each criterion chosen to compute these shares may in fact hide implicit assumptions about the behaviour of each group that have to be made explicit and, if possible, tested.

We now outline what data sources are needed to perform such an analysis, and how each of the apportioning coefficients α_i^k and β_j^k can be computed in the UK context.

7.5.2 Government receipts

The data is available from table C4 of the Public Sector Finances Databank. The Public Sector Finances Databank is a compilation of published data covering the main aspects of the Government Finances including receipts, expenditure, borrowing and debt. The databank is compiled by HM Treasury and is based on published ONS statistics. In particular, table C4 is based on table 2.1 of the monthly ONS Financial Statistics.

Table 3 reports the list of receipts from table C4. We have grouped receipts in nine groups, where all receipts in each group share the same apportioning coefficient α_i^k .

We now describe how the apportioning coefficients can be constructed, and we also discuss some possible problems and weaknesses of the respective approaches.

Income tax and NIC

The main data source for computing apportioning coefficients for Income Tax and National Insurance Contribution payments is the LFS. Income tax and NIC payments are computed for each individual in the LFS using the appropriate Income Tax and National Insurance Contributions rate in every year, applied to taxable income. Taxable income is obtained from the LFS income variable from which one has to first subtract the lump-sum personal allowance available to all individuals, then account for private pension payments. As there is no direct information on contributions to private pensions, one can use the probability of each individual of contributing to a private pension by age, sex, work pattern and income (calculated by the ONS based on the General Household Survey, and available for 2008 here http://www.statistics.gov.uk/downloads/theme_compendia/GLF08/GLF08chapter6-Pensions.xls). Similarly, there is no direct information on the pension contribution rate, but

the national average rate from the ONS Pension Trends, chapter 8 can be used for everyone. Likely pension payments are then subtracted from gross income to obtain a measure of taxable income, to which the appropriate rates of income tax and national insurance are applied to calculate approximate personal taxes paid.

After constructing total income tax and NIC payments for each individual in the sample, the share of total payments for each sub-population of interest can be computed. These shares constitute the apportioning coefficients which will be applied to the aggregate tax data to obtain total tax payments attributed to each sub-population group.

Potential weaknesses are that (i) the LFS does not have information on income for self employed, therefore all calculations are based on employees' incomes only; (ii) there is no direct information on contributions to private pensions, which means one has to rely on aggregate data, and implicitly assume that similar natives and immigrants have the same probability of contributing to private pensions.

Potential solutions to address these weaknesses are the use of survey data providing information on income of self employed as well as information on contribution to private pension schemes. Such data are currently not available.

Income tax credits

The main data source to compute apportioning coefficients for Income Tax Credits is again the LFS. Income tax credits are composed of Child Tax Credits (CTC) and Working Tax Credits (WTC). As CTC constitute about 3/4 of the total (source: HMRC - Child and Working Tax Credits Statistics: Finalised annual awards, 2007-08, table 1.1¹¹), one way of determining apportioning coefficients for this category is to use the proportion of dependent children that are in each sub-population group. The imprecision arising from the lack of explicit consideration of WTC will not affect the final estimates, as tax credits payments amount to about 1% of total government receipts in every fiscal year. Therefore the choice of

¹¹ <http://www.hmrc.gov.uk/stats/personal-tax-credits/ctcw-tax-credit-final-may09.pdf>

different criteria to determine apportioning coefficients has only minor effects on the overall result of the fiscal analysis.

Consumption taxes – VAT and excise duties

Consumption tax payments are computed applying to gross individual income from the LFS the effective tax-specific rates by decile of household disposable income (gross annual income less income tax and national insurance receipts). The effective tax rate for VAT and other indirect taxes are available from the ONS publication “The effect of Taxes and Benefits on Household Income”, which is based on data from the Expenditure and Food Survey (EFS). As with income tax, the share of total payments made by each sub-population group to total payments for VAT and other consumption taxes can then be calculated.

A potential weakness with this procedure is the implicit assumption that immigrants and natives with the same income have the same consumption behaviour. A possible solution would be to compute effective tax rates for VAT and other consumption taxes from surveys that include information on immigrant status, which are not currently available in the UK. Significant improvements in the determination of the total VAT payments of immigrants could be made if the EFS included a variable on nationality or country of birth of respondents.

Corporation tax and capital gains tax

The main data sources for comparing apportioning coefficients for corporation tax and capital gains tax are the LFS and the ONS “Share Ownership” report. Corporation taxes and capital gains tax are apportioned proportionately to the share of each sub-population group in the total population, net of the percentage likely to be paid by foreign shareholders. The share of foreign ownership in UK companies is available from the ONS “Share Ownership” report (<http://www.statistics.gov.uk/StatBase/Product.asp?vlnk=930>). Alternatively, one could use indirect information on business ownership from the LFS (for instance) and use the share of

each sub-population group among business owners as apportioning coefficients for the share of corporation taxes paid by resident shareholders.

