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The labour market impact of immigration

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Abstract In the first part of this paper, we present a stylized model of the labour market impact of immigration. We then discuss mechanisms through which an economy can adjust to immigration: changes in factor prices, output mix, and production technology. In the second part, we explain the problems of empirically estimating how immigration affects labour market outcomes of the resident population and review some strategies to address these. We then summarize some recent empirical studies for the UK and other countries. We conclude with an outlook on what we believe are important avenues for future research.

Key words: migration, labour market impact, wage distribution

JEL classification: J24, J31, J61

I. Introduction

One of the key questions regarding immigration concerns its benefits and costs for the receiving economies. Fears that immigration may, at least in the short run, have adverse effects on the labour market opportunities of the resident population are a main reason for opposition to more liberal migration policies. Figure 1, which is drawn from data from the European Social Survey, suggests that there is, indeed, some concern among residents in receiving countries that immigration is detrimental to their wages. The leftmost column suggests that almost 38 per cent of UK residents agree with the statement that immigration lowers wages in the receiving country. Breaking down responses by educational background shows, however, that it is mainly the lower-skilled who are concerned about detrimental wage effects through migration. Almost 50 per cent of individuals with no qualification and over 40 per cent of the low-qualified fear that immigration may reduce wages, while this concern is shared by only about 20 per cent of the highly qualified.

Are these concerns justified? The evidence that immigration does, in fact, depress wages or leads to large negative employment effects is, at best, mixed. What is certain, however, is

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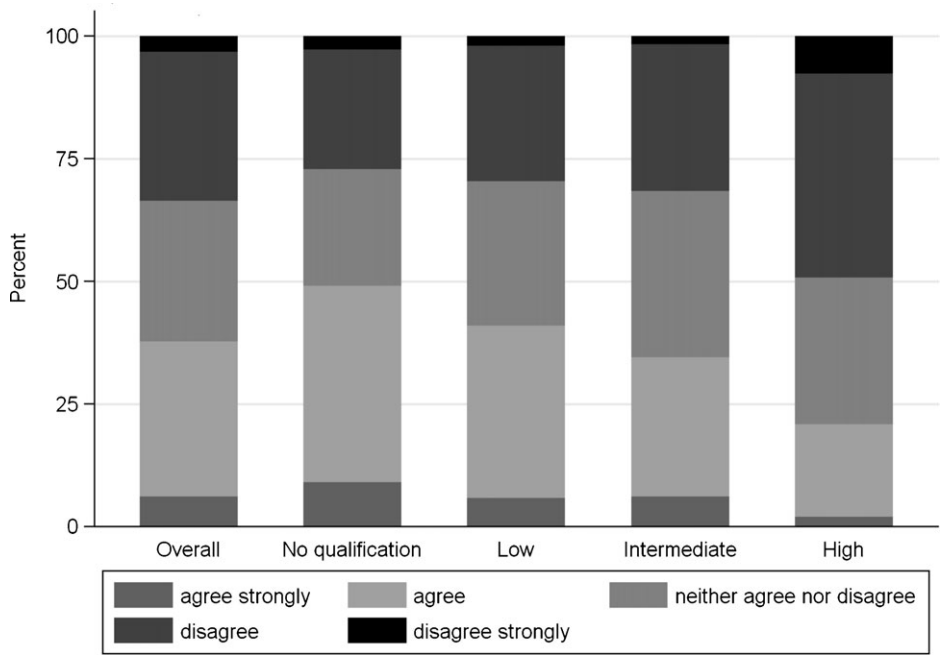
Figure 1: Does immigration lower wages? Answers from the European Social Survey



Notes: The figure shows the distribution of answers of UK residents to the question whether immigrants lower wages. The first column reports answers for the whole population, while columns 2–5 report distribution of answers by education group. High education: university degree or equivalent or postgraduate qualification. Intermediate education: A-level, national vocational qualifications level 3/5, or equivalent. Low education: GCSE, O-level, CSE, national vocational qualification level 1/2, or equivalent.
Source: European Social Survey, first wave, 2002.

that wage responses to immigration, if they occur, will not be distributed evenly across the distribution of resident wages, but will be more pronounced in those parts of the distribution in which immigrants compete with native workers. We return to Figure 1 later on, to understand whether the differential concern across different education groups is justified.

In this paper, we briefly review some of the possible mechanisms by which the receiving economy may adjust to immigration. The mechanism that has received most attention in the economic literature is factor prices, in particular wages. We explain the circumstances under which immigration may lead to negative wage effects for the native workforce, whose wages will be affected, and when adverse effects may or may not occur. But wage adjustments are only one of many mechanisms by which an economy may react to immigration. We briefly outline some important alternative adjustment channels.

After setting out the theoretical foundations, in the second part of the paper we turn to the challenges facing the analyst when attempting to estimate the effects immigration may have on wages. Here we discuss in particular problems of identification and how these can be solved.

In the third part, we review some recent research, and discuss the evidence on the wage effect of immigration in the UK and the international context.

II. The labour market impact of immigration

We commence by discussing the possible mechanisms by which immigration may impact on wages of the receiving country's population. We start with the simplest possible economic model, where wages are determined by the country's production technology, as well as supply of production factors. We assume that the potential immigration country has only one industry and produces only one output good, using both labour and capital.

