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## The Effect of Immigration on Public Finances

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***CReAM***

Discussion Paper Series

CDP No 23/13

## The Effect of Immigration on Public Finances

*Ian Preston*

# The Effect of Immigration on Public Finances <sup>\*</sup>

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## Abstract

The impact of immigration on the public finances is an important influence on public opinion. This paper aims to provide a thorough conceptual survey, pointing out the complexities of a full understanding and the relevance of indirect effects and covering both static perspectives and longer run dynamic issues. It considers simple accounting approaches which are relatively neglectful of behavioural responses but also tries to bring out the complexities in the nature of the relationship between rates of immigration and the public exchequer that come with more sophisticated modelling of its economic effects.

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# 1 Introduction

Objection to the perceived burden placed by immigrants on public finances seems to motivate much popular opposition to immigration. Concern at the economic impact is one major correlate of hostility to immigrants (Card, Dustmann and Preston 2012) and concern that immigrants take out more from the economy than they put in seems to be a concern of particular salience. Much attention has been directed, for example, to the effects of immigration on wages and employment; there is good reason to think that the effect on public finances is just as politically important and possibly more so. Analysis of attitudinal data across several European countries, for example, has shown that economic hostility to immigration is driven by concern about effects on public finances as much as and probably more than by effects on labour market outcomes (Dustmann and Preston 2006, 2007, Boeri 2010).

Such priorities may well be economically justified. Conventional analysis sees immigration as potentially benefiting the receiving country by generating an ‘immigration surplus’ accruing to native factors of production (Borjas 1999c) and arising through changes to production patterns. Such a surplus may not arise if the economy can absorb immigration without changes to factor returns and may be small even if it does in comparison to the fiscal surplus or deficit generated by the impact of immigration on tax payment and public spending.

From the perspective of public policy making, the consequences of immigration for the receiving country’s fiscal position is a major issue. The relevance of immigration to public finances in the UK has been a focus of recent reports by both the Office of Budget Responsibility (2013) and Organisation for Economic Cooperation and Development (2013), for example. A proper understanding of such effects is both an important input into decision making on immigration policy and a necessary concomitant to planning for its implications.

The state of the public finances is a consequence of two things. There are the characteristics and preferences of the population which determine the rates of taxation at which government can fund different levels of spending, or in other words the factors determin-

ing the government budget constraint. Then there are decisions taken about where on that constraint the government chooses to locate government activity, which is a matter of political economy dependent on the nature of political institutions and structures of decision making. The focus of the paper is on the first of these.

The paper addresses the general issues that are involved in evaluating the impact of immigration on the public finances. It aims to provide a thorough conceptual survey, pointing out the complexities of a full understanding and the relevance of indirect effects. It covers both static perspectives and longer run dynamic issues. It considers simple accounting approaches which are relatively neglectful of behavioural responses but also tries to bring out the complexities in the nature of the relationship between rates of immigration and the public exchequer that come with more sophisticated modelling of its economic effects. The paper's contribution is in bringing material together to clarify the range of issues involved in reaching a comprehensive assessment of the effect of immigration on public finances. Reference is made to evidence with particular emphasis on the UK, where possible, but drawing widely from relevant research also on other economies.

Section 2 considers the impact of immigration on fiscal balance in a static atemporal setting. Section 2.1 discusses immigrant tax payments and use of public services, breaking down the total effect into components associated with differences in immigrant and native tax payments and use of public services, with the impact on sharing of costs of providing public goods and with the effect on cost of providing services to natives. There is a discussion of selection and moral hazard issues, particularly in relation to immigrant benefit recipiency. Section 2.2 deals with static labour market effects, focussing on the relevance of changes in native factor returns arising from immigration for native tax payments and for cost of providing public services. Section 3 widens discussion to a dynamic setting in which immigration affects steady state sustainability of public finances through its effects on relative population size of different generations. Section 4 briefly considers the way in which these impacts may feed through into decisions taken on questions of public policy. Section 5 concludes.

## 2 Static Analysis

A full understanding of the exchequer consequences of immigration is unavoidably dynamic but before advancing to a treatment which recognises these aspects, we need first of all to think through the nature of effects in a static atemporal setting. Consider a country with a population of  $P$  individuals, composed of  $N$  natives and  $M$  immigrants. Immigration policy is taken to determine the rate of immigration  $\mu = M/N$  so that overall population size can be written  $P = N(1 + \mu)$ .

Immigration, because it changes the composition and size of the population alters the public budget constraint, both bringing in new sources of revenue and new sources of demands on services, but possibly also affecting the revenue-contributing capacity of existing resources and the cost of delivery of existing demands. To keep things initially simple, we can let both total revenue collected  $R(P, \mu)$  and total spending  $S(P, \mu)$  depend on size  $P$  and the ratio of immigrants to natives  $\mu$ . Government budget balance requires  $R(P, \mu) = S(P, \mu)$  and immigration eases public finances if the difference between revenue gained and spending incurred as a consequence of expanding numbers  $\partial(R - S)/\partial P$  outweighs any net revenue loss due to compositional change  $\frac{1}{N}\partial(R - S)/\partial\mu$ .

### 2.1 Immigrant Tax Payments and Benefit Use

To start with a simple case, consider the country before immigration. Suppose there is a homogeneous population of  $N$  individuals and say that each pays a tax of  $T$  so that  $R = NT$ . Each also receives a range of government services  $G_k$ ,  $k = 1, \dots, K$ . Assigning a cost of  $\pi_k^0(G_k, N)$  to each element of public provision covers the cases of both pure and impure public goods and publicly-provided private goods and implies that  $S = \sum_k \pi_k^0(G_k, N)$ .

