



*Centre for Research
and Analysis
of Migration*

CReAM

Discussion Paper Series

CDP No 18/09

Assessing the Fiscal Costs and Benefits of
A8 Migration to the UK

*Christian Dustmann, Tommaso Frattini and Caroline
Halls*

Assessing the Fiscal Costs and Benefits of A8 Migration to the UK

Christian Dustmann[†], Tommaso Frattini[†] and Caroline Halls[†]

[†] UCL, Department of Economics and CReAM (Centre for Research and Analysis of Migration)

Non-Technical Abstract

This paper assesses the fiscal consequences of migration to the UK from the Central and Eastern European countries that joined the EU in May 2004 (A8 countries). We show that A8 immigrants who arrived after EU enlargement in 2004, and who have at least one year of residence – and are therefore legally eligible to claim benefits - are 60% less likely than natives to receive state benefits or tax credits, and 58% less likely to live in social housing. Even if A8 immigrants had the same demographic characteristics of natives, they would still be 13% less likely to receive benefits and 28% less likely to live in social housing. We then compare the net fiscal contribution of A8 immigrants with that of individuals born in the UK, and find that in each fiscal year since enlargement in 2004, A8 immigrants made a positive contribution to public finance despite the fact that the UK has been running a budget deficit over the last years. This is because they have a higher labour force participation rate, pay proportionately more in indirect taxes, and make much lower use of benefits and public services.

Keywords: Migration, Fiscal Impact, Welfare state.

JEL Classification: J61, H20.

Assessing the Fiscal Costs and Benefits of A8 Migration to the UK

Christian Dustmann, Tommaso Frattini and Caroline Halls

UCL, Department of Economics and CReAM (Centre for Research and Analysis of Migration)

July 2009

Abstract:

This paper assesses the fiscal consequences of migration to the UK from the Central and Eastern European countries that joined the EU in May 2004 (A8 countries). We show that A8 immigrants who arrived after EU enlargement in 2004, and who have at least one year of residence – and are therefore legally eligible to claim benefits – are 60% less likely than natives to receive state benefits or tax credits, and 58% less likely to live in social housing. Even if A8 immigrants had the same demographic characteristics of natives, they would still be 13% less likely to receive benefits and 28% less likely to live in social housing. We then compare the net fiscal contribution of A8 immigrants with that of individuals born in the UK, and find that in each fiscal year since enlargement in 2004, A8 immigrants made a positive contribution to public finance despite the fact that the UK has been running a budget deficit over the last years. This is because they have a higher labour force participation rate, pay proportionately more in indirect taxes, and make much lower use of benefits and public services.

Keywords: Migration, Fiscal Impact, Welfare state

JEL Classification: J61, H20

1. Introduction

Immigration regularly causes debate in receiving countries about the potentially negative consequences an influx of immigrants may have on the welfare of incumbent residents. Of particular concern is whether immigrants “pay their way” in the welfare system. The belief that immigrants “take out” more than they “put in” is reflected in responses to questions in attitude surveys: according to the 2002 European Social Survey¹ 57% of the UK population believed that immigrants are taking more out than they put in the welfare system while only 11% thought that immigrants are net contributors.

These fears were echoed in the debate following the European Union (EU) enlargement of May 1st 2004 when the Central European countries Czech Republic, Estonia, Hungary, Latvia, Lithuania, Slovenia, Slovakia, and Poland joined the European Union. Citizens of these countries were granted immediate right of free movement across all EU countries, though access to national labour markets could be restricted by national governments for a transition period of up to 7 years. Only the UK, Sweden and Ireland allowed immediate access of new Central European citizens to their labour markets.²

Despite negative media coverage, there is no evidence that this expansion led, on average, to a setback of wages of workers born in the UK (see e.g. Dustmann, Frattini, & Preston (2008) and Lemos & Portes (2008)). Concerns about the fiscal impact on the UK budget are also often expressed in the popular press: “[Eastern European] Economic migrants need schools for their children. They need housing. They need medical care. They can even lose their jobs.” (Daily Mirror, 24/7/2006)³, or “Jobs dry up but Poles stay to reap the benefits”⁴ (Daily Mail, 9/1/2009). In a recent interview with The Times the Immigration Minister Phil Woolas acknowledged that fears of immigrants exploiting the British social security system may give rise to anti-immigration sentiments - “The problem, according to the minister, is that ‘the perception that immigrants jump the housing queue is very strong, even though the reality is very different. We must cut back on the few cases of abuse so people see that the system is fair.’ – and suggested that some restrictions to welfare access may be needed - “He is appalled by stories of immigrants being given £1 million houses at taxpayers’ expense. ‘These are council decisions. They shouldn’t do that kind of thing. I just think it’s wrong, even if it is rare.’”⁵(The Times, 18/10/2008).

Are these concerns justified? Do A8 immigrants make a positive contribution to the UK fiscal system, or do they receive more payments than they contribute in terms of taxes and contributions? Are they more, or less likely than natives to claim welfare benefits and live in social housing? This paper will

¹ This is the only wave of the European Social Survey where such question was asked.

² As of June 2009, restrictions to the free movement of A8 labour were still in place in Austria and Germany only. Finland, Greece, Italy, Portugal and Spain lifted all restrictions in 2006, Luxembourg and the Netherlands in 2007, France in 2008, Belgium and Denmark in 2009.

³ <http://www.mirror.co.uk/news/columnists/parsons/2006/07/24/honesty-s-the-best-immigration-policy-115875-17435755/>

⁴ <http://www.dailymail.co.uk/news/article-1108806/Jobs-dry-Poles-stay-reap-benefits.html>

⁵ <http://www.timesonline.co.uk/tol/news/politics/article4965568.ece>

provide answers to these questions; we first analyse the welfare dependency of A8 immigrants and natives, addressing the question “Are A8 immigrants more or less likely to receive benefits or live in social housing than natives?” We then evaluate the fiscal impact of A8 immigration to the UK for the fiscal years 2005-06, 2006-07, 2007-08, 2008-09, by comparing the benefits of migration due to receipt of additional tax contributions, to the cost of migration due to provision of government services to these immigrants and their families. Our results suggest that A8 immigrants are far less likely to receive benefits or live in social housing than natives; furthermore, they contribute significantly more to the tax and benefit system than they receive. This may be because A8 immigrants are younger, better educated, and have fewer children than natives. However, our analysis shows that, even if these individuals were identical to British native born in all these characteristics, welfare and social housing receipts of the new A8 immigrants are still lower.

In section 2 we provide some background information, summarising the previous literature on A8 immigration against the institutional setting and then describing the data used in the paper. Section 3 outlines a descriptive analysis of the characteristics of the A8 population. In section 4 we present our regression analysis of the relative probability of A8 immigrants and natives being on welfare or in social housing, and we describe our assessment of the A8's net fiscal impact. We discuss our results and outline the likely dynamic evolution in section 5.

2. Background

2.1 Previous literature

The stock of literature studying the fiscal impact of immigration is surprisingly small when compared, for instance, to the number of papers that attempt to estimate the labour market effects of immigration⁶. A number of papers have investigated whether immigrants are more or less likely than natives to use the provision of the welfare state (see e.g. Borjas & Hilton (1996), Brucker, Epstein, Saint-Paul, Venturini, & Zimmerman (2002), Barrett & McCarthy (2007)) and/or whether immigrants assimilate into or out of the welfare state (e.g. Borjas & Trejo (1991), Hansen & Lofstrom (2003))⁷. These studies typically use one or more cross sections or panel data to study the differential use of some welfare programs

⁶ Some of the most recent assessments of the wage effects of immigration in the UK are Manacorda, Manning, & Wadsworth (2006), Dustmann, Frattini, & Preston (2008), Nickell & Saleheen (2008)). Lemos & Portes (2008) study the labour market impact of A8 immigration to the UK, and do not detect any effect for natives' wages or unemployment. Blanchflower & Shadforth (2009) in their analysis of the consequences of migration from Eastern Europe on the UK economy suggest that immigration may have slowed wage inflation through the “fear of unemployment” mechanism.

⁷ Barrett & McCarthy (2008) present a recent review of this literature.

between immigrants and natives or between different cohorts of immigrants, or for the same immigrant cohorts over time.

Analyses of this type allow controlling for many individual characteristics and give important insights into how immigration interacts with the welfare state, but are clearly uninformative about the net fiscal effects of immigration. This is because they typically do not consider all types of government transfers, focussing on some type of welfare benefits only; also, they do not consider the amount of taxes paid in by immigrants.

Another group of studies has instead focused on the net fiscal impact of immigration (see Rowthorn (2008) for a recent review). Papers assessing the overall fiscal impact of immigration by comparing the difference between benefits received and taxes paid by immigrant can be classified as either static or dynamic analyses. For any given year, static analyses calculate the annual net fiscal contribution of immigrants as the difference between the value of taxes paid and the value of government transfers received⁸. Meanwhile dynamic studies instead compute the net present value of the lifetime net fiscal contribution of immigrants, and (in some cases) that of their descendants.

The main strength of the static approach is its simplicity and straightforwardness; no strong assumptions are required about the future behaviour of immigrants or the evolution of fiscal policies. Static analysis addresses the question “What is the net contribution of a particular group of immigrants to the tax and welfare system?”. Static analysis is backward looking, it allows assessment of how particular cohorts of immigrants have contributed to the tax- and welfare system over a period for which data is available. This type of analysis provides answers to questions usually raised in the public debate; for instance, in the case of A8 immigration to the UK, this approach can be used to assess the net contribution of A8 immigrants to the UK since EU enlargement.

Static analysis does not provide a projection into the future. For example it does not address the question “What is the discounted net contribution of a particular group of immigrants over their life cycle to the tax and benefit system of the host country?” Dynamic models allow for such assessment (see e.g. Storesletten (2000)) but require strong modelling assumptions regarding immigrant fertility, propensity to return to the country of origin, labour market participation, and future government spending and tax policies. These assumptions can substantially influence the final result, and may lead to predictions being unreliable. This is particularly the case for A8 immigrants as their very recent migration history allows only for limited data-based predictions regarding the evolution of their behaviour over time spent in the UK, or on their return migration patterns.