The first question that arises is how immigrants enter this model. Some early papers assume that immigrants are a distinct factor of production, i.e. labour consists of immigrants and natives (see, for example, Grossman, 1982), and that immigrants and natives are not perfectly substitutable. However, it seems quite difficult to argue that two equally qualified workers, one a native and the other an immigrant, are not easily substitutable in production. It seems more reasonable to draw a distinction between different groups of labour inputs along the skill dimension.

Therefore, later papers have chosen a production technology that distinguishes between skilled and unskilled labour, and assumes that immigrants are perfect substitutes with their corresponding native skill category. How skills are defined in detail varies by study, but typical dimensions are educational attainment (e.g. Altonji and Card, 1991; Dustmann *et al*., 2005), occupation (e.g. Card, 2001), or experience and education (e.g. Borjas, 2003; Aydemir and Borjas, 2007). We start by exploring the economic consequences and predictions of a model of this type.

More recently, some papers have gone a step further and relaxed the assumption of perfect substitutability of immigrants and natives within pre-defined skill categories using nested production technologies (see, for example, Ottaviano and Peri, 2006, and Manacorda *et al*., 2006). We briefly discuss this later.

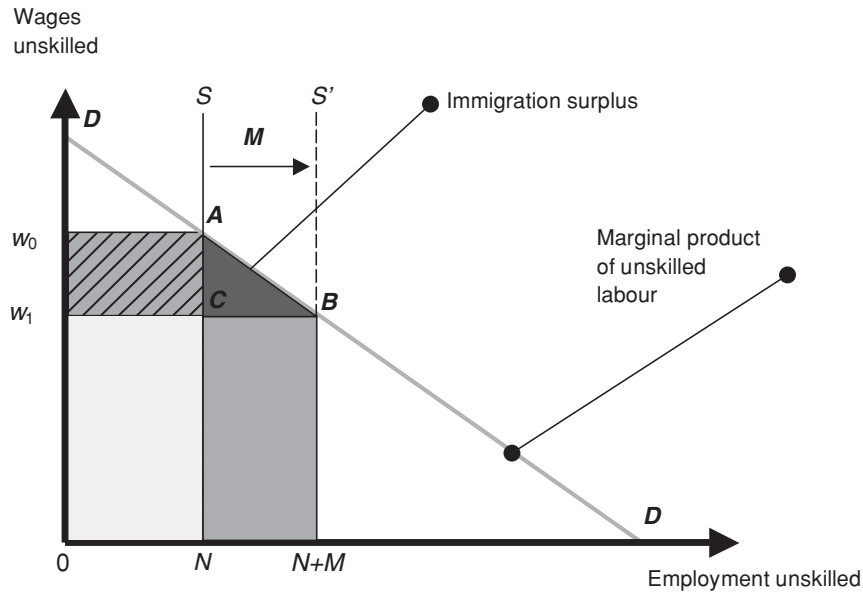
(i) Adjustment to immigration through wages

We distinguish between skilled and unskilled workers who may be natives (born in the destination country) or immigrants (born in a country other than the destination country). Within a particular skill group, immigrants and natives are perfect substitutes, i.e. they are interchangeable. The third factor of production is capital and we commence by assuming 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. Finally, we assume that both skilled and unskilled labour supply is perfectly inelastic. This means that workers will choose to work at any wage. Again, we relax this assumption later on.

Wages

Suppose now that, before immigration occurs, the economy consists of skilled and unskilled workers, say in equal proportions, and is in labour market equilibrium in the sense that all workers are employed at equilibrium wages, which may vary by skill level. If the newly arriving immigrants differ in their skill endowments from native workers, they will induce a change in the overall skill composition in the economy. For instance, if all immigrants are unskilled, then this will lead to a disequilibrium between supply of and cost-minimizing demand for different labour types at existing wages and output levels. There will be an excess supply of unskilled workers at the going wage rate. Absorption of these new workers into

Figure 2: Wage effects of unskilled immigration



the economy and restoration of equilibrium will therefore almost certainly involve short-run changes in wages and employment levels of different skill types.

A first key observation in this set-up is, therefore, that immigration only affects wages (and possibly employment rates) of resident workers if the skill distribution of immigrants differs from that of the native workforce. Only in that case will their inflow lead to changes in the relative supply of different skill groups and thus to a disequilibrium in the labour market of the host economy. If the skill distribution of immigrants is equal to that of natives and capital supply is fully elastic, then immigration will simply lead to an increase in the scale of the economy through an increase in output with no effect on wages and employment of natives.

For illustration, we consider the extreme case where all immigrants are unskilled. 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 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-immigration wage.

Accordingly, unskilled native workers lose as a consequence of immigration. However, a supply shock of unskilled workers leads to a relative scarcity of skilled workers in our economy, driving up their wages. Skilled workers therefore enjoy a gain from immigration. While wages of unskilled workers fall, wages of skilled workers 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 the 'immigration surplus'). We have demonstrated this in Figure 2, concentrating on unskilled workers only. The vertical axis shows wages and 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 at 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 D. The new equilibrium is at 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 $w_0 - A - C - w_1$. 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 triangle *ABC* and which also falls to skilled native workers.

