Communities and Local Government

Projections of migration inflows under alternative scenarios for the UK and world economies

Economics paper 3

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Department for Communities and Local Government

The findings and recommendations in this report are those of the authors and do not necessarily represent the views of the Department.

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Contents

Foreword

Evidence and the use of analysis is at the heart of what we do in Communities and Local Government. The Department has a large and active research programme covering a wide range of policy issues, and economic analysis forms an important part of that work.

We need to understand – and be capable of thinking rigorously about – the costs and benefits of government policy, the choices and trade offs that people make in reaching decisions, how regulations and incentives can affect behaviour, and the macroeconomic and social implications.

Migration is a phenomenon that epitomises individual choices, yet translates into significant international patterns which have economic and social consequences. Such patterns not only reveal where certain people want to live, but also the features which make certain places more attractive than others. By recognising these characteristics, we can look forward to see how they will develop over time; and therefore improve our understanding of how migration patterns may change in response to changing economic conditions in migrant source and host countries.

This is what this paper sets out to do. As the economic and social conditions around us change as a result of the global economic downturn, this research takes a longer- term perspective on how the flows of migrants from various parts of the world into the UK might be affected.

This paper is the third in a new series of CLG Economics Papers. We hope that you find it of interest, and would be happy to receive comments and reactions to this and subsequent papers in the series.

Electronic copies of this and earlier reports can be downloaded from our website: http://www.communities.gov.uk/corporate/researchandstatistics

Please contact us at analytical.services@communities.gsi.gov.uk if you wish to be added to the mailing list for these reports.

Grant Fitzner
Chief Economist and Director of Analytical Services
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Executive summary

This study examines the impact of the global economic downturn on the flow of migrants to the UK. The analysis uses the National Institute of Economic and Social Research's global Econometric Model, NiGEM, and builds on the work of Mitchell and Pain on the drivers of international migration into the UK. Mitchell and Pain (2003) estimate that migrant inflows into the UK depend on relative income levels and growth rates, as well as the unemployment rate in the UK while the stock of migrants depends on the speed of reaction to economic events and the net inflow of migrants. Hence, using economic forecasts of the UK and other economies we can produce projections of the number of migrants under different economic scenarios for the UK and migrants' source regions. In this paper, the baseline projection of migrant inflows and stocks is based on the world economy forecasts produced by NIESR in July 2008, and the alternative projection is based on the January 2009 forecasts. The difference between the July 2008 and January 2009 economic forecasts is a direct result of the worldwide economic downturn. Therefore, the difference between the two migration projections demonstrates the effect of the recession on long-run migration flows to the UK.

The UK has been affected relatively severely by the recent global economic crisis. The analysis finds that by 2015, the recession could result in net migration to the UK being some 50,000 lower than in the no recession case. The number of migrants arriving in the UK from Accession 8 (A8) countries is likely to fall the most, although migrants from source countries such as India and the US are also expected to respond relatively quickly to changing economic conditions in their home countries compared to the UK. The empirical evidence suggests that migrants from other parts of the world will be less responsive to the changing economic climate.

The paper suggests a downward revision to projections of the population of migrants resident in the UK by around 360,000 by 2015, reducing the UK labour force by approximately 200,000. In the short-run, the increase in the number of migrants leaving the UK, together with a fall in the number of those coming in, is likely to mitigate the potential increase in the unemployment rate. However, the slowdown in the inflow of migrants also implies that by 2015 UK trend growth could fall by around 0.1 percentage points over the next five years relative to the no recession scenario as a result of the fall in the size of the labour force.

1: Introduction

Migration has become a topical issue, with widespread discussion of its impacts on labour markets, employment and incomes. The recent crisis in the global economy has refocused discussions. In particular, changes to the growth prospects for the UK change both the potential scale of migration and the light in which it is viewed. This report looks at the impact of the crisis on the scale of migration into the UK. Section 2 discusses the level, and geographical origins, of inward migration into the UK over the past two decades. Migration from the New Member States (NMS or A8) is discussed in detail in Section 3. A simple theoretical model of the migration decision is outlined in Section 4 and a forecast of the scale and structure of migration is then discussed in Section 5. There is also a discussion of projections of migration using econometric models as compared to the Office for National Statistics' (ONS) projections. The recent slowdown in economic activity in the UK has been accompanied by rapid reductions in growth elsewhere, and hence it is unlikely to have a major impact on overall stocks of migrants for some years. However, based on the NIESR January 2009 forecast, the scarring from the crisis is likely to be smaller in traditional source countries, and hence the migrant stock might be lower than previously anticipated. All forecasts are uncertain, and Section 6 presents the results of simulations of the factors affecting inflows from source countries, and this allows the projections to be altered in light of changing circumstances. Some concluding comments are given in Section 7.

This report was commissioned by Communities and Local Government and was compiled by Ray Barrell, Sylvia Gottschalk, Simon Kirby and Ali Orazgani[1] from the National Institute of Economic and Social Research.

[1] We have benefited from comments by Carla Clifton and other department officials, James Mitchell and two referees. We would also like to thank participants at the CLG workshop on migration on 23 January 2009. This version includes data up until 20 February 2009 and was finally revised in early April 2009. Contact: r.barrell@niesr.ac.uk

2: Background

Migration in an international context

Data on recent trends in international migration indicate that global labour mobility is much lower than its prominence in political agendas would suggest. Data compiled by the United Nations for 2005 show that individuals residing outside their country of birth comprised just 3.0 per cent of the world's population. Moreover, during the last two decades the stock of international migrants has grown only modestly, rising from 2.2 per cent of the world population in 1980 to 2.9 per cent in 1990 and marginally after that[2]. The G7 countries were among the main recipients of international migrants but not the countries most impacted by migration. Australia (24 per cent), Switzerland (24 per cent), New Zealand (19 per cent), and Canada (19 per cent) were the countries with the largest immigrant presence in 2005, followed by Germany (13 per cent), the US (13 per cent), France (10 per cent), and the UK (10 per cent).

The last decade saw a substantial rise in the share of foreign-born populations in several OECD countries. Over the period 1995-2005 the largest changes occurred in Ireland (4.1 per cent increase), the US (3.6 per cent increase), New Zealand (3.2 per cent increase), the UK (2.8 per cent increase), Norway (2.7 per cent increase), Canada (2.5 per cent increase), Belgium (2.4 per cent increase), and Switzerland (2.4 per cent increase)[3]. Clearly, these official data underestimate the full scale of migration, since inflows of illegal immigrants are usually not taken into account.

Low-income countries are an important source of migrants to high-income OECD nations. Hanson (2008) and Beine, Docquier and Marfouk (2007), show that in 2000 67 per cent of immigrants in the OECD were from a developing country, up from 54 per cent in 1990. Among developing migrant-sending regions, Mexico, Central America, and the Caribbean are the most important, accounting for 20 per cent of OECD immigrants in 2000, up from 15 per cent in 1990. Half of this region's migrants come from Mexico, which in 2000 was the source of 11 per cent of OECD immigrants, making it the world's largest supplier of migrants. However, this migration was largely to the US and hence is not directly relevant to this study. The next most important developing source countries are Turkey (3.5 per cent); China, India, and the Philippines (each with 3 per cent); Vietnam, Korea, Poland, Morocco, and Cuba (each with 2 per cent); and Ukraine, Serbia, Jamaica and El Salvador (each with 1 per cent).

[2] *Source:* Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, Trends in Total Migrant Stock: The 2005 Revision http://esa.un.org/migration.

[3] The *OECD Migration Outlook for 2008* data we use does not include Spain because of the timing and definition issues but the shares of foreign born population for Spain in 2001 were 5.3 per cent and by 2006 that had risen to 11.9 per cent, which gives an increase of 6.6 percentage points which is larger than other OECD countries.

Although the total number of international migrants represents a small share of global population, the macroeconomic and social impacts of migration on individual countries can be significant. There is some evidence that immigrants from low-income countries tend to be highly educated and highly skilled, thereby depleting developing countries of human capital necessary for economic development. Recent papers, for instance Docquier and Marfouk (2007) and Benhabib and Jovanovic (2007), confirm the findings of earlier papers in that respect (Bhagwati and Hamada 1974). However, immigrants often have education levels below those of the population of the recipient country, since in many source countries the average level of schooling is lower than in receiving countries. As a result, from the receiving country's perspective, the average immigrant is relatively low-skilled and a low-income earner. However, Grogger and Hanson (2008) show that countries in which the rewards to education and skill are greater tend to attract a larger share of more educated migrants. The US and Canada for instance receive 51.4 per cent of OECD's immigrants, and 66 per cent of them were educated to university levels. Europe, in contrast, receives 38 per cent of OECD's immigrants, but only 24 per cent of them were university graduates.

Large inflows of unskilled immigrants are usually viewed as a potential burden on social welfare and means-tested governmental schemes (See Wellish and Walz 1998 and Borjas and Hinton 1996). Cohen and Razin (2008) investigate the impact of benefits under two immigration policies: free and controlled. Using OECD data and looking at migration to the European Union the authors find that higher welfare state benefits tend to attract lower skilled immigrants under free immigration. When immigration is controlled as it is in the UK, however, the educational level of immigrants tends to be higher. Unlike their low-skilled counterparts, highly skilled immigrants tend to be net contributors to the welfare state. They can thus help finance a more generous welfare system and are preferred by policy makers.

The analysis of economic impacts of migration tends to focus either on the benefits of migration on source and recipient countries or on its costs. Hanson (2008) investigates both aspects of international migration, and finds that there are undoubtedly large gross gains to international migration, but that net gains are more difficult to assess and less general. International migration expands global output by moving labour from low productivity to high productivity countries. In the absence of data on migration costs, net gains of migration from the perspective of the immigrants themselves are difficult to assess.

Impact of immigration on receiving countries

Regarding the affect on receiving countries, most studies have tended to focus on the impacts on labour markets. Hanson (2008), Borjas (2003) and Aydemir and Borjas (2007), among others, find evidence that immigration tends to depress wages for US and Canadian low-skilled workers. Negative wage effects of migration were also found in Germany (De New and Zimmerman 1994), and in Austria (Hofer and Huber 2003). In the UK, Dustmann, Frattini and Preston (2007) found that immigration had different effects along the distribution of wages for native workers. In particular, they showed that immigration depressed wages slightly for the bottom 20 per cent of the wage distribution, but led to a slight increase in the upper part of the wage distribution. The overall effect on average wages was slightly positive because, they believe, immigrants are paid less than the value of their contribution to production. A more recent study by Nickell and Saleheen (2008) found that, once the occupational breakdown is incorporated into a regional analysis of immigration in Britain, the immigration-native ratio has a significant negative impact on wages in the semi/unskilled services sector. Finally, Reed and Latorre (2009) also conclude that over the period 2001 to 2007, an increase in the share of migrants in the UK working age population would reduce wages by a small but significant amount. However, the empirical literature on the effects of immigration on the wages of natives is not clear cut, as negligible or no negative wage effects were found in Germany (Pischke, Jorn-Steffen and Velling 1997) the Netherlands (Zorlu and Hartog 2005), or in Spain (Carrasco, Jimeno and Ortega 2008). In the UK too, a recent review of the theoretical literature in Reed and Latorre concluded that it is extremely unlikely that increased migration into the UK will have a substantial negative effect on either wages or employment in aggregate, and they add that while there could be a small negative effect on wages and/or employment, immigration could also be positive or have no effect at all on the wages of native workers.

Recent trends in migration flows to the UK

Recent studies of the impacts of migration in the UK include Barrell, Fitzgerald and Riley (2009) which focused mainly on migration from European Union New Member States (NMS), which joined the EU in 2004. In particular, migration from the so-called Accession 8 (A8) countries (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia) was considered, as their nationals were allowed to settle in EU member states.[4] The paper also distinguishes itself from the literature surveyed above in that it investigates the impacts of short-term migration from the A8 to the UK on source and host countries, rather than the impacts of immigration on the host country. Using a general equilibrium model of the economy, NiGEM[5], Barrell, Fitzgerald and Riley (2009) estimate that

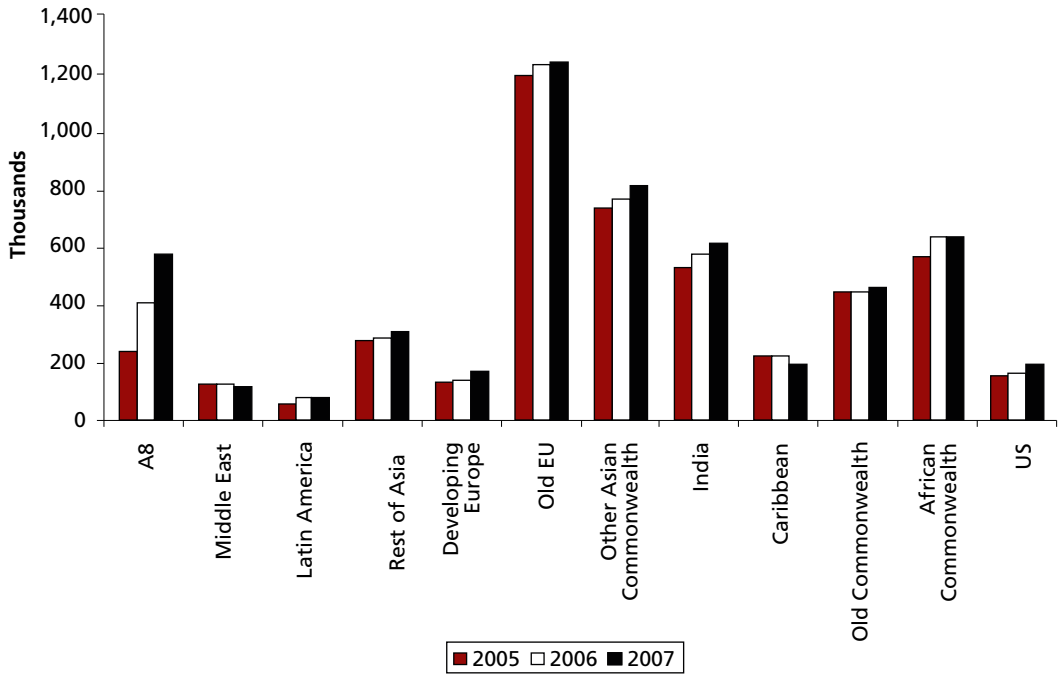
[4] NMS also comprised Malta and Cyprus. Both countries enjoyed free access to the UK labour market prior to accession. From the UK's perspective it is the accession of the A8 that is the significant policy change. Bulgaria and Romania joined the EU in 2007. In contrast to the A8, the right to settle in the EU was restricted for the population of these two countries.