Inheritance tax

The main data source to determine apportioning coefficients for inheritance tax is the LFS. Inheritance tax can be apportioned using house ownership as a proxy for asset ownership (financial, land and buildings). The share of each sub-population among house-owners can be calculated from the LFS, and it can then be used as apportioning coefficient. A potential weakness with this procedure is that there is no consideration of differences in age structure among sub-populations when constructing the coefficients. One way to account for this could be, for instance, apportion inheritance taxes according to the share of each sub-population among homeowners over the age of 70.

Council tax

The main data source to determine apportioning coefficients for council tax payments is the LFS. Council tax payments are apportioned proportionately to the share of each sub-population in total households, or proportionately to population shares.

Business rates

The main data source to determine apportioning coefficients for business rates is the LFS. Business rates are a tax on non-domestic property, typically paid by businesses and other organisations which occupy non-domestic premises. One can proxy the share of businesses owned by each sub-population with the share of self employed belonging to each group. These shares are then used as apportioning coefficients.

Other tax payments

All remaining tax payments are apportioned according to the population shares. These are the three “environmental” taxes, contributing annually to less than 0.4% of total revenue: landfill

tax - levied on waste that is disposed of at landfills; climate change levy - charged on business consumers of taxable commodities for lighting, heating and power; aggregates levy - a tax on sand, gravel and rock that is dug from the ground or dredged from the sea. The remaining receipt categories are “Other taxes and royalties”, “Adjustments”, “Interest and dividends”, “Other receipts”, and the negative item “Own resources contribution to EC budget,” which do not have any other natural apportioning criterion.

7.5.3 Public expenditure

We now turn to the computation of public expenditures. Public expenditure data are available from the Public Expenditure Statistical Analyses (PESA) published annually by HM Treasury. Data are typically in table 5.2 “Total Expenditure on Services by sub-function”.

Table 4 reports the list of expenditures from table 5.2 in PESA 2009. We have grouped together expenditures for which the same apportioning coefficient should be used.

We describe now the construction of expenditures apportioning coefficients, distinguishing between different groups of goods.

Pure public goods

The choice of the allocation coefficient to be used in apportioning expenditure on public goods reflects the assumptions the analyst makes about the cost of providing such public goods and services to immigrants. In particular, a choice has to be made as to whether public goods should be priced at their average or marginal cost. The average cost of provision is easily obtained as the ratio of total expenditure for the good to the total population. The marginal cost, on the other hand is typically unknown, and can be smaller or bigger than the average cost. Some types of public goods (like, e.g. national defence), would arguably be provided in the same amount and at the same cost regardless of the level of immigration. In this case, the marginal cost of providing the good to an immigrant would be zero. Conversely, the expenditure for other types of public goods and services (like, e.g. waste disposal) will increase as a result of immigration, although probably less than proportionately (in other words, the marginal cost will be smaller than the average cost). In general, attributing expenditures for public goods according to their average cost will tend, if anything, to overestimate immigrants’ share of expenditures¹².

¹² It is also worth noting that immigrants may affect the cost of provision of public goods. We abstract from these considerations here as such effects would be captured in the analysis of price and wage effects.

We can divide public goods and services in two categories: “pure” public goods, and “other” public goods and services. The former group consists of all the public goods and services that are typically non-rival in consumption: general public services, defence, economic affairs, and pollution abatement, protection of biodiversity and landscape, R&D environment protection, environment protection n.e.c, street lighting, health research.

The most conservative choice is to allocate expenditures for pure public goods to each sub-population according to its share in the total population, which is equivalent to charging the average cost of provision to all groups. Alternatively, expenditures for pure public goods can be charged to each sub-population group at their marginal cost. In this case, the costs for public goods are only borne by the part of the population that was already in the UK before immigration (i.e. natives and immigrants from earlier cohorts). In both cases allocation coefficients can be calculated from the LFS.

Other public goods and services

Not all public services are effectively non-rival, and therefore the increase in population may also increase the overall cost of providing them. For this reason those public goods that are – at least to some extent – rival in consumption, have to be apportioned proportionally to the share of each group in the total population. These are: fire-protection services; R&D public order and safety; public order and safety n.e.c; waste management; water management; community development; water supply; R&D housing and community amenities; housing and community amenities n.e.c.; recreation, culture and religion; education not definable by level; subsidiary services to education; R&D education; education n.e.c.; R&D social protection; social protection n.e.c. For simplicity, we have also included in this category EU transactions, accounting adjustments, and unallocated which – although not public goods – can also be apportioned proportionately to population shares. Again, the share of each group in the total population will be computed from the LFS.