The analysis provided in this paper does not attempt to predict the future fiscal impact of the existing A8 immigrant population. It instead evaluates the annual net fiscal effect immigrants from A8 countries had on the UK since enlargement in 2004. We also assess the degree to which A8 immigrants obtain

⁸ Card (2007) - following the suggestion in Edmonston & Lee (1996) – performs a different type of static analysis comparing measures of local spending and local tax revenues across cities with different immigrant concentration.

benefits, or rely on social housing, in comparison to UK native born. Previous work has considered the fiscal impact of overall migration (see Gott & Johnston (2002) and an extension until 2003/2004 by Sriskandarajah, Cooley, & Reed (2005)); ours is the first study to assess the fiscal impact of A8 immigration to the UK⁹

2.2 The 2004 EU enlargement and immigration to the UK

On May 1st 2004, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Slovakia, Slovenia and Poland, became members of the European Union. The EC Treaty guarantees free movement for all EU citizens, meaning every EU national has the right of employment in any EU member state on the same basis as a national of that country. However, the 2003 Treaty of Accession allowed member states to opt for restricting the access of nationals of new member states to their labour market (but not their movement) for a transitory period of up to a maximum of seven years. Fears that an inflow of immigrants from the new member countries could compromise natives' labour market opportunities led most EU-15 states to impose some restrictions to the employment of nationals of the new member states, with the exception of citizens of Cyprus and Malta. The nationals of the remaining eight Central and Eastern European accession countries came to be collectively known as the A8. The UK, the Irish Republic, and Sweden were the only EU member states that allowed A8 citizens unrestricted access to their labour markets. However, due to public concern that mass immigration from A8 countries would impact on the UK labour market and impose a burden on the welfare state, the UK introduced the so-called "Worker Registration Scheme" (WRS) to monitor the inflow of A8 workers. All A8 immigrants who intend to work for at least one month in the UK are required to register with the WRS, and pay the corresponding registration fee (currently £90). A8 immigrants are also limited in accessing the UK social security system; they are not eligible for tax credits until they register with the WRS, while eligibility for income-related benefits (Income Support, Pension Credit, Jobseeker's Allowance, Housing Benefit and Council Tax Benefit) comes only after twelve months of continuous employment. After this period immigrants are no longer required to register with the WRS and can obtain a residence permit confirming their right to live and work in the UK.

Following EU enlargement, the UK witnessed a rapid rise in the resident population of A8 migrants. Figure 1 depicts data from the Labour Force Survey. Between the second quarter 2004 and the first quarter 2009, the share of immigrants from A8 countries as a proportion of the UK population increased from 0.01% to 0.9% (solid line), comprising 1.3% of the working age population by the beginning of 2009 (dotted line). During the same period, the share of foreign born individuals increased from 8.7% to

⁹ See Lemos & Portes (2008) and Blanchflower & Lawton (2009) for an assessment of the labour market consequences of A8 migration.

11.3% of the total population, meaning that over one third of the total increase in the foreign population in recent years is due to migration from A8 countries¹⁰.

3. Data and Descriptives

The main source of data used in this study is the Labour Force Survey; we also draw on a number of publications by HM Treasury, the Office for National Statistics, and several other Government Departments. Below, we briefly describe each of these data sources and also provide some descriptive statistics.

3.1 The Labour Force Survey

The British Labour Force Survey (LFS) is a quarterly representative survey of all households residing at private addresses in the UK. Every quarter approximately 53,000 households are surveyed, representing about 0.1% of the total UK population. The LFS is a rotating panel whereby every household is interviewed for five successive cohorts before exiting the sample. The survey excludes individuals who have been resident in their household for less than 6 months and those who live in communal establishments; the LFS is therefore likely to underestimate the UK population of recent immigrants.

The LFS provides weights to compensate for differential non-response among different groups of the population. However as these weights are constructed without taking nationality or country of birth into account, they may be slightly inaccurate for determining the overall size of the foreign born population. Despite these limitations, the LFS remains the best available source of data on immigrant stocks, and is used for this purpose as well as when determining the labour market status or determining a number of demographic and socio-economic characteristics of the A8 and native population. We also use the LFS for our regression analysis of A8 residual welfare dependency.

As the fiscal year in the UK lasts from April to March, we use the LFS to apportion government expenditures and receipts for the years 2005-06 to 2008-09, by pooling the four relevant quarters of each year (for instance, for fiscal year 2008-09 we pool LFS Q2-Q3-Q4 2008 and LFS Q1 2009).

Government expenditures and receipts

We use tax receipt data from the Budget Reports for 2007-2009 (Chapter C, Table C6 years 2009 and 2008, Table C8 year 2007), as published by HM Treasury. Expenditure data are taken from the Public

¹⁰ See Drinkwater, Eade, & Garapich (2006), Blanchflower & Lawton (2009) and Blanchflower & Shadforth (2009) for more descriptive information on A8 immigrants and their labour market outcomes.

Expenditure Statistical Analyses 2009 (PESA) (Table 5.2 “Total Expenditure on Services by sub-function, 2003-04 to 2008-09”) also published by HM Treasury.¹¹

Other data sources

We also use data from the 2005, 2006 and 2007 Offender Management Caseload Statistics (OMCS) and from the June 2008 Population in Custody statistics (PiC), both Ministry of Justice Statistics Bulletin. We use these data to compute the nationality of the population in prison and to apportion costs of administering the legal system (law courts and prisons).

Information on distribution of health costs by age group is taken from the 2006 Department for Health Departmental Report (Figure 6.2: Hospital and Community Health Services Gross Current Expenditure by Age, 2003-04).

We use the annual ONS publication “The effects of taxes and benefits on household income” (ETB) for years 2005-06 and 2006-07 (the latest available year) to compute effective tax rates for VAT and other consumption taxes by decile of household disposable income. The ETB uses data from the Expenditure and Food Survey to analyse how taxes and benefits redistribute income between households in the UK, and provides detailed information on both gross and net income, cash and in-kind transfers as well as on taxes (including indirect taxes) paid according to the position of the household in the income distribution.

The ONS 2006 “Share Ownership” report gives the results of a survey of the ownership of ordinary shares in quoted companies in the United Kingdom. The survey, conducted by the ONS, gives details on the beneficial ownership of UK listed companies and, importantly, includes a geographical breakdown of holdings outlining foreign ownership between 1999 and 2006. We use this information in the apportionment of corporation taxes.

3.2 Immigration from the A8 countries

We define an A8 immigrant as a national of an A8 country who arrived in the UK in 2004 or later¹². In Table 1, we report descriptive statistics for A8 immigrants, pooling all quarterly waves from the second quarter 2004 to the first quarter 2009. The figures suggest that A8 immigrants are substantially younger and better educated than the native population; male A8 immigrants are on average almost 12 years younger than native born men (26 vs. 38), while women are 15 years younger than their native born counterparts (25 vs. 40). Moreover 70% of A8 men and 67% of A8 women are between the age of 20 and 35, while only 19% of native men and 18% of native women fall within the same age bracket.

¹¹ Data for fiscal years 2004-05 to 2007-08 are based on outturn receipts and expenditures, whereas data for 2008-09 are estimates based on figures for the first two quarters only, giving a larger margin for error in the analysis for 2008-09.

¹² The LFS does not allow identifying the month of arrival, so we cannot separately identify immigrants arrived before and after May 2004.

We measure education as the age at which individuals left full time education. An alternative measure is provided in the LFS and permits classification according to the UK education system, however due to the difficulties in reconciling international education systems we do not use this measure¹³. Instead we assign to the category “low education” all individuals who left full time education at 16 or earlier, the category “intermediate education” to all individuals who left full time education between the age of 17 and 20, and finally “high education” to all individuals who left full time education aged 21 or over. According to this classification, 32% of A8 men and 40% of A8 women are highly educated, while only 18% of native men and 16% of native women fall in this category. Conversely, the share of A8 migrants with a low education is around five times smaller than that of natives.

A8 immigrants have a higher labour market attachment than natives with a labour market participation rate¹⁴ of 95% for men (83% among natives) and 80% for women (75% among natives). A8 immigrants, particularly men, also have higher employment rates¹⁵: 90% of men and 74% of women at working age have a job (where working age is defined as 16-65 for men and 16-60 for women). This compares to 78% and 71% among native men and women respectively.

Despite the higher level of education among A8 immigrants, their average hourly wages are considerably lower than those of natives. This disadvantage is present at all parts of the wage distribution; Table 1 suggests that A8 immigrants’ median wages, along with wages measured at the 10th and 90th percentiles of the wage distribution are substantially lower than those of natives for both males and females (wages are real wages in 2005-equivalent pounds). While the average (median) hourly wage for A8 immigrant men is £6.8(£6.1), it is £11.9(£9.8) for native born men, and the native-A8 gap is larger at the top than at the bottom of the wage distribution.

The statistics in Table 1 are based on information obtained from pooling LFS quarters from the second quarter 2004 to the first quarter 2009, across different immigrant arrival cohorts. How do wages of the new immigrants develop with time spent in the UK? Although we do not have longitudinal data, it is possible to follow the same arrival cohort of A8 immigrants in the LFS to investigate changes in outcomes for the same arrival cohort over time; we present results in Table 2. The first panel refers to average wages. The numbers show a remarkable increase in average wages, for example, for the cohort that arrived in 2004/2005, wages have increased by 40 percent after four years in the UK. Wage growth for later cohorts follows a similar pattern, as can be seen from the other rows of the top panel. Mean wage growth across all arrival cohorts has averaged around 5 percent per year. This is very substantial, especially considering that the real wage growth of natives over the same period, reported in the last row of the panel, stands at just over 1 percent per year .

¹³ The LFS variable “hiqual” classifies all foreign degrees as “Other qualification”. See the appendix of Manacorda, Manning, & Wadsworth (2006) for a discussion.

¹⁴ Labour market participation rate: ratio of individuals who are either employed, self-employed or looking for a job to the total working age population.

¹⁵ Employment rate: ratio of employed or self-employed individuals to total working age population.

The increase in wages of A8 immigrants is slightly higher at the 10th than at the 90th percentile of the distribution; for the 2004 arrival cohort, the respective numbers are 45% and 36% until 2008/2009. Again, wage growth of native born workers over the same period has been much lower, as indicated by the numbers in the last rows of the respective panels.

The last two panels of Table 2 report employment rates and participation rates, again following the same arrival cohort. For the cohort that arrived in 2004, the employment rate grew by 13 percentage points (or 18%) over the next four years, and was more than 10 percentage points higher than that of native born workers by 2008/09. The participation rate likewise slightly increased, and is higher than that of native born workers even just after arrival (with the exception of the last cohort that arrived in 2008).

These numbers suggest that A8 immigrants are much more educated than native born workers. Despite this, they receive far lower wages on average. Yet their wage growth in the first four years of arrival is remarkable, and far higher than that of native born workers. They have also very high employment and participation rates, with employment rates increasing even further during the first years after arrival.

The figures presented in these tables do not account for differences in education or labour market experience between the two groups. A8 immigrants are younger than British born workers (see Table 1), which may partly explain their lower wages as well as their steeper wage growth profiles. However, the figures in the tables suggest that A8 immigrants – after initial disadvantage – have a period of rapid wage growth, which may be explained by transferring home country specific human capital to the needs of the UK labour market, and by obtaining information about better and more suitable job opportunities.

