Taxation, Growth and Employment

Andrew Lilico and Hiba Sameen

Policy Exchange

Taxation, Growth and Employment

Andrew Lilico
and Hiba Sameen

Policy Exchange

About the Authors

Dr Andrew Lilico is the Chief Economist of Policy Exchange. He was previously the Managing Director of Europe Economics, and has also worked as an economist for the Institute for Fiscal Studies and the Institute of Directors, as a business analyst for two plastics multinationals, as a mathematical chemist for ICI, and as an opera singer for Opera New Zealand.

He is a member of the IEA/Sunday Times Shadow Monetary Policy Committee, is one of Europe's top experts on the economics of financial regulation (having led the teams assessing for the European Parliament the impact of the AIFM Directive, the Financial Services Action Plan, led one of the two large projects for the European Commission on the FSAP, and led the project for the Financial Services Authority on the impact of the Markets in Financial Instruments Directive) and is a leading UK authority on cost of capital analysis (advising Ofwat on the cost of capital for the water industry, the CAA on the costs of capital for the London Airports, and Ofcom regarding BT, Sky Digital, and others).

His first degree was from St John's College, Oxford, and his doctorate was from University College London (where he has also lectured in Money and Banking, Macroeconomics, and Corporate Finance). He also has a Masters degree in Philosophy from the University of London (where he currently teaches Epistemology and Metaphysics).

Hiba Sameen is a Research Analyst at Policy Exchange. She works across the economics programme and has previously worked on public spending and fiscal policy. She has an M.Sc. in Economics from the University of Essex and an undergraduate degree in Economics and Mathematics from the American University in Cairo. Before joining Policy Exchange she worked for development projects funded by the World Bank, USAID and UNICEF in Pakistan and recently on social exclusion poverty in the UK at the New Policy Institute (NPI).

Policy Exchange's Economics Unit

What we stand for

- **Rebuilding the British economy.** Even as we manage our way through the recession, we need to think about how to transform the British economy so that we are ready to face the future. Our research looks at how to restore financial stability, and also how to reform government spending and regulation. We believe that with radical reform of the budget, tax, welfare, and the supply side of the economy, Britain will be able to enjoy sustainable and faster growth in the future.

What we are working on

- **Financial services reform:** We need to avoid a knee-jerk response to the financial crisis, and instead introduce the right regulatory and structural reforms. Do we need to reform central bank mandates or the inflation target? Are financial markets socially useful? And if they are, how can we make them sustainable and competitive in the UK, without placing the nation's balance sheet at risk? What can be done about asset price bubbles?

- **Innovation and industry:** Retaining a dynamic industrial base is essential to maintain a balanced economy. Governments can't pick winners, but they can create the conditions for winners to emerge. Policy Exchange will consider how government policy might better support manufacturing by reforming tax and regulation; encouraging innovation, science and technology; and ensuring that the necessary building blocks in education and skills are in place to put Britain at the forefront of the industries of the future.

- **The future of public services:** How can we shift resources from unproductive to productive government spending and find scope to reduce the tax burden? How can Government achieve more with less?

- **Public sector pay and staffing:** We are looking at pay, conditions and staffing in the public sector and considering what changes to remuneration, staffing levels and working conditions might be appropriate to achieve the savings necessary in the coming period of fiscal consolidation.

- **Welfare reform:** We are looking at the disincentives for people on benefits to seek work; analysing the potential for reform in the Housing Benefit system and what people have to do to qualify for welfare on health grounds; and developing a philosophy for what a modern social security system should look like.

If you would like to find out more about our work, please contact:

Dr Andrew Lilico, Chief Economist
Policy Exchange, Clutha House, 10 Storey's Gate, London SW1P 3AY
Email: info@policyexchange.org.uk
Telephone: 0207 340 2650, Fax: 020 7222 5859
www.policyexchange.org.uk

Acknowledgements

Contents

Executive Summary

This report examines the effect of various different types of tax on economic growth and employment. The tax system may thereby distort the choices between work and leisure, consumption and savings, and domestic and foreign investment. These tax-induced distortions impede efficient allocation of resources across the economy and lead to a cost over and above the revenue collected. Not only does the tax present a cost to the taxpayer, it also creates an additional welfare loss. Some taxes may create bigger distortions and deadweight costs than others.