Here  $\pi_k^0(G_k, N)$  is a cost of provision that depends on population size in a way that varies with the nature of the good.

- For a pure public good, consumption is non-rival and the cost of provision is therefore independent of population size given the standard of provision:  $\pi_k^0(G_k, N) =$

$\Pi_k^0(G_k)$ , say.

- For a pure private good, on the other hand, each individual consumes separately so that the cost rises proportionally with  $N$ :  $\pi_k^0(G_k, N) = \Pi_k^0(G_k)N$ .
- An intermediate case is then that of an impure or congested public good for which consumption is non-rival at low population size but becomes increasingly so as population grows:  $\partial\pi_k^0(G_k, N)/\partial N, \partial^2\pi_k^0(G_k, N)/\partial N^2 > 0$ .

The government budget balances if

$$NT - \sum_k \pi_k^0(G_k, N) = 0.$$

and an increase in native population loosens the government budget constraint if

$$T - \sum_k \frac{\partial\pi_k^0}{\partial N} = \sum_k \left[ \frac{\pi_k^0}{N} - \frac{\partial\pi_k^0}{\partial N} \right] > 0.$$

Thus population growth is fiscally beneficial if the marginal cost of provision is less than the cost per head. Public finances are at their healthiest if marginal cost is equated to cost of provision per head, which is the standard condition for optimum club size familiar from the literature on local public economics (as summarised, for example, in Rubinfeld 1987).

Now extend this to incorporate the possibility of immigration. Immigration expands population, bringing in new sources of revenue but also new and possibly different calls on public services. We distinguish therefore between the typical tax payments and service use of natives, say  $T^N$  and  $G_k^N$ ,  $k = 1, \dots, K$ , and those of typical immigrants,  $T^M$  and  $G_k^M$ ,  $k = 1, \dots, K$ . We want to allow also that the cost of providing public services (even to natives) can alter with changing composition of the population (because, for example, providing services to a more diverse population can be either more or less easy than doing so to a homogeneous one). Suppose therefore that the cost of providing the  $k$ th public service is  $\pi_k(\bar{G}_k, P, \mu)$  where

- $\bar{G}_k = [G_k^N + \mu G_k^M] / (1 + \mu)$  is mean service use and

- $\pi_k(\bar{G}_k, P, \mu)$  is cost per unit (with  $\pi_k^0(\bar{G}_k, N) \equiv \pi_k(\bar{G}_k, N, 0)$ ).

Public sector budget balance now requires

$$NT^N + MT^M - \sum_k \pi_k \left( \frac{NG_k^N + MG_k^M}{P}, P, \mu \right) = 0.$$

Differentiating with respect to  $\mu$  we see that increasing immigration is fiscally beneficial if

$$NT^M - \sum_k \left[ N \frac{\partial \pi_k}{\partial P} + \frac{\partial \pi_k}{\partial \mu} + \frac{\partial \pi_k}{\partial \bar{G}_k} \frac{\partial \bar{G}_k}{\partial \mu} \right] > 0.$$

Setting  $\mu = 0$  and extending similar reasoning to that earlier, we see that the introduction of immigration is beneficial for public finances if

$$\begin{aligned} & \sum_k \left[ \frac{\pi_k^0(G_k^N, N)}{N} - \frac{\partial \pi_k^0(G_k^N, N)}{\partial N} \right] - \frac{1}{N} \frac{\partial \pi_k(G_k^N, N, 0)}{\partial \mu} \\ & + (T^M - T^N) + \frac{1}{N} \sum_k \frac{\partial \pi_k^0(G_k^N, N)}{\partial G_k^N} (G_k^M - G_k^N) > 0. \end{aligned}$$

There are three terms to consider here:

- The first component  $\sum_k [\pi_k^0/N - \partial \pi_k^0/\partial N]$  captures the fiscal gain or loss from growing population size and has the same form as that derived above for the case without immigration. The size and sign of this term will depend on the mix between pure and impure public and private goods in public provision.
  - Since the cost of providing public goods is unaffected, all else equal, by growth in population numbers these parts of public provision will contribute positively to the expression as greater numbers mean that costs are spread over more people.
  - Pure private goods will contribute nothing to the expression as, for them, revenues and costs increase together.
  - Finally, congested public goods can contribute positively or negatively depending on the size of population.
- The second component  $-\frac{1}{N} \partial \pi_k / \partial \mu$  reflects any impact of changing population composition on cost of provision.



- The third component  $(T^M - T^N) + \frac{1}{N} \sum_k (G_k^M - G_k^N) \partial \pi_k / \partial G_k^N$  arises to capture differences in average tax payments and service use between immigrants and natives.

### 2.1.1 Taxes and Cash Benefits

Immigrants' tax contributions and welfare benefit receipts depend on the value and the natures of the incomes which they earn and the ways in which they spend. These in turn depend on the nature of immigrant skills, their demographic characteristics and labour market choices made. These are not static and immigrants' location in distributions of earnings evolves over time as they acquire host-country-specific skills with duration of stay.

Dustmann, Frattini and Preston (2013) show, for example, that recent immigrants to the UK over the late 1990s and early 2000s, though on average highly qualified relative to natives, tend to have wages concentrated either at the lower or higher end of the wage distribution among natives. In part, this is because immigrants tend to 'downgrade', working in jobs at lower pay than would suit someone of similar qualifications in the native population. Over time this downgrading tends to diminish and immigrants move to jobs at higher pay, presumably as they acquire host country specific skills and access to employment networks. Taxes paid by immigrants will evolve correspondingly.