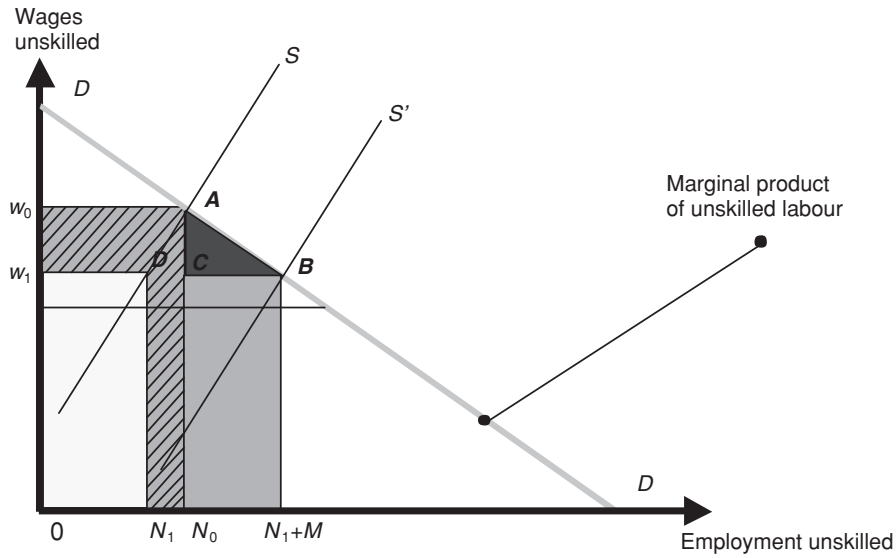
It seems that our simple model suggests that immigration has, in the worst case, *no* effect on average wages. How does that square up with the common perception that immigration is bad for wages on average? Remember that we made a key assumption, namely that capital is elastic in supply. This seems to us a reasonable assumption for small open economies such as the UK, and for migrations of the magnitude we usually observe. If we give up this assumption, then re-distribution will be not only to skilled labour but also to capital, and *average* wages (not only wages of the unskilled) may decrease as a consequence of immigration. Thus, which effects on average wages we expect within this simplest possible setting depends on the view we take about capital mobility.

There is little empirical evidence on how capital flows actually respond to immigrant inflows. In their analysis on the wage impact of immigration in the USA, Ottaviano and Peri (2006) explicitly take capital adjustments into account and estimate the speed at which capital reacts to deviations from its balanced growth path. Consistent with the evidence from the growth and business-cycle literature (Islam, 1995; Caselli *et al*., 1996; Romer, 2006), they find a convergence rate of 10 per cent per year (so that each year 10 per cent of the immigrant-induced deviation from the balanced growth path of the capital/labour ratio is eliminated by capital inflows), which they point out is likely to be a conservative estimate of the yearly speed of capital adjustment, in particular for open economies. In their example, this adjustment speed means that, instead of reducing the capital/labour ratio by 11 per cent and consequently average real wages by 3.6 per cent, the immigrant inflows to the USA between 1990 and 2004 only reduced the capital/labour ratio by 3.4 per cent, which in turn implies a much smaller negative effect of only 1.1 per cent on average wages in the economy. Basically, the faster capital is able to adjust, the smaller will be the effect on average wages in the economy. More direct evidence linking capital flows directly to immigration is needed. Dependent on the features of the destination country and the length of period under study, the assumption of elastic capital supply seems not unreasonable. On the other hand, the assumption of perfectly inelastic capital supply, which is implicitly often made in this literature, seems too strong to us.

Employment

One assumption we make above is that workers supply labour whatever the wage—we refer to that situation as one where labour supply is completely inelastic. If labour supply is somewhat elastic, then some workers will not want to work if wages are decreasing, and rather choose unemployment. In this situation, there are equilibrium employment effects. Immigration may cause (voluntary) unemployment among 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 no longer being prepared to work at the new, lower equilibrium wage. These workers (given by $N_0 - N_1$ in Figure 3) remain, therefore, voluntarily unemployed. In this situation, the total output share that goes to unskilled workers has decreased by the dark diagonally striped area. It now falls partly to skilled workers (the area of the rectangle w_0–A–C–w_1), and partly to the immigrants (the area of the rectangle D–C–N_0–N_1). The immigrant surplus, which again also falls to skilled native workers, is in

Figure 3: Employment effects of unskilled immigration



this case given by the triangle *A–B–C* and is smaller than it would have been in the case of perfectly inelastic labour supply.

(ii) Alternative adjustment mechanisms

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 (e.g. due to immigration) through changes in the wage structure. This is clearly a strong simplification—economies are characterized by a multitude of different sectors, producing goods that differ in their capital intensity and in their relative use of skilled versus unskilled labour. This complexity gives rise to two alternative adjustment mechanisms, which we briefly discuss in the next section.

Output mix

The first mechanism is reflected in the mix of output goods the economy produces. Suppose, as before, that immigrants increase the relative supply of unskilled versus skilled workers. While in our simple model above the absorption of the additional supply of unskilled workers comes about through a decline in unskilled wages, with more than one industry there is an additional way of accommodating the increase in unskilled labour supply: by increasing production of those output goods that use unskilled labour more intensively (Rybczynski, 1955). The idea here is the following (see Gaston and Nelson, 2000, for a more detailed description): suppose the immigrant-receiving country is a small open economy consisting of two industries which each produce an output good that is traded on the world market. Assume, further, that one of the industries is intensive in the use of unskilled labour while the other is intensive in the use of skilled labour. As long as the output produced in our economy relative to the overall world production of the goods is small, the small open-economy assumption