[5] NiGEM is the National Institute Global Econometric Model.

emigration from Poland could have reached around 1/3 million people of working age, and would reduce Polish output by around 2 per cent permanently. Similar effects are found in other A8 countries; Lithuania in particular. The impact on UK and Irish output presents a reverse pattern. The increase in the labour force raises potential output and in the longer term GDP rises to match this increase. However, the effects are not necessarily one-to-one due to changes in labour productivity. In the UK, for instance, GDP would increase permanently by 0.6 per cent, but Irish GDP would rise by 1.7 per cent, as the population of Ireland has been increased by a larger proportion than in the UK.

Figure 1 reports the stock of foreign-born residents in the UK. The source countries are grouped as in our modelling work set out below. It is clear from Figure 1 that cultural and historical links to the UK play an important role in the decision to settle in the UK. Over the period 2005-2007 and on average, 49 per cent of migrants were from Commonwealth countries. Adding the United States, and Hong Kong, which was a British territory until 1997, this share reaches 54 per cent. Finally, if the European Union, which importantly for this purpose includes the Republic of Ireland, is included, owing to historical ties or rights to live in the country given that EU nationals have the right to settle in the UK, the share of foreign-born residents with ties to or rights in the country accounts for 78 per cent.

Figure 1: Migrant stocks in the UK



Source: Table 1.3 in ONS (various editions) Population by country of birth and nationality, available from: http://www.statistics.gov.uk/statbase/Product.asp?vlnk=15147.

A large number of foreign-born residents in the UK are from the Asian Commonwealth countries, comprising India, Pakistan, Bangladesh, Malaysia, Singapore and Sri Lanka. Estimates of the foreign population resident in the UK produced by the ONS show that in 2004, 1.2 million people from this region settled in the UK, rising to over 1.4 million in 2007. The vast majority of these residents are from India and Pakistan, which represented 43 and 24 per cent respectively in 2004, and 40 and 24 per cent respectively in 2007, of the stock of migrants from south Asia. The 14 countries of the pre-Accession European Union constitutes the second major source of foreign-born residents. This stock, dominated by Irish citizens, but also with large groups of German, French, Spanish and Italian nationals, has been stable at around 1.2 million[6]. The stock of migrants from the eight New Member States has been rising, and by 2007 there were around 600,000 residents from these countries. We do not include Malta and Cyprus in either the EU or the group of New Member States, although together they have a stock of around 100,000 residents in the UK. These two countries were in the Commonwealth data group until 2004 and then became part of the expanded EU. They form part of our residual category.

The next three large groups of foreign-born residents also come from other Commonwealth countries, but the respective stocks are at a significantly smaller scale. Residents from the African Commonwealth, in particular Kenya, Nigeria and Zimbabwe numbered 578,000 people in 2004, rising to 650,000 in 2007. Residents from Australia, Canada, New Zealand and South Africa (Old Commonwealth) amounted to an average of 440,000 people during 2005-2007. As in the case of European residents, numbers remained stable during this period. Finally, residents originating from the Caribbean (mostly Jamaica) represented around 200,000 people over the 2005-2007 period[7].

Important source countries include China (with Hong Kong) and the United States. Nationals of these countries constitute, respectively, 172,000 and 188,000 residents in the UK in 2007. In both cases, numbers remained stable, with a slight rising trend. In this case as well, historic and cultural ties to the UK appear to be a strong determinant of the decision to take up permanent residence. Until 1997 Hong Kong was a British territory, and until 2006 its nationals represent the majority of the stock of residents for this grouping. In 2005, nationals from Hong Kong accounted for 57 per cent of total Chinese residents, however this declined to 45 per cent in 2007.

The non-EU European countries, including Russia, Turkey and Ukraine are represented by a substantial number of residents on the UK, around 170 thousand in 2007. Nationals from East Asian economies, including China, Indonesia and the non-Commonwealth Asian countries not included in the Middle East ranged between 253,000 in 2005 to 333,000 in

[6] The stock figures suggest that there are over 400,000 Irish national residents in the UK. The flow figures, discussed below, are based on the International passenger Survey, and this does not cover Irish migrants. Given the size of the stock, and the adjustment that is made for this in this survey, this probably under-represents the gross flow.

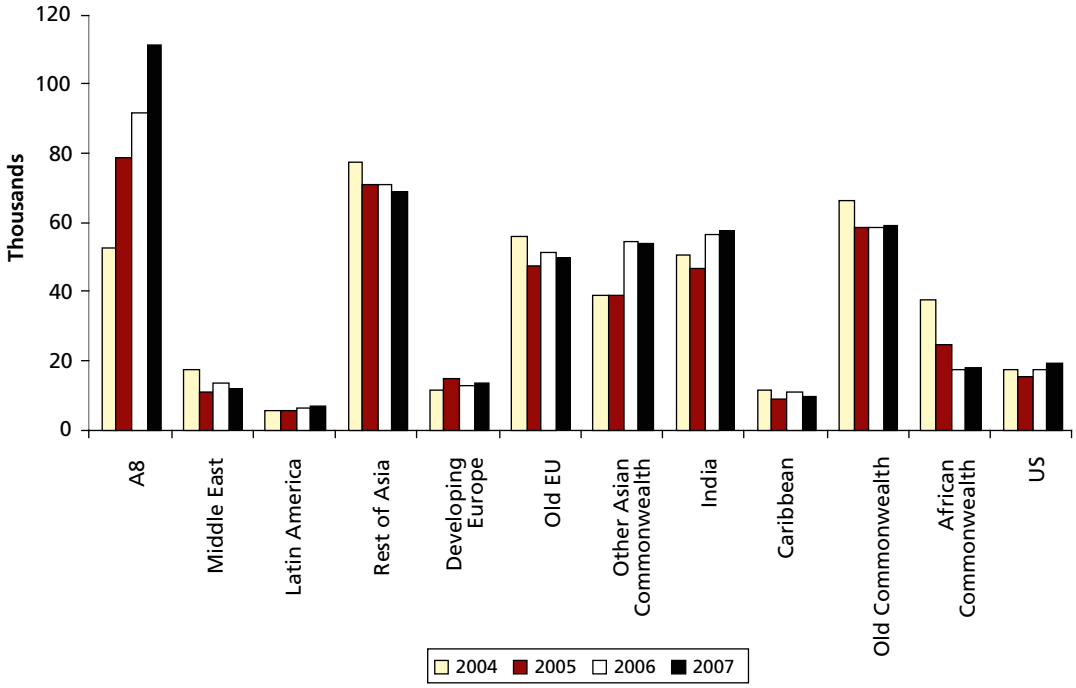
[7] The fall in the stock of Caribbean nationals between 2006 and 2007 does not represent a genuine reduction, but rather reflects the fact that Barbados and Guyana disappear from the stock data in that year, although their stocks had been stable at around 50,000 between them in the previous three years. Our data is from a table on the 60 largest source countries and hence smaller stocks for aggregates are liable to change for this reason alone.

2007. This increase reflects largely the rise in Afghan originated residents, but once again the data are affected by exclusion from the largest 60 countries over time, with the Thai stock disappearing from the data in 2006. Residents originating from non-Commonwealth Latin America and nationals of Middle East countries represent 70,000 and 110,000 residents toward the end of the whole period.

The recent evolution of the stock of residents originating from the A8 countries is particularly striking. It is the only group of source countries where the number of residents rose fourfold in four years. Moreover, it is difficult to account for this increase in the number of permanent residents on the grounds of linguistic or cultural ties. These are the Eastern European countries, which became members of the European Union in 2004, and their nationals were allowed to ultimately work in any country of the EU, with temporary restrictions until 2010 on migration into all countries except the UK, Ireland and Sweden. The resulting patterns of migration are discussed in Barrell, Fitzgerald and Riley (2009). As these countries are particularly significant we discuss them below. In 2004, 131,000 A8 nationals lived in the UK, rising to 575,000 in 2007. The bulk of residents come from Poland, which represented on average 68 per cent of the total A8 residents. It should also be noted that significant numbers of nationals from only 5 of the 8 countries actually took up residence in the UK: Czech Republic, Hungary, Latvia, Lithuania and Poland. Of the remaining A8 countries, this may reflect the registration patterns of Slovak citizens, and is influenced by the very strong ties between Estonia and Finland on the one hand and Slovenia and Austria on the other.

Figure 2 shows the gross inflow of migrants to the UK between 2004 and 2007 using the groupings from this study. These data were taken from the International Passenger Survey (IPS), which are available for the 1991-2007, and as such are not fully consistent with the stock data from the Labour Force Survey (LFS), as some inflows are clearly under-recorded. This is particularly the case for the A8, which has been the major source country grouping for inflows of migrants over the past four years. This can be seen as part of an adjustment of stocks of migrants after the removal of a barrier and also a reflection of the existence of barriers to other obvious destination countries such as Germany, France and the Netherlands. The major source regions of the remaining migrants were the European Union, India, and the rest of Asian Commonwealth, non-Commonwealth Asia (including Hong Kong), the old Commonwealth and the African Commonwealth. Migration inflows from Latin America, the Caribbean and from the US remained relatively moderate over this period.

Figure 2: Gross inflows of migrants



Source: Table 3.1.International Migration, (International Passenger Survey) 1991-2006.

3: Characteristics of A8 migrants

The most interesting changes to migration stocks and inflows in recent years have concerned the developments in relation to the A8. The stock and gross inflow data discussed above suggest that migrants from these countries might stay for only short periods of time, but it is difficult to assess this because the stock and flows have yet to reach their steady states. In the meantime, we can utilise alternative survey data to examine the characteristics of recent migrants in relation to migrants from over the past decade. Tables 1 to 4 report labour market statistics on the stock of migrants from the A8 countries since their accession to the EU in 2004. The data is presented for the first quarter of each year from 2005 to 2008, highlighting the evolution of these migrant stocks over time. Alongside this data on migration from the A8 countries since accession, we also present data on migration from all countries since 2004, data on migration over the period 1998-2003, and data on the labour market characteristics of the resident population of the UK.

Table 1: The structure of recent immigration (First quarter 2005)

	Population Structure	**Of which came to the UK**		
	First quarter of 2005	**1998-2003**	**2004**	
		All	**All**	**A8**
Numbers (thousands)	59306	1517	394	62
Age 18-24	5349	236	105	21
(% of total)	(9.0)	(15.5)	(26.6)	(34.7)
Age 25-34	7864	634	134	20
(% of total)	(13.3)	(41.8)	(33.9)	(33.2)
Age 35-49	13160	299	60	10
(% of total)	(22.2)	(19.7)	(15.1)	(16.5)
Working age	36972	1245	315	54
(% of total)	(62.3)	(82.1)	(80.0)	(88.2)

(table continues overleaf)

Table 1: The structure of recent immigration (First quarter 2005) *(continued)*

	Population Structure	Of which came to the UK		
	First quarter of 2005	1998-2003	2004	
		All	All	A8
Working age labour force	28982	877	202	47
(% of working age population)	(78.4)	(70.4)	(64.2)	(85.6)
Working age employed	27592	804	177	36
(% of working age population)	(74.6)	(64.6)	(56.1)	(65.4)
Working age unemployed	1390	72	25	11
(% of labour force)	(4.8)	(8.2)	(12.6)	(23.6)
In professional, managerial, and associate professional occupations	11500	368	66	–
(% of employed working age population)	(41.7)	(45.8)	(37.2)	–
In intermediate occupations	10940	244	62	15
(% of employed working age population)	(39.7)	(30.3)	(35.3)	(42.2)
Process, plant and machine operatives and elementary occupations	5151	193	49	18
(% of employed working age population)	(18.7)	(24.0)	(27.5)	(50.2)
Average years in UK		4.1	0.9	1.0

Source: Quarterly Labour Force Survey 2005Q1; Numbers weighted with population weights

Notes: (-) LFS sample size too small to report; population size differs from mid-year population estimates.

These figures are derived from the UK Labour Force Survey (LFS). The LFS is a quarterly survey of approximately 61,000 households, with a 5-quarter rolling panel design. The LFS probably underestimates the number of recent migrants. House of Lords (2008) notes the LFS sampling frame excludes those who have lived in the UK for less than six months and those who live in communal establishments[8]. Despite these shortcomings the LFS

[8] The LFS covers only a sub-sample if the UK population. As such the population estimates are slightly below the official mid-year population estimates.

is probably the most suitable data source currently available to provide information on the labour market characteristics of the stock of migrants resident in the UK. The data presented are for the first quarter of the year only. This avoids any seasonal variation allowing a more robust comparison across years.

Table 2: The structure of recent immigration (First quarter 2006)

	Population structure	Of which came to the UK		
	First quarter of 2006	1998-2003	2004-2005	
		All	All	A8
Numbers (thousands)	59659	1493	850	204
Age 18-24	5477	208	205	70
(% of total)	(9.2)	(13.9)	(24.1)	(34.3)
Age 25-34	7833	648	311	79
(% of total)	(13.1)	(43.4)	(36.6)	(38.9)
Age 35-49	13298	325	126	24
(% of total)	(22.3)	(21.8)	(14.9)	(11.6)
Working age	37272	1245	683	179
(% of total)	(62.5)	(83.4)	(80.4)	(87.9)
Working age labour force	29303	902	482	157
(% of working age population)	(78.6)	(72.4)	(70.6)	(87.5)
Working age employed	27734	817	435	145
(% of working age population)	(74.4)	(65.6)	(63.7)	(81.0)
Working age unemployed	1569	85	47	12
(% of labour force)	(5.4)	(9.4)	(9.8)	(7.4)

(table continues overleaf)

Table 2: The structure of recent immigration (First quarter 2006) *(continued)*

	Population structure	Of which came to the UK		
	First quarter of 2006	1998-2003	2004-2005	
		All	All	A8
In professional, managerial, and associate professional occupations	11820	356	156	15
(% of employed working age population)	(42.6)	(43.6)	(36.0)	(10.6)
In intermediate occupations	10714	275	120	39
(% of employed working age population)	(38.6)	(33.7)	(27.5)	(27.0)
Process, plant and machine operatives and elementary occupations	5203	185	159	91
(% of employed working age population)	(18.8)	(22.7)	(36.6)	(62.4)
Average years in UK		5.1	1.4	1.3

Source: Quarterly Labour Force Survey 2006Q1; Numbers weighted with population weights

Notes: (-) LFS sample size too small to report; population size differs from mid-year population estimates.

These data are an update of the estimates provided in Riley and Weale (2006) and Kirby *et al*. (2007). Differences between the reported estimates and those from earlier estimates are mainly due to more up-to-date data underlying the current estimates. A significant part of this is the use of a more recent vintage of population weights in the LFS micro data files. We use country of birth to determine migrants. This approach provides consistency with the official estimates used to produce the simulations presented in this report. In previous publications we have used the nationality of an individual (see Kirby, *et al.*, 2007 for example).