Law courts and prisons

The main data source to estimate apportioning coefficients for law courts and prisons is the Offender Management Caseload Statistics.

Expenditures for law courts and prisons are allocated to the different sub-populations proportionately to their share in the total prison population. Information on the nationality of prison inmates is taken from the Ministry of Justice's Offender Management Caseload Statistics¹³. If data about number of trials or litigations by nationality and/or country birth were available, these could be used to better apportion expenditure for law courts. However, no such data exist. Using the numerosity of the prison population for each national group seems therefore the best approximation.

A weakness of the data in the Offender Management Caseload Statistics is that there is no information about years spent in the UK by prison inmates, so it is not possible to distinguish between different entry cohorts.

Housing development

The main data source to estimate apportioning coefficients for housing development is the LFS. Housing development comprises expenditures for social and local authority housing, and is therefore apportioned according to the share of each sub-population among social housing tenants. A potential weakness of this procedure is that this figure is based on survey estimates. Access to administrative data about the proportion of immigrants and natives in social housing could improve the precision of the assessment.

Medical and other health services

The main data sources to compute apportioning coefficients for expenditure in medical and other health services are the LFS and the Department for Health Departmental Report 2006¹⁴. Apportioning coefficients for health care costs are calculated in a two step procedure,

¹³ Available here: <http://www.justice.gov.uk/publications/prisonandprobation-archive.htm>.

¹⁴ Available here: <http://www.official-documents.gov.uk/document/cm68/6814/6814.pdf>.

summarised in the following expression: $\beta^k = \sum_{i=1}^8 h_i \alpha_i^k$. First, the population is divided into eight age groups, indexed by i ; h_i denotes the fraction of total health costs spent for age group i , and is available from the Department for Health Departmental Report 2006 (figure 6.2). Then, the fraction of individuals from the sub-population k in the total population in the age group i , α_i^k , can be computed from the LFS. Finally, the share of total health costs attributable to sub-population k can be obtained summing over all the eight $h_i \alpha_i^k$ products, to obtain β^k . This can be used as apportioning coefficient for medical expenditures.

A potential weakness is that the share of medical expenditure by age group refers to one year only, and they are not available for earlier and later years. This could bias the estimates if the structure of health expenditure by age groups has changed considerably over time.

Education

The main data source to estimate apportioning coefficients for education expenditure is the LFS. Expenditure in compulsory education is apportioned using LFS information on the national composition of population in the relevant age group for each school grade. For instance, expenditure for primary education will be allocated proportionately to the share of each sub-population among children aged 5 to 10. Expenditure in post-secondary education is apportioned using LFS self-reported information about further education.

There are a number of weaknesses: (i) apportioning coefficients are based on estimates, not on actual school enrolment (e.g. there is no information about students enrolled in fee-paying schools, and therefore it is implicitly assumed they are evenly distributed across the different sub-populations); (ii) there is ambiguity about second generation immigrants and children of mixed foreign-native couples. It is not clear how these should be treated.

Police services

The main data source to estimate apportioning coefficients for expenditure for police services is the LFS. Police expenditures are divided into expenditure for immigration and citizenship, and expenditure for other police services.

Police expenses relative to immigration and citizenship are arguably a public service, and therefore their cost should be apportioned proportionately to the share of each sub-population group in the total UK population. However, it could also be argued that these costs should be entirely attributable to immigrants. Although this is disputable, since expenses for immigration controls are for the primary benefit of natives, one can also apportion immigration and citizenship costs proportionately to the share of each sub-population in the foreign-born population. This means that natives bear no cost for police services for immigration and citizenship, and all costs are shared among the immigrant population only.

Other police services can also be apportioned proportionately to the share of each group in the total population. However, one may fear that immigration may increase crime and hence raise police costs. For this reason an alternative criterion is to use as apportioning coefficients the share of each sub-population in the total prison population as a proxy of crime activity (i.e. using the same coefficients used in apportioning prison expenditure).

Social protection

The main data source to compute apportioning coefficients for expenditure for social protection is the LFS. The LFS contains a number of variables detailing what type of benefits (if any) each individual receives, and this can be used to compute the share of each sub-populations among the total recipients of each type of benefit. These shares can then be used as apportioning coefficients. However, the LFS variable outlining actual receipt of specific type of benefits is often unreliable when the data are broken down according to very fine sub-population groups due to small sample size. Therefore the robustness of the results can be checked using LFS information on potential benefit recipients.

