Office for
Budget Responsibility

Fiscal sustainability report

Annexes

July 2011

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Contents

This document provides a set of annexes to accompany the main *Fiscal sustainability report*.

A Asset sales

Asset sales and the central fiscal projections

A.1 Consistent with the *Charter for Budget Responsibility*, and our wider approach to policy announcements, we only include the impact of asset sales in our central projections once firm and final details are available, which provide enough information about the size and timing of the transactions for the effects to be quantified with "reasonable accuracy". The *Charter* states that:

> *The OBR's published forecasts shall be based on all Government decisions and all other circumstances that may have a material impact on the fiscal outlook. In particular:*
>
> • *where the fiscal impact of these decisions and circumstances can be quantified with reasonable accuracy, the impact should be included in the published projections; and*
>
> • *where the fiscal impact of these decisions and circumstances cannot be quantified with reasonable accuracy, these impacts should be noted as specific fiscal risks.*

A.2 Typically the proposed intention to sell an asset, subject to conditions, would not meet the criteria of a decision that can be quantified with reasonable accuracy. Therefore, many of the announcements at Budget 2011 and since, concerning the disposal of assets, have not been incorporated within the central long-term fiscal projections. However, consistent with the *Charter* it is important to consider the risks that currently unquantifiable future asset sales may present to our projections. So this annex provides a detailed discussion of the potential impact of asset sales on the public finances. It also provides an illustrative range of potential valuations, based on publically available information, for the assets the Government has announced it is considering selling.

A.3 Paragraphs 2.16-2.19 of *Budget 2011* set out a number of assets potentially available for sale. In particular:

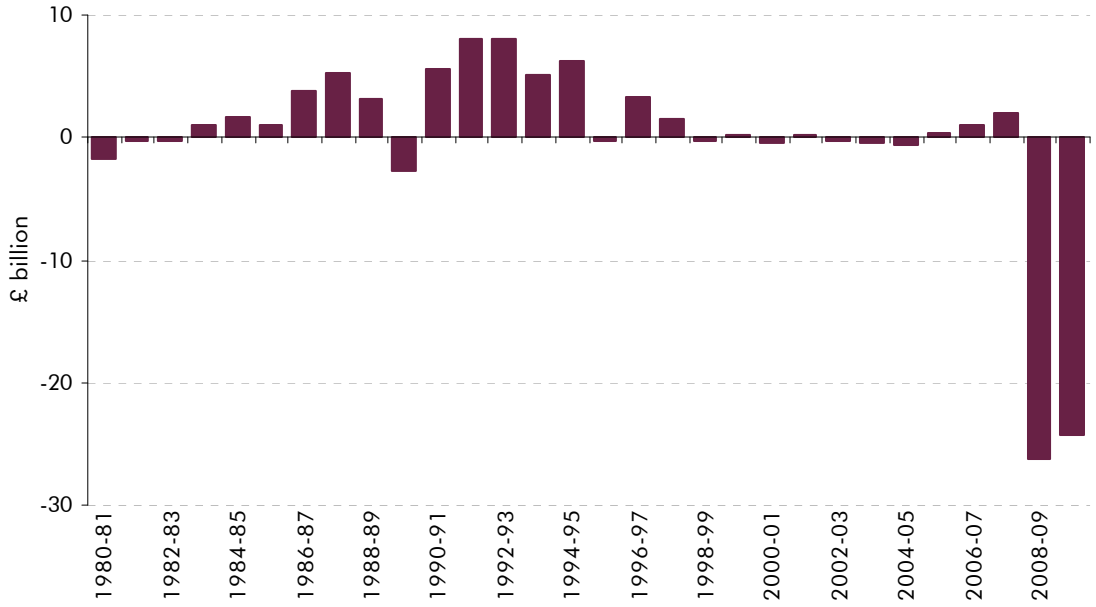
> *2.16 … the Government:*
>
> • *intends to realise value from its shareholding in NATS* [The UK's air traffic control operator]*, subject to considering the views of key interested parties;*

> • *intends to sell its stake in Actis* [the private equity investor in emerging markets]*, if the terms of a potential sale offer good value for taxpayers' money;*
>
> • *will complete the final stages of the open market process to resolve the future of the Tote* [the pool betting bookmaker]*, and will announce the outcome later in the spring; and*
>
> • *publish an implementation plan for the phased release of 500MHz of surplus spectrum from the public sector by 2020. In addition, Ofcom has recently published a consultation on awarding 800MHz and 2.6GHz spectrum, which is suitable for mobile broadband. This award will take place in early 2012.*
>
> *2.17 Following work on realisation of value from the student loan book, a decision on whether to proceed to a transaction will be made in the summer.*

A.4 It is evident that for the assets mentioned above – the Tote now aside – several hurdles are yet to be crossed which mean we cannot quantify the impact on the public finances with reasonable accuracy. For some, the intention to sell any stake is not yet clear, others are subject to external consultation, while for none other than the Tote is there information available on the contractual details of any eventual disposal or on the final timing of transactions. Similar uncertainty surrounds other announcements, relating to the intention to sell part of Northern Rock and shares in Royal Mail.

A.5 Neither does historical experience provide a reasonable guide to the scale of eventual sales. Chart A.1 sets out the net sales by central government of company securities. It illustrates the lumpy nature of such transactions, with peaks in the late 1980s and early 1990s, but also the fact that proceeds do not necessarily move in one direction. The chart does not cover proceeds from other types of assets, such as spectrum, that are of interest but even more volatile.

Chart A.1: Net central government sales of company securities



Source: ONS

A.6 Although we are unable to provide reasonably accurate estimates relating to specific asset sales, the remainder of this annex discusses the broad factors that should be considered when assessing the impact on the public finances. For each of the assets mentioned above, it attempts, where possible, to give a sense of the potential scale of any direct impacts based on publically available information. It does not consider indirect impacts through any effect on the wider economy, although we believe that any such effects would be minimal.

Sales by type of asset

Fixed assets

Property, plant and equipment

A.7 Sales of fixed assets such as property, are netted off gross capital expenditure in the National Accounts, and therefore reduce public sector net borrowing. However, the sales of such fixed assets by central government are included within departments' capital DELs (departmental expenditure limits). Capital DELs apply on a net basis, so that if departments sell more assets, this enables them to increase their other capital expenditure, which would leave spending and the public finances unaffected.

A.8 Departments have not yet published detailed gross and net spending plans, but this does not affect the accuracy of our medium-term forecasts, as they are based

on net capital DELs sets out in last October's Spending Review. We do make a specific forecast for local authority fixed asset sales, as in this case there is a relatively stable historical trend that we can use. We also include local authority sales of housing from their Housing Revenue Accounts, where the latter are classified as sales of assets by public corporations in the National Accounts. Table A.1 sets out the latest such projections, as published in the March *Outlook*.

Table A.1: Sale of fixed assets

	£ billion						
	Outturn		EFO forecast				
	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Sales of fixed assets							
Central government[1]	0.7	0.9	-	-	-	-	-
Local authorities	1.0	1.3	1.6	1.8	1.9	2.0	2.1
Housing Revenue Account[2]	0.6	0.6	0.7	0.8	0.9	1.0	1.2
Total sales of fixed assets	**2.3**	**2.8**	**-**	**-**	**-**	**-**	**-**

[1] Detailed breakdowns of department's spending plans for 2011-12 onwards were not available at publication.

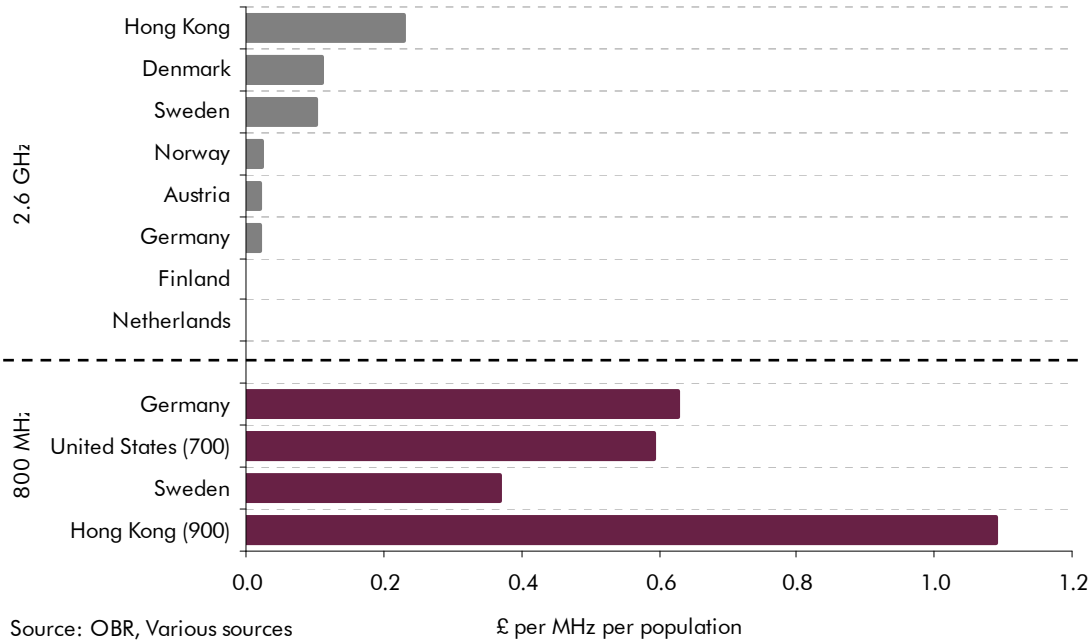
[2] Capital transactions by local authorities' Housing Revenue Accounts are classified as Public Corporations in the National Accounts, and so are shown separately.

Spectrum

A.9 The ONS currently treats receipts from allowing access to parts of the spectrum as rental payments for the use of an asset, meaning that the impact on public sector net borrowing is spread out evenly over the licence period. Our latest projections have been produced on that basis. The ONS are currently reviewing this treatment in the context of the Eurostat decision of 2000 that the government is actually selling an asset and should record the receipts as negative capital expenditure in the year of sale.

A.10 800MHz and 2.6GHz spectrum, suitable for 4G mobile networks, are expected to be awarded around the middle of 2012. An international comparison of equivalent spectrum access sales may offer some guide as to the eventual proceeds for the UK. Chart A.2 compares a number of recent spectrum sales, controlling for the amount of spectrum sold and the size of the corresponding population.

Chart A.2: Comparison of international spectrum sale proceeds



Source: OBR, Various sources

A.11 A simple calculation controlling for these two factors would suggest in the UK a potential range of £1.4 to 4 billion for the 60MHz of spectrum available around 800MHz and a further <£0.1 to £2.7 billion for the 190MHz of spectrum around 2.6GHz. However, there are a number of other factors that would determine the final outcome, so the eventual proceeds need not even lie within these relatively wide ranges. The degree of competition within the market, and how this interacts with the auction format will have a significant bearing. The precise auction format is yet to be confirmed, whilst differences in regulatory requirements, which are also currently unclear, distort any direct comparisons. Views on future demand for mobile products and the required costs to meet this will differ between individual participants in the auction, making an estimate of the aggregate proceeds very difficult to make at this stage.

A.12 The intention to release further spectrum at a later date may also affect the value. The Government has published an implementation plan for the phased release of another 500MHz of spectrum from the public sector by 2020[1]. The actual spectrum available for sale is yet to be determined. But unlike next year's auction proceeds, there will be clear offsetting impacts on the public finances. Releasing the additional spectrum will come at some operational cost, while departments are likely to retain part of the eventual proceeds.

[1] DCMS (2011)

Financial assets

A.13 Sales of financial assets, such as company securities, are not generally scored within public sector net borrowing. Instead, they are usually classified as financial transactions. They will have an effect on public sector net debt and will have an indirect effect on net borrowing through their effect on debt interest payments and if the Government loses a related income stream.