The stock of migrants from the A8 has increased significantly since Accession. The LFS suggests that there were around 62,000 A8 migrants in the UK in the first quarter of 2005. This stock has risen consistently, reaching 566,000 (0.9 per cent of the resident population) in the first quarter of 2008[9]. The tables show that migrants are predominately of working age. For A8 migrants this is no exception. In the first quarter of 2008, 86.5 per cent of the

[9] The LFS almost certainly underestimates the stock of migrants from the A8 in the first quarter of 2005 due to the requirement of living in the UK for 6 months to be eligible to participate in the survey. Indeed data on A8 migrant inflows from the Worker Registration Scheme suggest in the last three quarters of 2004 almost 126,000 applicants to the Worker Registration Scheme were accepted. In future years this is less of a concern. However, the caveat still stands if a significant proportion of the migrant inflow from A8 remains in the UK for less than 6 months. In this scenario the LFS will significantly under-report the true migrant stock in the UK.

migrants from A8 were of working age. The corresponding figure for all migrants that have arrived since 2004 was only 82.1 per cent. For the resident population of the UK the working age proportion is only 62.4 per cent.

Migrants from the A8 differ from other migrant stocks in a number of significant ways. They are younger. Initially 34.7 per cent of the A8 migrant stock was aged 18-24. This share has fallen back somewhat (to 28.5 per cent in the first quarter of 2008), but still remains high relative to the UK population in general and to all migrants who arrived in the UK in 2004-07.

The stock of A8 migrants is significantly different in much of their labour market behaviour. The participation rate of the working age population is high, varying between 88 and 89 per cent over the four-year period we examine. This compares with much lower participation rates of other migrant groups and the resident population in general. As Riley and Weale (2006) show migrant populations have a higher propensity to participate in full-time education[10]. This would not seem to be the case for migrants from A8 since 2004.

Migrants from the A8 have a high employment rate relative to other migrant groups and the resident population in general. By the first quarter of 2008 the employment rate of migrants from A8 reached 83.7 per cent. This compares with an employment rate of 74.6 per cent for the resident UK population. However, the data does suggest that there was some adjustment to the expansion of labour supply from the A8. The employment rate of migrants from the A8 in the first quarter of 2005 was only 65.4 per cent in comparison to an employment rate of 74.6 per cent for the resident population of the UK.

The migrants from the A8 are also more likely to be employed in low skilled occupations and less likely to be employed in managerial and professional occupations in comparison to other migrant groups and the resident population of the UK in general. From 2006 to 2008 the proportion of employed A8 migrants in low skilled occupations has remained above 60 per cent. In comparison, the figure for non-A8 migrants who have arrived since 2004 is between 20 and 25 per cent over the same time period. Clearly migrants from the A8 have been concentrated disproportionately in low skilled occupations. This is not to suggest that these workers are low skilled. Indeed, House of Lords (2008) refer to evidence, which suggests there is significant mismatch between the education/skills and employment of A8 migrants.

[10] This may still be an under-estimate since students living in halls of residence who do not have a parent resident in the UK are not sampled by the LFS.

Table 3: The structure of recent immigration (First quarter 2007)

	Population structure	Of which came to the UK		
	First quarter of 2007	1998-2003	2004-2006	
		All	All	A8
Numbers (thousands)	60021	1510	1290	401
Age 18-24	5600	170	294	122
(% of total)	(9.3)	(11.2)	(22.8)	(30.4)
Age 25-34	7803	604	501	172
(% of total)	(13.0)	(40.0)	(38.8)	(43.0)
Age 35-49	13391	386	198	43
% of total)	(22.3)	(25.6)	(15.3)	(10.8)
Working age	37505	1249	1057	356
(% of total)	(62.5)	(82.8)	(82.0)	(88.8)
Working age labour force	29441	905	775	315
(% of working age population)	(78.5)	(72.4)	(73.4)	(88.6)
Working age employed	27776	826	685	291
(% of working age population)	(74.1)	(66.1)	(64.8)	(81.7)
Working age unemployed	1665	78	90	24
(% of labour force)	(5.7)	(8.7)	(11.6)	(7.7)

(table continues overleaf)

Table 3: The structure of recent immigration (First quarter 2007) *(continued)*

	Population structure	Of which came to the UK		
	First quarter of 2007	1998-2003	2004-2006	
		All	All	A8
In professional, managerial, and associate professional occupations	11902	377	225	31
(% of employed working age population)	(42.9)	(45.6)	(32.8)	(10.7)
In intermediate occupations	10705	267	190	77
(% of employed working age population)	(38.5)	(32.3)	(27.7)	(26.3)
Process, plant and machine operatives and elementary occupations	5169	183	270	183
(% of employed working age population)	(18.6)	(22.1)	(39.5)	(63.0)
Mean years in UK		6.1	1.9	1.8

Source: Quarterly Labour Force Survey 2007Q1; Numbers weighted with population weights

Notes: (-) LFS sample size too small to report; population size differs from mid-year population estimates.

Tables 1 to 4 show that the mean number of years an A8 migrant stays in the UK has increased the further ahead we move from Accession. By the first quarter of 2008, the mean length of stay in the UK was 2.3 years. This is broadly the same length of stay as for non-A8 migrants who arrived after 2004. As the tables show the mean length of stay is increasing in-line with our distance from the Accession date. It is possible the mean length of stay in the UK will continue to increase in future years. Indeed this would be probable if those A8 migrants that are currently resident stay for a significant length of time. This implies the stock will continue to expand for several years. However, other EU countries have started to remove restrictions on labour mobility from the A8 countries. By 2011 restrictions across the EU will have been entirely removed. As such, we can expect a noticeable reduction in inflows from A8 countries over this period. We would expect the stock of A8 migrants to peak relatively soon. In fact, evidence from the Worker Registration Scheme (WRS) suggests the inflow of migrants from the A8 has already peaked. We expand upon this issue following a discussion of the modelling framework that underlies this report.

Table 4: The structure of recent immigration (First quarter 2008)

	Population structure	Of which came to the UK		
	First quarter of 2008	1998-2003	2004-2007	
		All	All	A8
Numbers (thousands)	60434	1415	1797	566
Age 18-24	5699	171	420	161
(% of total)	(9.4)	(12.1)	(23.4)	(28.5)
Age 25-34	7832	570	711	242
(% of total)	(13.0)	(40.3)	(39.6)	(42.7)
Age 35-49	13428	396	275	71
(% of total)	(22.2)	(28.0)	(15.3)	(12.5)
Working age	37708	1226	1475	490
(% of total)	(62.4)	(86.6)	(82.1)	(86.5)
Working age labour force	29722	911	1081	434
(% of working age population)	(78.8)	(74.3)	(73.3)	(88.5)
Working age employed	28130	836	1000	410
(% of working age population)	(74.6)	(68.2)	(67.8)	(83.7)
Working age unemployed	1591	75	81	24
(% of labour force)	(5.4)	(8.2)	(7.5)	(5.4)
In professional, managerial, and associate professional occupations	12209	391	304	30
(% of employed working age population)	(43.4)	(46.8)	(30.4)	(7.4)
In intermediate occupations	10611	266	283	110
(% of employed working age population)	(37.7)	(31.8)	(28.3)	(26.7)

(table continues overleaf)

Table 4: The structure of recent immigration (First quarter 2008) *(continued)*

	Population structure	**Of which came to the UK**		
	First quarter of 2008	**1998-2003**	**2004-2007**	
		All	**All**	**A8**
Process, plant and machine operatives and elementary occupations	5308	178	413	270
(% of employed working age population)	(18.9)	(21.3)	(41.3)	(65.9)
Mean years in UK (working age)		7.1	2.4	2.3

Source: Quarterly Labour Force Survey 2008Q1; Numbers weighted with population weights

Notes: (-) LFS sample size too small to report.

4: Empirical framework

In this report we combine Mitchell and Pain's model of the drivers of international migration into the UK (2003) with our forecasts for the UK and world economies as produced by NIESR's global econometric model (NiGEM), to examine how the deterioration in economic conditions since summer 2008 could impact on the flows of international migrants in and out of the UK, and how that in turn could affect UK's trend growth over the next five years.

The Mitchell and Pain model

Mitchell and Pain (2003) estimate an error correction model for a panel of 10 migrant source countries[11]. These are old Commonwealth (Australia, New Zealand, Canada and South Africa), new Commonwealth, other Commonwealth, African Commonwealth, Asian Commonwealth, Africa and the Middle East, rest of Asia, European Union, developing Europe and US. Their main result shows that the long-run behaviour of the rate of migration is determined by the migrant stock relative to the total population of the source country, UK income relative to that of the source country, bilateral trade, UK income growth relative to that of major competitor destinations in Europe, namely Germany, France, Italy and Spain,[12] and finally the UK unemployment rate. In the short-run, however, the change in UK income growth relative to those of source countries is an important determinant of the growth rate of migrants to the UK[13].

Mitchell and Pain (2003) find clear evidence of heterogeneity in the panel. In particular, two overall groupings can be obtained. The first encompasses the EU, old Commonwealth, African Commonwealth, the rest of Africa and the rest of Asia. The remaining locations form the second group. The first group is characterised by a smaller adjustment parameter to the long-run equilibrium, while the speed of adjustment of the second group is approximately three times higher. This implies that, following a shock to any of the factors that influence the long-term behaviour of migration, migration inflows from the first group will revert to their long-run pattern much more slowly than the second group.

[11] More detail of Mitchell and Pain (2003) can be found in appendix A.

[12] In Mitchell and Pain (2003), the EU4 group consisted of France, Germany, Belgium and the Netherlands. However, for the purpose of this paper, we have replaced Belgium and the Netherlands with Italy and Spain to reflect the increase in the importance of these two countries as migrant destination countries over the last five years.

[13] Incomes across countries are adjusted for purchasing power parity.

The long-run behaviour of migration of the whole panel of countries is given by equation

$$\ln\left(\frac{m_{i,t}}{P_{i,t}}\right) = 0.782 * \ln\left(\frac{S_{i,t-1}}{P_{i,t-1}}\right) + 0.059 * D_{i,t-1} + 0.676 * \ln\left(Y_{i,t-1}\right) + 0.176 * \ln\left(TR_{i,t-1}\right)$$
$$+2.193 * \ln\left(YR_{i,t-1}\right) - 0.01 * U_{i,t-1}$$

Where *i* denotes the migrant source country, *m* the migration inflow, *P* the source country population, *S* the migrant stock already in the UK, *D* the demographic share or specifically the proportion of the population in the source country i aged 15-29, *Y* per capita income in the UK relative to the source location, *YR* the income differential between the UK and the EU4,[14] TR is the bilateral trade-GDP ratio, and finally U is the UK unemployment rate.

For the purpose of the analysis in this paper, we use EU14 instead of EU4 as the alternative destination country group, and for simplicity we eliminate the trend like variables, i.e. the demographic share and the bilateral trade-GDP ratio; because they affect neither variations in our forecast in response to changes in the economic environment nor do they affect the simulation properties of the model. As a result we have the following long-run relationship:

$$\ln(m_{i,t} / P_{i,t}) = 0.782 * \ln(S_{i,t-1} / P_{i,t-1}) + 0.676 * \ln(Y_{i,t-1}) + 2.193 * \ln(YR_{i,t-1}) - 0.01 * U_{i,t-1}$$

We can write this long run equation as the attractor in a dynamic equilibrium correction equation in non-linear form so that the dependent variable becomes the change in the migration rate. We write this in general form as Mitchell and Pain demonstrate that the equilibrium correction parameter takes two values. They also test amongst the dynamic terms and find only the change in relative incomes is significant.

$$\Delta \ln(m_{it} / p_{it}) = \Phi_i [\ln(m_{i,t-1} / p_{i,t-1}) - \Theta x_{it}] + \sum_{j=1}^{p-1} \lambda_j \Delta \ln(m_{i,t-j} / p_{i,t-j}) + \sum_{j=0}^{q-1} \delta_j \Delta x_{i,t-j} + \mu_i + \varepsilon_{it}$$

This equation implies that the rate of migration changes over time in order to eliminate any differences between the past migration rate and the current equilibrium rate of migration determined by the factor in the previous equation which we denote x_{it} here. The steady state rate of migration is determined by the linear combination of long-run economic and demographic driving factors. When ϕi does not differ significantly from –1, adjustment is instantaneous. If it is insignificantly different from zero, the migration rate does not adjust towards any particular long-run level generated by a fixed linear combination of the variables included in the equilibrium-correction term (Mitchell and Pain, 2003). The coefficient on the short-run dynamic term (the change in UK income growth relative to that of the source country) is 2.69. The equilibrium-correction parameter, that gives the speed of adjustment to the long-run equilibrium, is -0.27 for group 1 and -0.88 for group 2.

[14] The EU4 are Germany, France, Italy and Spain.

The NiGEM model

NiGEM is used in this paper to produce forecasts of the UK and source countries' economies. NiGEM is a large estimated quarterly model of the world economy, which uses a 'New-Keynesian' framework where agents are assumed to be forward-looking but nominal rigidities slow the process of adjustment to the long-run equilibrium, as is discussed in Barrell et al. (2006)[15]. There are country models for each member of the European Union[16], and also for the individual members of the old Commonwealth, Australia, New Zealand, Canada and South Africa, as well as India, China, Russia, Mexico, Brazil, the US, Japan and a number of other countries and regional blocs. All country models contain the determinants of domestic demand, trade volumes, prices, current accounts and net assets. Domestic demand, aggregate supply, and the external sector are linked via the wage-price system. The model determines income and wealth, has a description of the financial and government sectors, and competitiveness has a strong role to play in determining the equilibrium of the model. The external sector links the domestic economy to the rest of the world.

In the supply side of NiGEM long-term output is determined by a Constant Elasticity of Substitution (CES) production function with labour augmenting technical progress, and long-run labour and capital demands are consistent with the production function. The labour market embodies an equilibrium level of employment. Employers have the right to manage, and the bargain in the labour market is over the real wage. Real wages, therefore, depend on the level of trend labour productivity as well as the rate of unemployment. Wage equations are designed to be consistent with the production function, and include both forward and backward looking elements. The labour force is assumed to grow in line with the population of working age and any exogenous changes in the participation rate.

Population stocks and inflows are modelled for all countries in this study. All countries have a total population, a working age and a retired population, and a labour force. Most of these are determined by age structure and participation equations and run off the total population. In this study total population and hence the population of working age, the labour force and employment are affected by migration. We assume migrant and native populations in the receiving country are equally productive and perfect substitutes, and that their productivity rises at the same rate over time.

Models such as NiGEM need both policy reactions and assumptions about expectations in order to produce coherent results. We assume that financial markets for equities, bonds and the foreign exchanges are forward looking and that their expectations are outcome consistent. Exchange rates, equity prices and bond prices will 'jump' in response to a shock, taking into account future events. Labour market bargains are also assumed to look forward and hence if the shock changes the expected level of unemployment in the

[15] For more details of NiGEM see Appendix B.