implies that prices for both goods can be assumed as fixed on the world market. In such an economy, the increase in unskilled labour supply induced by an immigrant inflow will now initially drive down wages of unskilled workers (and increase wages of skilled workers) as in the previous example. However, this change in relative wages now leads to a relatively larger decrease in unit production costs for the low-skill-intensive industry than for the skill-intensive industry. With output prices fixed, there will be larger profits in the low-skill-intensive industry. In a perfectly competitive market these profits then induce new firms to enter the industry (or firms to move from the skill-intensive to the more profitable low-skill intensive industry), expanding its production and increasing the relative demand for low-skilled workers. This, in turn, will drive up 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. However, the adjustment process may be very quick, for instance if firms foresee the change in skill composition, or if the required capital for the expanding industries is easily available. Leamer and Levinsohn (1995) refer to this as the hypothesis of factor price insensitivity. As a result, the economy will fully absorb the additional unskilled workers through an increase in the production of that good that uses unskilled workers more intensively without long-term changes in the relative wage structure. These results can be generalized to multiple input factors and multiple outputs, and can be extended to the case of non-traded goods, with the relevant algebra being detailed in trade theory models (see, for example, Woodland, 1982; Ethier, 1984). The key requirement to allow the economy to react through flexibility in its output mix is that there are more traded goods in the economy than there are factors of production.

Technology

There is a second adjustment mechanism to immigration. This mechanism works through technology. The idea is again simple, and can be most easily understood by inspecting the production of goods in different countries. Agricultural production of goods that are traded in international markets, such as rice, differ substantially in their labour intensity between countries of the developing world, where unskilled labour is abundant, and countries of the developed world, where unskilled labour is in relatively lower supply. There is a pool of production technologies available to produce the same output good. Suppose, as before, that there are two different industries which both produce an output good with a given technology and relative factor intensity. Immigration now leads again to an increase in the relative supply of unskilled workers. Faced with this change in labour supply, both industries now endogenously select a production technology out of the pool of available technologies that is more intensive in the use of unskilled labour. By changing production technologies, the economy will, in this case, be able to absorb the additional supply of unskilled labour without necessarily significant changes in the local wage structure or the local output mix. Recent empirical evidence that on-the-job computer use as well as automation expand most rapidly in those areas where the relative supply of skilled labour grows fastest, points towards the importance of this adjustment channel (Lewis, 2005; Beaudry *et al*., 2006; Doms and Lewis, 2006).

A number of papers analyse empirically which of the two channels, changes in output mix or changes in production technology, is quantitatively more important in absorbing changes in local labour supply (Hanson and Slaughter, 2002; Lewis, 2004; González and Ortega, 2007; Dustmann and Glitz, 2008). The overwhelming evidence from these studies shows that the

biggest part of the absorption of additional workers, roughly around two-thirds, is explained by endogenous changes in production technology.

(iii) Discussion

What do we learn from our above considerations for how we should assess the effects of immigration on the labour market, and on wages in particular? First, effects are only to be expected if immigrants change the skill structure of the receiving country.

Second, if that is the case, the effects of immigration are differently felt across the distribution of wages. In particular, it will be those workers who are most similar to immigrants in their skill composition that may lose, but workers who possess different skills may gain. In this context, a slight modification of the prediction of the distributional impact of immigration is required, if immigrants and natives are only imperfect substitutes within the same (observable) skill group (see Ottaviano and Peri, 2006; Manacorda *et al*., 2006). In that case, an increase in labour supply owing to immigration will primarily affect other immigrants already living in the host country. Owing to the overall complementarity of immigrants with natives, most groups of natives actually experience significant wage gains from immigration, with only the lowest skilled groups actually suffering some relatively mild wage cutbacks. However, owing to their higher substitutability, the detrimental effect from newly arriving immigrants on the wages of existing immigrants that are estimated in these studies is substantial.

Third, whether we believe that the overall effects on wages of resident workers (i.e. the effect on the average native wage in our economy) is positive, zero, or negative, and the magnitude of these effects, depends on our views about the elasticity of capital supply. If capital is supplied perfectly elastically, then migration does have wage effects, but these are negative for workers who compete with immigrants and positive for workers who do not. Overall, at the margin, the effect on the overall average wages is always zero. Owing to the migration surplus, the average wage effect for natives, however, may even be positive. Thus, migration may in this setting harm some, but it will benefit others (see Dustmann *et al*., 2008, for more detail).

Fourth, there are alternative adjustment mechanisms besides wages that may play an important part in an economy's response to immigrant inflows. If we allow for multiple industries and (some) fixed output prices through, for instance, trade, then migration, even if changing the skill structure of the economy, may not affect wages at all, but be absorbed through changes in the industry structure and the output mix.

Fifth, even if the industry structure remains unchanged, an alteration in the skill mix induced by immigration may be absorbed at constant wages by endogenous changes in production technologies.

Accordingly, theory provides us with a multitude of different effects immigration may have on the labour market. The key question that arises for particular countries is now how immigration actually impacts the particular economy in reality. For economists, this translates into the question as to how the effect of immigration on native employment and wages can be estimated, what the problems of empirical assessment are, and what the empirical evidence is. Below we discuss these challenges and how they can be addressed. The problems that arise in analysis are quite similar whether we wish to investigate the effects immigration may have on wages or, for instance, on the production technology. As the issue most intensively discussed is wage effects, we illustrate the empirical problems for estimating these.