A.14 Even when sale terms and prices have been agreed, the effect on the public finances is often far from this straightforward. It will often depend on an ONS classification decision that may not be agreed until some time after the sale has been completed.

A.15 For example, the ONS announced in January this year that they had decided that British Energy Group Ltd should be reclassified as a private non-financial corporation. This followed the takeover of the company by French power company EDF in January 2009. The ONS have yet to implement this decision and we have not reflected it in our projections because we do not yet have any reliable estimates of the effects of this change.

Company securities

A.16 A list of many of the Government's existing business shareholdings can be found on the Shareholder Executive's website[2].

A.17 The Government has recently announced the sale of the Tote to Betfred, subject to consultation with employees. Given final details have now been announced the impact can be quantified with reasonable certainty, and will be included in the November 2011 *Economic and fiscal outlook (EFO)*. However, the sums involved are small and are likely to be broadly neutral for the public finances over the long-term, and so would have no significant impact on the long-term projections in this report.

A.18 Of the headline value of £265 million, the Government will receive an initial £150 million, with the remainder deferred. Part of the proceeds will be provided to the racing industry, so the Government will ultimately retain only £90 million. Cash flows related to this sale will impact on net debt. But offsetting this over time, the Tote's gross operating surplus will be removed from public sector current receipts, which will increase net borrowing in future years. The operating surplus, calculated by the ONS, is broadly equal to the firm's operating profits, which were £25.2 million in 2009-10. On the other hand, the Tote's

[2] http://www.bis.gov.uk/policies/shareholderexecutive/structure/portfolio-unit

contributions to the racing industry will no longer count as public sector capital grants to the private sector.

A.19 The Government also intends to sell shares in Royal Mail. In early 2007, the National Audit Office (NAO) valued Royal Mail at between £1-3 billion[3], although this range did not fully take into account substantial long-term liabilities, such as its pension liabilities, and could not of course reflect subsequent events, such as Royal Mail's current restructuring.

A.20 The Government intends to take on Royal Mail's historic pension deficit with effect from March 2012 and also restructure the company's balance sheet. This support is conditional on state aid approval from the European Commission and, if approved, there is uncertainty as to how these measures will impact on the fiscal aggregates. The book value of total pension liabilities amounted to £32.2 billion in March 2011, partially offset by a £27.7 billion book value of assets, leaving a deficit of £4.5 billion. Royal Mail also has around £1.7 billion of debt facilities with the Government.

A.21 It is not clear what stake will be sold because the Government is retaining flexibility as to the form and timing of a sale. If the Government completes a sale of its entire stake, it has committed that at least 10 per cent of shares will go to employees. Royal Mail recorded operating profits of £180 million and £39million in 2009-10 and 2010-11 respectively. Were a sale completed, such operating surpluses would be removed from current receipts going forward, increasing net borrowing in the future. Royal Mail capital expenditure, which is currently within public sector gross investment, would also be removed.

A.22 The Government sold a 46 per cent stake in NATS, the UK's air traffic controller, for £758 million in July 2001, but has retained a 49 per cent minority share in the business. Again, any proceeds would be offset by the loss of future income. NATS is currently classified as a private non-financial corporation, and so the only relevant flows that enter public sector net borrowing are dividend receipts. Surplus cash was used to reduce gearing in the business until 2010-11 when the first significant dividend was paid out from operating profits. The most recent payment in May was a dividend for 2011-12 of £42.5 million, of which the Government will have received roughly half.

A.23 The Government also holds a 40 per cent stake in Actis, a private equity firm investing in developing economies. It sold 60 per cent of the firm to employees for £373,040 in 2004. The 2007 NAO report valued Actis at between £182-535 million. This was based on projected annual profits of £6 to 11 million and an

[3] The Committee of Public Accounts (2007) and NAO (2007).

optimistic range for the price relative to such earnings. Until 2013 the Government is entitled to 80 per cent of profits and 40 per cent thereafter, but has yet to receive any revenues from the business. Therefore proceeds from a sale are likely to be modest.

Student loans

A.24 The Government is also considering whether to sell a share of the student loan book. In Chapter 3 of the main report we discuss flows relating to the entire student loan book over time, but the proportion to be sold, if any, is unclear. A sale would affect the flow of receipts, with more recorded upfront, and less in future years. But assuming that the assets were sold at fair value, the expected return to the Government at the point of sale would be zero.

A.25 A sale would be expected to transfer some of the risks as well as rewards. There have been no precedents to such a sale in the UK, so the potential classification by the ONS is particularly uncertain. The classification decision, which would determine the impact on net debt and net borrowing, would be dependent on the degree of transfer of risks and rewards, which would be affected by the particular terms of any contract.

Financial interventions

A.26 Chapter 2 in this report discusses existing contingent liabilities relating to the financial interventions undertaken by the previous Government. These represent the total liabilities that the Government is exposed to from the particular interventions included. But these estimates take no account of offsetting assets held under the intervention schemes and unrealistically assume no recoveries would be made to set against losses. They also relate only to circumstances where the Government may need to spend additional money, so do not cover previous losses or income from the interventions.

A.27 In the November 2010 *EFO,* we certified the Treasury's approach for calculating the overall direct net cost or benefit to the taxpayer of these interventions. This is a more comprehensive approach as it considers income, losses and risks related to the range of assets and liabilities held by the Government under all the schemes. However, it is highly uncertain and will depend in large part on the eventual sale price for the Government's shareholdings in RBS and Lloyds, which it is not possible to predict with any confidence.

A.28 The Treasury's approach therefore uses market prices to value these shares. On the basis of the latest market prices, this implies a loss of £13.5 billion on these investments. In the March *EFO*, we reported a comparable loss of £1.6 billion. The change is entirely due to movements in the share prices of these banks in the

intervening period, illustrating the degree of uncertainty that surrounds these estimates.

A.29 The Treasury then uses the Asset Protection Agency's central projection of a net benefit to the taxpayer from the Asset Protection Scheme of £5 billion, including fee income. The aggregate costs of all other interventions are not expected to be material once fees, income and recoveries are taken into account.

A.30 Overall, this implies an estimated eventual loss to the taxpayer of £8.5 billion. This figure excludes the financing costs relating to debt raised to support the financial interventions, which are implicitly within our central debt interest projections. We will look to quantify these financing costs in our next *Outlook*.

A.31 Having injected £1.4 billion into Northern Rock, the Government has recently announced the intention to sell part of the bank. Market analysts expect the partial sale to raise around £1 billion, although other options to dispose of the asset are yet to be ruled out. The outstanding element, Northern Rock Asset Management, will be retained and run down over time. Therefore, the total benefit or loss of this particular intervention will not be clear for a number of years.

A.32 The projections present the fiscal aggregates on a basis that excludes the temporary effects of the interventions in the financial sector, but capture the permanent effects. Any sale of shares in Northern Rock plc, RBS or Lloyds would have an impact on public sector net debt. However, no estimate of this has been included in our central projections given the significant uncertainties around this, and as there is no firm plan for when, how and at what price such sales would take place.

Net impact on the public finances

A.33 In the first instance, the net impact of any asset sale on the public finances will depend on how the proceeds are used. Income from the sale of fixed assets is likely to be recycled within the relevant public sector body, with little or no net effect on the Government's overall fiscal position. The Government also intends to raise a further £1.2 billion from asset sales to fund the Green Investment Bank from 2012-13. Under such circumstances, the immediate fiscal impact is likely to be negligible.

A.34 In other cases, by selling an asset the Government gives up the right to a future flow of income. This is often true following the sale of company securities, but would also arise in other cases, for example if the Government were to sell part of the student loan book. Such sales would affect the profile of net debt, particularly at the point of any given sale. However, the eventual net impact is

determined by the size of the one-off payment relative to the present value to the Government of all related future flows, including income foregone and savings on debt interest payments. Over the extended time horizon that this report considers, the net impact may be significantly less than the headline sale price. Of course, when considering an asset sale, the Government will consider a number of factors other than the net impact on the public finances, such as any reduction in the level of risk that it is exposed to following a sale.

A.35 Our analysis highlights two asset sales that could have a material impact on the public finances: spectrum and the Government's shareholding in public sector banks. At present, spectrum sales appear to be a favourable risk to the public finances. However, the potential value is extremely uncertain. Conversely, at current market prices, the sale of the public sector banks represents a downside risk.

A.36 If the Government were to complete its planned sale of company securities and spectrum towards the middle of the range of the most recent publicly available estimates, and leaving aside offsetting factors over time, it would broadly offset the current market value of losses on the public sector banks and other financial interventions. So in this case the impact on our long-term projections would not be material. But these estimates do not offer any reliable guide to the eventual proceeds were these assets to be sold. That is because a wide range of final policy decisions, which will determine the exact nature of any sales, are yet to be clearly defined. It is not therefore possible to quantify the potential impact with reasonable accuracy and so consistent with the *Charter for Budget Responsibility*, we do not include these within our central projections.

B Demographic and economic assumptions

B.1 This annex provides further detail on the key demographic and economic assumptions underlying the long-term projections provided in Chapter 3 of the main *Fiscal sustainability report*.

Demographics

B.2 The changing structure of the UK population will be one of the most important factors affecting the evolution of the public finances over the next fifty years. It is the key driver of changes to projections of spending and revenue in our long-term public finance model.

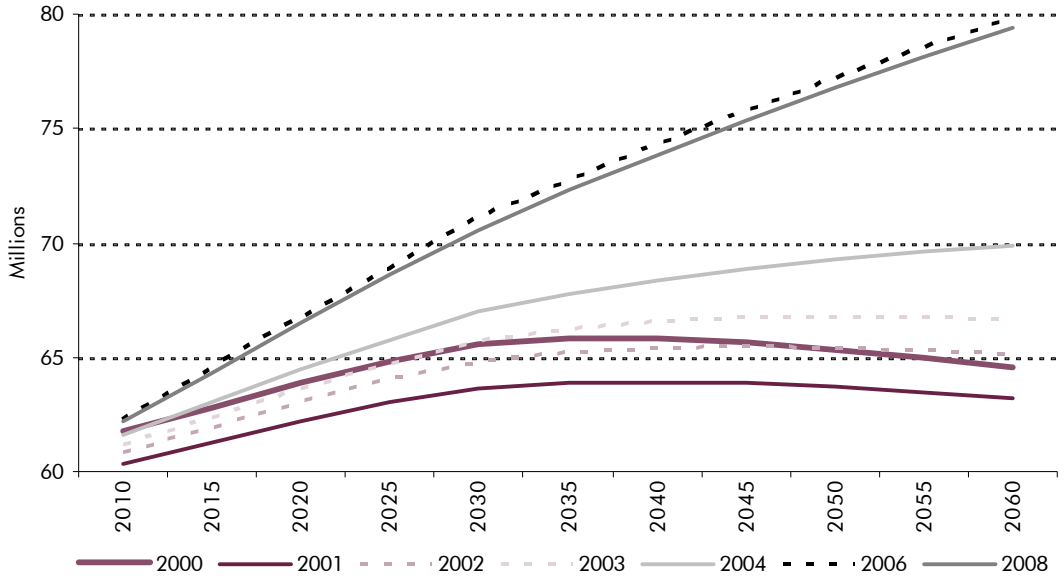
B.3 For our analysis we use the official population projections produced for the UK by the ONS, using a deterministic projection model.[1] The last set of these projections was produced in October 2009, based on 2008 population data.