[16] Excluding Luxemburg, Malta and Cyprus.

future will feed through expected inflation to the level of wages agreed now. Investment depends on the expected level of capacity output in four years and hence an expected increase in migration will induce a rise in investment to help employ the increased labour force. Monetary policy targets inflation, with short-term rates adjusting slowly. An increase in inward migration would put downward pressure on inflation and hence would allow the authorities to reduce interest rates. Government spending plans are set in relation to trend output, and taxes are set to achieve a medium term debt target. Spending depends on the level of unemployment and the age structure of the population. Migration will change both of these and hence will affect tax rates in the future.

In our analysis, we consider 12 source locations, which are presented in Table 5 overleaf. The US is modelled separately, and the four models of the old Commonwealth countries on NiGEM, Australia, Canada, New Zealand, and South Africa, are aggregated together. The core 14 EU countries in addition to Norway and Switzerland are all individually modelled in NiGEM and are aggregated for this analysis. The group "other Commonwealth countries", which include mostly the Caribbean, is not represented in NiGEM explicitly, but is part of an aggregate, Latin America (excluding Brazil and Mexico), and we use that grouping for them. Brazil and Mexico did not exist separately on the model in 2003, and we use them for the non-Commonwealth Latin American group in Mitchell and Pain (2003). These countries are the two biggest countries of this region in population terms. Table 5 summarises our groupings and compares them to Mitchell and Pain (2003).

We have split the group "rest of Europe" into the A8 countries, and a group comprising Russia, developing Europe, which includes Turkey, the former Soviet republics along with much of former Yugoslavia and Albania. Bulgaria and Romania are also included in this group since they face restrictions on labour mobility as compared to other EU members. The African Commonwealth, whose most populous country is Nigeria, is represented by the NiGEM aggregate for oil producers. We have a separate model for India, and an aggregate model for South Asia, which is dominated in population terms by Pakistan and Bangladesh. These two groups cover the new Commonwealth. Hong Kong and China are modelled separately in NiGEM, but were incorporated into the rest of Asia in Mitchell and Pain (2003). This group also included Japan and Korea. We consider them jointly and separately for the forecasts and simulations in this paper[17].

[17] The simulations in this report have country groupings that are much closer to the estimated pattern of flows than was possible in 2003 on NiGEM, as many of the relevant countries were missing from the model at that point. Hence, our results would differ from the Mitchell and Pain simulations but be a better representation of their empirical work.

Table 5: Source country groupings

Source Country Group	Mitchell and Pain (2003)	This paper
Old Commonwealth	AU, NZ, CN and SA	AU, NZ, CN, and SA (Slow – group 1)
African Commonwealth	All except SA	Oil Producers (Slow – group 1)
Asian Commonwealth		India (Fast – group 2)
		South East Asia (FE) (Slow – group 1)
Caribbean Commonwealth		Latin America excluding Mexico and Brazil (Fast – group 2)
Latin America		Brazil and Mexico (Fast – group 2)
Rest of Africa and Middle East		Middle East (Slow – group 1)
Rest of Asia	Includes HK	China and Hong Kong (Slow – group 1)
Rest of Europe	Non-EU15	A8 (Fast – group 2)
		Russia, Bulgaria, Romania, and other Developing Europe (Fast – group 2)
Europe	Old EU	European Union, Norway and Switzerland (Slow – group 1)
US	US	US (Fast – group 2)

Flows versus stocks

The migration inflow equations have to be combined with a stock adjustment equation to produce a projection for the stock of migrants. We may write the migrant stock as S_t and the gross inflow as described in the equation above as f_t. The net flow is the change in the stock of migrants after allowing for death rates, dt, or the gross inflow minus a gross outflow r_t, which may be modelled in relation to the existing stock. When the migrant stock increases, return migration also increases. The new equilibrium migrant stock is reached when increased inflows are matched by a rise in outflows driven by factors (which includes the rise in the migrant stock).

$$S_t = (1-d_t) S_{t-1} + f_t + r_t$$

As we have data on both the gross inflow and the migrant stock we can estimate the gross return flow[18]. In both the forecast and scenario analysis we need to make a mechanical projection for this or use an equation for it. Most studies of migration do not investigate the determinants of return migration, in part because data are poor. We assume that return migration depends both on the stock and on the same economic factors as the inflow, with a similar relative pattern of adjustment. We investigate the sensitivity of our results to changes in these assumptions. In particular we look at the sensitivity of our projections to the response of A8 migrants to economic conditions

[18] We use data from the Annual Population Survey (APS) to derive estimates of the stock of migrants. The APS is the LFS plus a sample boost. The underlying data on gross inflows of migrants is from the IPS. Both sources of data have severe limitations. The House of Lords (2008) has stressed the need for a significant improvement in the quality of data on the flows of migrants.

5: Outlook for the global economy and implications for migration into the UK

Our baseline forecast for migration depends on global growth compared to the UK's. In July a slowdown in global and UK growth was forecast, as we can see from Table 6, which gives our July growth forecast to 2015. Our forecast in July was close to consensus of other forecasters, in that we expected slow growth during 2008 and into 2009, with output dropping below capacity in the UK, the US and the Euro area. Oil prices were assumed to settle at around $120 per barrel, well below the peak seen in that month. In July we forecast a moderate slowdown in the global economy with strong growth in the old Commonwealth countries, all of who are minerals, oil or food, as well as robust growth in other traditional source countries.

Table 6: Growth forecasts for the UK and source countries, July 2008

Percent change in GDP

	2006	2007	2008	2009	2010	2011	2012-16
A8	6.5	6.4	5.0	4.6	3.6	4.2	4.0
Middle East	5.6	5.9	5.7	3.9	3.2	4.2	4.6
Latin America	4.3	4.3	1.9	1.9	2.6	3.0	2.8
China	10.9	11.1	10.6	9.6	8.6	8.4	7.4
Developing Europe	7.7	7.4	4.6	6.8	4.5	3.5	3.8
Old EU	3.0	2.7	1.7	1.6	1.9	2.1	2.0
Asian Commonwealth	7.3	7.4	9.2	7.5	7.0	7.0	6.0
India	9.7	9.2	8.5	8.1	9.3	8.8	6.3
Caribbean	6.0	8.0	7.4	4.7	2.4	3.2	3.5
Old Commonwealth	3.3	3.5	2.8	2.9	3.1	3.4	3.1
African Commonwealth	6.2	6.3	6.2	7.5	5.2	4.0	3.5
UK	2.9	3.1	1.5	1.4	1.9	2.4	2.3
US	2.9	2.2	1.9	1.6	2.6	2.9	2.3

Source: NIESR July 2008 and NiGEM model baseline.

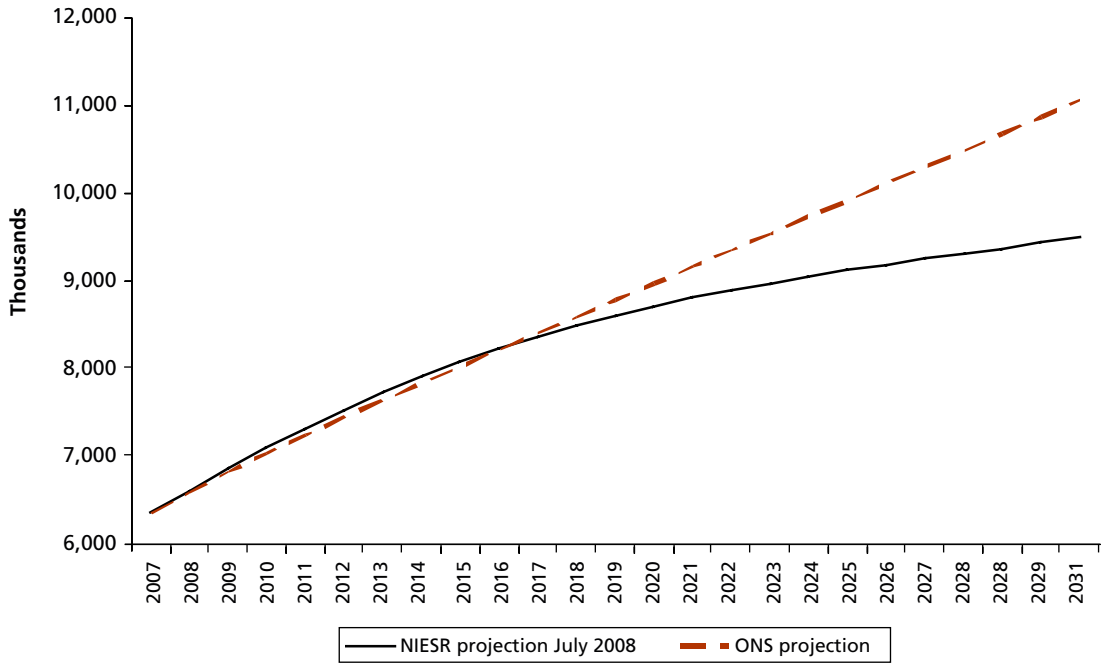
The latest ONS projections are 2006-based (see Office for National Statistics, 2008 for details)[19]. The ONS projections are based on historical trends in demographic patterns alone and do not use predictions of the domestic economy or other factors in determining migration into and out of the UK. The definition used is the international standard, whereby a migrant is defined as one who leaves their usual country of residence for at a least a year. This methodology provided the ONS with its latest assumption of a net inflow of 190,000 migrants per annum in the long run. These estimates are for the net inflow of migrants into the UK rather than a projection of the stock of foreign-born residents in the UK. If we assume that the stock of foreign-born migrants increases in-line with the net inflow if migrant numbers are as assumed by the ONS, then we can derive a simple benchmark for our projection of the stock of migrants in the UK over time[20]. However, we produce forecasts of the gross inflow and the gross outflow with economic factors affecting both.

The economic forecast discussed above produces a projection for migrant stocks that can be compared to that of the ONS, as we can see from Figure 3. After 2015, our projection based on our forecasts for the UK and world economies, which was produced in July 2008, falls below the stylised ONS projection. This is because our projection takes into account the fact that over the next 20 years many source countries are likely to experience faster economic growth than the UK, and their income levels will continue to converge towards that of the UK. As migration depends upon both relative income levels and the relative economic growth rates, we would expect gross and net inflows to decline and the stock to grow more slowly in the future than in the recent past.

[19] Previous population projections were produced by the Government Actuary's Department (GAD).

[20] This is a relatively simple assumption. A hypothetical example highlights this. If we assume that all of the inflow is foreign-born and the entire outflow is UK born then we can see that stock of migrants is actually equal to the stock of migrants last year plus the gross inflow of migrants. It is possible that the assumption we have used would over-estimate the stock of migrants derived from the ONS projection. However, since the estimate uses only those that intend to reside in the UK for at least a year it is possible that the **ONS** assumption under-estimates the stock of migrants.

Figure 3: Comparing the projections of the migrant stock made in July 2008 and January 2009



Our detailed projections for gross migration inflows given the projections for growth rates and for unemployment in the UK in our July forecast are given in Table 7. In general the forecast were made using 'flat residual' assumptions, in that we assumed that equations would continue to fit as well to the future as they do to the past. However, some judgement has to be employed when there has been clear and recent structural change. Almost a third of all migrants were expected to have come from the A8 and developing Europe in 2008, but this was a recently established inflow and flat residuals might be misleading, especially as institutions will change. After 2011 when all barriers in the rest of the EU have been removed, we expect that the gross inflow will stabilise, and return migration will remain relatively high. Although migration from the non-Indian Asian Commonwealth is likely to remain low, return migration rates are low, and the stock is expected to accumulate. These economies (Bangladesh, Pakistan in particular) are not expected to grow as rapidly as India, and return migration rates are higher to that country. As a result the stock of Indian migrants is expected to expand slowly.

Table 7: Gross inflows of migrants to the UK – July 2008 forecast										
	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
A8	92	112	148	188	193	198	203	208	212	214
Middle East	14	13	13	13	13	13	14	14	14	14
Latin America	7	8	9	10	11	12	13	15	16	17
Rest of Asia	71	69	69	69	70	70	70	70	69	67
Developing Europe	13	14	14	14	14	14	15	15	15	15
Old EU	52	50	51	51	52	52	52	53	53	53
Other Asian Commonwealth	55	54	53	53	53	54	55	56	56	57
India	57	58	57	57	57	57	58	59	60	60
Caribbean	11	10	9	9	9	10	10	10	10	10
Old Commonwealth	56	62	64	65	66	67	68	69	70	71
African Commonwealth	18	18	22	24	24	24	25	26	27	28
US	18	20	20	20	20	20	20	20	21	21
Total	591	577	620	663	671	681	692	702	712	719
Migrants, thousands.										

Our January 2009 projection falls below that of the ONS even earlier, as prospects for the UK have declined relative to the prospects for many other economies. Between summer and autumn 2008 the UK and the global economy entered a major crisis. By January 2009 projections for economic growth were revised down significantly as we can see from Table 8 below[21].

This major recession has been sparked by financial market problems in the US which have spilled over into the rest of the world, especially to the UK. Growth forecasts have been revised down by most for the US, but the UK is also expected to contract significantly. The sharp slowdown in the world economy has been accompanied by a drop in oil prices to around $40 per barrel in January 2009, from a peak of $147 in July 2008. Hence output and income growth in oil producing countries is expected to also moderate.

[21] The mean UK GDP forecast for 2009 of the HM *Treasury Forecasts for the UK economy: A comparison of independent forecasts* changed from 0.8 per cent in the August 2008 publication to -2.8 per cent. At the time of writing the mean forecast has been revised down to -3.2 per cent per annum.