As the LFS does not allow us to follow the same individuals over time, selective out-migration may lead to these numbers being an over- or under-estimate of wage and employment growth profiles from an individual's perspective. However, from a welfare point of view, the numbers in Table 2 are the most relevant as they measure the contribution of those immigrants that reside in the UK.

4. Analysis

4.1 Welfare dependency

We now turn to the question whether A8 immigrants are more or less likely than natives to receive public transfers. We investigate receipt of state benefits or tax credits, and the likelihood of residence in

social housing¹⁶. Since A8's eligibility for many benefits is limited for the first year in the UK (see section 2), we restrict our analysis to those immigrants who have been in the UK for more than one year.

Table 3 reports regression results from the following model:

$$y_i = \alpha + \beta A8_i + \gamma O_i + \delta' X_i + \tau_t + \varepsilon_i,$$

Where i is an index for individuals, y is alternatively a dummy variable indicating whether the individual receives any state benefits or tax credits (columns 1-3) or indicating whether the individual is living in social housing (columns 4-6), $A8$ identifies A8 immigrants who have been in the UK for at least one year, O are immigrants from other countries, or immigrants from an A8 country arrived before 2004, τ_t are time effects (year-quarter interaction) and X is a vector of other control variables which includes gender, education, age, and the number of dependent children in the household¹⁷. The error term ε is allowed to be correlated over time for the same individual, but not across individuals; we account for this by clustering the standard errors at the individual level. The coefficient β can therefore be interpreted as the difference in the probability of receiving state benefits between eligible A8 immigrants and natives, conditional on variables included in the vector X .

Column 1 in Table 3 reports the results from a regression which includes only year and quarter variables as control variables. The reported parameter is the raw difference in the probability of claiming state benefits or tax credits between A8 immigrants and natives. The figures show that A8 immigrants have a probability of receiving benefits which is 23.2 percentage points lower than for natives. Since the average probability of receiving benefits or tax credits is 39.2% (see also Table 1), this means that A8 immigrants have a 60% lower probability of being on welfare. Thus, if we compare the A8 immigrant population in the UK over the period between 2005 and 2009, the probability that A8 immigrants claim state benefits or tax credits is substantially smaller than that of natives.

One reason for the lower probability of receipt might be that A8 immigrants are very different in their demographic characteristics to the native born. In columns 2 and 3, we gradually make A8 immigrants more "similar" to natives, by adding additional control variables. This leads to a reduction in the size of the estimated coefficient. In the specification with full controls the coefficient drops to -0.053. This implies that if A8 immigrant were identical to natives in their educational background, their age and gender structure and the number of dependent children, they would still be 5 percentage points (or 13.5%) less likely than natives to claim state benefits or tax credits¹⁸.

¹⁶ Unfortunately we have no information about the amount of the benefit received, nor on the length of the welfare spell.

¹⁷ Specifically, we include age and age squared, dummy variables for low and intermediate education defined as above (high education is the excluded category), employment status, current disability, no dependent children under 19 in the household, and the number of dependent children under 19 in the household.

¹⁸ Notice that the sample size shrinks as we include additional regressors. As a robustness check, we estimate the unconditional coefficient for the same sample that we use in the regression results reported in column (3). The estimated coefficient is -0.213, which is smaller than the estimate of -0.232 reported in the table. This suggests

We have replicated this analysis to estimate the probability of A8 immigrants living in social housing. Results are reported in columns 4-6 of Table 3. Column 4 shows that the unconditional probability of an A8 immigrant with at least one year of residence in the UK of being in social housing is ten percentage points lower than for natives. Over the period 2004-2009 17.3% of the UK population was residing in social housing (see also Table 1), suggesting that A8 immigrants are 58% less likely than natives to live in social housing. As before, as we include more control variables the coefficient shrinks, but even if A8 immigrants were identical to natives in individual characteristics and the number of dependent children they would still be five percentage points (or 28%) less likely than natives to live in social housing.

4.2 Computing the Fiscal Impact of A8 Immigration

We now turn to a detailed analysis of the net fiscal impact of A8 immigrants to the UK tax and benefit system. As discussed above, our approach compares the transfers made to native born workers and A8 immigrants to the taxes and contributions the two groups make to the welfare system. Computation of these figures is based on various data sources, but requires some assumptions. We will compute various scenarios under different sets of assumptions.

More formally, in every year t the government runs a surplus or deficit (GSUR), which is given by the difference between revenues (REV) and expenditures (EXP). In turn, total revenues are calculated as the sum of all different taxes levied by the government (rev_i , $i=1, \dots, N_R$), where the total number of taxes is denoted by N_R . Further, total expenditures are the sum of N_E different government expenditures (exp_j , $j=1, \dots, N_E$). Therefore, the total government surplus or deficit can be written as:

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

We can de-compose this number into net contributions of the different population groups in the UK at a particular point in time (where “other immigrants” are the residual group). For our purposes, we divide the total UK population in three groups: A8 immigrants, natives, and other immigrants. We can then rewrite equation (1) as:

that the estimate in column (3) underestimates the difference in the claiming probability between the two groups due to sample attrition.

$$\begin{aligned}
GSUR = & \sum_{i=1}^{N_R} \alpha_i^{A8} rev_i + \sum_{i=1}^{N_R} \alpha_i^N rev_i + \sum_{i=1}^{N_R} (1 - \alpha_i^{A8} - \alpha_i^N) rev_i + \\
& - \sum_{j=1}^{N_E} \beta_j^{A8} exp_j - \sum_{j=1}^{N_E} \beta_j^N exp_j - \sum_{j=1}^{N_E} (1 - \beta_j^{A8} - \beta_j^N) exp_j
\end{aligned} \tag{2}$$

where α_i^G , $G=A8, N$, denotes the share of group G 's payments of taxes i and β_j^G denotes the share of group G 's receipts of government expenditures j .

One can further manipulate (2) to obtain:

$$\begin{aligned}
GSUR = & \tilde{\alpha}^{A8} REV + \tilde{\alpha}^N REV + (1 - \tilde{\alpha}^{A8} - \tilde{\alpha}^N) REV \\
& - \tilde{\beta}^{A8} EXP + \tilde{\beta}^N EXP + (1 - \tilde{\beta}^{A8} - \tilde{\beta}^N) EXP
\end{aligned} \tag{3}$$

where $\tilde{\alpha}^G = \sum_{i=1}^{N_R} \frac{\alpha_i^G rev_i}{REV}$ and $\tilde{\beta}^G = \sum_{j=1}^{N_E} \frac{\beta_j^G exp_j}{EXP}$ denote the share of total revenues and of total expenditures, respectively, that can be assigned to group G .

In the remainder of this section we compute these shares using data from government accounts and the LFS for the fiscal years 2005-06 to 2008-09. This enables assessment as to whether in each year, A8 immigrants under- or over- contribute to total tax payments and to total government expenditure, by comparing $\tilde{\alpha}^{A8}$ and $\tilde{\beta}^{A8}$, weighted with the share of A8 immigrants in total population, s^{A8} . It also allows us to investigate whether A8 immigrants are net fiscal contributors. If A8 immigrants contribute more (less) to the tax system than they take out in terms of benefit receipts, then the ratio $\frac{\tilde{\alpha}^{A8} REV}{\tilde{\beta}^{A8} EXP}$ should be larger (smaller) than one.

This computation depends critically on the criteria chosen to apportion revenues and expenditures, i.e. on the exact definition of the α_i and β_i , which is not always straightforward and requires some assumptions. In the remainder of this section we explain and discuss the assumptions used. We compute a central scenario, which is considered to be the most reasonable in terms of the assumptions made. To check robustness, we will also compute a number of alternative scenarios. We provide exact details of the specification of each of these methods in the Appendix.

Table 4 summarises the criteria used to apportion each category of government receipts in the central scenario (scenario 1) and under the two alternative scenarios. In the table we have aggregated the 32 main components of public sector receipts from Table C6 of the 2009 Budget Report into nine groups. Full details on how each component has been grouped are reported in Table A1 in the Appendix.

We use LFS information on weekly wages ($grsswk$) to calculate the share of income taxes and national insurance contributions (NIC) paid by A8 and natives. For each individual with wage information in the

LFS we calculate the value of income taxes and national insurance contributions paid, applying actual income tax and NIC rates to their taxable income, which is calculated taking into account second jobs and contributions to private pensions (see Appendix for details). For each fiscal year, we can then calculate the amount of income taxes and NIC paid by A8 and natives, and estimate their share of total payments¹⁹.

Since in all years Child Tax Credits constitute about 75% of total tax credits expenditures (source: HMRC -Child and Working Tax Credits Statistics: Finalised annual awards, 2007-08, Table 1.1), we apportion in our central scenario tax credits according to the proportion of dependent children of A8 or UK natives. Alternatively, in our scenario 2, we calculate for every year the share of CTC in total tax credits²⁰. We then use this share to calculate the amount of total tax credits to be allocated according to the proportion of dependent children and we allocate the remainder proportionately to the A8 and natives share of population.

For determining allocation coefficients of consumption taxes (VAT and excise duties) we proceed in two steps. Table 24 of the ONS publication “The effects of taxes and benefits on household income” reports average incomes and average tax payments for several indirect taxes by decile of household disposable income. We use this to construct decile-specific effective tax rates, and then apply these tax rates to individuals in the LFS, based on their households’ position in the wage distribution²¹. We then proceed as for income taxes, calculating for every year the amount of each indirect tax paid by A8 and natives, and their share in total payments.

In the case of Vehicle Excise Duties (VED), which are levied on cars, we also use (in scenario 2) LFS information on whether individuals drive to work to proxy for car ownership. In this case we apportion VED revenues proportionately to the share of each group in the population of individuals who drive to work.

We apportion corporation taxes and capital gains taxes, taking into account the role of foreign shareholders (here we follow Sriskandarajah, Cooley, & Reed (2005)). In particular, we use the ONS “Share ownership” information to calculate the percentage of foreign shareholders in UK companies, and subtract from the total corporation tax revenue their share. We then allocate the remaining share proportionately to the population. This allocation implies that, on average, native born workers and A8

¹⁹ The LFS does not have wage information for the self-employed. Therefore they are excluded from this calculation. Taxes on incomes of the self-employed make up less than 15% of total income tax revenues in every year (source: HMRC Survey of Personal Incomes, table 3-4). Therefore as a robustness check we have calculated in every year the share of total income tax payments due to employees. We have then used this share to calculate the fraction of total income tax payments to be apportioned as described above, and we have allocated the remainder proportionately to the share of A8 immigrants and UK natives in the self-employed population. Results are virtually unchanged.