Cross-country differences will arise from differences in the nature of the tax and benefit systems, particularly the progressivity of the tax code and rules within the benefit system specifying contributory requirements. Restrictions which require a minimum contributory period before establishment of entitlement to claim particular welfare benefits mean that immigration can only lead to delayed claims on these components of social insurance. Because benefit claims are contingent on circumstances such as employment, the exchequer cost is also likely to vary with the stage of the business cycle at which they are measured.

Among the factors driving the labour market success of immigrants, two economic arguments, in particular, deserve attention – a selection argument and a moral hazard argument:

(a) **Selection**

The dominant economic model of migrant selection sees migration as a response to potential economic gain (Roy 1951, Borjas 1987). Migrants move if the extra income that can be made in the destination country more than compensates for the cost of migrating, broadly conceived. Most prominent among the factors determining potential income differences will be potential earnings gains driven by international differences in wage distributions and this has been the focus of considerable economic research. Also relevant, however, will be differences in fiscal benefits arising from differences in tax and public spending environments.

A common argument, for instance, alleges that generosity of welfare provision itself encourages self-selection of welfare-dependent migrants. Particularly generous public welfare systems are sometimes argued to be ‘magnets’ for economic migration (Borjas 1999) which attract migrating individuals with circumstances or preferences inclining them towards dependence on benefits. Resulting selectivity pressures may lead to a composition of the immigrant population more likely to be dependent on benefits than would otherwise hold. Although most familiar as an argument about the drawing power of cash benefits, selectivity effects can arise from anywhere in the public sector. Generous health provision might attract ‘health tourists’ and low tax rates on high incomes might attract mobile individuals with high incomes.

The threat posed by such selective migration to the funding of redistributive national welfare systems concerns many. There is an echo here of observations commonplace in the literature on fiscal decentralisation (Tiebout 1956, Rubinfeld 1987) that spatial sorting makes a case against assigning redistributive functions to lower levels of government. If some local governments implement policies which are more redistributive than others and there are no costs to migration then high income individuals will leave those districts and low income individuals sort into them in a way that frustrates the object of the policy. Even if costs of migration are not small and there are other important considerations driving migration decisions, there is still

potential for such effects to undermine effectiveness of redistributive policy at local level. As Stiglitz puts it (1983, p.46): “Although the assumptions of that model are extreme, it is clear that the power to redistribute income locally with free migration is severely limited.” The extension of these arguments to the international context highlights a conflict between national redistributive policies and liberal migration policy.

The importance of these considerations is an empirical matter and depends on the dominant motivations for migration. If international migrants move primarily to seek better remunerated work then it will be less problematic than if they are more focussed on gaining from social insurance schemes to which they have not contributed. Several sorts of evidence for adverse selectivity effects have been investigated including

- evidence of greater welfare dependence of immigrants than natives within particular countries
- association across countries between skill composition or welfare dependency of migrants and welfare generosity
- association across countries between less skilled migrant flows and welfare differences.

Blau (1984) was an early paper to look at differences in welfare reliance of immigrants and natives within the US, finding immigrant-headed households in the US less likely to be dependent on cash transfers than natives, conditional on characteristics. Borjas and Trejo (1991) show that the likelihood of welfare use nonetheless increases the longer the immigrant stays and is higher for more recent immigrant cohorts while Borjas and Hilton (1996) suggest that relative welfare dependency of migrants looks less favourable if a broader set of benefits is considered.

In Europe, Hansen and Lofstrom (2003) find a greater welfare dependency among immigrants than natives in Sweden in the 1990s but that this diminishes with length of stay. Sarvimäki (2011) finds this to be true also of Finland. Bratsberg, Raaum

and Røed (2010, 2013), on the other hand, find that labour market performance declines and social insurance dependency worsens over time for immigrants to Norway. Barrett and McCarthy (2008) survey the evidence for a large number of countries and add evidence for Ireland and the UK; basing identification of immigrants on nationality, they find that, in Ireland, immigrants are less welfare-dependent than natives whereas, in the UK, immigrants defined in terms of nationality are more likely to claim welfare but this is entirely due to higher dependency rates of Irish citizens. Dustmann, Frattini and Halls (2010) show that immigrants to the UK from EU accession countries after 2004 have lower levels of benefit receipt than natives and Dustmann and Frattini (2013) extend this analysis to immigrants from all sources since 2000, demonstrating again lower levels of benefit receipt and use of social housing.

Several papers (Gramlich and Laren 1984, Blank 1988, Enchautegui 1997, Levine and Zimmerman 1999, McKinnish 2005) have provided evidence of welfare-driven interstate migration within the US. Borjas (1999) argues that immigrants, being already mobile, should be more sensitive to such incentives and provides suggestive though statistically weak evidence that low wage immigrants are indeed concentrated in US states where welfare entitlements are highest. Brücker et al (2002) point to large differences in migrant welfare dependency across European countries which are correlated to an extent with welfare generosity even after controlling for migrant characteristics, concluding that there is some evidence of welfare benefits distorting migrant composition though effects are ‘quantitatively moderate’.

Cohen and Razin (2008, see also Razin, Sadka and Suwankiri, 2010) argue that greater welfare generosity should lead to less skilled migrant composition if there is ‘free migration’ but that the reverse should be true where composition is policy-controlled. Taking matched host-source country pairs and assigning countries to the two groups according to whether migration flows between them are wholly within the EU or from outside to inside the EU, they suggest that the evidence supports this. De Giorgi and Pellizzari (2009), looking at data from the European Commu-

nity Household Panel on 3000 individual migrants within Europe over the period 1994-2001, find welfare generosity to be an influence but one of a magnitude that is low relative to unemployment rate and wage levels. Boeri (2010) takes the more recent EU Survey of Income and Living Conditions over the period 2004-7 and finds some evidence both that unskilled migrants are over-represented in countries with more generous welfare provision and more likely to receive non-contributory benefits than natives, particularly in high social spending countries. Migrants to Nordic countries such as Denmark, Finland, Norway and Sweden are particularly less likely than natives to be net fiscal contributors whereas the reverse is true of, for example, Austria, Germany, Spain and the UK. Pedersen, Pytlikova and Smith (2008) and Giulietti, Guzi, Kahanec and Zimmermann (2013) both analyse intercountry migration flows in panels of EU and OECD countries. Despite concluding there is evidence of both important economic and non-economic influences, neither believe there is any strong evidence that difference in welfare benefits is among them.