Sickness and disability benefits can be apportioned proportionately to the share of each sub-population among those who declare disability in the LFS, and are therefore potential recipients of sickness and disability benefits, based on the variable DISCURR. Alternatively, the share in the population of self-declared disability benefit recipients resulting from the LFS can also be considered.

Apportioning coefficients for expenditure in old age and survivors benefits (which include pension payments) can be constructed based on the share of each group in the inactive pension age population (potential recipients), or in the population of self-declared pension recipients. Social protection for family and children can be apportioned proportionately to the share of each group among the children population (potential recipients), or among the self-declared recipients of income support or family related benefits recipients. Expenditure on social protection for unemployment is apportioned alternatively according to the composition of the unemployed population (potential recipients), or according to the composition of the population of the self-declared unemployment benefits recipients. Housing expenditure is apportioned proportionately to the composition of the population in social housing (potential recipients) or to the composition of housing or council tax benefits recipients.

Finally, other expenditures on protection of social exclusion can be apportioned according to the share of each sub-population among the recipients of income support or family-related benefits recipients, as they make up in every year over 80% of the total expenditure in this category, and there is no obvious population of potential recipients to use as an alternative apportionment method.

A weaknesses in the construction of all these coefficients is that the LFS has no information on the amount of benefit received, only on whether the individual is a recipient or not. A potential solution would be to use survey data with information on amount of benefits received, but a suitable survey is not available for the UK.

8 Discussion

This report provides a comprehensive assessment of literature that assess quantitatively the impact of immigration on the receiving economy, and that assesses the fiscal cost and benefit of immigration. Immigration affects the receiving country in a multitude of different ways. Economists have investigated some of these channels, but many others have not been explored, or have sometimes not even been identified. Moreover, some of the cultural and political effects immigration may have on host countries are not measurable or quantifiable. Thus, there are large gaps in our understanding of the way immigration affects the receiving country. Also, there is no unifying framework, or model, that produces answers to all the questions we may want to pose. Even the areas we do understand are fragmented, and not investigated in an overall framework, which is related to the diverse nature of the issues. For instance, while the study of the impact of migration on labour markets is clearly related to existing empirical models, and requires on the empirical level the re-construction of a counterfactual situation "(e.g. how would native wages look like had migration not happened?"), the fiscal impact of migration is more of an accountancy exercise, where a systematic analysis is provided on the contributions, and the receipt of immigrants to the tax- and welfare system. With regard to the impact immigration has on the economy, the report illustrates the current methodology (both conceptually and empirically) that exists in the academic literature, and debates its advantages and disadvantages. It shows that even small progress on measuring the effects immigration has on the labour market and on other key areas in the receiving country is difficult, very slow, and much related to the quality of available data sources. The key difficulty for the estimation of the effects of immigration relates to the construction of a "counterfactual" situation: whenever immigration occurs we always observe how the labour market of the receiving country changes through immigration; however, we do not observe how the labour market would change in the absence of immigration. Computing this counterfactual situation is one of the greatest challenges in the

literature. The ability of the analyst to construct plausible counterfactual situations depends largely on the availability and quality of data on immigration, wages, and other economic variables. The credibility of the results that emerge from the different approaches is foremost related to the plausibility of the approach to construct this counterfactual situation.

Although the literature has made substantial progress in the analysis of the effects of immigration on the receiving economy, there are still large gaps in our understanding. One of the key areas we do not understand well is the way immigration affects the receiving economy through mechanisms other than captured in the simple model of the labour market that we discuss in chapter 2, and that underlies most of the empirical literature. For instance, how does immigration benefit the receiving country through complementary skills, like entrepreneurship; does immigration create positive externalities, e.g. by internationalisation of particular industries (like the banking sector) which helps business relationships with other countries? Are immigrants a means to equilibrate the labour market, in the sense that immigrants address skill shortages that are created by an immobile native workforce? What are the dynamics of immigrants' impacts on the receiving economy? These are examples for obvious and important questions; nevertheless, hardly any empirical or conceptual research exists to address them. A big issue is the lack of high quality data.

A different literature investigates the fiscal effects of immigration. In the report, we draw distinction between “static” and “dynamic” models, and we favour the “static” approach for policy purposes. A static analysis is able to assess the fiscal impact of immigrant populations over the years they reside in the UK. For instance, we can draw quite a precise picture on the taxes paid by immigrants from the A8 countries since 2004, and contrast these to the benefits they draw from the welfare system, thus assessing the net fiscal impact of these immigrants (see Dustmann, Frattini and Halls 2010). Similar analysis could be performed for other immigrant groups, and for longer periods. However, we are critical about approaches that attempt to predict the net fiscal impact of immigrant cohorts for the future. These approaches depend crucially on forecasts of key variables (like macro-economic indicators, the degree of

return migration, the way immigrant and native earnings develop over their life cycle, etc). We believe that – although academically interesting and challenging- the margin of error of these models may be very large, and may lead to misleading policy recommendations.