²⁰ 72% in 2007-08, 73% in 2006-07, 75% in 2005-06.

²¹ For instance, in 2006-07 the average household income of the bottom decile was £2,262, and the average VAT payment of the same decile was £875, so that the effective VAT rate for an individual in the bottom decile of the distribution of household income was 38.7%.

immigrants own the same share of UK companies stocks, relative to their share in the population. This may be unlikely as A8 immigrants had less time to be engaged in entrepreneurial activities²². We therefore consider an alternative scenario (scenario 3) where all corporation and capital gains taxes are allocated to natives.

Since taxes on houses are the single largest share of inheritance tax receipts (about 40% of inheritance tax is levied against property, according to HMRC figures²³) - and they are also likely to be a good proxy for other assets - in our central scenario we use the proportion of A8 immigrants and natives in the total population of house-owners from the LFS to apportion its revenue. Although house-ownership is not very common among A8 immigrants (only 5% of A8 immigrants - and 74% of natives - own outright or are buying with a mortgage the house they live in), this allocation may still be over-estimating A8's payments, as due to their age structure their mortality rates are low. Therefore we also consider an alternative scenario where all inheritance tax is apportioned to natives only (scenario 3).

To allocate council tax payments we use the proportion of A8 immigrant and native households from the LFS. Alternatively, in our third scenario, we simply apportion council tax payments proportionately to population. Allocation of Business rate receipts is not straightforward. Business rates, a tax on non-domestic property, is typically paid by businesses and other organisations that occupy non-domestic premises. In our central scenario we therefore use the proportion of A8 and natives in the self-employed population (from the LFS) to apportion revenue. In scenario 2, we alternatively apportion it proportional to population shares.

All remaining tax payments are apportioned proportionately to the population. These are the three "environmental" taxes, contributing annually to less than 0.4% of total revenue, "Other taxes and royalties", "Adjustments", "Interest and dividends", "Other receipts", and the negative item "Own resources contribution to EC budget" which do not have any other natural apportioning criterion.

Table 5 summarises the criteria followed to apportion expenditures, i.e. to construct each β_i , in the central scenario (scenario 1), and in two alternative scenarios. In the table we have aggregated each element of Table 5.2 ("*Public sector expenditure on services by sub-function*") in PESA 2009 into 11 groups. Details on the grouping and a full list of expenditures are reported in Table A2 in the Appendix.

A critical issue here is how to allocate expenditures for public goods. Provision of purely public goods (e.g. national defence, environmental protection) is to a large extent independent of the number of immigrants, and this is particularly true in the case of a relatively small group like the A8. However, here we take a more conservative stance and price "pure" public goods at their average cost for both immigrants and natives in all scenarios. In other words, we allocate the costs for public goods proportionately to the share of A8 immigrants or natives in the population. Notice that this is likely to

²² For instance, the LFS shows that the self-employment rate was 7.3% among employed A8 immigrants and 12.2% among natives.

²³ Table 12.6, available at: http://www.hmrc.gov.uk/stats/inheritance_tax/iht_126jan09.pdf

result in an underestimate of the A8's net fiscal contribution, and an overestimate of the net fiscal contribution of natives. The alternative is to assume that the supply of “pure” public goods would be unchanged in the absence of A8 migrants, and therefore spread its cost among the resident population (natives and previous immigrants) only. This alternative computation would clearly imply an improvement in the net fiscal contribution of A8 migrants, and a worsening of the net fiscal contribution of natives. In the Appendix we recalculate all our scenarios adopting this alternative apportionment.

Other publicly provided goods and services can, to different extents, suffer from congestion. For instance, the costs of waste management or the costs for fire protection services are both likely to increase with population increases. For this reason we apportion in all scenarios the expenditures for “Other public goods” proportionately to the share of A8 immigrants and natives in the total population.

Expenditure on prisons is apportioned proportionately to the nationality of inmates, taken from the Ministry of Justice Statistics Bulletins “Offender Management Caseload Statistics” and the “Population in Custody statistics”. This certainly provides an over-estimate of the prison expenditure for A8 migrants as we have no information about the year of arrival of foreign prison inmates, and it is likely - especially in the first years after the enlargement – that nationals from an A8 country who are in prison have arrived before May 2004. As no information is available regarding the number of trials or litigations involving A8 immigrants, we use this same data to apportion expenditures for law courts, again a conservative allocation for post-2004 A8 immigrants.

Housing development is apportioned proportionately to the share of the two populations living in social housing, which we calculate from the LFS. Coefficients for health care costs are calculated after taking into account the age structure of the population (again based on the LFS) and the share of gross current expenditures on the hospital and community health services for each age group in 2003-04²⁴, as detailed in the Department for Health Departmental Report 2006²⁵.

Since for all years family benefits, income support and tax credits make up between 84% and 90% of expenditures for “Social exclusion n.e.c.”, we apportion this proportionately to the share of each group in the population of income support or family benefits recipients, calculated from the LFS.

We allocate expenditure on compulsory education to the two groups by using LFS information on the proportion of migrant/native children that belong to each sub-population for pre-primary, primary and

²⁴ These are the latest figures available, and we use them for constructing the coefficients in every year. We are therefore implicitly assuming that the health expenditure by age group did not vary over the years we consider.

²⁵ Although age is the main factor in determining healthcare costs, socio-economic status is another important determinant of health determinants (see e.g. Smith (2007)). However we have no information on healthcare expenditure by socio-economic status and age group, so we use age structure only. A8 migrants earn significantly less than UK nationals in all age groups. On the one hand one may therefore suspect that they may have a poorer health status and therefore require a higher share of health expenditure. On the other hand, though, the proportion of individuals reporting long term ill-health in the LFS is much lower for A8 migrants than for natives in every age group.

secondary education. Expenditure in post-secondary education is apportioned by using LFS self-reported information about the current qualification individuals are currently studying towards.

Table 5.2 of PESA reports expenditures for two types of police services: “immigration and citizenship”, and “other police services”. In our central scenario we apportion both of these elements proportionately to the population shares. However, one could argue that immigration controls costs should be charged to immigrants only²⁶. We consider this possibility in scenario 3, where police services for immigration and citizenship are apportioned entirely to the foreign born population (i.e the natives’ share of this cost is zero, and the cost is borne only by A8 and other immigrants, proportionately according to their populations). Similarly, expenditure for police services may increase if the newcomers have a higher propensity for crime . We account for this possibility in scenario 3, where we use the share of migrants in the prison population as a proxy for crime activity in each group.

The LFS contains several detailed questions about the type of social security benefits received (but does not detail the amount). It is therefore possible, in principle, to apportion each type of expenditure for social protection according to the proportion of individuals receiving the relevant benefit. However, due to the small sample size and problems of under-reporting of benefits receipts in the LFS, the direct measurement of recipients of each type of benefit by immigrant status is subject to a considerable measurement error. As there are no alternative data outlining benefit receipts by nationality or country of birth²⁷, we use in our central estimate the *potential* rather than the self-declared recipients to apportion social protection expenditures. This is again conservative – it is likely to overestimate the share of benefits received by A8 immigrants both because of legal limits in eligibility (see section 2) and because immigrants are usually less likely to take up benefits they are eligible to, especially in the first few years after immigration (see e.g. Borjas & Trejo (1991) and Borjas & Hilton (1996)). Using self-declared benefit receipts – as we do in scenario 2 – does not alter significantly the results (see Table 7).

4.3 The Net Fiscal Impact of A8 Immigration

Table 6 reports our results under the assumptions presented in Table 4 and Table 5 for the central scenario (scenario 1 in both tables), for fiscal years 2005-06 to 2008-09.

For all fiscal years A8 immigrants’ contribution to total government revenues was similar to their share in the overall population. For example, in 2007-08, A8 immigrants constituted 0.87% of the total UK population, and accounted for 0.81% of total government revenues, while in 2008-09 they totalled

²⁶ See appendix and Sriskandarajah, Cooley, & Reed (2005) for a discussion.

²⁷ The Home Office Accession Monitoring Report reports some information about number of accepted and rejected applications of A8 immigrants for a limited number of benefits. However since the DWP does not collect nationality data there is no way of calculating the number of successful (or unsuccessful) benefit applications for natives.

0.91% of the population, and accounted for 0.96% of total government revenues. This is because, despite receiving lower wages than natives, and hence paying on average lower income taxes, A8 immigrants have very high employment rates. Largely due to this, overall the A8 immigrants' share of total income tax revenues is not proportionately much lower than natives'. Moreover, they also pay proportionately more than natives in indirect taxes, as the effective tax rate for most consumption taxes is higher for low-income individuals. In 2008-09, for instance, A8s contributed 0.85% of total income tax revenues and 1.3% of total VAT revenues despite constituting 0.9% of the population. Meanwhile natives contributed 86.4% of income tax and 87.3% of VAT revenues despite accounting for 88.8% of the population. This gives a ratio of the share of income tax payments to share in the population of 0.94 for A8s and 0.98 for natives with respective figures of 1.4 and 0.98 for VAT.

Moreover, in every year shown A8 immigrants accounted for a smaller share in government spending than their share of the population (for example 0.6% in 2008-09, which is far below their share in the overall population of 0.91%). Therefore, overall A8 immigrants made a net contribution to public finances.

This is illustrated in the last two columns of Table 6, where we report the ratio of revenues to expenditures for both A8 immigrants and natives. In all years, the ratio of tax receipts to expenditures for A8 immigrants was well above 1, indicating that A8 immigrants paid substantially more in taxes than they received in government assistance. The figures in the Table suggest that the A8 contribution to taxes was over 35% higher than the amount received in direct or indirect government transfers. This is even more remarkable because over this period the government was running a budget deficit, which is partially reflected by the same ratio of receipts to expenditures for natives, which was below 1 in every year.

We believe that the estimates we present in Table 7 are based on a set of plausible assumptions, which as discussed earlier, are rather conservative in the sense that they are likely to overestimate the expenditures allocated to A8 immigrants and underestimate the contributions made by the same group. However, as previously explained and as reported in Table 4 and Table 5 we also consider different allocation methods for both revenues and expenditures.

In Table 7, we present results for all combinations of scenarios. The table headings report the scenario numbers, with reference to the numbering used in Table 4 and Table 5. We consider all possible results arising from different combinations of the three scenarios for revenues and the three scenarios for expenditures.