III. Measuring the immigrant impact on the labour market

To understand what is involved in answering these questions, let us focus on wages, and let us assume that we have one big immigration wave in one particular year, *t*. The analyst observes the wage in the economy before migration takes place (year $t-1$), and the wage after migration has taken place (year $t+1$). One way to assess the effect of migration is to compare average wages in the years $t+1$ and $t-1$, $w_{t+1}-w_{t-1}$. However, it is obvious that this will not answer the question as to how migration has impacted on wages of resident workers because other mechanisms, such as the economic cycle, technology, etc., will also have affected wages after migration. What the analyst would want to compare is the wage *change* before and after migration, $w_{t+1}-w_{t-1}$, (which is observed) with the wage change that would have taken place had migration not occurred, $w^*_{t+1}-w_{t-1}$, and to relate this to the magnitude of immigration, which could be measured by the change in the stock of immigrants, $I_{t+1}-I_{t-1}$. The effect immigration has on native wages is then the parameter

$$\frac{(w_{t+1}-w_{t-1})-(w^*_{t+1}-w_{t-1})}{I_{t+1}-I_{t-1}}.$$

The problem is the hypothetical wage w^*_{t+1}—which is not observed, as we do not observe wages in the hypothetical absence of migration. This number is what we call the *missing counterfactual*. In order to obtain an estimate of the effects immigration has on wages, this counterfactual has to be re-constructed. In essence, the entire empirical literature on the impact of migration is concerned with re-constructing this missing counterfactual. Re-construction will always require some assumptions—we call these assumptions *identification assumptions*. How credible these identification assumptions are determines how much credibility we should give to the results of empirical work.

So how can we re-construct this missing counterfactual? One way to do it is basically to slice the labour market into different sub-markets, and compare wage changes in markets that experienced in-migration, and markets that did not. The most common approach in the literature to achieve this is to distinguish between different regional labour markets.

Suppose, for instance, that a receiving country has two regions, the North and the South, and that the North experienced less in-migration than the South in year *t*. Then one could utilize the variation in in-migration between the two regions to compute the parameter of interest. Using our notation above, and adding to the notation by distinguishing wages in the South and North through indices *S* and *N*, one could compute

$$\frac{\left(w^N_{t+1}-w^N_{t-1}\right)-\left(w^S_{t+1}-w^S_{t-1}\right)}{\left(I^N_{t+1}-I^N_{t-1}\right)-\left(I^S_{t+1}-I^S_{t-1}\right)}$$

and use this as an estimate of the effect of immigration on wages.

There is a remaining problem with this approach: immigrants are typically not randomly allocated across the regions of the receiving country; they rather choose where to go, and they are likely to choose that region that experiences the highest wage growth. The immigration inflow to either region, $I_{t+1}-I_{t-1}$, will thus be determined by the expected increase in wages in either region, $E(w_{t+1}-w_{t-1})$. Suppose the region with the higher wage growth is the South, and that immigrants correctly expect this, leading to a larger inflow into the South. In that case, our estimate above would give us a positive number (suggesting that immigration *increases* wages) even if the causal effect of immigration on wages were equal to zero.

To circumvent this problem, we can choose different avenues. First, in particular circumstances, it may be that immigrants have no choice of initial settlement, and are allocated to

particular areas. This is, for instance, the case with immigrant dispersal policies in Sweden (Edin *et al*., 2003) and Denmark (Damm, 2006). These government policies are a source of exogenous regional allocation of immigrants by assigning them to particular local labour market upon arrival and in that way preventing the immigrants from endogenously moving to those areas that offer the most favourable labour market conditions. For Germany, Glitz (2006) takes advantage of a similar policy in which a particular group of immigrants, so called ethnic German immigrants, were exogenously allocated to specific regions by the authorities, based on fixed quotas, in order to ensure an even distribution across the country. As predicted by the previous example, he finds evidence for an endogenous self-selection to the most attractive areas which would lead to a downward bias of the effect of immigration on local unemployment rates and wages.

A second possibility is to predict the allocation of immigrants to our two regions using variables that are not correlated with the expected shock to wages in the future. One such variable could be the historical settlement pattern of immigrants, making use of the observation that immigrants tend to settle where other individuals from their community have settled before (see Bartel, 1989, or Jaeger, 2007). Under the assumption that these past migration decisions are unrelated to contemporary, transitory wage shocks, it is then possible to obtain a measure of immigrant inflows that is exogenous with respect to current wage shocks and allows the identification of the 'true' causal impact of immigration on wages. This procedure, which is typically implemented by using past immigrant concentrations as an instrumental variable for contemporary changes in immigrant stocks, has found widespread use in the immigration literature, for instance by Altonji and Card (1991), Hunt (1992), Card (2001), and Dustmann *et al*. (2005). See also Lemos and Portes (2008) for alternative instrumental variables.

A last 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 higher wages. This will tend to disperse the wage impact of immigration throughout the national economy and undermine the ability to identify the wage impact from looking at effects within localities. It leads to estimates of the effect of immigration on wages and employment of workers currently residing in local labour markets that are not as negative as the effects which one would obtain without internal migration responses. Whether this is a serious problem remains disputed. While Wright *et al*. (1997), Card and DiNardo (2000), and Card (2001, 2005) find little or no evidence for this phenomenon, Filer (1992), Frey (1995, 1996), Borjas (2003, 2006), and Hatton and Tani (2005) consider out-migration of natives a far more important factor.