Reviewing evidence available at the time Nannestad (2007) concludes that “the idea of negatively self selected immigration into Western welfare states appears intuitively very plausible” but “[n]evertheless the empirical evidence so far appears inconclusive at best.” Surveying more recent evidence Giulietti and Wahba (2013) conclude that “it is plausible to conclude that fears about immigrant abuse of welfare systems are somewhat unfounded or at least exaggerated.”

#### (b) **Moral Hazard**

Nannestad (2007) suggests a further moral hazard problem that may increase migrants’ propensities to depend on welfare. The incentives to acquire costly host country specific skills will be dulled by availability of welfare benefits to those unsuccessful in host country labour markets and this may inhibit acculturation. This is just the extension of the standard disincentive argument regarding the effect of social insurance schemes to encompass a particular aspect of costly labour market

effort that is distinctive to immigrants. Like the selectivity argument above, this is raised in the context of welfare payments but is relevant to other forms of contingent cash transfer such as labour taxes. As Nannestad points out, much evidence brought to bear on the question of self selection could equally well be interpreted as pertinent to moral hazard and the conclusion that an intuitively plausible effect lacks compelling empirical support fits correspondingly well.

### **2.1.2 Benefits in kind**

The conceptual distinctions drawn above between different types of publicly provided goods provided in kind rather than in cash are not necessarily clearcut in practice. Evidence on use of certain public services by immigrants might be amenable to empirical analysis through collection of information from social surveys but for many aspects of public spending there may be little alternative to making plausible assumptions about publicness of the service provided in order to delineate a static picture of the exchequer effect.

Certain types of publicly provided goods, particularly health and education services, generate benefits which are partly non-rival but are largely private and specific to particular recipients. Both health and education have obvious and pronounced life cycle variation and will therefore depend not only on age structure of immigrant inflows but also be only understood properly in a dynamic context as considered in later sections.

It is not just individual use that needs to be assessed, however, to evaluate the exchequer cost. For example, the presence of children in schools for whom the native language is not the mother tongue may affect the teaching of native children, possibly positively or negatively. Evidence for the UK in Geay, McNally and Telhaj (2013) suggests that negative effects of linguistic diversity on native pupils' attainment can be ruled out.

Police and judicial spending is difficult to class as wholly public or private in the nature of the service provided. Spending on, say, crime prevention or judicial services will depend on how immigration affects crime rates which will depend, among other things, on the tendency of immigrants to commit and to become victims of crime. Bell and Machin

(2013) survey evidence from several countries and conclude that there is little evidence of immigration increasing crime. Where such a link can be found it tends to be related to poor labour market attachment and low opportunities. Jaitman and Machin (2013) show that evidence for any impact of immigration on crime rates in the UK is weak.

Effect on transport and environmental services will depend on existing levels of congestion and behaviour of immigrants. How provision of services like defence is affected by population size and composition depends on politically contentious questions about its purpose. To the extent that defence spending is about protection of borders and projection of military power in defence of interests overseas it may be regarded as close to purely public and therefore unaffected by population growth; to the extent that the armed services might be regarded as ultimate guarantor of the established domestic order, size and composition of the population may be regarded as more important.

### **2.1.3 Overall impact**

Cross sectional accounting studies compute contributions and spending effects in a single year for immigrants currently present, using survey evidence on labour market characteristics, expenditure patterns and public service use. Some of these confine attention to cash transfers, others attempt the more ambitious exercise of including, to varying degrees, spending on benefits in kind.

Borjas (1994) is an early example of the narrower sort of exercise for the US, concluding that immigrants pay in more in taxes than they take out through means-tested entitlement programs but noting that incorporating a costing of the congestion associated with immigrant use of other public provision might reverse this. In the UK, attempts include Gott and Johnston (2002) and Sriskandarajah, Cooley and Reed (2005). Dustmann, Frattini and Halls (2010) provide a relatively comprehensive analysis indicating fiscal gains from European accession migrants and Dustmann and Frattini (2013) extend the analysis to all immigrants over the period 1995 to 2012. Their conclusions suggest a complex picture in which different migrant groups contribute differently but one in which, all things considered, migrants from within the EEA and more recent migrants have made

a positive net contribution to public finances over that period.



## 2.2 Labour Market Equilibrium Effects

The above discussion has ignored the possibility of immigration affecting remuneration of existing factors. A full accounting will not confine itself to net transfers paid by immigrants themselves. The economy has been treated as if capable of absorbing immigration without affecting native taxes or benefit receipts and the possibility needs to be considered that this might not be so. Immigration has the potential to affect economic equilibrium in the receiving society in many ways. Prices and especially wages may differ (Friedberg and Hunt 1995, Card 1990, 2001, Borjas 2003, Manacorda, Manning and Wadsworth 2012) and do so across the whole distribution (Dustmann, Frattini and Preston 2013). This changes tax payments from other economic agents.