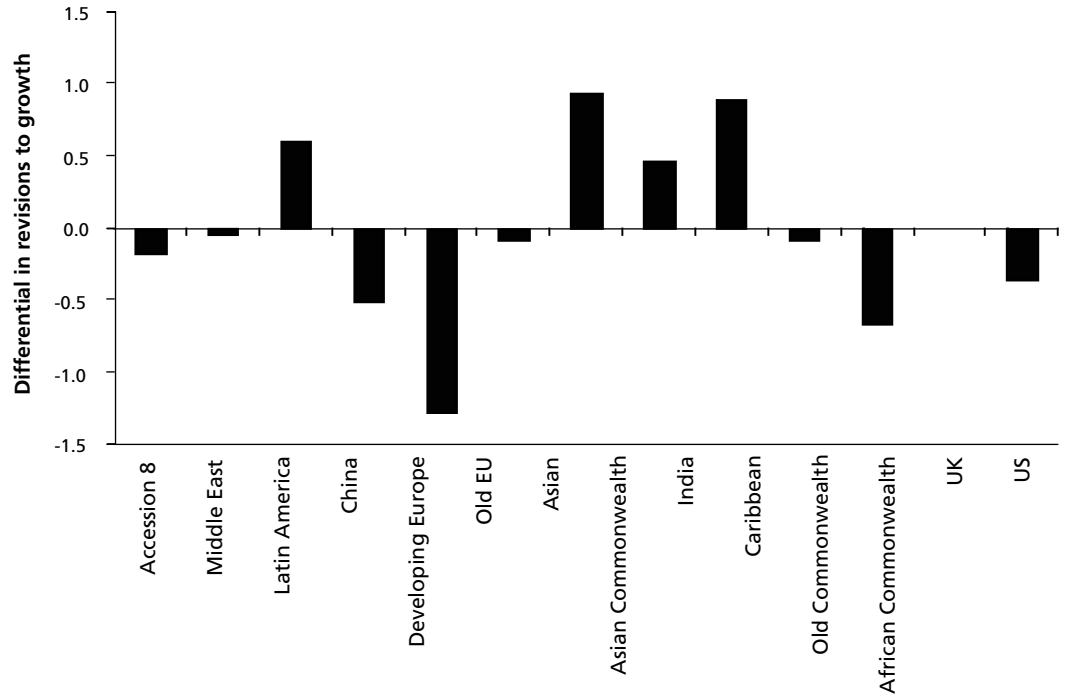
Table 8: Revisions to GDP growth – July 2008 and January 2009 (Percentage points)

	2008	2009	2010	2011	2012-15
A8	–0.54	–3.98	–1.34	1.02	–1.11
Middle East	2.24	–2.88	–4.11	–2.32	0.38
Latin America	2.71	0.29	–1.40	–1.28	–0.26
China	–0.78	–4.16	–2.49	–1.01	–0.87
Developing Europe	1.01	–5.23	–4.66	–1.10	–1.36
Old EU	–0.91	–3.50	–1.85	–0.60	–0.53
Asian Commonwealth	–5.30	–1.33	0.22	0.71	–0.17
India	–0.76	–0.61	–1.22	–0.44	–0.52
Caribbean	–1.29	–2.61	–0.44	–0.43	0.52
Old Commonwealth	–1.01	–2.98	–1.54	0.05	–0.92
African Commonwealth	–0.15	-3.95	–3.26	–1.09	–0.99
UK	–0.80	–4.12	–1.31	–0.22	–0.48
US	–0.57	–4.14	–2.18	–0.03	–0.91

The oil producing countries in the Middle East and the African Commonwealth as well as developing Europe (dominated in GDP terms by Russia) show a stronger slowdown in growth over the next four years than does the UK. The US and China also slow more over the first four years of our forecast, albeit from a relatively high level in China. All other source countries grow more rapidly than the UK relative to our July forecast up until 2011. Hence in the short-term gross inflows will be reduced partly because of the reduced attractiveness of the UK. Figure 4 plots the relative revisions to growth over the period 2009 to 2015[22], which suggests that in the longer term prospects may change a little in the New Member States (NMS).

[22] Revisions to 2008 include revisions to data and these should not impact on migration flows as much as revisions to prospects.

Figure 4: Revisions to growth 2009-2015 – Home minus UK



Note: Revision is July 2008 forecast minus January 2009 forecast.

Barrell and Kirby (2008) have argued that the rise in risk premia, which the financial turmoil has produced since 2007, will permanently lower the level of equilibrium output in the UK, especially relative to the rest of Europe. This will in turn impact on stocks of migrants. These effects feed through slowly in the model since the migrant inflow equation has an inherently slow adjustment process, as we can see from the next section. The crisis is also rapidly developing.

These major revisions to GDP growth forecasts inevitably lead us to revise our projections for the inflows and stocks of migrants, as we can see from Tables 9 and 10. The largest changes are to the projections for the stock and gross inflow of migrants from the A8 countries. It is relatively widespread across groups, as we can see from the table. The rise in UK unemployment means that the gross inflow of migrants from major source regions, such as the A8, slows down noticeably in the short term. This is despite weaker economic growth in that group of countries. Return migration would increase especially to India, the Asian Commonwealth and the Caribbean. As we can see from the tables, half the reduction in the stock of migrants comes from a reduction in inflows, with the rest from a rise in outflows.

Table 9: Changes to forecasts of migrant gross inflows July 2008 to January 2009

	2008	2009	2010	2011	2012	2013	2014	2015
A8	0	0	–2	–2	–3	–10	–17	–22
Middle East	0	–1	–1	0	0	1	2	3
Latin America	0	–2	–2	–3	–4	–5	–6	–8
Rest of Asia	0	0	–1	–3	–4	–6	–7	–8
Developing Europe	0	–1	0	0	0	0	0	0
Old EU	0	–1	–1	–1	–1	–1	–1	–1
Other Asian Commonwealth	0	0	–1	–1	–1	–1	–1	–2
India	0	–1	–1	–2	–3	–3	–4	–4
Caribbean	0	–1	–1	–1	–1	–1	–1	–1
Old Commonwealth	–1	–1	0	0	–1	–1	–2	–3
African Commonwealth	0	0	–1	–1	–1	–2	–3	–4
US	0	0	0	0	0	0	0	–1
Total	–2	–7	–12	–14	–20	–31	–42	–52

Migrants, thousands.

Table 10: Changes to forecasts of migrant stocks July 2008 to January 2009

	2008	2009	2010	2011	2012	2013	2014	2015
A8	–2	–10	–16	–22	–41	–64	–86	–104
Middle East	0	–4	–6	–6	–5	–2	1	6
Latin America	–1	–5	–10	–16	–23	–32	–41	–51
Rest of Asia	0	–3	–6	–10	–15	–22	–29	–37
Developing Europe	–1	–5	–6	–6	–6	–6	–7	–8
Old EU	0	–1	–5	–7	–9	–11	–14	–16
Other Asian Commonwealth	0	–4	–9	–14	–19	–24	–28	–32
India	–1	–9	–20	–28	–37	–45	–52	–58
Caribbean	0	–3	–5	–7	–9	–11	–12	–13
Old Commonwealth	0	–2	–3	–3	–3	–5	–8	–12
African Commonwealth	0	–3	–5	–7	–10	–15	–23	–34
US	–2	–3	–3	–3	–4	–5	–5	–5
Others	5	8	9	11	12	11	9	6
Total	–1	–43	–86	–119	–169	–231	–296	–360

Migrants, thousands.

The overall reduction in the projection of migrant stocks that results from the sharp downturn in UK activity and consequent rise in unemployment will in turn have longer-term consequences for the economy. Most immediately, the rise in unemployment rate that will be associated with the downturn will be more muted than that projected. Given the age structure and participation rates of migrants, and especially of A8 migrants, the reduction in the stock of migrants will lead to significant falls in the workforce, as we can see from Figure 5 below. In 2009 we project that lower migration will reduce the labour force by 23,000, lowering the level of unemployment by a similar number as compared to the scenario of no change in migration. By 2010 the labour force will have shrunk by 45,000 as compared to our July projection. By 2015 the labour force is expected to be around 200,000 lower than we projected in July 2008. By 2015 we would have expected the UK labour market to have adjusted to its new equilibrium which suggests that the sustainable level of output would be reduced by more than 0.5 per cent as a result of a decline in the stock of migrants. As a result trend growth between 2009 and 2013 would be reduced by more than 0.1 per cent a year. However, there are considerable uncertainties around these estimates, and they are more likely to be too low than too high.

Figure 5: The impact of the downturn on population and the labour market projections (July 2008 to January 2009)

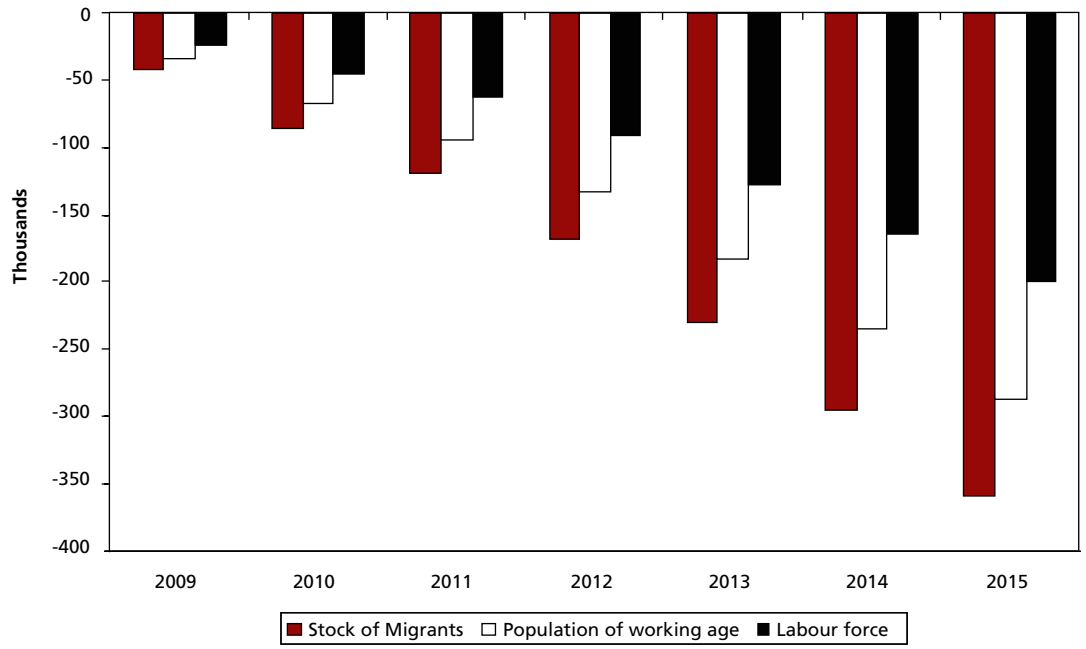


Figure 6 plots the revised projection for the stock of migrants given the revised forecast for the UK and world economies produced in January 2009. By 2015 there may be 300,000 or so fewer migrants than we or the ONS projected in mid-2008. Over the medium term our projection drops well below that of the ONS. By 2020 the reduction is likely to be between 800,000 and 900,000 migrants as compared to the ONS and around 600,000 less than our projection based on July 2008 data. By 2030 the revision as compared to the ONS projection and our July projection would be 2,300,000 and 860,000 migrants, respectively.

There are many uncertainties in our forecast, and we have discussed the impact of shocks to the world economy on the forecast in relation to our overall projection. We have put forecast uncertainty bounds around our January projection of the foreign born population, and it is clear that the July 2008 projection is outside the 95 per cent confidence bands. This reflects the scale of the revision to our forecast of the medium term, which is the largest we have made in the last 20 years[23].

Figure 6: Revisions to migrant stock projections – July 2008 to January 2009

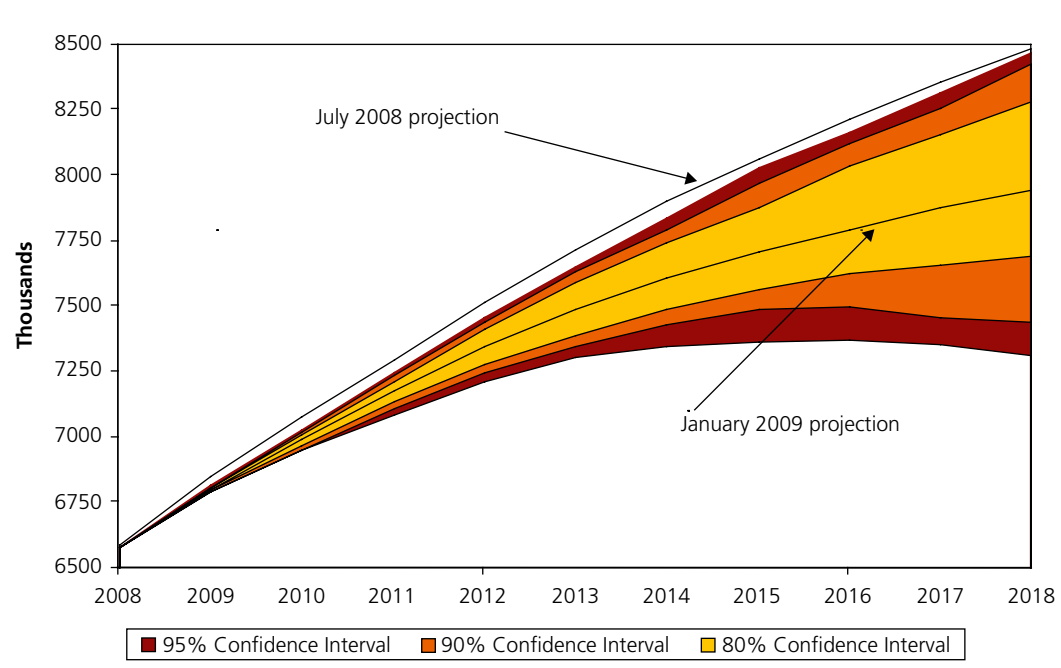
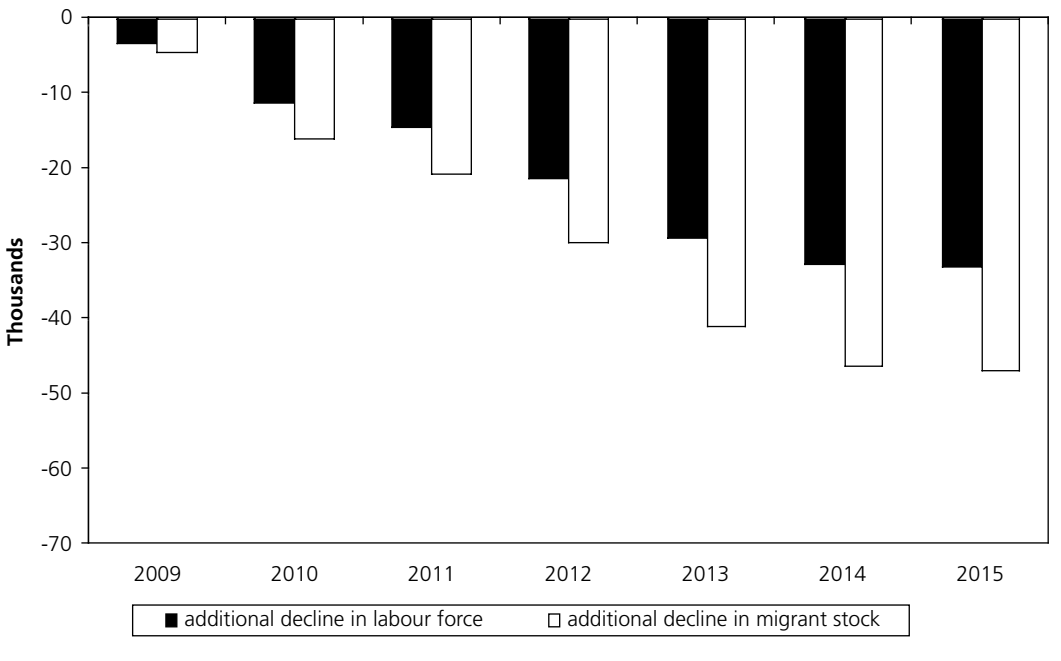