In columns 1 and 2 we consider the case where social security benefits are apportioned according to stated receipt, as reported in the LFS (revenues scenario 1, expenditures scenario 2). The net fiscal contribution of A8 immigrants is in this case even larger than before, with the ratio of receipts to expenditures for the A8 ranging from 1.37 in 2008-09 to 1.66 in 2006-07. In columns 3-4 we still keep revenues allocation fixed (scenario 1), but consider scenario 3 for expenditures. As explained in Table 5, in this case we are attributing the entire cost of management of the immigration system to the foreign

born population, and imputing other police costs proportionately using the share of each group in the prison population. Results under these criteria still suggest that A8 immigrants contribute more than they receive, although the ratio of revenues to expenditures is now slightly lower in every year. For example in 2008-09 the ratio stands at 1.34, against 1.37 in our central scenario.

All other scenarios considered give similar results: a ratio of receipts to expenditures consistently above 1 for A8 immigrants, and consistently below 1 for natives. The worst case scenario (from the A8 immigrants' point of view) is reported in the bottom right corner of Table 7. Here we again consider each of the scenario 3s for expenditures and for receipts, where corporation and inheritance tax revenues are entirely allocated to natives and council tax revenues are apportioned proportionately to population. In this case the revenues/expenditures ratio for A8 immigrants in 2008-09 drops to 1.28 while for natives it slightly increases to 0.81.

The results show that, although different choices of apportionment methods lead to some changes in the revenues/expenditure ratio, A8 immigrants are unambiguously net fiscal contributors, while natives are unambiguously receiving more than they contribute.

5. Discussion and Conclusions

This paper contributes to the debate as to whether immigration after the 2004 EU accession was beneficial to the UK. It is the first comprehensive analysis of the net fiscal contribution of A8 immigrants. Our findings suggest that A8 immigrants are highly educated; around 35% (and 17% of natives) left full time education at or after the age of 21, and only 11% (53% of natives) left school before the age of 17. Despite this, A8 immigrants receive low wages, in particular immediately after entry to the UK. However, every entry cohort to date has experienced a remarkable increase in wages since arrival. A8 immigrants are also more likely to participate in the labour market, and have higher employment rates than natives, on average. Again, each entry cohort increases their employment rates substantially after arrival, with much higher employment rates after about 4 years.

All this paints a very positive picture of A8 immigration to the UK, one of highly educated, young people, entering into the UK predominantly to work with subsequent positive contributions to the tax system. The analysis also suggests that the labour market situation of immigrants substantially improves with time in the UK, in terms of both wages and labour force attachment.

The – on average – lower wage position of the new immigrants may suggest that their fiscal net contribution is low, as they contribute less to the tax system than comparable natives. However our analysis suggests that this is, at least partly, offset by higher participation and employment rates. Above all, our study shows that the A8 receipt of government expenditures, in terms of benefits and other transfers, is substantially lower than their share of population, so that – on balance – A8 immigrants have made a substantial net contribution to the UK fiscal system. This net fiscal contribution remains in even the most conservative scenario of allocating tax receipts and expenditures. Thus, from the fiscal

point of view, A8 immigration has not been at all a burden on the welfare system – rather it has rather contributed to strengthen the fiscal position.

But what are the longer term effects on the fiscal system? As we point out, our analysis is static and backward looking in nature. It relates to the years after accession in 2004. But what happens if A8 immigrants age, have children, and may become more susceptible to illness and disability? As we discuss in the paper, any predictions of future contributions and receipts must rely on a set of very strong assumptions, and we do not wish to engage in such speculation. However, while it is true that younger populations receive less in benefits, it is also the case that younger immigrants, and in particular those who just arrived, receive lower wages. The strong wage growth of A8 immigrant arrival cohorts that we illustrated is likely to continue with time in the UK, so that the contributions A8 immigrants make to the tax system are likely to rise considerably. In fact, if in the long run A8 immigrants receive wages relative to their levels of education similar to those of native born workers, then – as A8 immigrants are far better educated than natives in the same age cohort²⁸ –their contributions to the tax system should considerably supersede those of natives. Thus, there is in our view little reason to believe that in the longer run, A8 immigrants who arrived between 2004 and 2008 will constitute a net burden to the welfare system. This is also in line with analysis we provide on the probability of welfare claims, where we show that A8 immigrants – even if they were identical in a large number of characteristics to natives, like age, education, children and disability – would still be less likely to claim benefits.

²⁸ Comparing A8 immigrants and natives aged 25-35 shows that A8 immigrants are considerably more educated even within this cohort: 47% have a high education, and 9% a low education, which compares to 27% and 42% among natives.

References

- Barrett, A., & McCarthy, Y. (2008). Immigrants and welfare programmes: exploring the interactions between immigrant characteristics, immigrant welfare dependence, and welfare policy. *Oxford Review of Economic Policy*, 24, 542-559.
- Barrett, A., & McCarthy, Y. (2007). Immigrants in a Booming Economy: Analysing Their Earnings and Welfare Dependence. *Labour*, 21 (4/5), 789-808.
- Blanchflower, D.G., & Lawton, H. (2009). The Impact of the Recent Expansion of the EU on the UK Labour Market, in: M. Kahanec and K. F. Zimmermann (eds.), *EU Labor Markets After Post-Enlargement Migration*, Springer.
- Blanchflower, D.G., & Shadforth, C. (2009). "Fear, Unemployment and Migration", *Economic Journal*, 119(535), F136-F182.
- Borjas, G. J., & Hilton, L. (1996). Immigration and the Welfare State: Immigrant Participation in Means-Tested entitlement Programs. *Quarterly Journal of Economics*, 575-604.
- Borjas, G. J., & Trejo, S. J. (1991). Immigrant Participation in the Welfare System. *Industrial and Labor Relations Review*, 44 (2), 195-211.
- Brucker, H., Epstein, G., Saint-Paul, G., Venturini, A., & Zimmerman, K. (2002). Welfare State Provision. In T. Boeri, G. Hanson, & B. McCormick, *Immigration Policy and the Welfare State* (pp. 66-90). Oxford: Oxford University Press.
- Card, D. (2007). *How Immigration Affects U.S. Cities*. CReAM Discussion Paper No.11/07.
- Drinkwater, S., Eade, J., & Garapich, M. (2006). *Poles Apart? EU Enlargement and the Labour Market Outcomes of Immigrants in the UK*. IZA Discussion Paper No. 2410.
- Dustmann, C., Frattini, T., & Preston, I. (2008). *The Effect of Immigration along the Distribution of Wages*. CReAM Discussion Paper No. 03/08.
- Edmonston, B., & Lee, R. (1996). *Local Fiscal Impacts of Illegal Immigration*. Washington, D.C.: National Academy Press.
- Gott, C., & Johnston, K. (2002). *The migrant population in the UK: fiscal effects*. Home Office Research, Development and Statistics Directorate Occasional Paper No.77. London: Home Office.
- Hansen, J., & Lofstrom, M. (2003). Immigrants Assimilation and Welfare Participation. *Journal of Human Resources*, 38 (1), 74-98.
- Lemos, S., & Portes, J. (2008). *New Labour? The Impact of Migration from Central and Eastern European Countries on the UK Labour Market*. IZA Discussion Paper No. 3756.

Manacorda, M., Manning, A., & Wadsworth, J. (2006). *The Impact of Immigration on the Structure of Male Wages: Theory and Evidence for Britain*. CReAM Discussion Paper No. 08/06.

Nickell, S., & Saleheen, J. (2008). *The impact of immigration on occupational wages: evidence from Britain*. Federal Reserve Bank of Boston Working Paper 08/6.

Rowthorn, R. (2008). The fiscal impact of immigration on the advanced economies. *Oxford Review of Economic Policy*, 24 (3), 560-580.

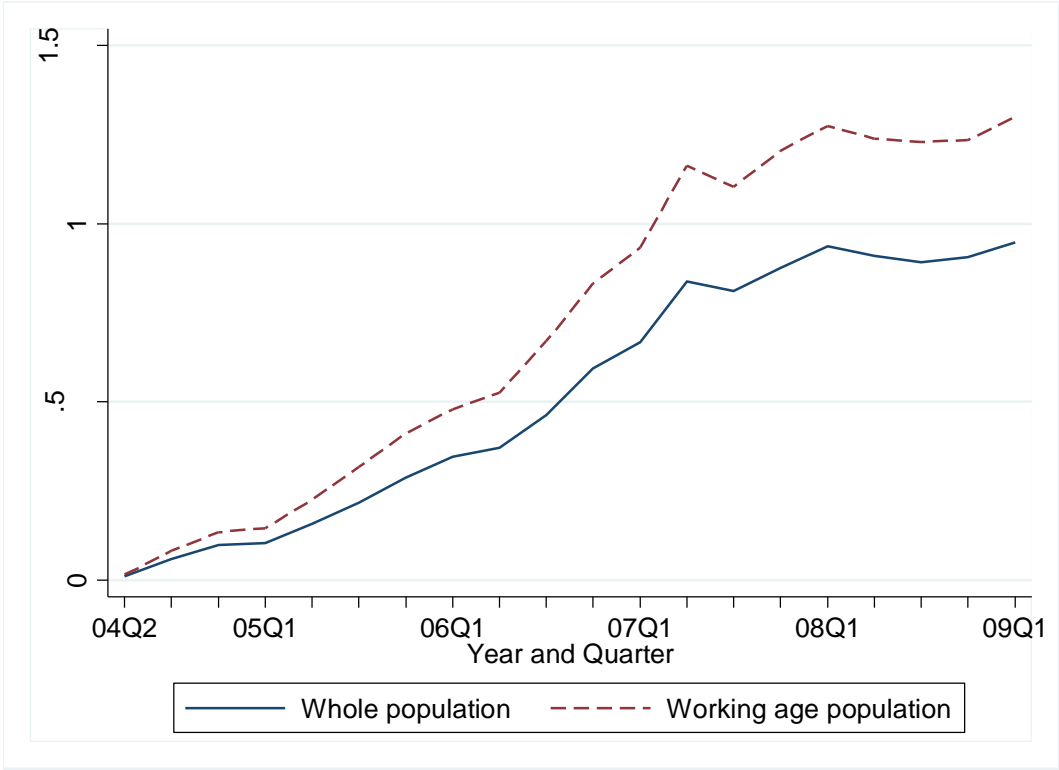
Smith, J. (2007). The impact of social economic status on health over the life-course. *Journal of Human Resources*, 42, 739-764.

Sriskandarajah, D., Cooley, L., & Reed, H. (2005). *Paying their way: the fiscal contribution of immigrants in the UK*. London: IPPR.

Storesletten, K. (2000). Sustaining Fiscal Policy through Immigration. *Journal of Political Economy*, 108 (2), 300-323.