Slicing the labour market by region is one way to estimate the wage effect of immigration. Another possibility is to slice the labour market by occupation or skill group, and using the fact that immigration happens to a different extent in different skill groups for estimation. Borjas (2003) defines skill groups by experience and education and discards regional variation, using only variation in inflows across these experience–education cells. This strategy allows him to address criticism that immigration may lead to out-migration of natives of particular regions, thus dispersing the effect of immigration across the national economy. It also addresses the problem of selection of immigrants into regions that do well economically. However, the problem remains that those individuals immigrate that belong to skill groups which do very well. Furthermore, and more importantly, this approach depends on the assumption that immigrants and natives are perfect substitutes within pre-defined skill categories—an assumption that may be violated if immigrants downgrade in an unpredictable manner, which

is what we find for the UK (see also Eckstein and Weiss, 2004, for evidence for Israel). We return to this later.

IV. Empirical illustration and evidence

We now come back to the initial question of whether or not immigration lowers wages and, if so, for whom—a question that seems to raise some concern in the population (see Figure 1). Similar conceptual problems and similar solutions can be applied to studying effects on other economic outcomes than wages, e.g. prices, the housing market, technology, and output structure. Space constraints prevent us from discussing all this literature.[1] We therefore illustrate briefly the empirical results of some studies for wage effects for some European countries and the USA. We then discuss the existing literature for the UK.[2]

(i) International empirical evidence

The theoretical discussion in section II has shown that, within the model framework we set out, if capital is supplied elastically immigration has, at most, no effect on natives' wages, and may have a positive impact on natives' average wages as long as immigrants differ from natives in their skill composition. Nevertheless, if there is any wage change, some groups of natives lose and others gain. Indeed, many recent empirical papers, adopting different identification strategies, fail to find a negative impact of immigration on natives' wages. Winter-Ebmer and Zweimuller (1996) use the spatial approach outlined above, as well as an alternative strategy that slices the national labour market across industries, to study the impact of immigration on average wages of young Austrians. Both methodologies show that immigration had a positive impact on natives' wages. Similarly Friedberg (2001) investigates the issue for Israel, identifying different labour markets on a national level along occupational lines, and using alternatively individual and aggregate level data. In both cases she estimates a positive impact of immigration on Israelis' wages, although the estimates from aggregated data are not statistically significant. Carrasco *et al*. (2008) adopt a methodology similar to that of Borjas (2003), where the different labour markets are defined as experience–education–gender cells, for Spain. They fail to find any significant effect of immigration on average wages. Even for the USA, while earlier papers tended to find some modest (e.g. Altonji and Card, 1991; Card, 2001) or more sizeable (e.g. Borjas, 2003) negative impact on native wages, more recent papers have challenged these results. Ottaviano and Peri (2006), building on the approach in Borjas (2003) and allowing for imperfect substitutability between immigrants and native workers even within the same education and age cell, show that in the period 1990–2004 immigration increased the average wage of US native workers. This positive effect arises from a relatively large positive effect on wages of more highly educated native workers and a slight negative effect on wages of native high-school drop-outs.[3] In another

[1] For studies on housing prices see, for instance, Saiz (2003), Saiz (2007), Ottaviano and Peri (2007); for studies on prices see Lach (2007), Cortes (2008), Frattini (2008).

[2] For a comprehensive survey of the literature on the labour market impact of immigration see Dustmann and Glitz (2005) and Okkerse (2008).

[3] See Borjas *et al*. (2008) for a critical evaluation of this study.

recent paper, Peri (2007) applies a similar approach to the case of California, the US state with the highest percentage of immigrants in its workforce, most of whom have a very low level of education. Even in this case, he finds that immigration caused an increase in the average wage of US-born workers.

What has happened in the UK? The next section describes some key characteristics of the immigrant population in the UK, and shows that the results of some recent empirical studies fit with the predictions of our simple theoretical model of section II(i).

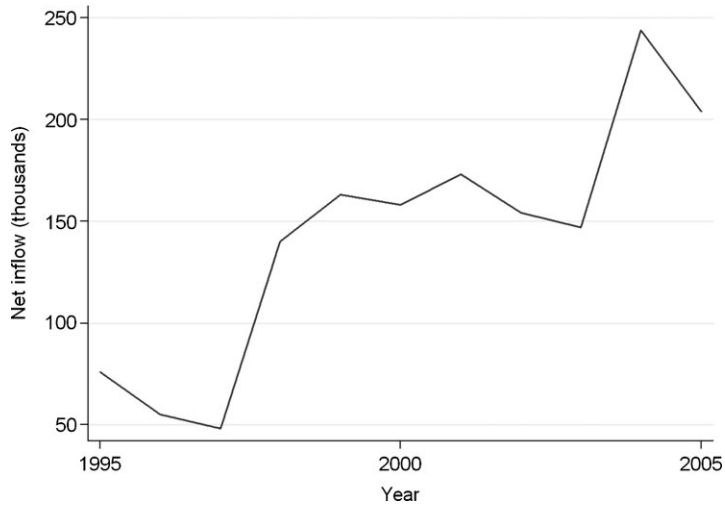
(ii) Evidence for the UK

In an early paper Dustmann *et al*. (2005) investigate the effect immigration has on wages and employment, using data from the British Labour Force Survey (LFS). Their analysis on the employment effects focuses on the period 1983–2000, while for wages the period they consider is dictated by the wage information available in the LFS which starts to report wages only from 1992 onwards. The approach they use is the spatial correlation approach, combined with an instrumenting strategy for the fraction of immigrants in the different regions based on earlier information of immigrant settlement—see section II(iii).