B.4 Three main drivers will dictate the direction of future population change – longevity (life expectancy), fertility (the number of children born per female) and net migration (the difference between inflows and outflows of people to the country). Each of these is highly uncertain, given the multitude of economic, social and other external factors that can influence the variables and the interactions between them. As a result, any estimate of the future population structure will itself be highly uncertain. For this reason, alternative projections produced by organisations such as the UN and Eurostat can differ quite markedly over longer horizons, potentially due to small differences in the underlying determinant assumptions.

B.5 As population projections are deterministic, relatively recent developments in fertility and net migration can get locked into the future projections. For this reason the projections often also vary considerably from round to round. Chart B.1 shows the evolution of projections for total population produced over the past ten years.

[1] ONS (2009)

Chart B.1: Comparison of ONS and GAD principal population projections



Source: ONS, GAD

B.6 Interpreting the population projections therefore requires a great deal of caution. This variability also serves to highlight the uncertainty inherent in the economic and public finance projections that are based on these population projections. There could be significant changes in our long-term public finance projections every two years based purely on the updating of the population assumptions, even if we make no changes to our wider assumptions or modelling approach.

B.7 To illustrate the impact of this uncertainty we make use of the population variants produced by the ONS by changing these underlying assumptions. We use these variants to produce sensitivity analysis around our public finance projections, as discussed later.

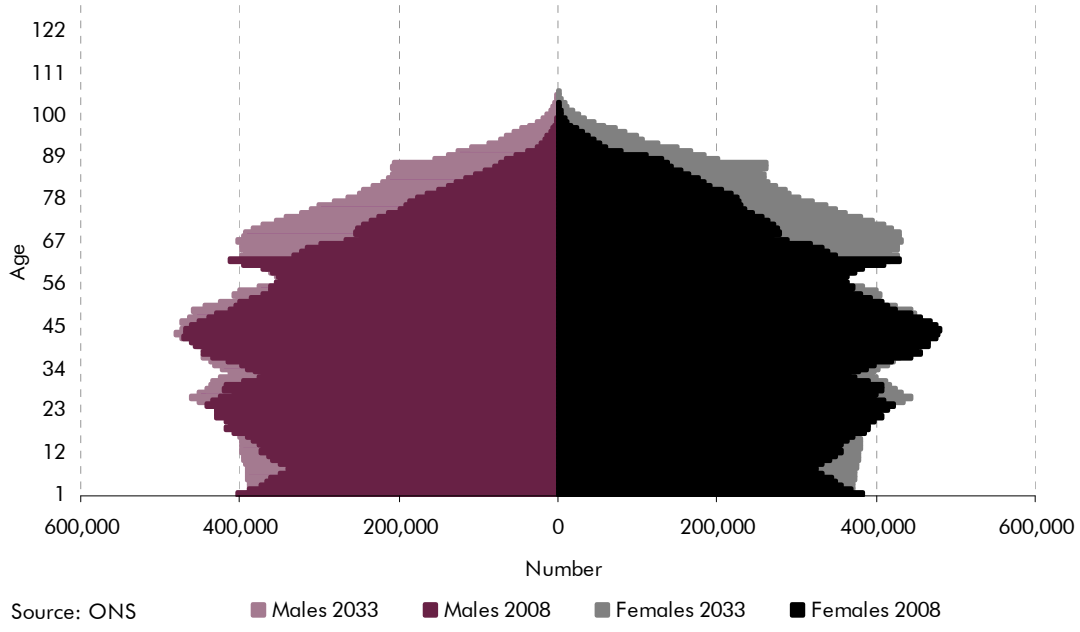
B.8 However, whilst precision in these projections is elusive, the general direction of travel is more discernable. In particular the UK, as with many developed nations, is projected to have an 'ageing population' – that is, in future the proportion of the population in old age is set to increase substantially. This is largely based on three historical factors – the historical trends of increasing life expectancy, declining fertility, and the 'demographic bulge' created by the post-WWII 'baby boom'. Because these factors occurred in the past, their impact on the shape of the population in future years can be estimated with reasonable accuracy. What creates uncertainty in the projections is the assumptions on future rates of longevity, fertility and migration.

The post-war baby-boom

B.9 The baby-boom was caused by a surge in birth rates in the UK in the aftermath of WWII from 1946 to around the mid 1960s. A similar surge was seen in much of Europe and North America. This surge is normally seen in two waves, with a second, larger wave born in the 1960s. The effect of this is to create a 'demographic bulge', which initially skewed the age distribution towards younger people, and for many years lowered the average age of the population. With time the bulge has moved through the age distribution, and so led to an increasing average population age.

B.10 The demographic bulge created by the baby boomers will continue to move through the population age distribution, as shown in Chart B.2. This will occur largely regardless of any future changes in longevity, fertility and migration. In many developed countries the ageing of these baby boomers constitutes the key challenge for the sustainability of the public finances. The first of the baby boomers are now reaching the age of 65, which is the current male State Pension Age in the UK. Assuming that the majority live into their mid-80s the average age of the UK population will continue to rise until around 2050. After this point, the shape of the population will return to being largely dictated by the underlying trends in longevity, fertility and migration.

Chart B.2: Population pyramid



Life expectancy

B.11 The trend of rising longevity has been occurring for many centuries. Historically, improvements in longevity have often been a result of the reduction in deaths at young ages, through better sanitation and medication, and through better management of epidemics. However, gains in life expectancy have continued in recent years through further advances in medicine and changes in life-style, although this can vary significantly between different subsets of the population.[2]

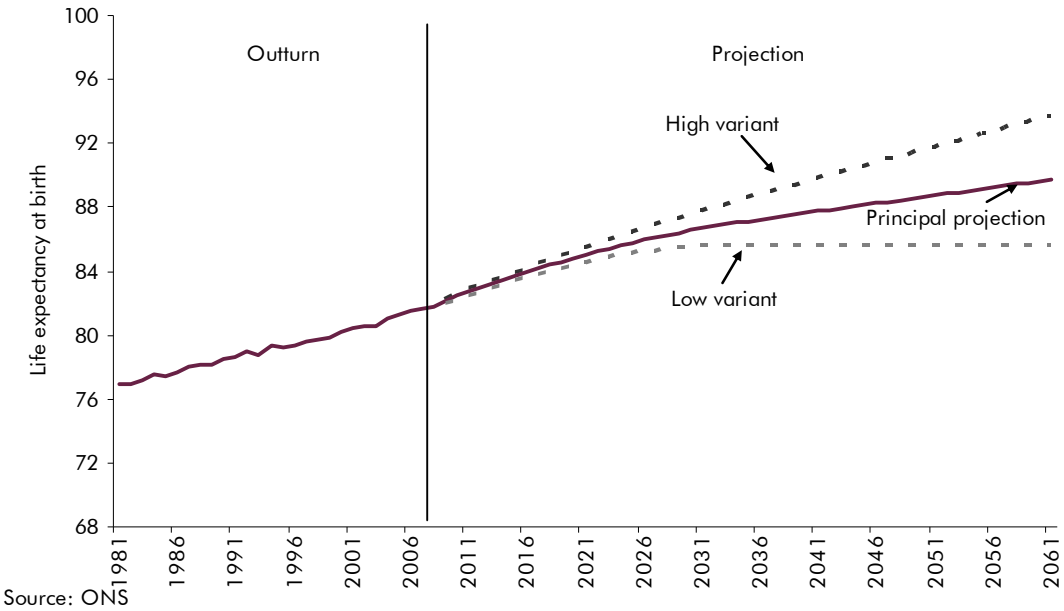
B.12 In the central ONS population projections these improvements in life expectancy are assumed to continue in the future. Arguably this is more certain than the assumptions made on future trends in fertility and migration. However, there is still huge debate over whether previous increases in life expectancy can be repeated in the future. 'Limit theorists' consider that there is a distinct biological limit to life expectancy on which we are converging, while 'no-limit theorists' believe that increases at the current rate will be able to be sustained indefinitely into the future.[3] The ONS therefore also produce a high and low variant for life expectancy which we also use in our projections. This is shown in Chart B.3, where life expectancy either trails off or continues to increase depending on the specific longevity assumption.

B.13 Longevity assumptions have a marginal effect on the size of the working age population over the course of the fifty year period that we are considering. However, they have a significant effect on the relative size and evolution of older age groups. A very important related issue is the amount of extra life expectancy that is spent in good health. If greater numbers of older age groups are spending a greater portion of their lifetime in ill health, then this will have a strong impact on projections of the demand for health care and long-term care. These are two important drivers of our projections for future government health care spending, as discussed in Chapter 3 of the main *Fiscal sustainability report* and in Annex D of this document.

[2] Woods et al (2004)

[3] Olshansky et al. (2001) and Oeppen and Vaupel (2002).

Chart B.3: Historic and projected life expectancy at birth (female)



Source: ONS

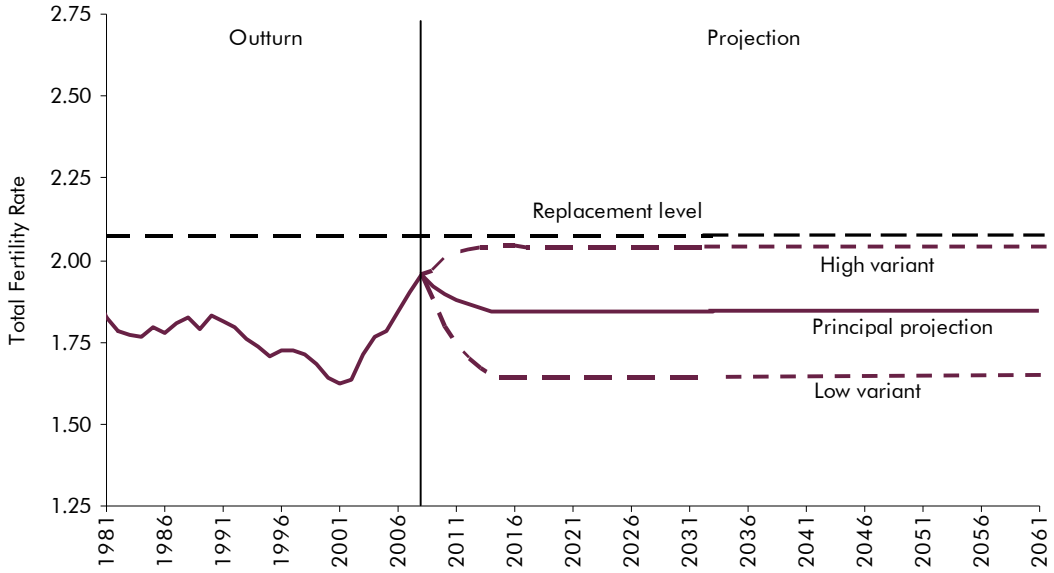
Fertility

B.14 Assumptions around future fertility levels (the average number of children per female) are probably even less certain than for longevity. Whilst there are various measurements of fertility, total fertility rates in the developed world have been falling since around 1970. The rate of fertility that would hold the population constant in the absence of any migration is usually assumed to be around 2.1, and fertility in the UK has largely been below this rate for the last 30 years. However, for the ten years up to 2008, fertility rates in the UK had been increasing, a trend not seen in the majority of other developed nations.[4]

B.15 In the ONS central projections, total fertility rates in the UK are projected to decline following recent increases to 1.8 children per female, around the average of the last twenty to thirty years. The ONS also produce two variants on the basis of changing fertility levels for different age groups. Factors that are considered possible influences on these rates include the level of education and labour force participation and the relative cost of caring for children. The fertility rate of migrant groups is also likely to have an impact on the UK's total fertility rate, so the previous level and composition of migration is also a factor. The balance of these factors can vary significantly between any given years, as reflected in Chart B.4. Fertility rates did start to fall back in 2009, the first year following the production of the 2008 projections, but recovered in 2010.