Standard economic arguments suggest that if immigration changes factor returns then it generates a total surplus to the benefit of the receiving country but that this may involve pretax losses for some and gains for others. Capturing and redistributing that immigration surplus to ensure a fairer distribution of the gains will depend on the nature of the tax system. The impact of immigration on wages may also mean that prior native wages of those of similar type may be a misleading guide to the tax payments that may be expected from immigrants themselves.

### 2.2.1 Arguments for factor price effects

Start again with a relatively simple case. Suppose that a single type of output  $Y$  is produced locally using labour  $L$  and capital  $K$  according to a technology captured by production function  $Y = F(L, K)$  and sold on world markets at a fixed price  $p^*$ . If we assume constant returns to scale we can write output per head  $y$  as a function of capital per head  $k$ ,  $y = f(k) \equiv F(1, K/L)$ . The return to labour is the wage  $w$  and the return to capital is  $r$  and given profit maximising behaviour and constant returns to scale in competitive conditions these will be equated to the values of the respective factors'

marginal products

$$w = p^* [f(k) - kf'(k)]$$

$$r = p^* f'(k)$$

Assume that the labour force is fully employed so that  $L = N(1 + \mu)$ .

Government funds are raised by proportional taxes at rate  $\tau_L$  on labour income,  $p^* [F(K, L) - Kf'(K/L)]$ , and  $\tau_K$  on capital income,  $p^* Kf'(K/L)$  so that

$$R(P, \mu) = \tau_L p^* F(K, L) + (\tau_K - \tau_L) p^* Kf'(K/L)$$

and the government budget constraint therefore requires

$$\tau_L p^* F(K, L) + (\tau_K - \tau_L) p^* Kf'(K/L) - S(P, \mu) = 0$$

where government expenditure is  $S(P, \mu)$ .

If we consider a small increase in immigration then the effect is beneficial for public finances if

$$\tau_L w - (\tau_K - \tau_L) (K/L)^2 p^* f''(K/L) - \frac{d}{d\mu} S(P, \mu) > 0$$

If  $\tau_L = \tau_K = \tau$  then tax receipts are a fixed fraction of the value of production. The first order tax effect  $\tau_L w$  is just proportional to the impact of immigration on the value of production which is the same as the wage income of the immigrants. Distributional effects can therefore be ignored and the question is simply whether taxes on labour income of immigrants are more than they add to spending.

If labour and capital income are differently taxed however then the redistribution between factors matters. The return to capital must rise and the wage rate fall in order to persuade producers to switch to a lower capital-labour ratio in production and thereby employ the immigrating labour. If capital is more lightly taxed then this leads to a decrease in revenue as factor returns shift towards the more lightly taxed factor.

If we consider larger changes then effects which can be neglected in marginal analysis begin to matter. There are gains to capital and losses to labour for the reasons just explained but the effects are not balanced. The gains to capital exceed the losses to

native labour so that total income of factors employed in production before immigration increases. This is the so-called ‘immigration surplus’ accruing to native factors and occurs because immigration causes a movement down the economy’s labour supply curve so that immigrating labour is paid less than it adds to production. The surplus accrues to capital (given that payments to factors exhaust the value of output). If capital and labour are similarly taxed,  $\tau_L = \tau_K = \tau$ , then this leads to an increase in taxes paid by those factors. The increase in the total value of production is however less than the value of immigrating labour at the initial wage so that the increase in tax receipts is less than  $\tau w N \mu$  even if  $\tau_L = \tau_K$ .

Assuming only two factors is evidently a major simplification. Labour, for example, comes in many different skill types and immigration may change the skill composition if the skill mix in the immigrant inflow is unlike that in the native labour force. If the economy needs to change the mix of skills employed within industries then native skill types which compete closely with those dominant in the immigrant inflow may see falls in wages relative to other skill types. To the extent that marginal tax rates on these labour types differ then this will have consequences for tax receipts. Dustmann, Frattini and Preston (2013) provide some evidence that immigration to the UK puts modest downward pressure on wages in parts of the distribution where immigrants are concentrated, especially at the lowest end, while raising wages elsewhere. While interesting, the implied tax effects are not plausibly large relative to the effects that will be found by a simple accounting approach.

### **2.2.2 Arguments for absence of factor price effects**

Notwithstanding the arguments above, there may well be convincing arguments for thinking that economies can absorb immigration without any effect on factor returns, particularly in the longer run when other possible dimensions of adjustment may operate.

This discussion has assumed that the capital stock is unaffected by immigration but, as has been seen, immigration raises the return to capital and one might expect inflow of capital as a consequence. The effect of any such inflow, will, of course, be to counteract

the effects on factor returns described above. Indeed if capital is perfectly internationally mobile then one might assume its value will be fixed by its value on world markets so that the inflow will continue until the return to capital goes back its initial value and wages also regain their initial level. In such a scenario the effect of immigration will simply be a proportional expansion of production plans with an associated expansion of tax receipts.

Even if capital is immobile, the economy may have other means of adjustment which dampen effects on factor returns. For example, if the economy produces more than one type of output then changes in the output mix may alone be sufficient to absorb the impact of immigration. Suppose there are two industries  $A$  and  $B$ , each with constant returns to scale production technologies,  $y^A = f^A(K^A/L^A)$  and  $y^B = f^B(K^B/L^B)$ , where superscripts denote quantities specific to the relevant sectors and  $L = L^A + L^B$ ,  $K = K^A + K^B$ . Suppose that output in each sector is again traded at prices fixed on world markets,  $p^{A*}$  and  $p^{B*}$ . Mobility of factors between sectors means that returns to factors in each industry must be equal so that

$$\begin{aligned} w &= p^{A*} \left[ f^A(k^A) - k^A f^{A'}(k^A) \right] = p^{B*} \left[ f^B(k^B) - k^B f^{B'}(k^B) \right] \\ r &= p^{A*} f^{A'}(k^A) = p^{B*} f^{B'}(k^B) \end{aligned}$$

If  $k = K/L$  falls between the values for  $k^A$  and  $k^B$  that simultaneously solve these equations both before and after immigration then labour and capital can be split between the two industries in such a way that factor returns will not alter as immigration occurs. The lower economy-wide capital-labour ratio will be achieved by reallocating production from the less to the more labour-intensive sector rather than adjusting capital-labour ratios inside either sector. Factor returns will therefore be unaffected (Leamer and Levinsohn 1995). In such an economy, immigration will again lead to expansion in output but there will be no redistribution from labour to capital and tax receipts will grow simply by the taxes taken on immigrant earnings.