Many of the results we have presented and discussed are results "on average": e.g. the effect of immigration on average wages, or average wages for particular groups; or the average fiscal impact of migration, as well as the average demand for social housing. These effects are quantifiable, and these are the effects we need to understand in the policy debate. However, they don't represent the effects migration may have on particular subgroups. For instance, some particular native workers may be more affected by immigration, or in some areas the concentration of immigrants may lead to serious pressure on public services. The imbalance between the increase in revenues at the central level and the additional demand on local public services may lead to fiscal tensions if not adequately targeted. This is an under-investigated area that deserves further research.

Our understanding of the effects of immigration on the UK has quite improved over the last 15 years. There are now several studies that investigate the effect immigration has on the labour market (e.g. Dustmann, Fabbri and Preston (2005), Manacorda, Manning and Wadsworth (2006), and Dustmann, Frattini and Preston (2008)); all these suggest that the negative effects of immigration on wages are small, which is in line with much of the international literature. There are various studies that assess the fiscal effects of immigration (see, for instance, the comprehensive review in Rowthorn (2008)). The latest study by Dustmann, Frattini and Halls (2010) suggests that immigration of A8 immigrants since 2004 has been beneficial to the tax- and benefit system, with immigrants over this 4 years period being less likely to claim benefits and housing subsidies, and paying substantially more in terms of taxes than they take out in terms of benefits. A recent paper of Frattini (2008) shows that immigration has kept down the growth in prices of some types of services, like for instance restaurants and take-away food shops, although it has possibly contributed slightly to the growth in price of some traded grocery goods. These studies are important, as they put

much of the anecdotal evidence that is provided by the media in context. They can also offer support for policy-making: they help to understand the consequences of different migratory policies, to identify winners and losers from migration, and to assess the overall balance of cost and benefit that it brings to the UK.

As we discuss before, there is no over-arching theoretical model that allows us to answer all the questions on how migration affects the receiving economy - the complexity of the issue is far too large. And even if we had developed such a model, a major challenge would be to obtain reliable estimates on the different parameters that determine the model structure. For instance, in chapter 3 we discuss a large literature that is concerned with the estimation of only one parameter: the effect immigration has on wages, and there is no clear agreement what is the best way forward among academic economists. Despite all that, progress in research in the different areas on what immigration does to the receiving economy, how immigrant communities perform, what their fiscal impact is etc. has been substantial over the last decades. Today's policy-makers can base their policies on a much larger array of factual knowledge and well-researched quantitative evidence than 20 years ago. There are many answers available about particular areas for which legislation is considered. Despite that, there are large gaps to be filled, and some of them are currently addressed, and are at the frontier of academic research.

9 Tables

Table 1 – Studies on labour market effects of immigration

| Estimate of production functions | | | | |
|---|----------------|---|--|--|
| <u>Paper</u> | <u>Country</u> | <u>Data</u> | <u>Outcome of interest</u> | <u>Results</u> |
| Grossman (1982) | USA | National Origin and Language Subject Report, the County and City Data Book, 1970 Census, Census of Manufacturing, Annual Survey of Manufacturing. | Employment and wages | Small effects on natives, larger effects on first generation immigrants |
| Borjas (1987) | USA | 1980 Census, Census of Manufactures, Annual Survey of Manufactures | Wages | Limited effects on natives, sizable negative effects on earlier migrants |
| Gang and Rivera-Batiz (1994) | USA and EU | 1980 US Census, 1986-1989 Eurobarometer | Wages | Small effects, increase for residents who are complementary to immigrants, decrease for residents who are substitutes with immigrants, |
| Spatial Correlation | | | | |
| <u>Paper</u> | <u>Country</u> | <u>Data</u> | <u>Outcome of interest</u> | <u>Results</u> |
| | | | | <i>effects of inflow of immigrants of 1% of resident population (unless otherwise indicated)</i> |
| Card (1990) | USA | 1979-1985 CPS | Wages, Unemployment | No significant effects |
| Altonji and Card (1991) | USA | 1970 and 1980 Census | Wages, Employment, Labour market participation of less-skilled natives | Negligible effects on employment and participation. Wages: approx. -1.2% |
| Butcher and Card (1991) | USA | 1979, 1980, 1988, 1989 CPS | 10 th and 90 th wage percentiles | No significant effects |