[4] ONS (2011)

Chart B.4: Historic and projected total fertility rate



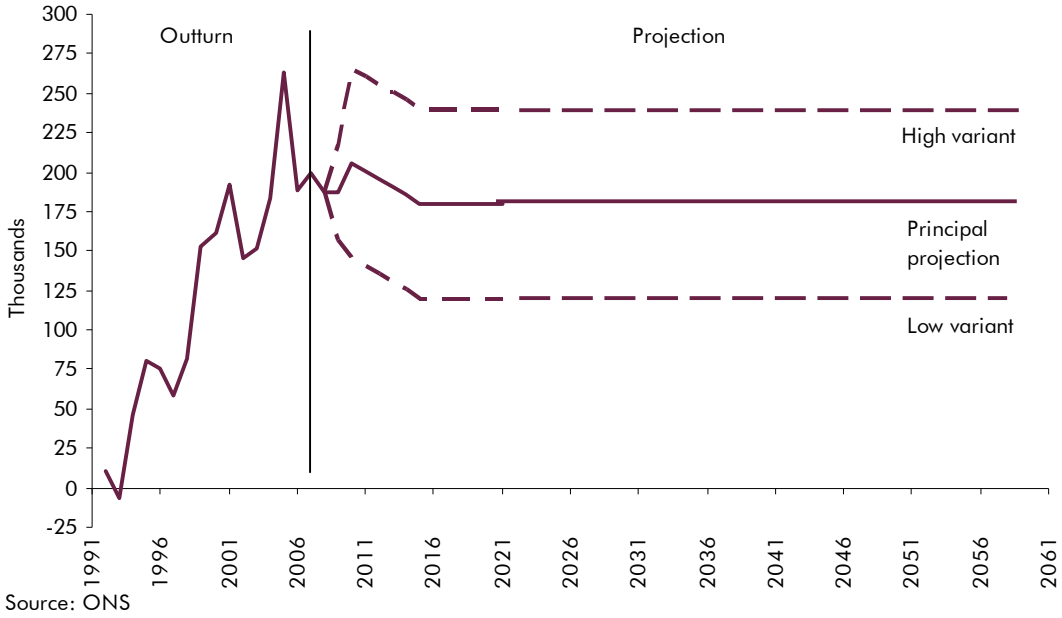
Source: ONS

Migration

B.16 Migration is the final driver of the population projections. It is net migration – the balance of inflows against outflows of migrants – that is important for the overall impact on the demography of the UK. The UK has recently seen positive net migration which has been attributed in part to the effects of globalisation and the expansion of the EU. Future flows of migration are highly uncertain and will depend on a range of economic and social factors, as well as policy choices made by future governments.

B.17 Inward migrants are assumed in the ONS projections to be more concentrated in working age than the population in general. As shown in Chart B.5, the ONS principal projection assumes that net migration to the UK rises to over 200,000, before falling back to 180,000 in 2014-15. Alternative high and low variants are produced with annual net migration of 240,000 and 120,000 respectively. These are intended as plausible alternative scenarios rather than confidence intervals, and are not based on the assessment of factors that are likely to affect annual net migration in future. These factors are hard to forecast because they are very dependent on the relative attractiveness of the UK as a migration destination.

Chart B.5: Historic and projected annual net migration



Source: ONS

Population projection variants

B.18 Different assumptions on the drivers outlined above will result in very different population sizes and structures over the fifty year period than we are considering in our central projections. We therefore use the different population variants produced by the ONS to show the sensitivity of our economic and public finance projections to these assumptions.

B.19 We have made the judgement that in order to align our projections with the medium-term forecast produced in the March *Economic and fiscal outlook,* we would use the ONS low migration variant as our central projection. There are a number of reasons we might expect net migration to be lower than the 180,000 principal projection over the long run, including both the removal of migration restrictions for A8 migrants across the rest of the EU and stated government policy over the shorter term. The ONS low net migration scenario is also consistent with our assumption for our medium-term economic forecasts of around 140,000 per annum on average over the medium-term forecast period. To consider sensitivity around this we have looked at a variant using the ONS high migration assumption. Table B.1 shows the variants that we have opted to use for our sensitivity analysis.

Table B.1: ONS population variants

	Fertility rate	Life expectancy at birth in 2033 (years)		Long-term average annual net migration (thousands)	Size of population in 2060 (millions)	
		Males	Females		16-65	Total
Low migration[1]	1.84	83.1	86.9	120	43.4	75.1
Old age structure	1.64	85.0	88.1	120	40.4	72.1
Young age structure	2.04	81.2	85.7	240	52.3	87.4
High migration	1.84	83.1	86.9	240	49.2	83.9

[1] Consistent with our central variant.

Why demographics matter – the economic impact

B.20 Economic growth is the product of employment growth and productivity growth. Demographic change is likely to alter the employment level within the economy. In the simplest approach one could assume that current total employment rates remain the same and that changes in employment levels are driven purely by changes in the size of the overall population. However, this would fail to capture important labour market participation trends related to age and gender.

Cohort method of employment projection

B.21 Our approach projects future labour market participation and employment rates based on historic participation profiles of different 'cohorts', i.e. a subset of the overall population grouped by date of birth and sex. Using this data it is possible to calculate the rate of entry into and exit from the labour force by gender and by each year of age.

B.22 It is then possible to apply these entry and exit rates so as to project a new participation rate for a cohort ageing one year. This process can be repeated for each further year, using the relevant entry or exit rate for each age and gender, to create projected participation rate profiles for all future years. By applying these participation rates to population projections it is then possible to project labour market participation levels, and, from this, employment and unemployment levels.[5]

[5] For a more technical derivation of the cohort method, see HM Treasury (2005) or European Commission (2009).

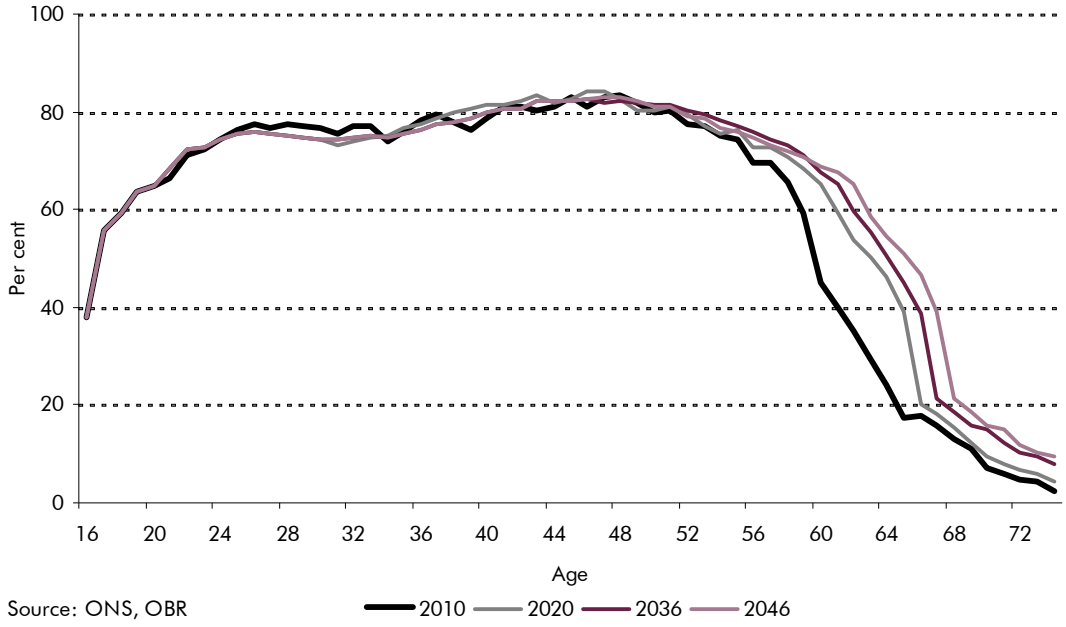
B.23 In calculating the entry and exit rates to be used in the cohort model, we have used an average calculated from 1997 to 2008. Using the most recent data would have captured cyclical effects related to the financial crisis and recession, which would have then been locked into all future employment projections.

B.24 There are several trends in recent labour market activity that we have also incorporated into the cohort model. One such adaptation is for the increasing proportion of younger cohorts entering higher education, which is likely to be more noticeable as school leaving age increases to 17 in 2013 and 18 in 2015. The impact of this trend is to reduce the (labour market) participation rates of these cohorts, but in doing so it creates a lower base to which future entry rates would be applied. This seems unreasonable given that higher educational attainment is likely to lead to higher participation in the labour market. For this reason we have taken the approach of applying accelerated entry rates for cohorts aged 20 to 24. As entry rates are increasing with age across these cohorts, the accelerated re-entry should offset the lower base participation rate.

B.25 Another important factor to incorporate into the projections is the likely impact of the increasing State Pension Ages (SPA). As a result of policy introduced by the Government, female State Pension Ages will rise from 60 to 65 by 2018. From 2018 to 2020 there will then be a further increase for males and females to 66. Further changes to 67 and 68 then occur from 2034 to 2036 and 2044 to 2046 respectively.

B.26 To account for this we adjust the cohort model by reducing female exit rates near the State Pension Age. We structure this so that female and male exit rates equalise by 2020. For further increases in the SPA a similar process is used. This effectively shifts exit rates profiles on one year, meaning a 66 year old when the SPA is 67 has the rate equivalent to a 65 year old when the SPA is 66. We smooth this transmission of exit rates over a ten year period so that a small proportion of the cohort starts to adjust ten years before the policy is introduced. The overall impact of this approach is to increase the participation rates of older age groups later in the projections. This can be seen by the rightward shift in profiles for future years in Chart B.6.

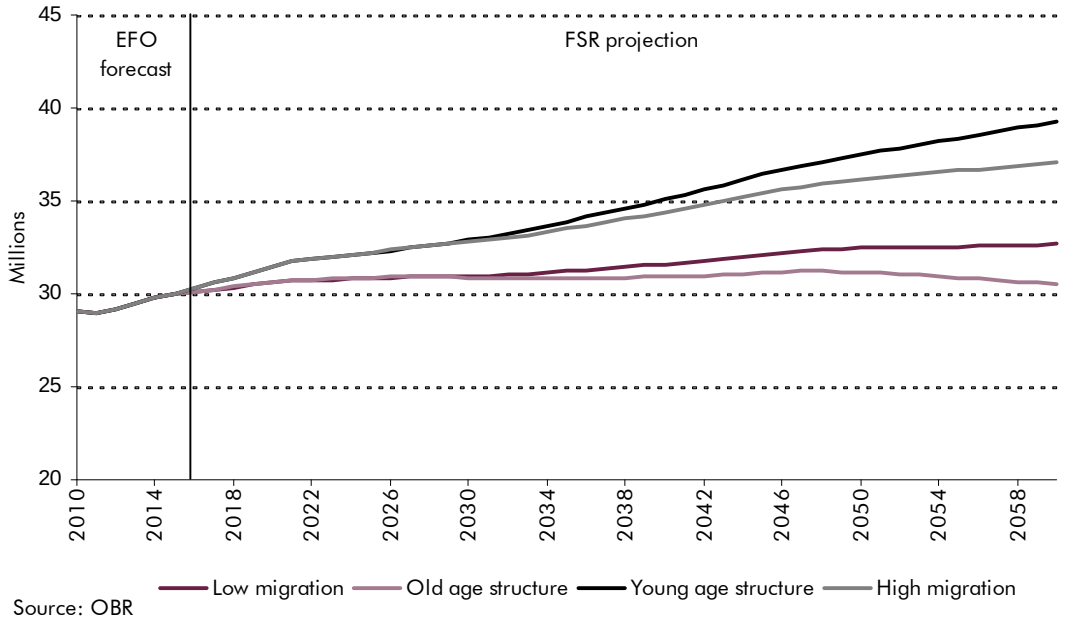
Chart B.6: Female participation rates



Source: ONS, OBR

B.27 From these participation rates it is possible to project employment rates for the different population scenarios that we are interested in. These are shown in Chart B.7. In general, total employment increases, driven by increases in the working age population.