Figure 7: The labour market impact of increased sensitivity of A8 migrants to UK economic growth

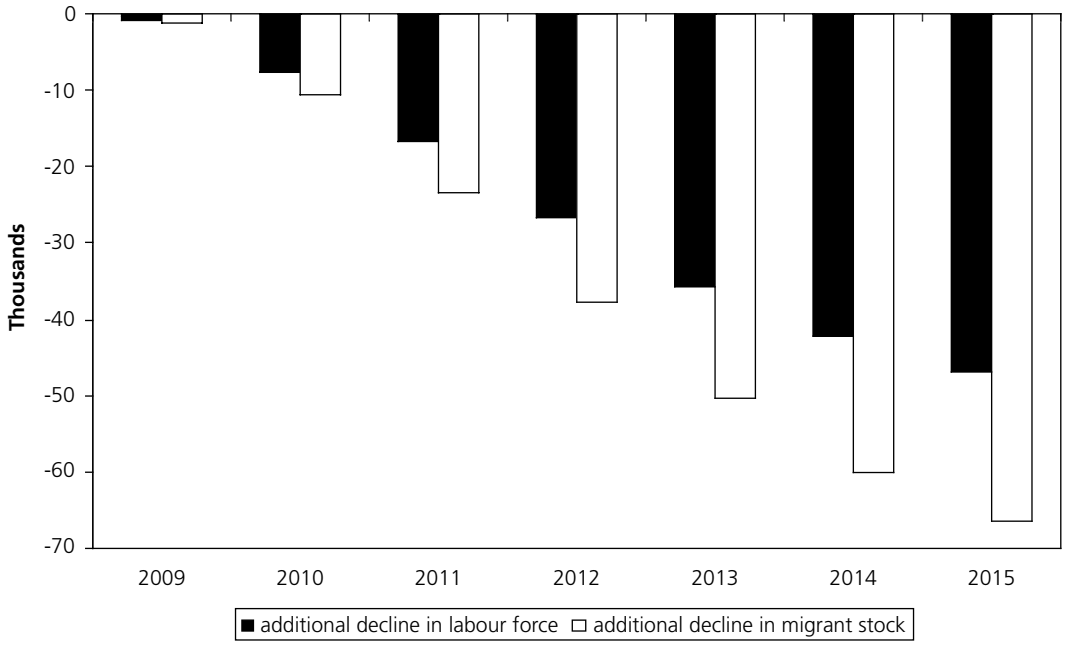


[23] Forecast bounds are regularly produced in the *National Institute Economic Review*. The bootstrapping technique is discussed in Barrell (2001) and has been applied in Barrell, Hall and Hurst (2006).

The parameters of our model are also uncertain, especially in relation to newly established flows such as those from A8 countries. The recent rapid rise in the stock of A8 migrants makes it more difficult to forecast, as the stock has developed fewer ties with the UK than is the norm, and communities are less settled. We might expect that they could be more sensitive to economic conditions both in the UK and in the rest of Europe. In Figure 7 we report the results of doubling the effect of changes in economic conditions on return migration. This alone would lead to a further 33,000 fall in the labour force by 2015, given the relatively high participation rates of A8 migrants. It would reduce the stock of migrants from all countries of 47,000 and the A8 migrant stock by 40,000 by 2015.

It is also possible that A8 migrants are particularly sensitive to UK unemployment, as their main reason for migration is to raise income and perhaps return home. In our forecast UK unemployment rises quite sharply over the next four years, and this is likely to reduce all inflows, but it may have a greater impact on this group, as return migration is not costly. In order to analyse this sensitivity we have increased the coefficient on unemployment in the migration inflow equation to five times that of other groups. The effects are plotted in Figure 8. The stock of migrants falls by around 67,000 more than would have been the case, with some 57,000 of them from A8 countries. Given participation rates, the labour force falls by around 40,000 by 2015.

Figure 8: The labour market impact of increased sensitivity of A8 migrants to UK unemployment



If it were the case that the A8 were more sensitive to economic conditions than in our main case the effects on output would be larger. If we add the two A8 scenarios discussed above to our baseline projection then the trend level of output would be around ¾ of a per cent lower by 2015, and trend growth would be reduced by around 1/8 of a per cent for five years between 2009 and 2013. There are other sensitivities we could estimate, and these are discussed in the final section on simulations. In particular, the impacts of changes in relative growth rates in the UK and the Euro Area are important when assessing A8 migration.

6: Evaluating the impacts of uncertain outcomes on migration into the UK

In this section of the analysis we look at a one per cent increase or decrease in output in 2009 relative to our January baseline. This change is designed as a 'pulse' in that output is meant to return to base quickly, but spillovers to other countries and the feedbacks over time mean that the effect is marginally persistent, but ultimately transitory. There will be a dynamic pattern in the response of migration to the pulse shock, however, and this will be determined by three features of the model:

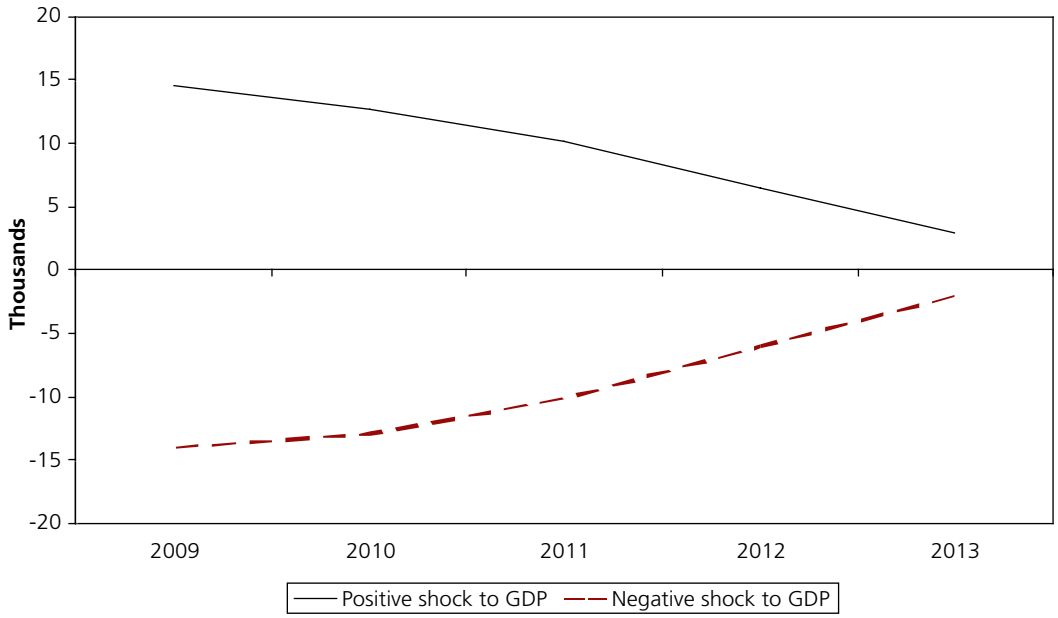
1. Some countries are fast reacting and others are slow reacting, and we have built this into the inflow equations, as we discuss above. We look at this distinction in the tables below.

2. The dynamics of response will also be conditioned by the ratio of stocks to flows. In the steady state, the observed ratio of stocks to flows is a good indicator of speeds of adjustment, but where stocks have not reached their steady state, as with migrants from A8 countries, this may be a little misleading.

3. The European Union is the major alternative destination and it reacts slowly to shocks.

There are many uncertainties in our projections. We first look at the effects of a one percent of GDP increase (or decrease) in UK GDP in 2009 with UK output returning essentially to base in 2010. The increase (decrease) in UK output in the first year would raise (lower) the stock of foreign migrants by around 15,000. The inflow adjusts as output returns to base and as output in other countries experiences an increase (decrease) in subsequent quarters because of the effects of an increase (decrease) in UK imports. After five years the stock of migrants is almost back on base. This is illustrated in Figure 9 below.

Figure 9: Change in the stock of migrants due to a shock to UK GDP



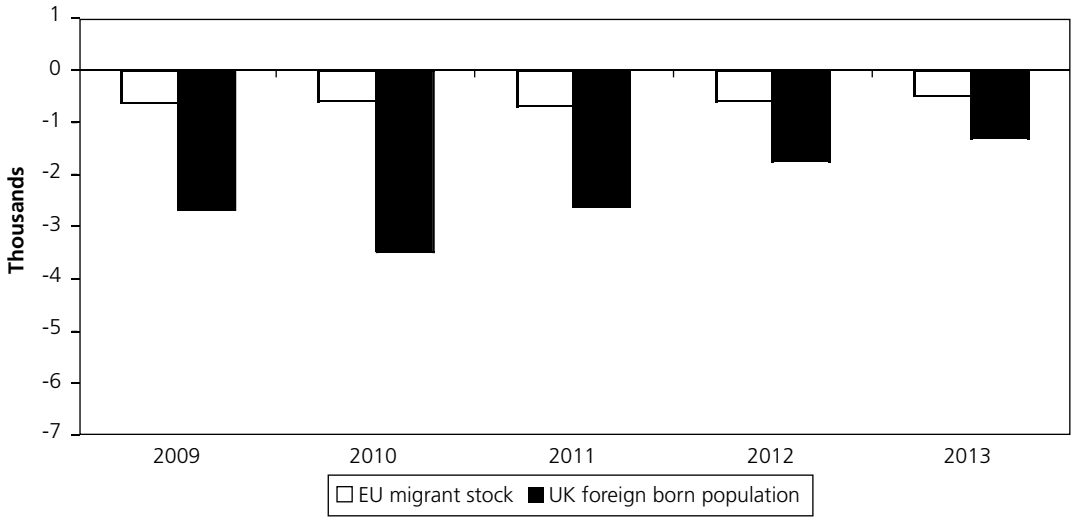
Note: Shocks are a 1 per cent increase/decrease in GDP in 2009, with GDP returning to base over the next few years.

Speeds of reaction vary, as we see below, and we plot positive shocks for the five major source groups. There are uncertainties about output growth in other regions as well, and we shock each in turn.

The old EU

We first shock output positively in the old EU countries and the results are reported in Figure 10. In the equations from Mitchell and Pain (2003) these are seen as a major competitor destination, and hence there is a great deal of diversion (the difference between the stock from the country group being shocked and the overall impact). This is especially the case for migrants from the A8 economies, but also from other major source countries.

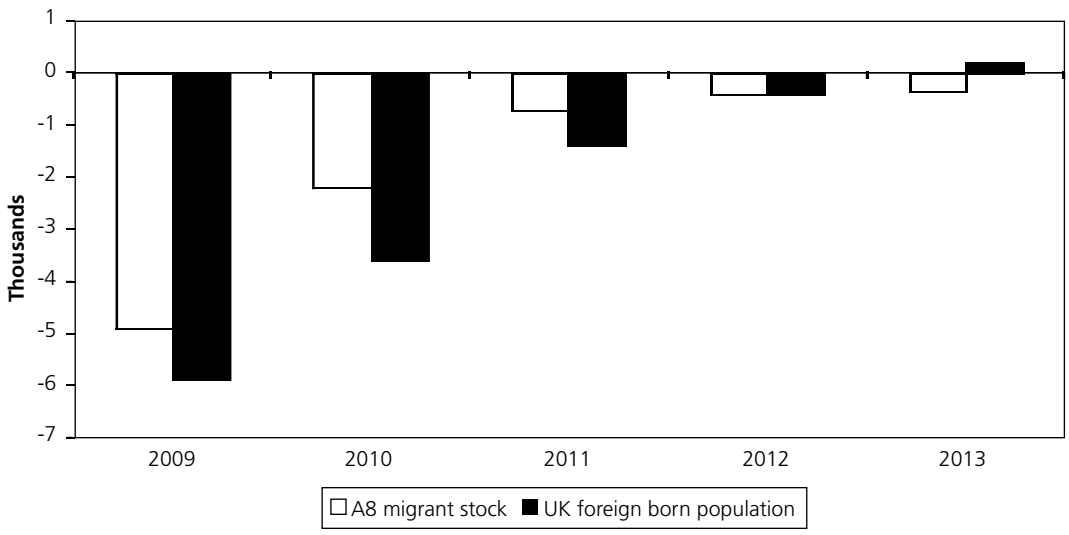
Figure 10: Old EU positive shock: 1 per cent increase in output in the Old EU



The A8 countries

Major uncertainties come from the projections for the stock of migrants from the New Member States. Figure 11 below plots the effects of a one per cent increase in A8 economies' GDP. Such a one-year pulse would have a sustained negative impact on the UK labour force. The effects are more immediate than for the shock to the old EU, in part, because the speed of reaction to shocks in the A8 is greater than for pre-Accession EU countries. It is also because the inflow is a much higher proportion of the stock, and hence the stock adjustment is more rapid. The differences between the two simulations also reflect the immediate impacts on the A8 rather than the diversion of gross inflows to the EU. A positive shock to the A8 economies spills over through trade with the old EU members, raising their output and reducing the stock of migrants from this major source in the early years of the experiment. The trade related shock to the old EU (and other regions) impacts only transitorily and is less persistent than the output shock to the A8, and hence the overall stock of migrants adjusts more quickly than the A8 stock.

Figure 11: A8 positive shock: 1 per cent increase in output in the A8 Countries



The Indian sub-continent

The next two shocks we consider are to the Indian sub-continent. Here we distinguish between India and the other Asian Commonwealth countries. The speed of reaction to shocks is greater and the duration of stay is shorter for India as we can see from the final table below. As we would expect, Figures 12 and 13 suggest that the Indian migrant population adjusts slightly more quickly that the rest of Commonwealth Asia, but the spillovers to other source countries are larger, because an increase in growth in India will have more impact on its trading partners than the same percentage (but absolutely smaller) impact on the other group. GDP growth would strengthen in the rest of the Asian Commonwealth in response to stronger Indian GDP growth. Australia, China and other countries that are major sources of migrants would also see their GDP growth increased and hence the effects on the stock of migrants in the UK are both larger and more sustained when Indian output is increased than when output is increased in the other Asian Commonwealth countries.