Their results show that immigration over the period considered had no significant effect on the overall employment of natives. They then analyse separately the impact of immigration on three education groups: those with no formal qualifications (low education), those with O-levels or equivalent qualifications (intermediate education), and those with A-levels or university degrees (advanced education). The disaggregated analysis shows detrimental and statistically significant effects on the employment, unemployment, and participation of the intermediate group. For natives in this group an increase in immigration of the size of 1 per cent of the native population would lead to a decrease of 1.8 percentage points in the employment rate, a decrease of 1.1 percentage points in the participation rate, and an increase of 1 percentage point in the unemployment rate. These negative effects are however counterbalanced by an increase in employment of natives with advanced education. For this highly educated group an inflow of immigrants of the same size would lead to an increase of 1.1 percentage points in the employment and participation rate, and would have no effect on the unemployment rate. They fail to find any significant impact on natives with no formal qualification. The analysis on wage effects is limited by data availability to the period 1992–2000. The estimated results are statistically not significant, but tend to show a positive impact of immigration on average wages. Thus their study seems to suggest that there are some detrimental employment effects, but that these particularly affect natives with intermediate education levels, and they are compensated by the positive employment effects on the highly qualified. On the other hand, there is no evidence for negative wage effects; rather, immigration would lead, if anything, to slightly positive effects on wages.

In a recent study, Manacorda *et al*. (2006) investigate the extent to which the immigrant inflows to the UK over the period 1975–2005 have affected both native and immigrant average real wages. Rather than relying on regional variation to identify the wage effects, the authors follow Borjas (2003) in distinguishing skill groups by education and age on the national level. The crucial point of their study, though, is to allow immigrants and natives within the same education and age group to be imperfect substitutes in the production process. Using data from the LFS as well as the General Household Survey (GHS), and starting from a multi-level constant elasticity of substitution (CES) production function, Manacorda *et al*. (2006) first estimate elasticities of substitution between immigrants and natives and between

Figure 4: Net inflows into the UK, 1995–2005



Source: ONS, Total International Migration.

workers in different age and education groups. They then proceed by simulating the effect the immigrant inflow to the UK between 1975 and 2005 had on the return to education among natives and the overall native–migrant wage differential. Similar to Ottaviano and Peri (2006), who carry out a parallel study for the USA, Manacorda *et al*. (2006) find evidence that natives and immigrants are indeed imperfect substitutes within the same age–education cell, with an estimated elasticity of substitution of around 6. Their simulations then show that the immigrant inflow to the UK has raised the return to education for natives, and thus inequality, by a very modest 0.4 per cent, but has increased the native–migrant wage differential by 5.5 per cent. This is because immigrants mainly compete with other immigrants in the labour market, hence impacting mostly on their wages. Overall, the authors conclude that the immigrant impact on the wage distribution of the native population has been small and that immigration in the UK primarily impacts the wages of immigrants who are already in the country.

An alternative to explicitly allowing for imperfect substitutability between immigrants and natives within skill groups could be to abstain altogether from an explicit pre-allocation of immigrants to particular skill groups based on their observable characteristics. This is the empirical strategy followed in a very recent paper by Dustmann *et al*. (2008). Using data from the LFS, they study the period between 1997 and 2005, which has been a period of relatively high immigration to Britain. Figure 4 shows the net inflow of international migrants to the UK over the period. Immigration flows have increased sharply since 1997 and have reached their maximum in 2004, after the EU enlargement. These inflows have resulted in a growth of the share of immigrants in the total working-age population of slightly less than 3 percentage points between 1997 and 2005, from 8.5 to 11.2 per cent.

In contrast to previous papers, the authors investigate the effect immigration has along the distribution of native wages, rather than on wages of different skill groups. They develop an empirical model based on a standard production-function framework with many skill types, and where immigrants compete with natives not within measured skill groups, but with natives that are in the same percentile in the wage distribution. Thus,

their empirical approach is flexible in the sense that it determines substitutability between immigrants and natives according to where immigrants are actually found in the distribution of native wages, rather than where they would be assigned according to their observable skills.

Dustmann *et al*. (2008) argue that, at least for the UK, such pre-assignment may lead to misleading results. They show that immigrants—and, in particular, recent immigrants who are used for estimation—are extremely well educated. For instance, 46 per cent of recent immigrants in 2005 had left full-time education at age 21 or later. This share was only 16 per cent among natives, and 35 per cent among earlier immigrants. However, at the same time these immigrants downgrade substantially upon arrival and work in jobs and professions that are far below where they would be assigned based on their observable skills. For instance, 26 per cent of the highly educated recent immigrants were employed in routine and semi-routine occupations, the two lowest-paid occupation categories. However, that was the case for only 11 per cent of earlier immigrants and 5 per cent of natives with the same level of education. The authors show also that the distribution of immigrants along the native wage distribution is, despite their higher level of education, heavily skewed towards the low end. On the other hand, the distribution that would result if immigrants were allocated along the native wage distribution according to observable skill levels would be skewed towards the top end of the distribution. They conclude from this evidence that, at least for the UK, pre-allocation based on observed skills may allocate immigrants to compete with natives in skill groups where in reality they do not compete.

Their empirical evidence, in line with where immigrants are in the native wage distribution, illustrates a negative wage effect at the low end of the distribution, but a positive wage effect further up the distribution—exerting wage effects almost exactly as implied by where immigrants are found in the native distribution, and very different from where they would be allocated according to their observed skills.