Chart B.7: Projection of total employment



Source: OBR

Productivity and economic growth

B.28 As stated earlier, economic growth is the product of employment growth and productivity growth. We have assumed in our central variant that productivity growth will average 2 per cent, measured on an output per worker basis, over the projection horizon. This is simply based on the average growth experienced over the past 50 years in the UK, as shown in Chart B.8. The average from 1961 to 2010 is 1.9 per cent, but if considered up to 2007, before the financial crisis, the average is 2.1 per cent. We therefore consider 2 per cent a suitable central assumption.

Chart B.8: Log productivity level (output per worker)

Source: ONS, OBR

B.29 Whilst the rate of productivity growth has been fairly constant over this period, there is no reason that this has to continue for the next 50 years. There are numerous reasons why productivity growth could change over this period, dependent on the relationship between labour, capital and technology. There is also mixed evidence towards the impact of ageing on productivity,[6] although as the composition of the workforce remains relatively constant in our projections, changes in productivity of older workers are unlikely to have significant affects on output per worker. However, to take account of the uncertainty regarding productivity growth, we also conduct variant assumptions for productivity of 2.5 per cent and 1.5 per cent.

[6] Skirbekk, V (2003)

B.30 Combining the projected employment and productivity rates produces the projected GDP growth rates given in Table B.2. The period for 2010-11 to 2019-20 includes above trend growth in 2016-17 and 2017-18, consistent with our medium-term forecast.

Table B.2: Economic growth rates for variant assumptions

	Real GDP growth (per cent)				
	2010-11 to 2019-20	2020-21 to 2029-20	2030-31 to 2039-40	2040-41 to 2049-50	2050-51 to 2060-61
Low migration[1]	2.5	2.1	2.2	2.3	2.1
Old age structure	2.5	2.1	2.0	2.1	1.8
Young age structure	2.8	2.4	2.7	2.7	2.5
High migration	2.8	2.4	2.5	2.5	2.3

[1] Consistent with our central variant.

Additional assumptions

B.31 These real growth rates are the key economic assumptions for our model. However, some of the analysis that we conduct requires use of nominal figures, and other additional assumptions. We have assumed that over the long term the GDP deflator increases by 2.7 per cent per year, consistent with the assumption at the end of our medium-term forecast. We also assume that nominal wage growth is the combination of changes in the GDP deflator and our productivity growth assumption.

B.32 Another key assumption is that the Bank of England will meet the inflation target, so that CPI inflation remains at 2 per cent over the long term. We also assume a long-term wedge between CPI inflation and RPI inflation of 1.2 percentage points, meaning the long-term trend is for RPI inflation of 3.2 per cent. However, the figure for 2015-16 is still higher than this assumption, at 3.8 per cent, reflecting the fact that mortgage interest payments are assumed to rise faster than earnings over the medium term. We therefore smooth a transition path for inflation to the long-term assumption over a five year period.

B.33 We project future interest rates on the stock of government debt and assets using yield curve projections provided by the Debt Management Office (DMO). In particular, we use a weighted average of short, medium and long-term gilt rates, and hold this average constant after 2020 at 5.1 per cent.

Items included in the OBR long-term public finance model

B.34 The assumptions set out above are used to project a large number of government revenue and expenditure items in our long-term public finance model, allowing projections of total government revenue and expenditure to be built bottom-up. Here we provide a list of all the individual elements projected in the model.

Revenue

- Income tax
- Corporation tax
- Taxes on capital gains
- Petrol revenue tax
- Other taxes on income and wealth
- VAT
- Fuel duty
- Tobacco
- Alcohol
- National non-domestic rates
- Stamp duties
- Betting, gaming and lottery
- Insurance premium tax
- Payment to National Lottery distribution fund
- Other customs and excise duties
- Vehicle excise duty paid by business
- Other taxes on production
- Other miscellaneous taxes on production
- Council tax
- Vehicle excise duty paid by households
- Other miscellaneous taxes transfers and fees
- Inheritance tax
- Total national insurance contributions
- Contributions to public service pension schemes
- Rent and other current transfers
- Gross operating surplus
- Vehicle excise duty paid by business
- Other taxes on production
- Other miscellaneous taxes on production
- Council tax

Expenditure

- Retirement pension: basic (including non-contributory)
- Retirement pension: state earnings-related pension scheme & state second pension
- Pension credit
- Other pension benefits
- Other DWP benefits
- Public service pensions
- Child Benefit
- Child & working tax credit (expenditure element)
- Student grants
- Total final consumption: education: schools
- Total final consumption: education: higher education full time
- Total final consumption: education: higher education part time
- Total final consumption: education: further education full time
- Total final consumption: education: further education part time
- Total final consumption: personal social services: residential social care
- Total final consumption expenditure: health: hospital and community health service (HCHS) Service under 45s
- Total final consumption expenditure: health: HCHS over 45s death-related
- Total final consumption expenditure: health: HCHS over 45s age-related
- Total final consumption expenditure: health: family health service excluding drugs
- Total final consumption expenditure: other
- Miscellaneous current transfers: grants to schools
- Miscellaneous current transfers: grants to higher education
- Miscellaneous current transfers: grants to further education
- Miscellaneous current transfers: other grants to non-profit institutions
- Miscellaneous current transfers: grants to NHS for intermediate consumption
- Subsidies: health
- Subsidies: other (non-attributable)
- Gross capital formation: education
- Gross capital formation: health
- Gross capital formation: housing
- Gross capital formation: other
- Miscellaneous current transfers: grants to higher education

- Miscellaneous current transfers: grants to further education
- Miscellaneous current transfers: other grants to non-profit institutions
- Miscellaneous current transfers: grants to NHS for intermediate consumption
- Subsidies: health
- Subsidies: other (non-attributable)
- Gross capital formation: education
- Gross capital formation: health
- Gross capital formation: housing
- Gross capital formation: other
- Child & working tax credit (expenditure element)
- Student grants
- Total final consumption: education: schools
- Total final consumption: education: higher education full time
- Current international cooperation
- Capital transfers payable: education
- Capital transfers payable: health
- Capital transfers payable: private non-financial corporations
- Compensation of employees: contributions: education
- Compensation of employees: contributions: social services
- Compensation of employees: contributions: health
- Compensation of employees: contributions: other

C Income tax and benefits uprating assumptions in the long-term projections

C.1 The long-term projections that we produce for the *Fiscal sustainability report* are based on an assumption of 'unchanged' government policy. Over the five year forecasting horizon of the OBR's *Economic and fiscal outlooks,* the Government's tax and spending policies are usually publicly announced and well-defined. In most cases, however, a long-term policy is not clearly defined. And in many cases to simply assume that the Government would maintain the medium-term policy over many decades would be unrealistic and paint a misleading picture of fiscal sustainability. So in the absence of a well-defined long-term policy, we make an appropriate and transparent assumption about policy over the longer term.

C.2 This annex explores the significance of the assumptions we have chosen to use in two areas. In both cases our assumptions depart from the stated medium-term policy:

- the annual uprating of tax allowances and thresholds and the impact this has on future liabilities of income tax and National Insurance Contributions (NIC); and
- the annual uprating of working age and pensioner benefits.

C.3 The transition from the stated medium-term policy to our long-term assumptions takes place at the end of the medium-term forecast period and should not be taken to imply that current policy on either tax thresholds or benefit uprating suddenly becomes unrealistic.

C.4 In our medium-term forecasts, unless the Government states otherwise, it is assumed to uprate income tax allowances and thresholds in line with inflation. But because earnings typically rise more quickly than prices, this definition of unchanged policy will result in the average tax rate rising steadily over time as people find more of their income becoming subject to higher tax bands. This effect is known as 'fiscal drag'. In our long-term projections we therefore assume that allowances and thresholds rise in line with earnings rather than prices beyond the medium-term horizon, turning off fiscal drag after five years.

C.5 A similar issue arises on spending, where uprating benefits in line with prices rather than average earnings over the long-term would see the value of those benefits shrinking steadily relative to the living standards of the bulk of the population. In our long-term projections we therefore increase benefits in line with earnings from the medium-term onwards.

Income tax and national insurance contributions

C.6 Fiscal drag is the process by which the average tax rate rises if allowances and thresholds are indexed to prices rather than earnings, resulting in more taxpayers' income becoming subject to higher tax bands. In the UK in recent decades, fiscal drag and the impact of policy decisions has helped to push up the numbers of higher rate taxpayers and the proportion of all taxpayers they represent[1]. In the decade up to 2007-08 the number of higher rate taxpayers increased by 1.75 million to 3.87 million, rising as a share of all taxpayers from 8.1 per cent to 11.9 per cent.

C.7 More recently, inflation has outpaced earnings growth, so the impact from fiscal drag would be negative. However, as part of the June 2010 Budget, the basic rate limit was lowered with the aim that higher rate taxpayers did not benefit from the rise in the personal allowance. HMRC projections show that the number of higher and additional rate taxpayers this year will reach 4.05 million or 13.5 per cent of all taxpayers[2].

C.8 HMRC's Personal Tax Model (PTM) can be used to provide projections of the impact of fiscal drag in income tax and NIC liabilities up to 2030-31. The basic methodology consists of projecting forward the nominal incomes of taxpayers from the baseline[3] to 2030-31 using OBR's latest assumption for the trend growth in nominal GDP per capita, which is 4.4 per cent per year[4]. Then, the size of income tax and NIC liabilities and the personal taxpaying populations are measured in two different scenarios where income tax and NIC allowances and thresholds are uprated according to:

[1] The higher rate of 40 per cent has been in place since 1988-89; previously the higher rate was in the range 40-60 per cent from 1979-80.

[2] See HMRC Survey of Personal Incomes Table 2.1, available at www.hmrc.gov.uk/stats/income_tax/table2-1.pdf

[3] This baseline is consistent with the 2007-08 Survey of Personal Incomes and OBR's medium term forecast assumptions used in the March 2011 *Economic and fiscal outlook* and includes both labour and non-labour income sources liable to income tax and NIC.

[4] For simplicity, the population in the Personal Tax Model is fixed at its 2016-17 projected levels. Therefore it makes more sense to assume incomes grow in line with nominal GDP per capita at 4.4 per cent per year rather than nominal GDP growth of 4.7 per cent per year.

- CPI price indexation (2 per cent per year); and
- Full income indexation (4.4 per cent per year).

C.9 The differences in estimated liabilities of income tax and NIC and the personal taxpayer populations under these two scenarios represent the cumulative impact of fiscal drag over the period.

C.10 One indicator of fiscal drag is a comparison of the median wage reported in the Annual Survey of Hours and Earnings (ASHE)[5] with the level at which taxpayers would start to pay some of their income at the higher rate. In this example, where incomes rise in line with nominal GDP per capita and tax thresholds rise in line with CPI inflation, a taxpayer would start to pay some of their income at the higher rate in 2016-17 if their wage was 84 per cent above the median wage in the economy. By 2030-31, a taxpayer would start to pay at the higher rate if their wage was 33 per cent above the median wage.

C.11 The analysis is based entirely on the income tax and NIC regimes currently in place. Therefore, we make no adjustments for the Government's stated aim of increasing the personal allowance to £10,000, since as set out in the March *Economic and fiscal outlook* no commitment has been made on the timing for meeting this aim over the medium-term forecast horizon. Furthermore, the additional rate of income tax levied at £150,000 and the personal allowance taper that comes into effect at income over £100,000 have been kept in place. In accordance with Government policy, neither of these thresholds is index linked so are not uprated in line with CPI inflation[6].