### 2.2.3 Costs of public sector provision

The discussion so far has concentrated on the impact of changes in factor returns on tax receipts. However such changes may also affect cost of provision of public services. For example, return to the model with two output goods and two inputs, labour and capital. Let the first sector continue to produce an internationally traded good as above so that factor returns in that sector continue to satisfy the same relations

$$\begin{aligned} w &= p^{A*} \left[ f^A(k^A) - k^A f^{A'}(k^A) \right] \\ r &= p^{A*} f^{A'}(k^A) \end{aligned}$$

Assume now however that the second sector produces, not a traded good, but a publicly provided service. Suppose that we allow for the possibility that the quantity provided of that good depends on population size  $P$  and composition  $\mu$  so that  $y^B = \Gamma(P, \mu)$ , say (where this would be proportional to  $P$  for a publicly provided private good, independent of  $P$  for a pure public good and so on). Provision is nonetheless cost efficient so that the ratio between wages and returns to capital is still equated to the ratio of their marginal products

$$w/r = f^B(k^B)/f^{B'}(k^B) - k^B$$

The cost of providing the public service will be  $S(P, \mu) = \Gamma(P, \mu)c^B(w, r)$  where  $c^B(w, r)$  is the minimised unit cost in sector  $B$ . In this setting, immigration will typically lead to substitution between capital and labour in the traded sector, reducing  $w$  and raising  $r$ , and this will affect the unit cost of public provision according to whether the public sector is more or less labour intensive than the private sector.

This is not likely to be an issue so much with changes in returns to broadly defined factors, but may be more relevant where government policy encourages immigration of specific labour types to staff particular public services. Immigration of foreign-born medical staff to provide health services would be a case in point. Dustmann and Frattini (2011) show that immigrants to the UK are relatively more likely to work in the private sector but that certain sections of the public sector, especially health and social work, do draw disproportionately on immigrant labour.

### 3 Dynamic Analysis

The need to recognise the dynamic context of these questions is widely accepted – “in a static set-up, one cannot fully grasp the implications of migration for the welfare state (Razin and Sadka 1999)”. Immigrants adapt to labour market expectations of the receiving country as the duration of their stay extends, particularly in terms of linguistic proficiency, and as a consequence earn more and pay more in taxes. Immigrants who arrived when young set up families, age, consume differently and make different demands on public services. Many remain to raise later generations but some return to their country of origin and do so possibly at differential rates according to their contributions to public finances. Understanding of return intentions, which themselves depend on regulations governing entitlement to remain, cannot be divorced from understanding of long term effects on the public exchequer. A common theme of popular discussion is the plausibility of immigration as a long term solution to the consequences of population aging and rising dependency ratios in recipient countries. This is not an issue that can be plausibly addressed without considering these questions.

#### 3.1 Overlapping generations economies

Points about fiscal effects in a dynamic setting can be made most simply if we assume an overlapping generations exchange economy with pay-as-you-go education and pensions funding.

Consider firstly a steady-state overlapping generations economy of identical individuals without migration (Samuelson 1958, 1975, Diamond 1965). As before, let output per head  $y$  be produced using labour and capital according to a constant returns to scale production function,  $y = f(k)$  where  $k$  is capital per worker. Individuals live for three periods. In the first they require education at a cost of  $\gamma$ . In the second they work and earn a wage  $w = f(k) - kf'(k)$  from which  $T$  is taken in taxes and  $s$  is saved so that consumption is

$$c_0 = f(k) - kf'(k) - T - s.$$

In the third period they draw a state pension of  $B$  and consume that and the value of

their savings

$$c_1 = B + s(1 + f'(k)).$$

The population growth rate is  $n$ . The simplification of considering public spending in terms of education and pensions alone simplifies a reality in which many sorts of publicly provided goods may have very pronounced life cycle patterns to use but serves to illustrate the central issues and does not misrepresent the likely overall pattern: “From birth until leaving full-time education, an individual will be a net fiscal cost, due to the costs of providing education and other services. But once an individual enters the labour market they are likely to make a net fiscal contribution, as taxes paid will usually exceed the cost of services consumed. This will depend on the employment rate, level of earnings, and amount of services consumed. Finally, upon retirement an individual is likely to be a net burden again, as they are receiving pensions and often require greater use of medical services. (OBR, 2013, p.144)”

Both pensions and education costs are assumed to be publicly funded on a pay-as-you-go basis. The government budget constraint therefore requires that taxes raised from the working population should cover both pensions and the cost of educating children. Given the relative sizes of the three generations alive at any point a balanced budget requires

$$T(1 + n) - B - \gamma(1 + n)^2 = 0$$

Public spending comprises spending of  $B$  on the old and  $\gamma$  on the young of whom there are  $(1 + n)^2$  times as many. Taxes raised to cover this come from the intermediate generation of relative size  $1 + n$ .