The effect on average wages is positive, quite in line with their earlier work for an earlier period. Dustmann *et al*. (2008) offer three explanations for this positive effect. The first mechanism through which immigration may generate positive wage effects is the conventional equilibrium 'immigration surplus' argument we presented in section II(i). However, simulations conducted by the authors show that immigration inflows of the size observed in the data are not sufficient to produce wage effects of the estimated magnitude. Alternative explanations are therefore based on disequilibrium assumptions, where workers are not paid the value of their marginal product on the local labour market. The first disequilibrium argument is similar to the idea of Borjas (2001) that immigration 'greases the wheels' of the labour market. In Borjas, efficiency gains are realized by immigrants equalizing differences in the marginal product of labour in different sub-markets, and, thus, capturing the surplus. Dustmann *et al*. (2008) assume that wages deviate from their marginal products in sub-markets in the pre-migration situation—for instance, because of institutional factors that determine equality of wages across regions or occupations, or because of wage rigidity. In this case, and if immigrants go to areas where the differences are largest, a surplus will be realized, which will now be captured by native workers. A further explanation is that immigrants are paid a wage below their marginal product. The evidence on occupational downgrading of immigrants presented in the paper shows that highly skilled immigrants are often employed in typically low-skilled jobs, especially in the first years after their arrival. Moreover, higher-skilled immigrant workers are expected to be more productive than lower-skilled native workers, also within the same occupation. Nevertheless they are paid the same wage, determined by native productivity. This again generates a surplus which is captured by native workers.

Dustmann *et al*. (2008) simulate the magnitude of the surplus that is created by each of these mechanisms, for the particular immigration over the period considered. Although the simulations suggest that none of these mechanisms is alone able to generate a surplus of the magnitude required to explain the estimated positive wage effect, the authors argue that a combination of the three surpluses may generate positive wage effects similar in magnitude to those that are observed.

V. Discussion and conclusion

In this paper we briefly review the simplest theoretical model that helps explain the effects immigration has on economic outcomes of native workers in the receiving country. Our discussion suggests that the way immigration affects outcomes depends crucially on the skill structure of immigrants relative to the skill structure of natives, as well as assumptions about the elasticity of capital supply. If capital is perfectly elastic, then immigration will not affect labour market outcomes of native workers as long as immigrants perfectly resemble natives in terms of skills—the economy will absorb the additional labour force simply by expansion.

If, on the other hand, immigrants differ from native workers in skill composition, and if we exclude other mechanisms of adjustment, then absorption will imply wage adjustments. Who gains and who loses from immigration depends on the skill mix of immigrants relative to native workers. Thus, immigration will lead to a re-distribution, harming some, but leading to gains for others. The average effect immigration has on wages will again depend on the assumption we are willing to make about capital supply. If capital supply is perfectly elastic, the average wage will not decrease, but may increase if the inflows are sufficiently high owing to a migration surplus. If capital supply is not perfectly elastic, there will again be an average gain for the overall economy, but this is partly captured by the owners of capital, so that average wages may decrease. Important in this discussion is to note that the same immigrant inflow may affect different recipient countries in a different way, depending on the skill structure of the native workforce (and, of course, of the immigrant inflow).

We also discuss alternative adjustment mechanisms, through the output mix of the economy and technology adjustment. To materialize, these adjustments require a slightly more general model of the economy, where some goods are traded. In fact, recent work for the USA, Spain, and Germany (see, for example, Lewis 2004, 2005; González and Ortega, 2007; and Dustmann and Glitz, 2008) suggests that these mechanisms are important.

We point out the difficulties the analyst faces when attempting to assess empirically the effects immigration has on wages. They key issue here is one of creating a hypothetical situation that would have occurred if immigration had not taken place. For the UK, we discuss the evidence of three recent papers, all of which do not find evidence for negative average wage effects. The paper by Dustmann *et al*. (2008) demonstrates a dramatic 'downgrading' of immigrants upon arrival, leading to wage competition and wage pressure at the low end of the wage distribution. Relating this finding to the figure we displayed in the introduction on different population groups' assessment of the wage effects of immigration, it seems that the larger concern of the low-skilled population is, indeed, justified by the evidence.

However, the paper also finds that there is an average gain to wages of a magnitude that is not easily explained by simple surplus arguments of the type suggested by the model discussion. It seems, therefore, not unlikely that the standard equilibrium frameworks within which immigration effects are usually discussed are not capturing all the possible mechanisms by

which immigration affects the labour market outcomes of native workers in receiving countries. Dustmann *et al*. (2008) discuss some alternative channels of surplus creation. This is an important avenue for future work, explaining the perhaps more complex effects immigration has on receiving countries through enhancement of efficiency as well as complementarity to existing factors of production.

Such insights could also be fruitful for a better assessment of the broader impact of immigration on the host economy. One key summary measure often used in the policy debate is the effect of immigration on the GDP *per capita* of the resident non-migrant population. These calculations are closely linked and often directly based on estimates of the effect of immigration on the wages of the resident population, assuming that wages are a good reflection of the contribution of each worker to the economy. Clearly, the better we are able to understand and measure the wage impact and the alternative adjustment mechanisms discussed in this paper, the more reliable will be the assessment of the overall impact on this key economic measure. However, besides GDP *per capita*, there are a number of other dimensions by which immigration may affect the host-country economy, such as the price of goods, the housing market, the availability of public services, and the fiscal system, which equally deserve attention and should be taken into account in the design of suitable migration policies.

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