C.12 Table C.1 presents headline results for income tax. Cumulative fiscal drag between 2016-17 and 2030-31 is estimated at £90 billion (2.3 per cent of GDP), adding 1.5 percentage points to average annual growth in income tax liabilities over the period and raising the ratio of income tax liabilities to GDP by 0.16 percentage points per year. This is higher than in previous Budget forecasts which assumed an increase of 0.1 percentage points per year and is largely due to the introduction of the additional rate and personal allowance taper, and also the move from RPI to CPI indexation which results in a slower uprating of nominal thresholds and allowances[7].

[5] The results of ASHE are available at www.statistics.gov.uk/StatBase/Product.asp?vlnk=13101

[6] Both thresholds for the additional rate and personal allowance taper were held constant in the latest Budget having been introduced in April 2010.

[7] Box 3.5 in the March 2011 *Economic and fiscal outlook* looks at the long-run difference between inflation rates measured by the CPI and RPI. If coverage and weights in the two indices were identical the use of

Table C.1 Income tax modelled fiscal drag: 2016-17 to 2030-31

	2030-31		Impact of fiscal drag				
	CPI indexation	Income indexation	Total	Allowances	Basic rate limit	Higher rate limit/£100K price effect	Higher rate limit/£100K real effect
Liabilities							
£ millions	487.0	397.0	90.0	40.3	27.6	11.7	10.5
Per cent of GDP	12.4	10.1	2.3	1.0	0.7	0.3	0.3
Numbers liable (millions)							
Total	35.5	31.4	4.0	4.0	0.1	0	0
Basic rate	25.2	26.1	-0.9	2.7	-3.6	0	0
Higher rate	8.7	4.9	3.8	1.2	3.7	-0.7	-0.4
Additional rate	1.6	0.5	1.1	0	0	0.7	0.4

Source: HMRC calculations

C.13 Tax allowances make the largest contribution to the total effect at £40.3 billion, as an additional 4.0 million taxpayers are shifted into paying income tax. Much of the effect would be from taxpayers paying a higher proportion of their income at the basic rate because the tax allowance threshold increases less quickly each year when uprated by CPI rather than income. The basic rate limit contributes a further £27.6 billion, with an extra 3.7 million taxpayers moving into the higher rate tax band, but with most of the yield coming from those who would be higher rate taxpayers with or without fiscal drag. As a result there is a net outflow of 0.9 million taxpayers from the basic rate[8].

C.14 The additional rate threshold and personal allowance taper contribute a further £22 billion. This is split into a price effect of £11.7 billion from not uprating the threshold in line with CPI inflation and a real effect of £10.5 billion from not further uprating these thresholds in line with incomes. Numbers liable at the additional rate would be three times higher when fixed in nominal terms compared with full income indexation.

C.15 Table C.2 presents headline results for NIC[9]. Cumulative fiscal drag between 2016-17 and 2030-31 is estimated at £11.6 billion (0.3 per cent of GDP),

different formulae means that RPI inflation would exceed CPI inflation. This formula effect has risen from around 0.5 percentage points to 0.8 percentage points in the last year due to changes in the way which prices of clothing are measured.

[8] The Survey of Personal Incomes is primarily a taxpayer survey so might under represent low income non-taxpayers who would have become taxpayers if incomes were projected forward at 4.4 per cent up until 2030-31.

[9] Analysis of NIC in HMRC's Personal Tax Model is based on the simplified modelling assumption that NIC operates on an annual and cumulative basis like income tax.

adding 0.3 percentage points to average annual growth in NIC liabilities over the period. Overall, fiscal drag raises the ratio of NIC liabilities to GDP by just 0.02 percentage points per year over the period.

Table C.2 NIC modelled fiscal drag: 2016-17 to 2030-31

	2030-31		Impact of fiscal drag		
	CPI indexation	Income indexation	Total	Lower limits	Upper limits
Liabilities (£ billions)					
Total: -	257.0	245.0	11.6	25.3	-13.6
of which Individual	104.0	105.0	-1.5	12.1	-13.6
of which Employer	153.0	140.0	13.1	13.1	0
Liabilities (per cent of GDP)					
Total: -	6.5	6.2	0.3	0.6	-0.3
of which Individual	2.6	2.6	0	0.3	-0.3
of which Employer	3.9	3.6	0.3	0.3	0
Numbers liable (millions)					
Employee (Class 1 Primary) and self-employed (Class 4) total	27.4	24.9	2.5	2.5	0
of which main rate	19.4	20.8	-1.4	2.5	-4.0
of which additional rate	8.0	4.1	4.0	0	4.0
Employer (Class 1 Secondary)	36.3	32.6	3.7	0	0

Source: HMRC calculations

C.16 The low impact of fiscal drag on average rates of NIC liabilities is mainly because fiscal drag is mildly negative overall for employee NIC. The rate structure for employee (Class 1 Primary) and self-employment (Class 4) contributions is such that the marginal rate falls to 2 per cent above the upper earnings limit from standard rates of 12 per cent and 9 per cent respectively. Fiscal drag is estimated to bring an additional 2.5 million individuals into NIC by 2030-31, but with a net outflow of 1.4 million from main to additional rates. So while an additional £12.1 billion is raised from not fully indexing the primary threshold, £13.6 billion is lost from also not fully indexing the upper limit with respect to income leading to an overall reduction of £1.5 billion in personal NIC liabilities.

C.17 Therefore, overall positive fiscal drag for NIC is more than explained by employer NIC (Class 1 Secondary) where the standard rate above the lower earnings limit is 13.8 per cent and no upper threshold exists. An extra £13.1 billion is generated by indexing the lower limit relative to CPI growth rather than income growth.

Benefits uprating

C.18 The value of individual benefit payments over time is strongly determined by how they are uprated. In this section, we illustrate the implications of the assumption

we use in our central long-term projections that benefits are generally uprated in line with average earnings.

C.19 To do this we compare the shares of total working age benefits (including child benefit) and pensioner benefits in GDP on the basis of:

- the assumption used for our central long-term projections where benefits are uprated in line with average earnings; and
- medium-term policy settings where some benefits are uprated in line with CPI inflation.

C.20 Projections of the future levels of working age and pensioner benefits in each case have been provided by DWP[10]. The overarching demographic assumptions are based on the population projections used in Chapter 3 which are outlined in more detail in Annex B.

C.21 Economic assumptions are consistent with our March 2011 *Economic and fiscal outlook* forecasts to 2015-16 and with our longer-term projections from 2016-17 onwards. The key economic assumptions for benefits uprating are the rates of CPI inflation and average earnings growth. Beyond the forecast period, annual CPI inflation is projected at 2 per cent in line with the Bank of England's inflation target. Average earnings growth is projected at 4.7 per cent reflecting trend productivity growth of 2 per cent and average growth in the GDP deflator of 2.7 per cent each year.

C.22 Projections for working age benefits consist of two parts. First a projection of future caseloads for each benefit is made using the OBR's cohort employment model. These are consistent with our long-term population projections and key economic determinants such as unemployment, employment and inactivity. Second, the future value of each benefit is projected using the average earnings approach that we use in our central projections and current medium-term policy assumptions. Medium-term policy is that most working age benefits are uprated by CPI inflation. The main exceptions are the variable elements of statutory maternity pay and maternity allowances which are uprated in line with earnings[11].

[10] With the exception of child benefit and tax credits. These projections have been generated by OBR and are also consistent with long-term demographic and economic assumptions.

[11] There are also a couple of minor exceptions to uprating by CPI inflation. The triple guarantee (the highest of CPI inflation, average earnings growth or 2.5 per cent) is in place for industrial death benefit. Return to work credit, in-work credit, Christmas bonus, specialised vehicles fund and vaccine damage fund payments are not uprated. However, the total value of these benefits was less than 0.1 per cent of GDP in 2010-11.

C.23 In both sets of projections we assume Universal Credit is introduced in 2013 and replaces a suite of current benefits including tax credits, income support, housing benefit and the non-contributory portions of employment and support allowances and jobseekers allowance. The approach taken in our projections is to model the continuation of the current suite of benefits with the estimated marginal cost of Universal Credit of £3 billion added on, which is then projected in line with spending on the current benefits it will replace.

C.24 For pensioner benefits the projections take account of changes to state pension age, which are equalised for men and women at 65 years by November 2018 and increased to 66 years by April 2020[12]. Again for an analysis of pensioner benefits we compare the implications of using earnings uprating as in our central projections against uprating with current medium-term policy settings. However, in this case the earnings uprating variant is relatively similar to current policy. This is because under current policy settings:

- the basic state pension is subject to the triple guarantee meaning it is uprated by the higher of average earnings, CPI or 2.5 per cent[13];
- although the second state pension is uprated by CPI in payment it is uprated by average earnings in accruals. This means that when someone reaches the state pension age all the additional state pension accrued over their working life is revalued by earnings;
- the standard minimum guarantee in pension credit and related housing benefit and council tax benefit parameters are uprated by earnings; and
- other pension benefits such as winter fuel payments are considered to be part of a single long-term pension system and so, for the purposes of consistency, are also treated the same in both cases[14].

C.25 Chart C.1 shows how total benefits change as a proportion of GDP with uprating by average earnings and under medium-term policy settings. At the end of the

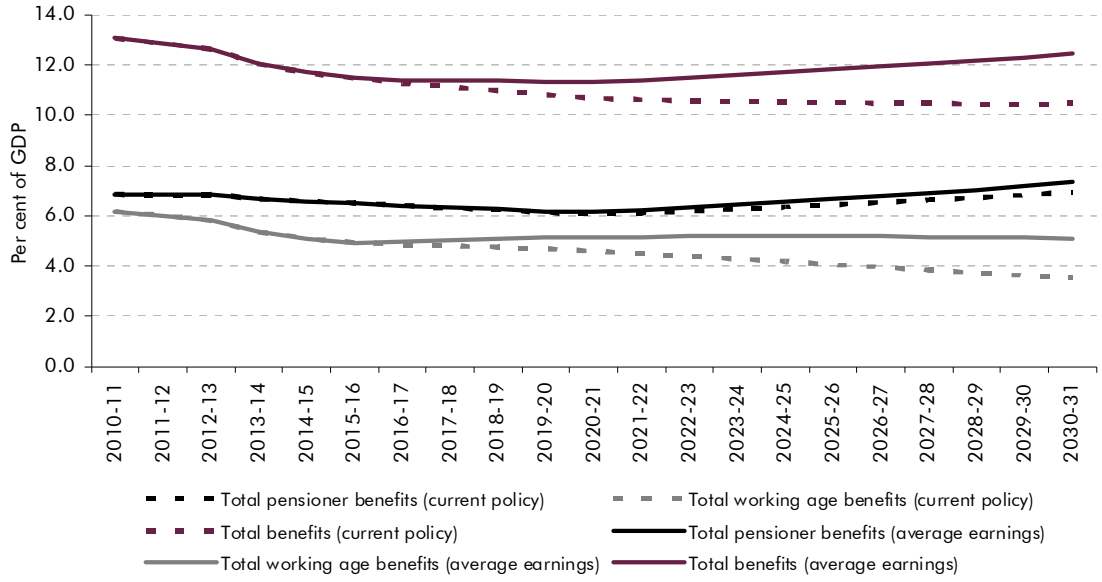
[12] State pension age increases further to 67 years between 2034 and 2036 and to 68 years between 2044 and 2046. However, these dates lie beyond the projections to 2030-31 considered here.

[13] To allow for the possibility of the other two factors exceeding the earnings increase in some years our long-term projections assume that basic state pension is uprated by earnings plus 0.2 per cent each year, on advice from GAD.