Higher population growth increases the size of the working population relative to pensioners but also increases education costs from the generation coming behind them. Differentiating the balanced budget equation, we see that it eases public finances overall for given values of  $B$ ,  $T$  and  $\gamma$  if and only if pension costs exceed education expenses,  $B > \gamma(1 + n)^2$ .

Capital market equilibrium requires that the savings of any one working generation provides the capital for the next so that  $s = k(1 + n)$  and substituting from this and the

government budget constraint into private budget constraints shows that consumption per head is determined by

$$c_0 + \frac{c_1}{1+n} = f(k) - nk - \gamma(1+n).$$

Maximising this by choosing capital stock according to the golden rule which sets its return to the population growth rate,  $f'(k) = n$ , results in an outcome which is dynamically efficient. The fact that accelerated population growth dilutes capital stock and therefore reduces output per head can be seen clearly and is something that has to be set against any beneficial impact on pension financing.

Now allow for the possibility of migration. Let  $\mu$  now denote the fraction, not of total population but of the existing working age population, arriving as immigrants in each period. Suppose that the migrants arrive in the second period of their life, working and paying taxes. We allow that migrant tax contributions might differ from natives by distinguishing between native tax payments  $T^N$  and immigrant tax payments  $T^M$ . Each migrant is accompanied by  $1+m$  children where  $m$  may be greater than or less than  $n$  depending on the relative birth rate in native and immigrant populations and on whether children accompany migrants or remain with family in the country of origin. In the following period a proportion  $\rho$  of migrants return without drawing pensions (although their now-adult children stay) while the remaining migrants do draw state pensions. The children of migrants enter the labour force and assimilate to the population growth rates and tax contributions of natives.

To construct the government budget constraint requires that we evaluate the relative sizes of the three generations in steady state. We express the size of each generation relative to the size of the elderly population when young:

- The elderly pension-drawing population consists of those in the country two periods ago plus those of a similar age who have immigrated since and are drawing pensions,  $(1 + \mu(1 - \rho))$ .
- The working population consists of the children of the current elderly (including the previous periods's immigrants) plus new working age migrants,  $(1 + n + \mu(1 +$



$m))(1 + \mu)$

- The youngest generation consists of the children of the current working age population,  $(1 + n + \mu(1 + m))^2$

Hence, considering government costs and receipts, we can construct a new steady-state budget balance equation

$$(T^N + \mu T^M)(1 + n + \mu(1 + m)) - B(1 + \mu(1 - \rho)) - \gamma(1 + n + \mu(1 + m))^2 = 0$$

Differentiating, setting  $\mu$  to zero and using the budget balance equation without migration to simplify, we see that the steady-state effect on public finances is positive at zero migration if

$$(T^M - T^N)(1 + n) + \gamma(1 + n)^2 + B\rho + \frac{1 + m}{1 + n} [B - \gamma(1 + n)^2] > 0.$$

Suppose firstly that all immigrants stay and claim pensions,  $\rho = 0$ , but that none bring children,  $m = -1$  and that immigrants contribute similarly to natives,  $T^N = T^M$ . Then only the second, necessarily positive, term  $\gamma(1 + n)^2$  is non-zero. Immigrants more than pay their way since they arrive with education already paid for and the gain per old person is proportional to the education cost saved.

If some immigrants return without pensions then the third term  $B\rho$  is also positive and the gain is evidently bigger. In practice, rules governing the portability of social security rights accrued by virtue of taxes paid while working as a temporary immigrant are complex and differ in the UK, for example, for EU and non-EU citizens but those rules together with rates of return migration need to be understood to appreciate the long run fiscal impact of migration. More broadly, if we think of benefits enjoyed in the final period of life as encompassing not only pensions but benefits received in kind, especially health services, then it is clear that a substantial portion of these will not be internationally portable. “Not all social benefits are fully transferable, making return beneficial for the host country (OECD, 2013, p.140)”.

If immigrants do bring children then  $m > -1$  and the final term  $[B - \gamma(1 + n)^2](1 + m)/(1 + n)$  also matters. Immigrant children raise population growth

rates and therefore ameliorate or worsen long run public finances just as an increase in native population growth would do. The higher the immigrant birth rate relative to that among natives the more this aspect of the impact is accentuated, improving public finances if pension payments exceed education costs and worsening them otherwise.

Finally, any difference in immigrant and native tax contributions requires an obvious adjustment in fiscal effect.

Razin and Sadka (1999, 2000) consider a one-off inflow of working-age migrants with children in a two-generation model. There is an initial gain in pension affordability because of taxes paid and no effect in future years as immigrants' descendants cover pension costs of their parents. Timing effects mean that immigration can be beneficial to public finances, to the extent that every native generation is better off, even if immigrants are net beneficiaries over their lifetime. Krieger points out that the argument is weakened if immigrants are less skilled or have lower fertility rates (2004) or there is return migration by descendants (2008). The above argument can be seen as extending this sort of reasoning, suitably modified, to a continual migrant inflow.

Constructing the steady state population budget constraint depends upon how we specify ownership of the capital stock. Nonetheless the public policy tradeoff between consumption in the two periods of adult life may be altered and also the condition for dynamic efficiency affected.

## **3.2 Measuring dynamic effects**

A cross sectional accounting approach of the sort described in the previous section will reveal the long run effect accurately only in steady state with stable migrant characteristics. In practice, characteristics of migrants in different generations differ considerably, if only because the frequency of social and political change is high relative to the length of an individual migrant's life time.