Figure 12: India positive shock: 1 per cent increase in output in the A8

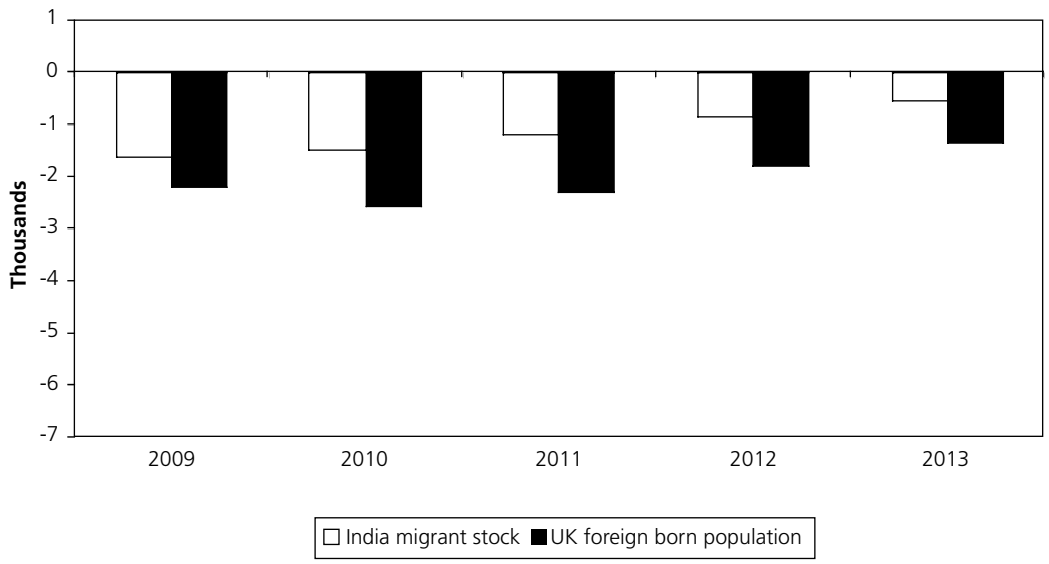
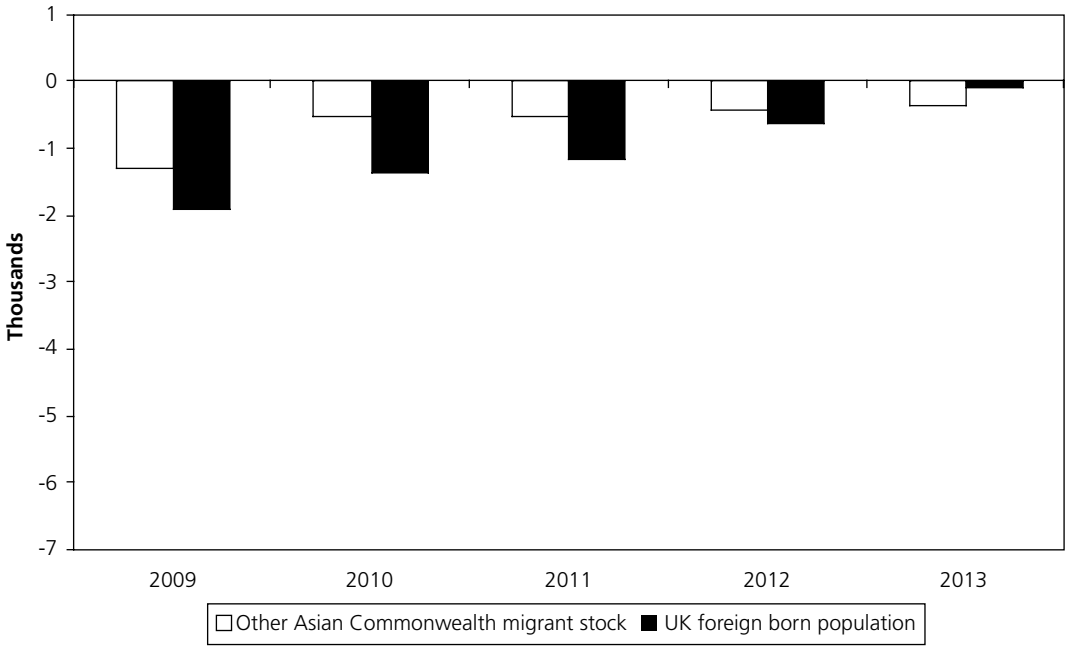


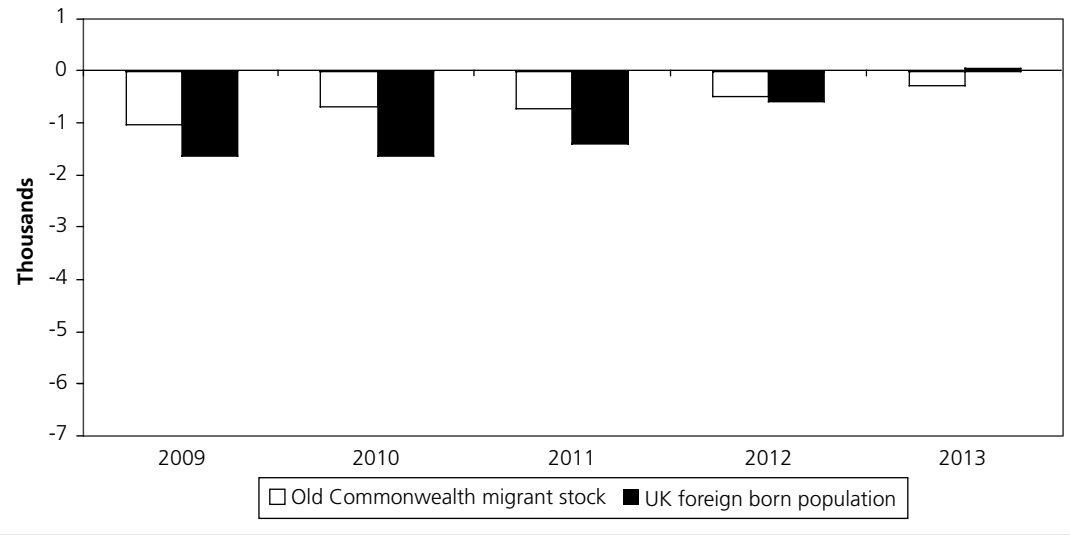
Figure 13: Other Asian Commonwealth positive shock: 1 per cent increase in output in the other Asian Commonwealth



The old Commonwealth

The remaining relatively large effect on source country migration is in relation to the old Commonwealth (Figure 14). Although the speed of reaction of the inflow to the shock is slow, because the average length of stay for migrants from the old Commonwealth is short, the adjustment of the migrant stock to changes in economic conditions is relatively rapid. In addition, because these economies are quite large, there are noticeable spillover effects. Therefore, the overall effect of a positive shock to GDP in the old Commonwealth countries on the size of the UK foreign-born population is initially some 60 per cent larger than the own country effects. This is because, as growth increases in the old Commonwealth countries, so does growth in its main trading import markets, thereby reducing migration into the UK from these countries.

Figure 14: Old Commonwealth positive shock:



Direct and spillover effects of a **positive** shock to source countries' GDP on migrant inflows

Tables 11A and 11B give details for all our groups of a 1 per cent of GDP positive shock on GDP. In each case we report the own effects and the overall effects, and the latter are in all cases larger, at least initially. There are two sources of spill over. First a shock that affects EU GDP will divert originally UK-destined migration to the EU. As the model is a general equilibrium description of the world economy, we can always expect this diversion to be present. There will also be spillover effects, which will be similar for all countries, although it is greater for large countries such as the US, and for those with strong trading links such as developing Europe and the A8 economies or India and the old and Asian Commonwealths. Tables 12A and 12B give similar results for a contraction of output in each country or group.

Table 11A: Effects of a positive 1 per cent of GDP pulse shock in 2009 on source country and overall migration: **slow reacting countries**

(Change in stocks, thousands)

	2009	**2010**	**2011**	**2012**	**2013**
Other Asian Commonwealth	–1.31	–0.53	–0.53	–0.43	–0.37
UK Population	–1.91	–1.38	–1.20	–0.63	–0.11
Old Commonwealth	–1.02	–0.68	–0.70	–0.47	–0.26
UK Population	–1.62	–1.64	–1.37	–0.59	0.07
African Commonwealth	–0.74	–0.28	–0.27	–0.16	–0.05
UK Population	–1.11	–0.84	–0.65	–0.22	0.14
Old EU	–0.60	–0.59	–0.68	–0.58	–0.47
UK Population	–2.66	–3.47	–2.60	–1.72	–1.28
Rest of Asia	–0.96	–0.78	–0.83	–0.58	–0.29
UK Population	–1.81	–1.33	–0.95	–0.15	0.47
Middle East	–0.22	–0.22	–0.24	–0.21	–0.16
UK Population	–0.45	–0.64	–0.58	–0.33	–0.07

Table 11B: Effects of a positive 1 per cent of GDP pulse shock in 2009 on source country and overall migration: **fast reacting countries**

(Change in stocks, thousands)

	2009	2010	2011	2012	2013
India	–1.61	–1.47	–1.20	–0.85	–0.53
UK Population	–2.21	–2.57	–2.30	–1.81	–1.34
A8	–4.90	–2.19	–0.71	–0.42	–0.33
UK Population	–5.88	–3.60	–1.39	–0.42	0.21
US	–0.52	–0.42	–0.33	–0.25	–0.19
UK Population	–0.77	–0.61	–0.37	–0.02	0.25
Latin America	–0.24	–0.19	–0.10	–0.01	0.03
UK Population	–0.65	–0.79	–0.51	–0.09	0.23
Caribbean	–0.29	–0.14	–0.07	–0.08	–0.09
UK Population	–1.81	–1.33	–0.95	–0.15	0.47
Developing Europe	–0.39	–0.24	–0.12	–0.09	–0.14
UK Population	–1.05	–1.24	–0.96	–0.43	–0.12

Direct and spillover effects of a **negative** shock to source countries' GDP on migrant inflows

Tables 12A and 12B give details for all our groups of a one per cent of GDP negative shock on GDP. As with the positive shock above, in each case we report the own effects and the overall effects, and the latter are again in all cases larger, at least initially.

Table 12A: Effects of a negative 1 per cent of GDP pulse shock in 2009 on source country and overall migration: **slow reacting countries**

(Change in stocks, thousands)

	2009	2010	2011	2012	2013
Other Asian Commonwealth	1.20	0.32	0.45	0.44	0.41
UK Population	1.34	0.28	0.40	0.47	0.52
Old Commonwealth	0.88	0.60	0.68	0.54	0.40
UK Population	0.41	-0.37	-0.19	0.08	0.39
African Commonwealth	0.70	0.23	0.26	0.20	0.12
UK Population	0.68	0.08	0.09	0.10	0.12
Old EU	0.67	0.72	0.88	0.83	0.73
UK Population	1.43	2.22	1.82	1.76	2.02
Rest of Asia	0.85	0.10	-0.03	-0.28	-0.43
UK Population	1.34	-0.05	-0.11	-0.21	-0.14
Middle East	0.20	0.20	0.23	0.22	0.17
UK Population	0.02	-0.14	-0.02	0.14	0.28

Table 12B: Effects of a negative 1 per cent of GDP pulse shock in 2009 on source country and overall migration: **fast reacting countries**

(Change in stocks, thousands)

	2009	2010	2011	2012	2013
India	1.47	1.63	1.70	1.70	1.68
UK Population	1.30	1.18	1.16	1.22	1.29
A8	4.30	2.39	0.72	–0.12	–0.52
UK Population	4.32	2.27	0.60	0.17	0.22
US	0.48	0.22	0.06	–0.02	–0.06
UK Population	0.32	–0.37	–0.46	–0.33	–0.11
Latin America	0.23	0.11	0.00	–0.08	–0.12
UK Population	0.02	–0.36	–0.40	–0.24	0.00
Caribbean	0.27	0.09	0.02	0.05	0.05
UK Population	1.34	–0.05	–0.11	–0.21	–0.14
Developing Europe	0.36	0.22	0.11	0.07	0.09
UK Population	0.43	0.18	0.13	0.12	0.30

7: Conclusions

Migration flows, both inward and outward are subject to economic influences. The impact of these influences on the stock of migrants depends upon the speed of reaction of the flow to economic events and also on the relationship between the stock and the net inflow. When migrant inflows are large relative to migrant stocks adjustment is likely to be rapid, as in the case of migrants from the A8. The sharp downturn in the world economy since September is bound to have an effect on patterns of migration. It is our judgement that the UK will be more severely affected by the downturn than migrant source countries. Hence, we think it reasonable to revise down projections of migration, and by 2015 we expect that there will be 360,000 fewer foreign born residents in the UK than might previously have been anticipated. The major adjustment will take place among A8 migrants who will respond rapidly to rises in UK unemployment. Given the size of the UK labour force and the participation rates of migrants these numbers suggest that for this reason alone the sustainable level of output will be 0.5 to 0.75 per cent lower by 2015 than we would have projected in the summer of 2008. The impacts will be relatively evenly spread over the period and hence we can say that changes to the pattern of migration will reduce trend output growth by 0.1 to 0.125 percentage points over the next five years.

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Appendix A:

The Mitchell and Pain model

Given data on time periods $t=1,\ldots,T$ and source locations $i=1,\ldots,N$, a dynamic autoregressive distributed lag (ARDL) model (see Pesaran and Shin, 1999) of the migration rate can be expressed as:

$$\ln(m_{it}/P_{it}) = \sum_{j=1}^{p} \lambda_{ij} \ln(m_{i,t-j}/P_{i,t-j}) + \sum_{j=0}^{q} \partial'_{ij} x_{i,t-j} + \mu_i + \varepsilon_{it} \qquad [A1]$$

where m denotes the migration flow, P the source location population (so that m_i/P_i is the migration rate from location *i*) and xit is a vector of explanatory variables, x_{it}= [ln($S_{i,t-1}$/ $P_{i,t-1}$), Dit, ln(Y_{it}), ln(TR_{it}), ln(YR_t), Ut]'. S denotes the migrant stock, D the demographic share, Y and YR per capita income in the UK relative to the source location and the EU15 respectively, TR the bilateral trade-GDP ratio and U the UK unemployment rate. Group-specific fixed effects are denoted as μ_i; these pick up any factors that differ across groups but not across time. The disturbances, εit, are assumed to be independently and identically distributed across *i* and *t*, with zero means and variances σ^2_i>0 and finite fourth moments. They are also assumed to be distributed independently of the regressors x_{it}.[24] The coefficients on the lagged dependent variable λ_{ij} are scalars and δ_{ij} is the vector of coefficients on the explanatory variables x_{it}.