Figures and Tables

Figure 1 - A8 immigrants as a share of UK population



The figure reports the share of A8 migrants in the total (solid line) and working age (dotted line) population for each quarter since the second quarter 2004. A8 migrants are defined as nationals of Czech Republic, Estonia, Hungary, Latvia, Lithuania, Slovenia, Slovakia, and Poland arrived in the UK since 2004. Working age: 16-65 for men, 16-60 for women. Source: LFS, Q2 2004- Q1 2009

Table 1 - A8 and UK nationals: Descriptive statistics 2004-2008

		A8		Natives	
		M	F	M	F
1.	Average age	26.5	25.1	37.7	39.8
2.	% age 20-35	69.8	67.3	18.6	18.0
3.	Education				
3.a	% Low	11.9	10.0	58.3	53.9
3.b	% Intermediate	56.1	50.2	24.1	29.6
3.c	% High	32.0	39.9	17.6	16.5
4	Labour market				
4.a	Employment rate	90.4	74.2	78.3	71.1
4.b	Participation rate	94.9	80.4	83.0	74.6
5	Wage				
5.a	Average hourly wage	6.8	6.0	11.9	9.5
5.b	Median hourly wage	6.1	5.6	9.8	7.7
5.c	10th hourly wage percentile	4.5	4.1	5.2	4.7
5.d	90th hourly wage percentile	9.4	8.2	20.9	16.4
6	Welfare				
6.a	% claiming benefits or tax credits	12.4	23.7	24.2	55.0
6.b	% in social housing	6.5	7.7	15.9	18.3

The table reports descriptive statistics for the A8 and native UK population by gender for years 2004 (quarter 2) -2009 (quarter 1) pooled.

Row 1 reports the average age, while row 2 reports the percentage of each group in the age bracket 20-35.

Rows 3.a-3.c report the educational distribution of each group. Education is defined based on age at which individuals left full time education. "Low": left education at 16 or earlier; "Intermediate": left between 17-20; "High": left at 21 or later.

Row 4.a reports the employment rate: defined as the ratio of individuals in employment or self employed to the working age population. Row 4.b reports the participation rate, defined as the ratio of individuals in the labour force to the working age population.

Rows 5.a-5.d report the average real hourly wage (5.a) and the 50th (5.b), 10th (5.c) and 90th (5.d) real hourly wage percentile. Wages are discounted using the quarterly 2005-based CPI.

Rows 6.a and 6.b report the percentage claiming benefits or tax credits (6.a) and the percentage in social housing (6.b).

Source: LFS, Q2 2004- Q1 2009

Table 2 - A8 immigrants' wage and employment by cohort

	Year of arrival in the UK	Fiscal Year				
		2004/05	2005/06	2006/07	2007/08	2008/09
Average wage	2004	5.7	6.4	6.6	6.7	8.0
	2005		6.0	6.8	6.8	6.8
	2006			5.8	6.1	6.5
	2007				5.4	6.2
	2008					5.7
	natives	10.4	10.6	10.8	10.9	10.9
Median wage	2004	4.8	5.7	6.1	6.1	7.3
	2005		5.5	6.1	6.2	6.3
	2006			5.3	5.7	5.9
	2007				5.2	5.8
	2008					5.5
	natives	8.4	8.6	8.7	8.8	8.8
10th percentile	2004	3.3	4.2	4.4	4.4	4.8
	2005		4.0	4.3	4.6	4.6
	2006			3.8	4.2	4.6
	2007				3.8	4.6
	2008					4.4
	natives	4.7	4.9	4.9	5.0	5.0
90th percentile	2004	8.1	8.3	9.2	8.8	11.0
	2005		8.4	8.6	9.5	9.6
	2006			8.3	8.2	9.0
	2007				7.1	8.0
	2008					7.8
	natives	18.2	18.6	18.8	19.1	19.1
Employment rate	2004	72.3	78.9	88.2	90.1	85.1
	2005		82.4	86.3	87.5	85.5
	2006			74.4	82.0	87.1
	2007				75.1	80.9
	2008					68.6
	natives	75.1	75.1	74.8	74.8	74.4
Participation rate	2004	84.9	84.1	92.5	94.9	89.4
	2005		89.7	89.9	90.5	89.9
	2006			85.1	86.6	90.0
	2007				85.0	84.3
	2008					78.5
	natives	78.7	78.8	79.0	78.9	79.3

The table reports the evolution over time of the average, median, 10th percentile and 90th percentile of real hourly wages (discounted using 2005-based CPI) and of employment and participation rate for each A8 immigrants' arrival cohort and for natives.

LFS, Q2 2004- Q1 2009

Table 3 - Probability of claiming state benefits/tax credits and of living in social housing

	Benefits/tax credits			Social Housing		
	(1)	(2)	(3)	(4)	(5)	(6)
A8	-0.232*** (0.007)	-0.111*** (0.007)	-0.053*** (0.006)	-0.097*** (0.004)	-0.053*** (0.005)	-0.048*** (0.005)
Origin dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year and quarter effects	Yes	Yes	Yes	Yes	Yes	Yes
Gender	No	Yes	Yes	No	Yes	Yes
Education and age	No	Yes	Yes	No	Yes	Yes
Dependent children	No	No	Yes	No	No	Yes
N	1626253	1406533	1404792	2408729	1407267	1405528

The table reports results from a regression of the dummy variable “receiving state benefits or tax credits” (cols. 1-3) and of the dummy variable “receiving state benefits or tax credits” (cols.4-6) on three dummy variables for migrant status: A8 immigrants who have been in the UK for one year or more, other immigrants and natives (the excluded variable). Additionally all specifications include an interaction of year and quarter dummies.

Education dummies include three dummy variables for different level of education: high (left full time education at 21 or later), intermediate (left between 17-20), low (left at 16 or earlier). Age include age and age squared. “Dependent children” includes a dummy variable for having no dependent children under the age of 19 in the household and the number of dependent children under the age of 19 in the household.

Robust standard errors in parenthesis are clustered at the individual level.

** denotes significance at 5%; * denotes significance at 1%; *** denotes significance at 0.1%

Table 4 - Receipts allocation criteria

	Scenario 1	Scenario 2	Scenario 3
<i>Income tax and National Insurance</i>	Share of total payments: actual tax and NI rates applied to LFS income	Same as 1	Same as 1
<i>Income tax credits</i>	Share of dependent children population	Approx. 75% as in 1, approx. 25% share of population	Same as 1
<i>VAT and excise duties</i>	Share of total payments: effective rates by household income decile from ONS "Effects of taxes and benefits on household income" applied to LFS income	Same as 1	Same as 1
<i>Vehicle Excise Duties</i>	Share of total payments: effective rates by household income decile from ONS "Effects of taxes and benefits on household income" applied to LFS income	Share of individuals driving to work	Same as 1
<i>Corporation tax and Capital Gains tax</i>	Share of population, net of foreign owned share from ONS "Share ownership"	Same as 1	All to natives, net of foreign owned share
<i>Inheritance tax</i>	Share of houseowners population	Same as 1	All to natives
<i>Council tax</i>	Share of total households	Same as 1	Share of population
<i>Business rates</i>	Share of self employed	Share of population	Same as 1
<i>Other</i>	Share of population	Same as 1	Same as 1

The table summarises the criteria followed to apportion tax receipts for each of the scenarios considered.

Column 1 gives the apportionment followed in the central scenario. Columns 2 and 3 report the apportionment criteria used in alternative scenarios.

See Table A1 (and text) for details. Where not specified, the data source is the LFS. The list of tax receipts is based on grouping of items in Table C6 of the 2009 Budget Report.

Table 5 - Expenditures allocation criteria

	Scenario 1	Scenario 2	Scenario 3
"Pure" public goods	Share of population (<i>average cost</i>) / All to natives (<i>marginal cost</i>)	Same as 1	Same as 1
Other publicly provided goods and services	Share of population	Same as 1	Same as 1
Law courts and prisons	Share of prison population from ONS "Offender Management Caseload Statistics"	Same as 1	Same as 1
Housing development	Share of social housing tenants	Same as 1	Same as 1
Health (except health research)	Share of population in age group, and share of total health costs of age group from Department for Health Report	Same as 1	Same as 1
Social protection: Social exclusion n.e.c.	Share of income support or family benefits recipients	Same as 1	Same as 1
Compulsory education	Share of children in each age group	Same as 1	Same as 1
Post-secondary education	Share of population studying towards qualification	Same as 1	Same as 1
Immigration and citizenship police services	Share of population	Same as 1	Share of immigrant population
Other police services	Share of population	Same as 1	Share of prison population from ONS "Offender Management Caseload Statistics"
Social protection *	Share of potential recipients	Share of actual recipients	Share of potential recipients

The table summarises the criteria followed to apportion expenditures for each of the scenarios considered. Column 1 gives the apportionment followed in the central scenario. Columns 2 and 3 report the apportionment criteria used in alternative scenarios. See Table A2 (and text) for details. Where not specified, the data source is the LFS. The list of expenditures is based on grouping of items in Table 5.2 in PESA 2009. All three scenarios can be calculated apportioning "Pure" public goods – row 1– at their average cost, i.e. proportional to population, or at their marginal cost, i.e. only to natives.

"Pure" public goods: General public services, Defence, Economic Affairs, Environment Protection (except waste and waste water management), street lighting, health research. Other publicly provided goods and services: Fire-protection services, R&D public order and safety, Public order and safety n.e.c. Waste and waste water management; Housing and community amenities (except housing development and street lighting); Recreation, culture and religion; Other education, not definable by level.

* Except Housing, Social exclusion n.e.c., R&D Social Protection, Social Protection n.e.c.

Table 6 - Results: central scenario

Fiscal Year	% of population		Expenditures			Revenues			Revenues/ Expenditures	
	A8	Natives	Total (£ million)	% A8 ($\tilde{\beta}^{A8}$)	% Natives ($\tilde{\beta}^N$)	Total (£ million)	%A8 ($\tilde{\alpha}^{A8}$)	%Natives ($\tilde{\alpha}^N$)	A8	Natives
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2005-06	0.25	90.47	524173	0.16	91.20	485700	0.24	86.26	1.39	0.88
2006-07	0.52	89.88	550116	0.33	90.82	519700	0.56	85.31	1.60	0.89
2007-08	0.87	89.24	582676	0.57	90.30	548000	0.81	84.38	1.35	0.88
2008-09	0.91	88.80	620685	0.60	89.89	530700	0.96	83.86	1.37	0.80

The table reports, for each fiscal year 2005-06 to 2008-09, the percentage of A8 immigrants and of natives in the total UK population (columns 1,2), the total government expenditures (in million £) and the share attributed to A8 and natives under the central scenario (columns 3,4,5), the total government revenues (in million £) and the share attributed to A8 and natives (columns 6,7,8), and the ratio of revenues to expenditures for A8 and natives (columns 9,10).

The central scenario is described as scenario 1 in Table 4 and Table 5.