[14] In both projections winter fuel payments and the contributory part of the Christmas bonus are held flat in cash terms. If these benefits were uprated by earnings the additional spend in 2030-31would be approximately 0.03 per cent of GDP.

medium-term forecast period in 2015-16 total benefit payments are 11.4 per cent of GDP, increasing to 12.4 per cent of GDP in 2030-31 if uprated with average earnings but falling to 10.4 per cent of GDP if uprated using current policy assumptions. Therefore using the assumption of earnings uprating rather than medium-term policy means the central projections for benefits in this report are 2.0 per cent of GDP higher in 2030-31.

Chart C.1: Projections of total benefits, working age benefits and pensioner benefits as a proportion of GDP



Source: DWP and OBR projections

C.26 If uprated by average earnings, working age benefits as a percentage of GDP would be projected to increase from 4.9 per cent in 2015-16 to 5.1 per cent by 2030-31. Under the medium-term policy setting working age benefits fall as a proportion of GDP to 3.5 per cent in 2030-31 because nearly all working age benefits are uprated by CPI inflation.

C.27 With earnings increases, the proportion of total pensioner benefits to GDP increases from 6.5 per cent in 2015-16 to 7.3 per cent in 2030-31. Under medium-term policy settings there is a smaller increase in pensioner benefits to 6.9 per cent of GDP in 2030-31 in line with less generous uprating.

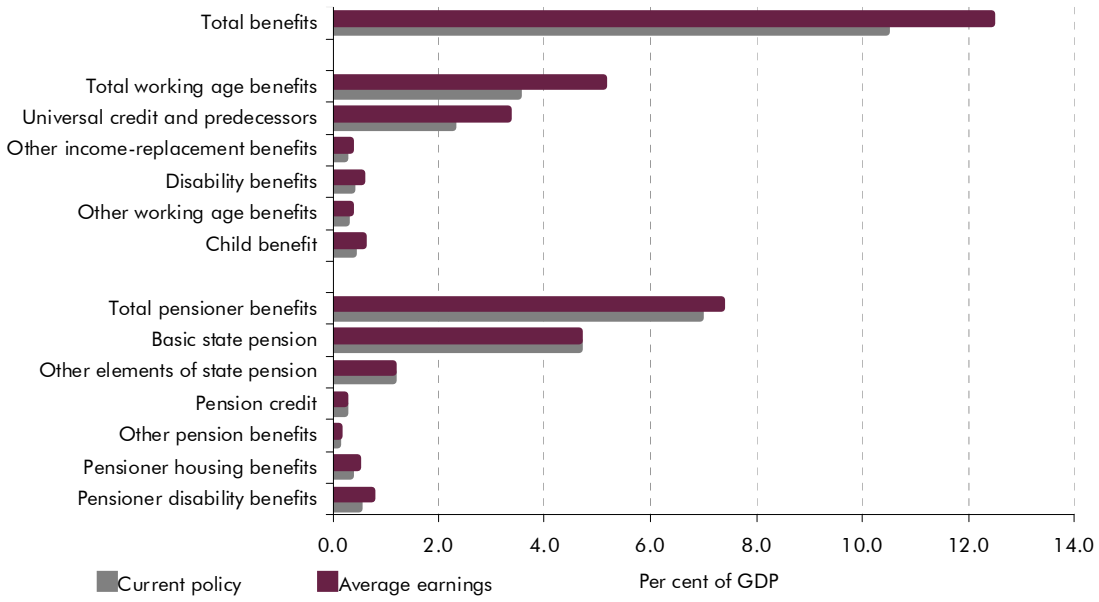
C.28 A more detailed picture of total benefit payments in 2030-31 in each case is presented in Chart C.2.

C.29 Almost all working age benefits are uprated in line with CPI under medium-term policy so the values of these benefits generally all move together. In 2030-31, working age benefits are 1.6 percentage points higher as a proportion of GDP

when uprated with average earnings rather than with medium-term policy assumptions.

C.30 Pensioner benefits are split into pension and non-pension benefits received by pensioners. Total pension benefits, which are 5.5 per cent of GDP in 2015-16, are projected to increase to 6.1 per cent of GDP in both cases as the uprating assumptions are the same. In 2030-31 total pensioner benefits as a proportion of GDP are 0.4 percentage points higher under earnings uprating than under medium-term policy. This is entirely due to the more generous uprating of pensioner disability benefits and housing benefits.

Chart C.2: Working age and pensioner benefits as a proportion of GDP in 2030-31



Source: DWP and OBR projections

Summary

C.31 The analysis in this annex shows that if we had allowed fiscal drag to continue beyond the end of the medium-forecast period, it would cumulatively increase income tax liabilities by £90 billion (2.3 per cent of GDP) and NIC liabilities by £11.6 billion (0.3 per cent of GDP) by 2030-31. Therefore, the ratio of income tax and NIC liabilities to GDP would increase by 2.6 percentage points.

C.32 Uprating working age and pensioner benefits in line with average earnings means that in our projections they are 2 percentage points higher as a proportion of GDP by 2030-31 than if they had been uprated in line with medium-term policy settings.

C.33 So relative to projections based on announced medium-term policy, the overall impact of our long-term assumptions is to reduce income tax and NIC revenues by turning off fiscal drag and to increase spending on benefits through more generous uprating. The results presented here give an indication of the size of these effects up to 2030-31 but if the analysis were extended to 2060-61 the estimated impact would be significantly larger.

C.34 While our long-term projections assume earnings uprating, this is simply a proxy for the many different policies that governments could pursue to limit fiscal drag or the decline of benefits relative to average living standards, if they chose to do so. In practice, past governments have often used ad hoc uprating arrangements or made changes to the structure of the tax and benefits systems which have similar effects.

D Long-term trends in health spending

Introduction

D.1 This section examines the assumptions we make in our long-term projections of health spending and considers some of the key sensitivities. We set out some sensitivity analysis based on varying assumptions for the relative growth of productivity in the health sector and the length of time individuals spend in poor health (morbidity).

D.2 Spending on health is of particular interest for our long term projections because it is closely linked to demographic trends. Our central projections show health-related spending rising from 7.4 per cent of GDP in 2015-16 to 9.8 per cent of GDP in 2060-61, driven primarily by the UK's ageing population structure. However, there are likely to be significant additional pressures on health spending in the future beyond pure demographics, including[1]:

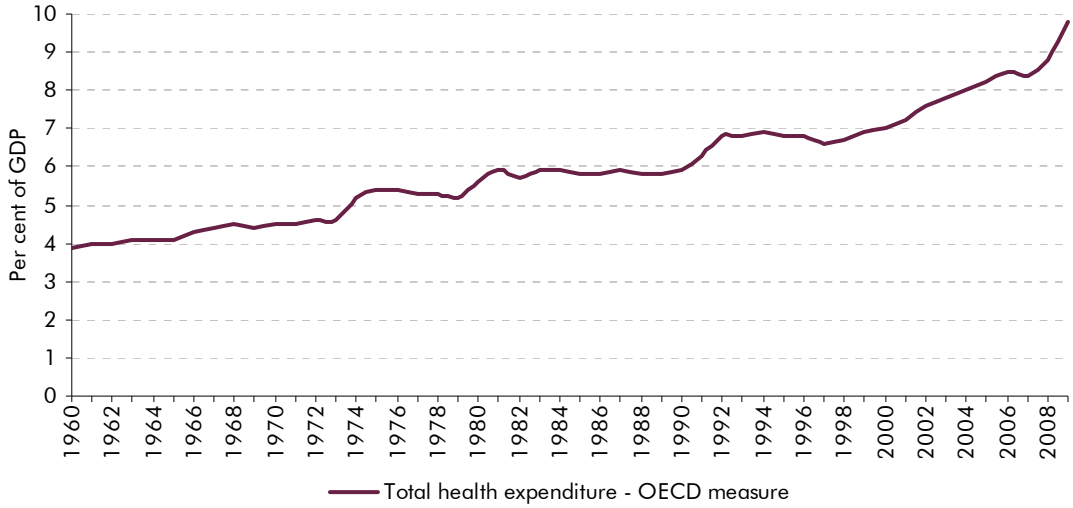
- productivity growth in the health sector and its impact on the cost of provision;
- how demand for health services changes with income;
- the health status in which extra years of life are spent; and
- the disease mix.

D.3 As Chart D.1 shows, total health spending in the UK by all sectors has grown significantly faster than national income in the past. That spending has risen by more than that implied by demographics alone[2] points to the significant contribution of other factors to underlying spending pressures.

[1] There are likely to be similar non-demographic pressures on other areas of public spending, for example education. We have chosen in this report to focus on health, given its importance to the long-term projections and the wide existing literature available on which to base our analysis. In future reports, we aim to consider other areas of public spending in a similar way.

[2] See Wanless (2001).

Chart D.1: Total health spending (OECD measure[1])



[1] OECD total expenditure on health includes expenditure on health by health administrations, prisons, the armed forces, households, charities and religious organisations, and investment in all medical facilities by all sectors of the economy.

Source: OECD

D.4 Given the significance of future trends in health spending for the public finances, a wide range of reports have looked at this issue in detail. Our discussion here draws extensively from the work of others including the Wanless Reports[3] on the UK and the European Commission (2010), which conducts similar analysis for other countries.

Assumptions for the central projection

D.5 To arrive at our central health spending projections, we first calculate spending by age and gender at the end of the medium-term forecast period in 2015-16. This is then assumed to grow by 2 per cent in each year of the long-term projection. This means that, over the projection period, real health spending is broadly constant as a share of per capita GDP for a person of a specific age and gender. We then apply projections of long-term demographic trends. This captures the implications for health spending from demographic factors such as population ageing or a change in the ratio of females to males. We do not make any explicit assumptions in our central projections about productivity growth in the health sector or changes in the level of health care per person over time, although these could have a significant impact on expenditure.

[3] See Wanless (2001, 2002, 2006).

D.6 To capture the acute health care costs associated with proximity to death, we also construct separate per-capita expenditure profiles for those in their final year of life and for those who are not, in line with Wanless (2001).

Sensitivities

D.7 In subsequent sections we consider the potential sensitivities around these core assumptions, including those relating to wider non-demographic pressures. The level of public spending devoted to health in the future will be the result of policy choices made by successive future governments. This analysis seeks to illustrate the underlying pressures which may drive these choices in the future.

Productivity and technological change

D.8 Our central projection assumes that, demographic effects aside, real spending in the health sector grows by 2 per cent a year. In the absence of demographic pressures, this assumption serves to hold health spending stable as a share of GDP in both nominal and real terms so long as prices in the health sector rise in line with those in the wider economy.

D.9 We do not make explicit assumptions in our projections about productivity growth in the health sector or changes in the level of health care per person over time. If productivity in the health sector were to improve in line with whole economy productivity, then this would tend to imply an increase in health care per person of around 2 per cent per year with a unit income elasticity of demand for health services.[4] However, given the labour intensity in much of the provision of health services and the associated difficulty of making significant productivity gains, it may be more realistic to assume that productivity in the health sector does not improve as fast as in other sectors of the economy.