The generational accounting approach (Auerbach and Oreopoulos 1999, 2000, Lee and Miller 2000, Fehr, Jokisch and Kotlikoff 2004) attempts to project forward from the characteristics of current migrants to a more accurate assessment of the present discounted

value of lifetime fiscal contributions. Doing so requires an accurate knowledge of future earnings paths, future return decisions and future paths of tax and welfare systems and to that extent the approach is unavoidably ambitious in the assumptions it needs to rely upon.

Lee and Miller (2000) suggest substantial net gains, especially from high skilled immigration. Auerbach and Oreopoulos (2000) also stress the importance of educational composition, suggesting that altering the composition of immigration rather than the level would have greatest potential to reduce fiscal burden.

Storesletten uses a calibrated general equilibrium overlapping generations model for the US (2000) and Sweden (2003). The long run fiscal effect of immigration to the US depends on age, skills and employment rates of migrants - it is positive for high skilled and negative for low skilled migrants, though never as negative as for a new-born native. Discounted gain are argued to be potentially large, peaking with high skilled immigrants aged between 40 and 44; the fiscal problem associated with the aging baby boom is shown to be potentially resolvable by admitting 1.6m immigrants annually. There are smaller gains in Sweden with the peak in immigrant fiscal gain coming at an earlier age; the average new immigrant is fiscally costly but an immigration policy targeted on young high skilled immigrants could yield a “large net gain.”

Schou’s (2006) results using a computable general equilibrium model for Denmark are less positive, suggesting that general immigration would worsen fiscal sustainability while selective immigration could be only modestly beneficial. Fehr, Jokisch and Kotlikoff (2004) construct a three-region general equilibrium model of the US, Japan and the EU reaching the sceptical conclusion that expansion of general immigration makes “essentially no difference” to population aging problems whereas the scale of high-skilled immigration needed to make a meaningful impact would be practically challenging to achieve.

Rowthorn’s (2008) conclusion from reviewing work in the area is that “there is no strong fiscal case for or against sustained large-scale immigration”.

## 4 Political Economy

The above discussion has outlined ways in which immigration affects the public budget constraint. In doing so it can affect the overall affordability of public spending as well as the relative attractiveness of different public spending items. By changing the nature of the native income distribution, immigration can also affect the desirability of income redistribution. These changes affect different population groups differently, setting up conflicts over both policies regarding the scale and nature of immigration allowed and the appropriate fiscal response to that immigration (Casarico and Devillanova 2003). Political equilibrium can be expected to respond to this and this has motivated several, typically theoretical, analyses of the impact of immigration.

Correlations between tax receipts, public spending levels or other indicators of fiscal position and rates of immigration will pick up the total effect, incorporating both the impact on the government budget constraint and any chosen policy response. This total effect is not something uninteresting and in a sense answers the question of how immigration affects public finances in a fully comprehensive way but it needs to be distinguished from what it does not answer, which is the question of whether immigration eases affordability of the public sector or, in other words, whether immigrants pay their way in fiscal terms.

The way in which these effects play out will obviously depend on the nature of economic and political institutions. For example, in theoretical treatments of the political economy of immigration and pension provision, it matters what is assumed about rules governing pension rights. Assuming public pension benefits are fixed and immigration therefore eases the tax payments on younger generations required to finance them leads to the conclusion that immigration is likely to be favoured by the young but not the old (Scholten and Thum 1996); assuming that contributions are fixed and immigration therefore increases pensions instead leads to the opposite conclusion that immigration will tend to be favoured by the old rather than the young (Razin and Sadka 2000, Kemnitz 2003). Leers, Meijdam and Verbon (2003) allow both taxes and pensions to respond to population change. Since population growth means that the young outnumber the old, differing assumptions can

lead to seemingly inconsistent conclusions about the consequences for immigration policy, as, for example, Haupt and Peters (1998) point out in an analysis that explores both types of model. Krieger (2003) explores the potential for differences in conclusions depending upon whether pension benefits are assumed to be flat (Beveridgean) or earlier-income-related (Bismarckian) though he finds this to be less important.

In reality, what is fixed and what is not is itself a policy choice. If immigration generates a fiscal gain then the question of how that is divided up is an object of political debate not an input into it. As Scholten and Thum (1996) point out, pivotal political agents – in typical models, the median voter – will not usually be modelled as taking account of the effects of immigration on others and chosen immigration policy can be correspondingly inefficient.

Immigration not only generates a fiscal surplus or deficit to be appropriately fought over according to the processes of political decision making but also changes prices in the fiscal budget constraint. In the static setting, growth in population makes public goods cheaper relative to private goods and this could encourage shift in the composition of public spending towards such goods. In a dynamic setting, immigration may make public pension provision cheaper or, thinking in terms of individual budget constraints, make later consumption more attractive and that may motivate higher pensions.

The way in which immigrants and their descendants acquire voting rights on the items involved has consequences. Dolmas and Huffman (2004) discuss how future voting rights of immigrants change the position of the median voter and therefore future redistributive outcomes. That fact will affect how current generations feel about immigration. Ben-Gad (2012) argues that immigration provides an incentive for current native voters to support higher public sector deficits because the cost of financing them can be partially pushed onto descendants of immigrants.

## 5 Conclusion

The impact of immigration on the public exchequer raises complex issues. Even within a static setting, it is necessary to think carefully about how immigrants affect labour market outcomes and spending on different types of public service. A full accounting requires the adoption however of a dynamic perspective. Because the answers to important questions depend, among other things, on the nature of tax and spending rules, the selection pressures on immigrant composition and the stage of the business cycle at which effects are assessed, there are no general conclusions about whether immigration is favourable for public finances or not and it is not surprising that evidence suggests that answers differ in different circumstances. Consideration of the factors identified in the preceding pages is intended to be helpful in clarifying the source and nature of such differences.

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