| | | | | |
|-------------------------------------|-------------------------|---|--|--|
| Hunt (1992) | France | 1962 and 1968 Census | Ages, unemployment, labour market participation | Wages: at most -0.8% Unemployment: +0.2 percentage points |
| Carrington and de Lima (1996) | Portugal | Aggregate data from 1973-1981 issues of the Portuguese Statistics Yearbook | Wages and unemployment rate | Unstable results. Negative effects on wages, mild increase in unemployment |
| Winter-Ebmer and Zweimueller (1996) | Austria | Social Security Records 1988-1991 | Wages of young male blue collar workers | Depending on the specification: +0.2% to +3.7% |
| Pischke and Velling (1997) | Germany | Aggregate data from German Statistical Office and Federal Institute for Regional Planning for 1985-1989 | Unemployment and employment rate | No effects on unemployment. Employment: -0.44 percentage points |
| Winter-Ebmer and Zweimueller (1999) | Austria | Social Security Records 1988-1991 | Unemployment of young workers | No overall effects, some displacement for seasonal workers and earlier immigrants |
| Card (2001) | USA | 1990 Census | Relative occupational wages and employment | Wages: approx. -0.15%. Employment rate: -0.1 /- 0.15 percentage points |
| Angrist and Kugler (2003) | 18 European countries | 1983-1999 Eurostat aggregate data | Employment | About -0.05 percentage points |
| Zorlu and Hartog (2005) | Netherlands, Norway, UK | 1997 Register data and LSO for Netherlands, 1997-1998 LFS for UK, 1989 and 1996 KIRUT for Norway | Wages | Very small effects in the Netherlands and Norway, no effects in the UK. |
| Dustmann, Fabbri and Preston (2005) | UK | 1983-2000 LFS | Wages (1992-2000), employment, participation and unemployment rate | No significant effect on wages. Mild negative effects on other outcomes for intermediately educated only |
| Glitz (2007) | Germany | 1996-2001 IAB | Wages and employment | No significant effects on wages |

| | | | | |
|---------------------------------------|----|----------------------------|------------------------|---|
| Dustmann, Frattini and Preston (2008) | UK | 1997-2005 LFS | Wages | Average wages: approx+0.35% 10 th wage percentile: -0.6%; 90 th wage percentile:+0.43% |
| Lemos and Portes (2008) | UK | 2004-2006 WRS, JSA, ASHE | Wages and unemployment | No indication of significant adverse effects |
| Nickell and Saleheen (2009) | UK | 1992-2006 ASHE/NES and LFS | Occupational wages | Average: -0.04%; semi/unskilled services:-0.52%; skilled production: -0.24% |

Simulation Based

| <u>Paper</u> | <u>Country</u> | <u>Data</u> | <u>Outcome of interest</u> | <u>Results</u> |
|---------------------------------|----------------|-------------------------------|----------------------------|--|
| Borjas, Freeman and Katz (1992) | USA | 1980-88 CPS, 1980 Census | Employment and wages | Substantial negative effect on relative earnings and employment opportunities of high school dropouts. Small effect on college/high school wage differential |
| Borjas, Freeman and Katz (1996) | USA | 1980 and 1990 Census | Wages | Substantial effects for high school dropouts, smaller effects on other education groups |
| Jaeger (1996) | USA | 1980 and 1990 Census | Wages | Negative effect on high school dropouts, mild negative effect for high school graduates, mild positive effect for college equivalents |
| Borjas, Freeman and Katz (1997) | USA | 1960, 1970, 1980, 1990 Census | Wages | Substantial effects |

Skill Cell Correlation

| <u>Paper</u> | <u>Country</u> | <u>Data</u> | <u>Outcome of interest</u> | <u>Results</u> |
|---------------|----------------|---|----------------------------|--|
| Borjas (2003) | USA | 1960, 1970, 1980, 1990 Census and 1998-2001 CPS | Wages | effects of inflow of immigrants of 1% of resident population (unless otherwise indicated) -0.4% |

| | | | | |
|-----------------------------------|---------------------|---|------------------------|---|
| Cohen-Goldner and Paserman (2004) | Israel | 1989-1999 Israeli Labor Force and Income Surveys | Wages and employment | Employment: no effects Wages: -0.1% to -0.3% in the short run, no effect after 4 to 7 years |
| Bonin (2005) | Germany | 1975-97 IAB data | Wages and unemployment | No effects on average wages or unemployment. Some negative effects for older and less qualified workers |
| Aydemir and Borjas (2007) | USA, Canada, Mexico | 1960, 1970, 1980, 1990, 2000 Census for Mexico and US, 1971, 1981, 1986, 1991, 1996, 2001 Canadian Census | Wages, employment | Negative wage effects in US and Canada, positive effects in Mexico (emigration). Negative employment effects in US and Canada |
| Carrasco, Jimeno, Ortega (2008) | Spain | 1991 and 2001 Census, 1993-1999 Register of Work Permits, 2002 Wage Structure Survey | Wages and employment | No significant effects |