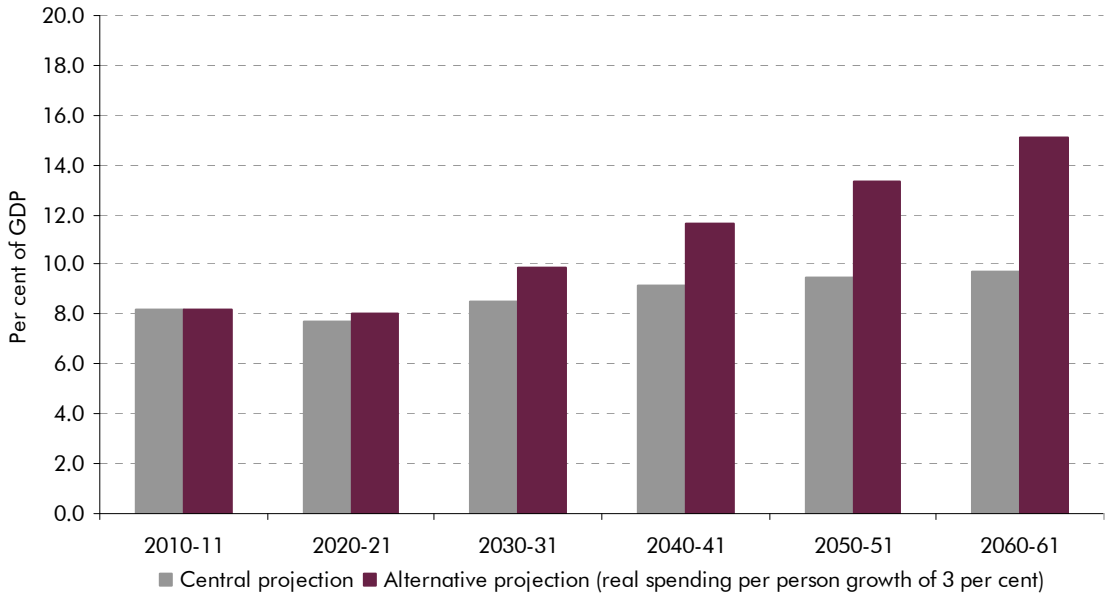
D.10 In this case, the provision of health services may be subject to 'Baumol cost disease'[5]. Under such a scenario, wage growth in the health sector keeps pace with wage growth in the rest of the economy in order to clear the labour market, even though productivity growth in the health sector lags behind that of the whole economy. Because wages grow faster than productivity, relative unit costs increase and prices in the health sector rise relative to prices in the rest of the

[4] The income elasticity of demand refers to how demand for a good changes with income. A unit income elasticity of demand for health care implies that demand for health care rises proportionately with income. In this discussion we assume that projected changes in health care demand correspond to changes in publicly-funded health care provision. Over time the private sector might also be expected to respond to changes in the demand for health care services.

[5] See Baumol (1996).

economy. With a unit income elasticity of demand for health services, expenditure on health would therefore need to increase more sharply to maintain a given improvement in health care per person each year. For example, if productivity growth in the health sector was 1 per cent lower than assumed whole economy productivity growth, then real health expenditure per person would need to increase by 3 per cent each year to maintain an improvement in health care per person of 2 per cent per year, in line with real earnings growth. This would have the effect of increasing health spending as a share of GDP in 2060-61 by just over 5 percentage points relative to our central projection (Chart D.2). In the main report, we illustrate the effect this could have on our long-term projections of public sector net debt.

Chart D.2: Projected health spending: alternative real spending per person growth



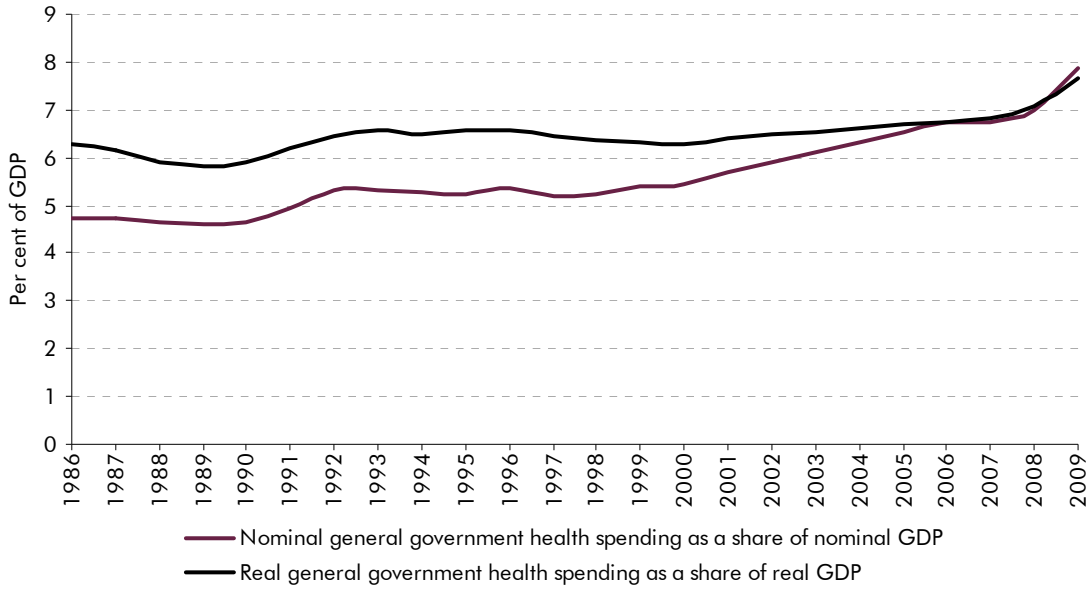
Source: ONS, OBR

D.11 One implication of Baumol cost disease is that nominal health spending as a share of GDP rises faster than real health spending as a share of GDP, as the relative price of health services increases. The historical evidence on Baumol effects is mixed. Chart D.3 shows that, until the late nineties, increases in nominal spending were roughly equated to increases in real spending. But thereafter, nominal spending rose significantly faster than real spending and, accordingly, the gap between the lines narrowed. This suggests that Baumol effects have dominated in recent years and productivity growth in the provision of health services has been weak. This is consistent with the latest estimates produced by the UK Centre for the Measurement of Government Activity (UKCeMGA), which

suggest that quality-adjusted health care productivity fell by around 3 per cent between 2000 and 2008.[6]

D.12 However, measuring historical trends in health care productivity is notoriously difficult. No market prices for government output exist, meaning that it is not possible to compare input costs with output costs and arrive at value added.[7] Instead, certain health outputs are often measured directly by, for example, the number of GP consultations. For particular components of health care, such as GP-prescribed drugs, the same method is used to construct measures of inputs and outputs, implying productivity growth close to zero. So, by construction, the data may show Baumol effects for these elements of health spending.

Chart D.3: Government health spending



Source: ONS

D.13 Whether we expect the future to be more like the earlier period than the latter has implications for the level of health services delivered by a given level of nominal spending. In our central projection, we assume that the two lines will move together in the future, more like the earlier period, which is consistent with stable income shares of expenditure in both nominal and real terms.

[6] Penaloza et al (2010).

[7] See Atkinson Review (2005) for more details on the challenges of measuring government output.

D.14 Over time, the wider availability of technology and treatments is also likely to affect spending on health. A government's price elasticity of demand for new technology is a key determinant of the resulting pressure on health spending. If demand for a procedure is price elastic then the effect of any potential improvements in efficiency associated with technological improvements would be more than offset by stronger demand. Wanless (2001) finds that technology has been a key driver of health spending, adding 2 percentage points to the annual growth rate of health spending over the preceding 20 years. International experience is also consistent with this view – in a recent survey of the literature the CBO (2008) finds that around half of the growth in health care spending in the United States over the past few decades can be attributed to technological advances.

Patient preferences and the demand for health services

D.15 Changing patient expectations and preferences driven by non-demographic trends may also alter the demands placed for health services over time. For example, patients may expect improvements in the quality of treatment or the speed with which it is administered. They may also expect greater choice over when and where they are treated. The spending implications depend on whether patients expect quality, speed and choice to improve faster than, slower than or at the same rate as incomes; and on how future governments choose to respond to changing expectations.

D.16 The extent to which demand for health services changes with income – the income elasticity of demand – is likely to be an important determinant of long-term pressures on health spending. When the income elasticity of demand for a good is greater than unity, an increase in income leads to a proportionately larger increase in spending. Therefore, spending on that good rises as a proportion of income – these types of goods are known as luxury goods.

D.17 Macroeconomic studies which estimate the income elasticity of demand for health services are typically of two types. Cross-sectional studies focus on cross-country comparisons, where the health spending share of resources varies with national income. Time-series studies look at how health spending varies with income over time. Both cross-sectional studies such as Gerdtham et al (1992) and time-series studies, such as Fogel (1999), find that health spending as a proportion of income is rising in income – the income elasticity of demand is greater than unity. However, estimates vary significantly.

D.18 A further consideration relates to the equilibrium share of national income one might reasonably expect health spending to reach. Projecting health spending forward using an income elasticity of demand that is greater than unity implies that, eventually, all income would be spent on health services. Likewise, if the

elasticity is assumed to be lower than unity nothing would be spent on health when expenditure is projected forward indefinitely. Therefore it is reasonable to assume that the income elasticity of demand for health services will eventually settle on unity so that the share of national income is stable in the long run.

Health status

D.19 A key driver of health spending is the length of time which people spend in ill health, known as morbidity. In our central projections we assume a constant health status for a person of a specific age and gender. Implicitly this assumes that the increases in life expectancy projected by the ONS will be spent partly in poor health – an expansion of morbidity.

D.20 This would be the case, for example, if advances in medical science have been focused on preventing death rather than restoring health, so that increases in life expectancy lead only to more years spent in ill-health. This places upward pressure on health spending in our projections.

D.21 An alternative assumption would be that the increase in life expectancy is composed of, on average, some increase in healthier years and some increase in years spent in poor-health. Wanless (2006) discusses the mixed evidence on improvements in healthy life expectancy in the UK and finds that healthy life expectancy has not kept pace with overall life expectancy – suggesting some degree of expansion of morbidity.[8] Chart D.4 sets out an alternative path for health spending based on the assumption that the total number of years in relative ill-health per person declines by 1 year every 10 years.[9] The resulting slower increase in morbidity implies a smaller increase in health spending over the projection period, with the health spending to GDP ratio just over half a percentage point lower by 2060-61 than our central projection. Again, in the main report we show the impact of this on our long-term projections of public sector net debt. These projections are highly illustrative, and we will return to this issue in future editions of the *Fiscal sustainability report* as development of our model continues.

[8] See Manton (1982).

[9] In particular, the cost profile for age-related health expenditure on those over the age of 65 is shifted upwards by one year of age for every ten years of the projection period. This implies, for example, that spending per person on an individual of age 70 in 2020-21 is equivalent to current spending on an individual of age 69, after controlling for general increases in real spending per person during this period (which is assumed to increase in line with real earnings growth for all ages).

Chart D.4: Projected health spending: alternative morbidity assumption

Source: ONS, OBR

The disease mix and treatment costs

D.22 As set out above, our central projections assume a constant health status for people of every age. We also assume that the types of diseases people suffer do not change over time and that more or less costly treatments are not rising as a share of total spending. There are a number of reasons why this may not hold.

D.23 First, there may be spending pressures arising from trends in lifestyle choices. Factors such as smoking, poverty, inequality, diet, exercise, drug use and pollution, all discussed in Wanless (2001), could act to reduce or increase the overall demand for health services.

D.24 Second, there may be a shift towards illnesses that are more or less expensive to treat. Taking smoking as an example, a sustained downward trend could lead to fewer incidences of diseases for which smoking is a risk factor – such as lung cancer. But this might translate into higher incidences of other diseases, such as dementia. The aggregated approach used to project long-term health expenditure would not reflect any spending pressures arising from differences in the cost of treating the two illnesses.

D.25 While some models project spending on a disease-by-disease basis, in practice this is very difficult. Most studies relating to the long-term public finances use more tractable models estimated at a higher level of aggregation.[10] The disease-mix is not considered in further detail here but, again, this issue may be one to which we return in future editions of the *Fiscal sustainability report*.

[10] See European Commission (2010), for example.

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