Equation [A1] can be re-written in error-correction form:

$$\Delta \ln(m_{it}/P_{it}) = \phi_i \ln(m_{i,t-1}/P_{i,t-1}) + \beta_i' x_{it} + \sum_{j=1}^{p-1} \lambda^*_{ij} \Delta \ln(m_{i,t-j}/P_{i,t-j}) + \sum_{j=0}^{q-1} \delta^{*'}_{ij} \Delta x_{i,tj} + \mu_i + \varepsilon_{it} \qquad [A2]$$

where:

$$\phi_i = -(1 - \sum_{j=1}^{p} \lambda_{ij}); \ \beta_i = \sum_{j=0}^{q} \delta_{ij}; \lambda^*_{ij} = -\sum_{m=j+1}^{p} \lambda_{im}; \ \text{j=1,2,...,p-1}$$

and: $\delta^*_{ij} = -\sum_{m=j+1}^{q} \delta_{im}$; , j=1,2,...,(q-1).

[24] The ARDL approach can remain valid even when the regressors are not strictly exogenous. If the components of x_{it} follow finite order auto-regressive representations, the inclusion of additional lags of the regressors makes it possible to obtain consistent estimates (Pesaran, 1997).

Assuming the *ARDL(p,q,q,…,q)* model is stable, in the sense that all values of the scalar z satisfying $\sum_{j=1}^{p} \lambda_{ij} z^{j} = 1$, *i=1,2,…,N*, lie outside the unit circle, we know $\phi i < 0$. This ensures that a long-run relationship exists between $\ln(m_{it}/P_{it})$ and x_{it}. This long-run relationship is defined as:

$$\ln(m_{it} / P_{it}) = -(\beta_i' / \phi_i) x_{it} + \eta_{it} \qquad [A3]$$

for each *i=1,2,…,N*, where ηit is a stationary process. Let $\Theta i = -(\beta' i / \phi i)$. The stability assumption also ensures that the order of integration of $\ln(m_{it}/P_{it})$ is at most equal to that of x_{i+}.

$$\Delta \ln(m_{it} / P_{it}) = \phi_i \left[\ln(m_{i,t-1} / P_{i,t-1}) - \Theta_i' x_{it} \right] + \sum_{j=1}^{P} \lambda_{ij}^{*} \Delta \ln(m_{i,t-j} / P_{i,t-j}) + \sum_{j=0}^{Q} \delta_{ij}^{*\prime} \Delta x_{i,t-j} + \mu_i + \varepsilon_{it} \qquad [A4]$$

where $\left[\ln(m_{i,t-1} / P_{i,t-1}) - \Theta_i' x_{it} \right]$ is the error correction component and ϕi indicates the speed of adjustment to the long-run equilibrium relationship.[25] The interpretation of equation [A4] is that the migration rate changes over time in order to eliminate any differences between the past migration rate and the current desired rate given by the linear combination of the long-run economic and demographic driving factors. When ϕ_i does not differ significantly from –1, adjustment is instantaneous. If it is insignificantly different from zero, the migration rate does not adjust towards any particular long-run level generated by a fixed linear combination of the variables included in the equilibrium-correction term.

Consistent estimates of the average, across groups, long-run relationship between the dependent variable and the regressors were obtained by Mitchell and Pain (2003) using the Mean Group (MG) estimator (Pesaran and Smith, 1995). The MG estimates are given by the mean of the coefficients derived by estimating [A4] separately for each of the N groups. If the long-run coefficients are homogeneous across groups, as Mitchell and Pain (2003) found was the case after empirical testing, then it is more efficient to pool the data and impose the homogeneity restriction(s) rather than estimate unrestricted ARDL models for each group. Mitchell and Pain (2003) therefore employed the Pesaran, Shin and Smith (1999) Pooled Mean Group (PMG) estimator to estimate the long-run coefficients (the Θi in [A4]). The PMG estimator imposes equality of the long-run coefficients, but allows dynamics and error variances to still differ across groups.[26]

Mitchell and Pain (2003) found that the speed (denoted ϕ_i in [A4]) with which migration from different locations responds to changes in the common long-run driving factors differed significantly across source locations. The EU, Old Commonwealth, African Commonwealth, the Rest of Africa and the Rest of Asia were found to have a common

[25] Equation [A4] involves a partial adjustment type error correction. It can be easily re-written to incorporate a lagged error-correction component $\left[\ln(m_{i,t-1} / P_{i,t-1}) - \Theta_i' x_{i,t-1} \right]$ (Pesaran, Smith and Akiyama, 1998).

[26] The restrictions $\Theta i = \Theta$, i=1,2,…,N can be tested by means of either a Likelihood Ratio (LR) test or a Hausman test.

adjustment parameter of –0.27, whilst the other five locations, in their application, were found to have a common parameter of –0.88, implying a much quicker change in the migration flow to any change in the key driving forces.

We should also note, by way of comparison, that the majority of applied studies of inward migration into the UK have either ignored the dynamic adjustment effects that are allowed for explicitly in Mitchell and Pain's ARDL approach (for example, Glover et al, 2001) and/or employed common panel data estimators, such as the one-way fixed or random effects estimator (for example, Hatton and Williamson (2002) and Hatton (2005)). Such estimators are restricted forms of the general system of ARDL models [A1] and the PMG equivalent. Two sets of restrictions are required to move from an unrestricted system of separate ARDL equations for each group, with heterogeneous parameters across groups, to a model with a single set of parameters common to all groups. These are that each of the independently estimated equations has a common error variance and common parameters. Only the intercept (μi in [A1]) can differ across groups in the fixed effects model. Such restrictions can (and should) be tested. If there is heterogeneity across groups, which Mitchell and Pain (2003) found to be the case in terms of the speed of adjustment coefficients (denoted ϕ_i in [A4]), then the one-way fixed effects estimator will yield inconsistent estimates of the average, across groups, effect of the exogenous variables on the dependent variable in a dynamic model (even as $T \rightarrow \infty$) (Pesaran and Smith, 1995).

Appendix B:

The use and structure of the NiGEM model

For a macroeconometric model to be useful for policy analyses, particular attention must be paid to its long-term equilibrium properties. At the same time, we need to ensure that short-term dynamic properties and underlying estimated properties are consistent with data and well determined. As far as possible the same long run theoretical structure of NiGEM has been adopted for each of the major industrial countries, except where clear institutional or other factors prevent this. As a result, variations in the properties of each country model reflect genuine differences in data ratios and estimated parameters, rather than different theoretical approaches. The model has been in use at the National Institute since 1987, but it has developed and changed over that time. Some of its development was initially financed by the ESRC, but since 1995 it has been funded by its user community of public sector policy institutions. These currently include the Bank of England, the ECB, the IMF, the Bank of France, the Bank of Italy and the Bundesbank as well as most other central banks in Europe along with research institutes and finance ministries throughout Europe and elsewhere.

Each quarter since 1987 the model group has produced a forecast baseline that has been published in the *National Institute Economic Review* and used by the subscribers as a starting point for their own forecasts. The forecast is currently constructed and used out to beyond 2031 each quarter, although the projection beyond 2015 is a stylized use of the long run properties of the model. Since 1998 the model has also been used by the EFN Euroframe group to produce forecasts for the European Commission[27]. Forecasts are produced based on assumptions and they do not always use forward-looking behaviour. In policy analyses the model can be switched between forward, rational expectations mode and adaptive learning for consumers, firms, labour and financial markets. Policy environments are very flexible, allowing a number of monetary and fiscal policy responses. The model has been extensively used in projects for the European Commission, UK government departments and government bodies throughout the world. It has also contributed to a number of National Institute ESRC projects.

[27] See http://www.euroframe.org/.

Production and price setting

The major country models rely on an underlying constant-returns-to-scale CES production function with labour-augmenting technical progress.

$$Q = \gamma\left[s(K)^{-\rho} + (1-s)(Le^{\lambda t})^{-\rho}\right]^{-1/\rho} \qquad [B1]$$

where is Q is real output, K is the total capital stock, L is total hours worked and t is an index of labour-augmenting technical progress. This constitutes the theoretical background for the specifications of the factor demand equations, forms the basis for unit total costs and provides a measure of capacity utilization, which then feed into the price system. Barrell and Pain (1997) show that the elasticity of substitution is estimated from the labour demand equation, and in general it is around 0.5. Demand for labour and capital are determined by profit maximisation of firms, implying that the long-run labour-output ratio depends on real wage costs and technical progress, while the long-run capital output ratio depends on the real user cost of capital

$$Ln(L) = \left[\sigma \ln\{\beta(1-s)\} - (1-\sigma)\ln(\gamma)\right] + \ln(Q) - (1-\sigma)\lambda t - \sigma \ln(w/p) \qquad [B2]$$

$$Ln(K) = \left[\sigma \ln(\beta s) - (1-\sigma)\ln(\gamma)\right] + \ln(Q) - \sigma \ln(c/p) \qquad [B3]$$

where w/p is the real wage and c/p is the real user cost of capital. The user cost of capital is influenced by corporate taxes and depreciation and is a weighted average of the cost of equity finance and the margin adjusted long real rate, with weights that vary with the size of equity markets as compared to the private sector capital stock. Business investment is determined by the error correction based relationship between actual and equilibrium capital stocks. Government investment depends upon trend output and the real interest rate in the long run. Prices are determined as a constant mark-up over marginal costs in the long term.

Labour market

NiGEM assumes that employers have a right to manage, and hence the bargain in the labour market is over the real wage. Real wages, therefore, depend on the level of trend labour productivity as well as the rate of unemployment. Labour markets embody rational expectations and that wage bargainers use model consistent expectations. The dynamics of the wage market depend upon the error correction term in the equation and on the split between lagged inflation and forward inflation as well as on the impact of unemployment on the wage bargain (Anderton and Barrell 1995). There is no explicit equation for sustainable employment in the model, but as the wage and price system is complete the model delivers equilibrium levels of employment and unemployment. An estimate of the NAIRU can be obtained by substituting the mark-up adjusted unit total cost equation into the wage equation and solving for the unemployment rate. Labour supply is determined by demographics, migration and the participation rate.

Consumption, personal income and wealth

Consumption decisions are presumed to depend on real disposable income and real wealth in the long run, and follow the pattern discussed in Barrell and Davis (2007). Total wealth is composed of both financial wealth and tangible (housing) wealth where the latter data is available.

$$\ln(C) = \alpha + \beta \ln(RPDI) + (1-\beta)\ln(RFN + RTW) \qquad [B4]$$

where *C* is real consumption, *RPDI* is real personal disposable income, *RFN* is real net financial wealth and *RTW* is real tangible wealth. The dynamics of adjustment to the long run are largely data based, and differ between countries to take account of differences in the relative importance of types of wealth and of liquidity constraints. As Barrell and Davis (2007) show, changes in financial (dlnNW) and especially housing wealth (dlnHW) will affect consumption, with the impact of changes in housing wealth having five times the impact of changes in financial wealth in the short run. They also show that adjustment to the long run equilibrium shows some inertia as well.

$$d\ln C_t = \lambda(\ln C_{t-1} - \ln PI_{t-1}) + b_1 d\ln RPDI_t + b_2 d\ln NW_t + b_3 d\ln HW_t \qquad [B5]$$

Al-Eyd and Barrell (2005) discuss borrowing constraints, and investigate the role of changes in the number of borrowing constrained households. It is common to associate the severity of borrowing constraints with the coefficient on changes in current income (dlnRPDI) in the equilibrium correction equation for consumption, where d is the change operator and ln is natural log,

Financial markets

We generally assume that exchange rates are forward looking, and 'jump' when there is news. The size of the jump depends on the expected future path of interest rates and risk premia, solving an uncovered interest parity condition, and these, in turn, are determined by policy rules adopted by monetary authorities as discussed in Barrell, Hall and Hurst (2006):

$$RX(t) = RX(t+1)[(1+rh)/(1+ra)](1+rprx) \qquad [B6]$$

where *RX* is the exchange rate, *rh* is the home interest rate set in line with a policy rule, *ra* is the interest rate abroad and *rprx* is the risk premium. Nominal short term interest rates are set in relation to a standard forward looking feedback rule. Forward looking long rates should be related to expected future short term rates

$$(1+LR_t) = \Pi^{T}_{j=1},\ (1+SR_{t+j})^{1/T} \qquad [B7]$$

We assume that bond and equity markets are also forward looking, and long-term interest rates are a forward convolution of expected short-term interest rates. Forward looking equity prices are determined by the discounted present value of expected profits

Public sector

We model corporate (CTAX) and personal (TAX) direct taxes and indirect taxes (ITAX) on spending, along with government spending on investment and on current consumption, and separately identify transfers and government interest payments. Each source of taxes has an equation applying a tax rate (?TAXR) to a tax base (profits, personal incomes or consumption). As a default we have government spending on investment (GI) and consumption (GC) rising in line with trend output in the long run, with delayed adjustment to changes in the trend. They are re-valued in line with the consumers' expenditure deflator (CED). Government interest payments (GIP) are driven by a perpetual inventory of accumulated debts. Transfers (TRAN) to individual are composed of three elements, with those for the inactive of working age and the retired depending upon observed replacement rates. Spending minus receipts give us the budget deficit (BUD, and this flows onto the debt stock.

$$BUD = CED*(GC+GI)+TRAN+GIP-TAX-CTAX-MTAX \quad [B8]$$

We have to consider how the government deficit (BUD) is financed. We allow either money (M) or bond finance (debt).

$$BUD = \Delta M + \Delta DEBT \quad [B9]$$

Rearranging gives:

$$DEBT = DEBTt\text{-}1 - BUD - \Delta M \quad [B10]$$

In all policy analyses we use a tax rule to ensure that Governments remain solvent in the long run (Barrell and Sefton 1997). This ensures that the deficit and debt stock return to sustainable levels after any shock. A debt stock target can also be implemented. The tax rate equation is of the form:

$$TAXR = f(\text{target deficit ratio} - \text{actual deficit ratio}) \quad [B11]$$

If the Government budget deficit is greater than the target (e.g. -3 % of GDP and target is -1% of GDP) then the income tax rate is increased.

External trade

International linkages come from patterns of trade, the influence of trade prices on domestic price, the impacts of exchange rates and patterns of asset holding and associated income flows. The volumes of exports and imports of goods and services are determined by foreign or domestic demand, respectively, and by competitiveness as measured by relative prices or relative costs. The estimated relationships also include measures to capture globalization and European integration and sector-specific developments. It is assumed that exporters compete against others who export to the same market as well as domestic producers via relative prices; and demand is given by a share of imports in the markets to

which the country has previously exported. Imports depend upon import prices relative to domestic prices and on domestic total final expenditure. As exports depend on imports, they will rise together in the model. The overall current balance depends upon the trade balance and net property income form abroad, which comprised flows of income on gross foreign assets and outgoings on gross foreign liabilities. Gross national product (GNP) is gross domestic product (GDP) plus net factor income from abroad.

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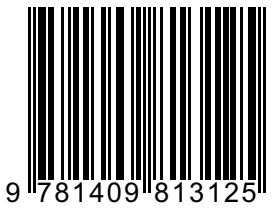

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