Imperfect substitutability of immigrants and natives

| | | | | |
|---|---------|--|----------------------|--|
| Manacorda, Manning and Wadsworth (2006) | UK | 1975-2005 LFS and General Household Survey | Wages | Very small effects on natives, large negative effects on earlier immigrants |
| Ottaviano and Peri (2008) | USA | 1960-2000 Census, 2006 American Community Survey | Wages | Very small effects on natives, large negative effects on earlier immigrants |
| D'Amuri, Ottaviano and Peri (2009) | Germany | 1987-2001 IAB | Wages and employment | No effects on natives. Negative effects on wages and employment of earlier immigrants. |

Cross-industry variation

| | | | | |
|------------------|--------|--|----------------------|--|
| Friedberg (2001) | Israel | Israeli Immigrant Employment Survey, Income Surveys, and LFS 1989 and 1994 | Wages and employment | No employment effects, positive or no effects on wages |
|------------------|--------|--|----------------------|--|

Table 2 - Dataset summary

| <i>Core Datasets</i> | | | | |
|---|---|---|--|---|
| <i>Dataset</i> | <i>Used in analysis of</i> | <i>Weaknesses</i> | <i>Strengths</i> | <i>Information on immigration</i> |
| Labour Force Survey (LFS) | <ul style="list-style-type: none"> • Labour market • Price changes and inflation • Housing • Crime • Fiscal effects | <ul style="list-style-type: none"> • Relatively small number of sampled immigrants • Sampling weights do not account for immigrant status • No identifiers of second generation immigrants | <ul style="list-style-type: none"> • Large nationally representative survey • Continuous sampling • Long time dimension | <ul style="list-style-type: none"> • Country of birth • Nationality • Ethnicity • Year of arrival in the UK |
| Annual Population Survey (APS) | <ul style="list-style-type: none"> • Alternative to LFS for: • Labour market • Price changes and inflation • Housing • Crime • Fiscal effects | <ul style="list-style-type: none"> • Same as LFS • Short time dimension (started in 2004) | <ul style="list-style-type: none"> • Boost sample of local areas | <ul style="list-style-type: none"> • Country of birth • Nationality • Ethnicity • Year of arrival in the UK |
| Annual Survey of Hours and Earnings (ASHE) | <ul style="list-style-type: none"> • Price changes and inflation • Housing | <ul style="list-style-type: none"> • No immigrant identifiers | <ul style="list-style-type: none"> • Accurate wage information • Detailed geographic indicators | <ul style="list-style-type: none"> • No information |
| Census of Population | <ul style="list-style-type: none"> • Labour market • Price changes and inflation • Housing • Crime | <ul style="list-style-type: none"> • Available every 10 years only • Limited comparability across time for some key variables • Microdata available for small subsamples and limited number of variables | <ul style="list-style-type: none"> • Large sample size | <ul style="list-style-type: none"> • Country of birth |
| <i>Other Data Sources</i> | | | | |
| <i>Dataset</i> | <i>Uses</i> | <i>Weaknesses</i> | <i>Strengths</i> | <i>Information on immigration</i> |
| International Passenger Survey (IPS) | <ul style="list-style-type: none"> • Measures immigration flows into and out of the UK | <ul style="list-style-type: none"> • Small sample size | | <ul style="list-style-type: none"> • Nationality • Country of residence • Length of stay • Purpose of visit |
| Citizenship Survey (CS) | <ul style="list-style-type: none"> • Information about identity, prejudice, involvement in local community | <ul style="list-style-type: none"> • Limited labour market information | <ul style="list-style-type: none"> • Boost sample of ethnic minorities • Information on parents' country of birth | <ul style="list-style-type: none"> • Country of birth • Parents' country of birth • Year of arrival in the UK • Ethnicity |