Table 7 - Results: alternative scenarios

	Revenues/Expenditures							
Revenues scenario	1		1		2		2	
Expenditures scenario	2		3		1		2	
Fiscal Year	A8	Natives	A8	Natives	A8	Natives	A8	Natives
2005-06	1.50	0.88	1.26	0.88	1.40	0.88	1.51	0.88
2006-07	1.66	0.89	1.50	0.89	1.61	0.89	1.68	0.89
2007-08	1.38	0.88	1.30	0.88	1.35	0.88	1.38	0.88
2008-09	1.37	0.80	1.34	0.80	1.36	0.80	1.36	0.80
Revenues scenario	2		3		3		3	
Expenditures scenario	3		1		2		3	
Fiscal Year	A8	Natives	A8	Natives	A8	Natives	A8	Natives
2005-06	1.27	0.88	1.33	0.88	1.44	0.89	1.21	0.89
2006-07	1.52	0.89	1.54	0.89	1.60	0.90	1.45	0.90
2007-08	1.30	0.88	1.29	0.89	1.32	0.89	1.24	0.89
2008-09	1.33	0.80	1.31	0.80	1.31	0.81	1.28	0.81

The table reports, for each fiscal year 2005-06 to 2008-09, the ratio of revenues to expenditures for A8 and natives under several scenarios. Scenarios differ according to the method followed to apportion revenues and expenditures. Revenues and expenditures scenarios are numbered following Table 4 and Table 5 (the first two rows of the table indicate the scenario computed) where they are also described.

Appendix

In this appendix we explain in detail the construction of the different allocation coefficients for receipts and expenditures – α_i and β_j – , and in Table A1 and Table A2 we map all items of government receipts and expenditures to the groupings used in Table 4 and Table 5. Finally, we also report in Table A3 results obtained replicating the previous analysis (all scenarios) but apportioning “pure” public goods according to their marginal cost, i.e. to the resident population only.

Tax receipts

Income tax and NIC

Income tax revenues and national insurance payments are calculated using a simple algorithm based on LFS variable *grsswk*, which is aggregated to annual salaries, including second jobs alongside the main occupation. After subtracting the lump-sum personal allowance available to all individuals, we make use of data published by the Office for National Statistics from the General Household Survey for 2006, outlining the proportion of individuals with private pensions by age, sex, work pattern and income.²⁹ Likely pension probabilities are calculated for each income decile by working pattern and sex, and then applied to individual pensionable income to calculate likely pension payments for each observation. The rate of pension payments is set for everyone at the year-specific national average for private sector employees, ranging from 4% in 2004 to 4.4% in 2007, the latest year available (source: ONS Pension Trends, Chapter 8, 2009 and 2005³⁰). These payments are subtracted from gross income to obtain a measure of taxable income, to which the appropriate rates of income tax and national insurance are applied to calculate approximate personal taxes paid.³¹ The LFS does not contain enough detail on individual circumstances to allow consideration of all incidental allowances. However this is not believed to have a material impact on the results presented here.

Total tax payments are summed within the sample, and α_1 and α_2 are then estimated as the ratio of A8 migrants’ and UK nationals’ payments to total payments. This ratio is applied to aggregate tax data for the relevant fiscal year to obtain total tax payments by each group.

²⁹ http://www.statistics.gov.uk/downloads/theme_compendia/GHS06/GHS06chapter6-Pensions.xls

³⁰ http://www.statistics.gov.uk/downloads/theme_compendia/pensiontrends/Pension_Trends_ch08.pdf and http://www.statistics.gov.uk/downloads/theme_compendia/pensiontrends2005/Pension_Trends.pdf. Data are available for 2004, 2006, and 2007 only. Therefore we use 2004 figures for 2005, and 2007 figures for 2008. Figures for 2006 and 2007 are our calculations based on a weighted average of contribution rates for members of defined benefit and defined contributions schemes.

³¹ For rate guidance and information on income tax and NI structure see: Income tax information, including rates and allowances, guidance etc http://www.hmrc.gov.uk/stats/income_tax/index.htm NIC rates and allowances <http://www.hmrc.gov.uk/rates/nic.htm> NIC guidance: www.hmrc.gov.uk/nic/background-nic.htm

Income tax credits

Income tax credits are composed of Child Tax Credits (CTC) and Working Tax Credits (WTC). As in all years CTC constitute about 3/4 of the total (source: HMRC -Child and Working Tax Credits Statistics: Finalised annual awards, 2007-08, Table 1.1³²), we apportion in our central scenario tax credits according to the proportion of dependent children that are A8 or UK natives. Alternatively, in our scenario 2, we calculate for every year the share of CTC in total tax credits³³. We then use this share to calculate the amount of total tax credits to be allocated according to proportion of dependent children (s we do not have the figure for 2008-09, we use for this latest year the 2007 share) and we allocate the remainder proportionately to the A8 and natives share of population. However, given that tax credits payments are about 1% of total government receipts in every year, the choice of their allocation criteria will not affect our final results.

Consumption taxes – VAT and excise duties

Consumption tax payments are computed using average effective tax rates by decile of household disposable income (gross annual income less income tax and national insurance receipts) from the ONS publication “The effect of Taxes and Benefits on Household Income”, 2005-06, 2006-07. These are then applied to gross individual income. Because the latest available year is 2006-07, we use effective rates for this year also for fiscal years 2007-08 and 2008-09. As with income tax, these figures were totalled and the ratio of payments made by A8 migrants and natives to total payments are calculated for VAT and other consumption taxes ($\alpha_5, \dots, \alpha_{17}$)³⁴. This procedure implicitly assumes that immigrants and natives with the same income have the same behaviour. Alternatively, we try to relax this assumption using the proportion of individuals driving to work – thought to be a proxy of car ownership – from the LFS to allocate vehicle excise duties (α_{17}).

Corporation tax and capital gains tax

Corporation taxes and capital gains tax ($\alpha_{18}, \dots, \alpha_{21}$) are apportioned using methodology from (Sriskandarajah, Cooley, & Reed, 2005), which subtracts the percentage likely to be paid by foreign shareholders, before apportioning the remainder using the percentage of A8 migrants and natives in the sample. We obtain information on the share of foreign shareholders from the ONS 2006 “Share Ownership” report. This gives the annual share of foreign ownership in UK companies between 1999 and 2006, with the exception of 2005. We therefore use the 2004 figure for 2005, and similarly we use the 2006 share for all subsequent years.

Alternatively, we relax the implicit assumption that A8 immigrants and natives generate the same amount of corporation tax per head by apportioning revenues entirely to natives ($\alpha_{18}^{A8} = \dots = \alpha_{21}^{A8} = 0$; $\alpha_{18}^N = \dots = \alpha_{21}^N = 1$).

³² <http://www.hmrc.gov.uk/stats/personal-tax-credits/ctcw-tax-credit-final-may09.pdf>

³³ 72% in 2007-08, 73% in 2006-07, 75% in 2005-06.

³⁴ For petroleum revenue tax and fuel duties we have used effective tax rate for duty on hydrocarbon oils ($\alpha_6 = \alpha_7$), similarly for wine and spirit we have the same rate ($\alpha_{10} = \alpha_{11}$).

Inheritance tax

In apportioning inheritance tax we use house ownership as a proxy for asset ownership (financial, land and buildings). We calculate from the LFS the percentage of house owners (using the variables *ten96* and *ten1*) and use it for α_{22}^{A8} and α_{22}^N . However, given that A8 immigrants are much younger than natives, we also consider a scenario where all inheritance tax revenue is apportioned to natives ($\alpha_{22}^{A8} = 0; \alpha_{22}^N = 1$).

Council tax

Council tax payments are apportioned proportionately to the share of A8 and native households (α_{23}), or alternatively proportionately to population shares.

Business rates

Business rates are a tax on non-domestic property, typically paid by businesses and other organisations which occupy non-domestic premises. We use the proportion of A8 and natives in the self-employed population from the LFS as the best proxy, to construct α_{24} . Alternatively, we also simply apportion business rates proportionately to population.

Other tax payments

All remaining tax payments are apportioned according to the population shares ($\alpha_{25}^{A8} = \dots = \alpha_{32}^{A8} = s^{A8}; \alpha_{25}^N = \dots = \alpha_{32}^N = s^N$). These are the three “environmental” taxes, contributing annually to less than 0.4% of total revenue: landfill tax - levied on waste that is disposed of at landfills; climate change levy - charged on business consumers of taxable commodities for lighting, heating and power; aggregates levy - a tax on sand, gravel and rock that is dug from the ground or dredged from the sea. The remaining receipt categories are “Other taxes and royalties”, “Adjustments”, “Interest and dividends”, “Other receipts”, and the negative item “Own resources contribution to EC budget,” which do not have any other natural apportioning criterion.

Expenditures

Pure public goods

Costs for pure public goods (in the terminology of PESA 2009, used also in Table A” – General public services, defence, economic affairs, pollution abatement, protection of biodiversity and landscape, R&D environment protection, environment protection n.e.c, street lighting, health research) are attributed to A8 and natives according to their share in the population, which is equivalent to charging the average cost of provision to both groups ($\beta_1^{A8} = \dots = \beta_9^{A8} = s^{A8}; \beta_1^N = \dots = \beta_9^N = s^N$). In Table A3 we also report results for all scenarios in the case where expenditures for public goods are charged at their marginal costs. Then we assume that the costs for public goods are only borne by the part of the population that was already in the UK before the 2004 EU enlargement (i.e. natives and earlier migrants). Results in this case clearly strengthen the findings of our analysis as they improve A8 immigrants’ net fiscal contribution, while worsening that of natives.

Other public goods and services

Not all public services are effectively non-rival, and therefore the increase in population may also increase the cost of providing them. For this reason, we apportion the costs for those public goods that are –at least to some extent – rival in consumption, proportionally to population ($\beta_{10}^{A8} = \dots = \beta_{25}^{A8} = s^{A8}$; $\beta_{10}^N = \dots = \beta_{25}^N = s^N$). These are: fire-protection services; R&D public order and safety; public order and safety n.e.c; waste management; water management; community development; water supply; R&D housing and community amenities; housing and community amenities n.e.c.; recreation, culture and religion; education not definable by level; subsidiary services to education; R&D education; education n.e.c.; R&D social protection; social protection n.e.c.

For simplicity, we have also included in this category EU transactions, accounting adjustments, and unallocated ($\beta_{26}, \beta_{27}, \beta_{28}$) which – although not public goods – we have always apportioned proportionately to population shares.