| | | | | |
|---|--|---|--|---|
| National Insurance Number Registrations (NINOs) | <ul style="list-style-type: none"> • Can be used as a measure of inflows into Local Authorities within the UK | <ul style="list-style-type: none"> • No information on outflows • Information only about individuals in work or looking for a job; no information on dependents or students • Potential lag between arrival in the UK and application for a NINo • Information on Local Authority of residence, potentially different from LA where individual works. | <ul style="list-style-type: none"> • Detailed geographic information | <ul style="list-style-type: none"> • Nationality |
| National Health Service Central Register (NHSCR) | <ul style="list-style-type: none"> • Can be used as a measure of inflows into Local Authorities within the UK, and of internal migration. | <ul style="list-style-type: none"> • Potential lag between arrival in the UK/move to a different LA and NHS registration • Information on residence, not on location of workplace | <ul style="list-style-type: none"> • Detailed geographic information | <ul style="list-style-type: none"> • Country of birth |
| Worker Registration Scheme registrations (WRS) | <ul style="list-style-type: none"> • Measures inflows of immigrants from A8 countries | <ul style="list-style-type: none"> • No information on self-employed and on citizens of non-A8 countries • No measure of outflows | <ul style="list-style-type: none"> • Detailed information on geographic location of employer and on industry and occupation | <ul style="list-style-type: none"> • Nationality |
| National Pupil Data Base (NPD) | <ul style="list-style-type: none"> • Can be used to study achievement gaps of ethnic minorities | <ul style="list-style-type: none"> • No information on citizenship or country of birth | <ul style="list-style-type: none"> • Pupils can be followed over time and across schools | <ul style="list-style-type: none"> • Ethnicity • English as mother tongue |
| Millennium Cohort Study (MCS) | <ul style="list-style-type: none"> • Analyses on ethnic minorities | <ul style="list-style-type: none"> • Detailed geographic information | <ul style="list-style-type: none"> • Boost sample of ethnic minorities | <ul style="list-style-type: none"> • Ethnicity |

Table 3 – List of government receipts and grouping

| <i>Revenue source</i> | <i>Grouping</i> |
|---|---------------------------------------|
| Income tax revenue NICs payments | Income tax and National Insurance |
| Income tax credits Tax credits adjustment | Income tax credits |
| VAT Fuel duties Stamp duties Tobacco duties Spirits duties Wine duties Beer and cider duties Betting and gambling duties Air passenger duty Customs duties and levies Insurance premium tax | VAT and consumption taxes |
| Vehicle Excise Duties | Vehicle Excise Duties |
| Corporation tax Corporation tax credits Capital Gains Tax Petroleum revenue PC corporation tax payments | Corporation tax and Capital Gains tax |
| Inheritance tax | Inheritance tax |
| Council Tax | Council Tax |
| Business rates | Business rates |
| Landfill tax Climate change levy Aggregates levy Other taxes and royalties Adjustments Interests and dividends Other receipts Own resources contribution to EC budget | Other |

The table reports the list of receipts from Table C4 of the Public Sector Finances Databank and the category in which they have been grouped.

Table 4 – List of government expenditures and grouping

| <i>Expenditure</i> | <i>Grouping</i> | <i>Expenditure</i> | <i>Grouping</i> |
|---|---|--|---|
| 1. General public services 2. Defence 4. Economic affairs 5.3 Pollution abatement 5.4 Protection of biodiversity and landscape 5.5 R&D environment protection 5.6 Environment protection n.e.c 6.4 Street lighting 7.2 Health research | <i>"Pure" public goods</i> | 10.9 Social protection n.e.c. EU Transactions Unallocated Accounting adjustments | <i>Other public goods</i> |
| | | 3.3 Law courts 3.4 Prisons | <i>Law courts and Prisons</i> |
| | | 6.1 Housing development | <i>Housing development</i> |
| | | Medical services Central and other health services | <i>Health (except health research)</i> |
| 3.2 Fire-protection services 3.5 R&D public order and safety 3.6 Public order and safety n.e.c. 5.1 Waste management 5.2 Waste water management 6.2 Community development 6.3 Water supply 6.5 R&D housing and community amenities 6.6 Housing and community amenities n.e.c 8. Recreation, culture and religion 9.5 Education not definable by level 9.6 Subsidiary services to education 9.7 R&D education 9.8 Education n.e.c 10.8 R&D social protection | <i>Other publicly provided goods and services</i> | 9.1 Pre-primary education: <i>under fives</i> 9.1 Primary education 9.2 Secondary education | <i>Compulsory education</i> |
| | | 9.3 Post-secondary non-tertiary education 9.4 Tertiary education | <i>Post-secondary education</i> |
| | | 3.1 Police services: Immigration and citizenship | <i>Imm. and citizenship police services</i> |
| | | 3.1 Other police services | <i>Other police services</i> |
| | | 10.1 Sickness and disability 10.2 Old age 10.3 Survivors 10.4 Family and children 10.5 Unemployment 10.6 SP: Housing 10.7 Social exclusion n.e.c | <i>Social protection</i> |

The table reports the list of expenditures from Table 5.2 in PESA 2009 and the category in which they have been grouped.

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