Law courts and prisons

Expenditures for law courts and prisons (β_{29}, β_{30}) is allocated to A8 and natives proportionately to their share in the total prison population. Information regarding the nationality of prison inmates is taken from the 2005, 2006 and 2007 Offender Management Caseload Statistics, and from the June 2008 Population in Custody statistics, both Ministry of Justice Statics Bulletin³⁵. It is worth stressing that this measure provides an over-estimate of the share of A8 immigrants in the prison population, predominantly because we are not able to separately identify individuals from A8 countries arrived before and after the EU enlargement of May 2004. We use the proportion of prison population to apportion expenditures for law courts as well because no data are available about number of trials or litigations by nationality.

Housing development

Housing development (β_{31}) is apportioned according to population share living in social housing calculated from the LFS, based on the variables *llord*, *land96*, *ten1*, *ten96*

Medical and other health services

We apportion medical costs by age for both A8 and native individuals. We use information from the Department for Health Departmental Report 2006 (figure 6.2) outlining the share of health costs by age band in 2004. These are the most recent available data; therefore we use these figures to apportion expenditures in all years, assuming that the distribution of health costs by age did not vary over the years we analyse. Formally, coefficients are constructed as: $\beta_{32}^G = \beta_{33}^G = \sum_{i=1}^8 h_i a_i^G$ where *i* indexes the

³⁵ Available at www.homeoffice.gov.uk/rds/pdfs06/omcsq405tab3.xls (2005); www.justice.gov.uk/publications/offender-management-caseload-stats-2006.htm (2006); www.justice.gov.uk/publications/prisonandprobation.htm (2007); <http://www.justice.gov.uk/publications/populationincustody-2008.htm> (2008).

eight age bands, h_i is the share of total health costs of age band i , and a_i^G is the share of individuals of group G ($G=A8$, natives) in age band i .

Education

We apportion expenditure in compulsory education using LFS information on the national composition of population in the relevant age group for each school grade. For pre-primary education, β_{35} is the share of A8 and migrants in the population aged 0 to 4; for primary education, β_{36} is the share in population aged 5 to 10; for secondary education, β_{37} is the share in population between 11 and 15. Expenditure in post-secondary education ($\beta_{38}^G, \beta_{39}^G$) is apportioned using LFS self-reported information about further education contained in the variable *qulhi4*.

This approach does not take into account the proportion of children enrolled in fee-paying schools. Over the period we consider, 7% of school age pupils in England attended a fee-paying school (source: DCSF: The Composition of Schools in England, June 2008, p.10), and it is likely that these children are disproportionately drawn from the UK national subpopulation. We have therefore also experimented an alternative apportioning method, where 7% of education costs are apportioned to foreigners only. This does not affect our results.

Police services

Police expenses relative to immigration and citizenship are arguably a public service, and therefore we apportion their cost proportionately to population in our central scenario ($\beta_{40}^{A8} = s^{A8}$; $\beta_{40}^N = s^N$). However, it could be argued that these costs should be entirely attributable to immigrants. Although this is disputable where expenses for immigration controls are for the primary benefit of natives (see the discussion in Sriskandarajah, Cooley, & Reed (2005)) we have also tried to apportion immigration and citizenship costs proportionately to the share in the foreign population. This means that $\beta_{40}^N = 0$, and β_{40}^{A8} is equal in every year to the share of A8 immigrants in the total immigrant population.

Other police services are also apportioned proportionately to population in our central scenario $\beta_{41}^{A8} = s^{A8}$; $\beta_{41}^N = s^N$. However, one may fear that immigration may increase crime and hence raise police costs. For this reason we also checked our results using the share of A8 and natives in prison population as a proxy of crime activity (see apportionment of prison costs for details) in the construction of β_{41}^{A8} and β_{41}^N .

Social protection

In our central scenario we generally apportion expenditures on elements of social protection according to potential recipients (the exception is Social Security n.e.c.). This is because the LFS variable outlining actual receipt of specific type of benefits (*tpben31*) is often unreliable when we break down the data according to very fine country of birth groups, leaving us with few observations for A8. However, we also check the robustness of our results using LFS information on actual benefit recipients, and it turns out to make little difference. Unfortunately we have no information as to the *value* of the benefits received, only on the number of recipients.

We apportion sickness and disability proportionately (β_{42}) according to the composition of those who declare disability in the LFS, based on the variable *discurr*. Alternatively, we also use the population of self-declared disability benefit recipients resulting from the LFS. Old age and survivors shares ($\beta_{43} = \beta_{44}$) are constructed based on the proportion of A8 and natives in the inactive pension age population (women over 60, men over 65), or in the population of pension recipients. Social protection for family and children (β_{45}) is apportioned proportionately to the share of A8 and natives among dependent children (we define as dependent children anyone who is inactive and under the age of 18), or among the recipients of income support or family related benefits recipients. Expenditure on social protection for unemployment (β_{46}) is apportioned according to the composition of the unemployed population, or according to the composition of unemployment benefits recipients. Housing expenditure (β_{47}) is apportioned proportionately to the composition of the population in social housing or to the composition of housing or council tax benefits recipients.

Finally, we have apportioned other expenditures on protection of social exclusion (β_{34}) according to the share of A8 and natives among the recipients of income support or family-related benefits recipients, as they make up in every year more than 84% of the total expenditure in this category, and there was no obvious population of potential recipients to use as an alternative apportionment method.

Table A1 – List of government receipts and grouping

<i>i</i>	<i>Revenue source</i>	<i>Grouping in table 4</i>
1	Income tax revenue	Income tax and National Insurance
2	NICs payments	
3	Income tax credits	Income tax credits
4	Tax credits adjustment	
5	VAT	VAT and consumption taxes
6	Petroleum revenue	
7	Fuel duties	
8	Stamp duties	
9	Tobacco duties	
10	Spirits duties	
11	Wine duties	
12	Beer and cider duties	
13	Betting and gambling duties	
14	Air passenger duty	
15	Customs duties and levies	
16	Insurance premium tax	
17	Vehicle Excise Duties	Vehicle Excise Duties
18	Corporation tax	Corporation tax and Capital Gains tax
19	Corporation tax credits	
20	Capital Gains Tax	
21	PC corporation tax payments	
22	Inheritance tax	Inheritance tax
23	Council Tax	Council Tax
24	Business rates	Business rates
25	Landfill tax	Other
26	Climate change levy	
27	Aggregates levy	
28	Other taxes and royalties	
29	Adjustments	
30	Interests and dividends	
31	Other receipts	
32	Own resources contribution to EC budget	

The table reports the list of receipts from Table C6 of the 2009 Budget Report (second column), together with the indexing used in the paper (first column) and the category in which they have been grouped in Table 4 (third column).

Table A2 – List of government receipts and grouping

<i>j</i>	Expenditure	Grouping in table 5	<i>j</i>	Expenditure	Grouping in table 5
1	1. General public services	<i>"Pure" public goods</i>	25	10.9 Social protection n.e.c.	<i>Other public goods</i>
2	2. Defence		26	EU Transactions	
3	4. Economic affairs		27	Unallocated	
4	5.3 Pollution abatement		28	Accounting adjustments	
5	5.4 Protection of biodiversity and landscape		29	3.3 Law courts	<i>Law courts and Prisons</i>
6	5.5 R&D environment protection		30	3.4 Prisons	<i>Housing development</i>
7	5.6 Environment protection n.e.c		31	6.1 Housing development	
8	6.4 Street lighting		32	Medical services	
9	7.2 Health research		33	Central and other health services	
10	3.2 Fire-protection services	<i>Other publicly provided goods and services</i>	34	10.7 Social exclusion n.e.c	<i>Social Protection: Social exclusion</i>
11	3.5 R&D public order and safety		35	9.1 Pre-primary education: under fives	<i>Compulsory education</i>
12	3.6 Public order and safety n.e.c.		36	9.1 Primary education	
13	5.1 Waste management		37	9.2 Secondary education	
14	5.2 Waste water management		38	9.3 Post-secondary non-tertiary education	<i>Post-secondary education</i>
15	6.2 Community development		39	9.4 Tertiary education	
16	6.3 Water supply		40	3.1 Police services: Immigration and citizenship	<i>Imm.and citizenship police services</i>
17	6.5 R&D housing and community amenities		41	3.1 Other police services	<i>Other police services</i>
18	6.6 Housing and community amenities n.e.c		42	10.1 Sickness and disability	<i>Social protection</i>
19	8. Recreation, culture and religion		43	10.2 Old age	
20	9.5 Education not definable by level		44	10.3 Survivors	
21	9.6 Subsidiary services to education		45	10.4 Family and children	
22	9.7 R&D education		46	10.5 Unemployment	
23	9.8 Education n.e.c		47	10.6 SP: Housing	
24	10.8 R&D social protection				

The table reports the list of expenditures from Table 5.2 in PESA 2009 (columns 2 and 5), together with the indexing used in the paper (columns 1 and 3) and the category in which they have been grouped in Table 5 (columns 3 and 6).

Table A3 – Results when public goods are apportioned to pre-2004 residents only

	Revenues/Expenditures					
<i>Revenues scenario</i>	1		1		1	
<i>Expenditures scenario</i>	1		2		3	
Fiscal Year	A8	Natives	A8	Natives	A8	Natives
2005-06	2.31	0.90	2.65	0.91	1.85	0.88
2006-07	2.67	0.91	2.85	0.92	2.25	0.89
2007-08	2.18	0.90	2.25	0.90	1.92	0.88
2008-09	2.21	0.82	2.21	0.82	1.99	0.80
<i>Revenues scenario</i>	2		2		2	
<i>Expenditures scenario</i>	1		2		3	
Fiscal Year	A8	Natives	A8	Natives	A8	Natives
2005-06	2.33	0.90	2.67	0.91	1.86	0.88
2006-07	2.69	0.91	2.88	0.92	2.27	0.89
2007-08	2.19	0.90	2.26	0.90	1.93	0.88
2008-09	2.20	0.82	2.20	0.82	1.98	0.80
<i>Revenues scenario</i>	3		3		3	
<i>Expenditures scenario</i>	1		2		3	
Fiscal Year	A8	Natives	A8	Natives	A8	Natives
2005-06	2.21	0.91	2.53	0.91	1.77	0.88
2006-07	2.57	0.92	2.75	0.92	2.17	0.89
2007-08	2.08	0.91	2.15	0.91	1.84	0.88
2008-09	2.12	0.82	2.12	0.83	1.91	0.80

The table reports, for each fiscal year 2005-06 to 2008-09, the ratio of revenues to expenditures for A8 and natives under several scenario, when we apportion public goods according to their marginal cost, i.e. allocating their costs only to pre-2004 residents.. Scenarios differ according to the method followed to apportion revenues and expenditures. Revenues and expenditures scenarios are numbered following Table 4 and Table 5, and the first two rows of the table indicate the scenario reported.