In this report we examine whether some taxes might be worse than others in two main ways. First we run a number of experiments on a standard macroeconomic model of the UK economy. We use Oxford Economics' Model, which is similar to the ITEM club model and HM Treasury's model. This gets results which are fitted to the UK specifically. We also look at academic evidence from around the world looking in greater detail at the different types of taxes. We then run a series of experiments on the model which involves raising one tax and reducing another. These are "fiscally neutral" – in other words, they leave the deficit unchanged – but might boost growth or employment.

Context

Contrary to some press discussion, the fall-off in tax receipts has not been a particularly significant factor in driving the UK's current high deficit, compared to the increase in spending. During the recession of the early 1970s 82% of the deterioration in the deficit was due to falling tax revenues, while in the early 1990s about 46% was due to tax falling back. But only 33% of the increased deficit in this recession is due to falling tax revenues.

Early studies found that the effects of the level of taxation upon economic growth were modest, but the overwhelming message of more recent studies is that increases tax levels reduces the growth rate of economies — in the most authoritative studies, a 10% rise in the overall ratio of tax to GDP is found to be associated with a 0.5%-2.0% fall in the growth rate of GDP.

The 2009 pre-budget report has already announced a rise in taxes by £19 billion, thus the primary concern for policy-makers in the short term will be how to structure this rise in taxation to maximise growth (i.e. to minimize how much growth is damaged by a rise in taxes on this scale).

Findings on specific taxes

Increasing Employers National Insurance appears to be one of the most damaging ways to raise revenue. Evidence from the 2007 reassessment of the OECD Jobs Strategy suggests that a ten-percentage-points reduction in the tax wedge on labour in an average OECD country would increase the employment rate by 3.7 percentage points. Afonso & Fuceri (2008) find that whilst income taxes have no large effects upon eco-

nomic growth, reducing social security contributions will increase growth. Macro-economic models like the Oxford Economics model, find that increasing employers National Insurance dramatically increases unemployment and reduces growth. These effects (also found in the Treasury's own model) are so powerful that they should be treated very cautiously – a 2p rise in Employers National Insurance in the model reduces GDP after three years by 2%. However, it seems fairly clear that Employers National Insurance is one of the worst possible taxes to raise. Under circumstances where wage growth is already very low it might be particularly difficult for employers' to cut wages further in response to a rise in employers' NIC, and so the key effect might be raised costs of employment, resulting in greater unemployment.

Increasing consumption taxation (e.g. VAT) is often seen as the least damaging way to raise taxes. However both recent academic evidence and experiments on the model suggest that increasing VAT may be as bad as, or worse, than increasing the basic rate of income. Some firms will try to absorb some of the effects of a VAT rise – e.g. because they do not operate in competitive markets, or because they are in financial difficulties and need to maintain turnover. Consequently, not all prices will necessarily rise by the same amount, distorting relative prices, re-directing economic activity inefficiently and so reducing growth. Not all goods attract the same level of VAT – e.g. some are subject to reduced or zero rates increasing the distorting effect. In the 1970s, rates of income tax were high, income tax complexities excessive, and union power higher (increasing the distorting effects of income tax) whilst rates of VAT were low (so that the effects of distortions were small). Until the index-linking of benefits during the 1980s, VAT increases also effectively reduced the value of benefits, increasing work incentives. At this point the trade-off may well have been more favourable to increasing VAT and reducing income tax. Now the rate of VAT is approaching the basic rate of income tax it may be the case that VAT rises will dominate over income tax-related distortions.

Increasing tax on debt interest and reducing corporation tax. This measure should be expected to reduce growth during booms and reduce the scale of recessions. Since, in practice, policy responses to deep recessions are likely to be damaging to growth in the long term, we believe that the net effect of increasing the neutrality of the tax treatment of debt versus equity will be to promote more rapid economic growth. The effects of increasing the degree of neutrality between recycled and distributed profits are unclear — there would be an increase in exploitation of economies of scale at the expense of fewer business start-ups and less competition. Despite this, the overall effect should be expected to be positive for growth and stability. According to HM Treasury, each percentage point cut in corporation tax would cost about £800 million in revenues. So if debt interest taxation raised £12.5 billion, we would have scope to cut the corporation tax rate by around 11% - from 28% to 17%. This suggests that the overall effect would reasonably place us with an arrangement of corporation tax at 17% and debt interest and dividends tax at 10% after a transitional period. However, it would obviously require a long transition because firms have made investment decisions on the basis of the current balance of tax on debt and equity.

Reducing savings taxes relative to other taxes. When there are significant distortions in savings taxation – in particular, when savings are subject to material double taxation – then reductions in savings taxes tend to promote growth. Until recently, in the UK the

extent of double taxation of savings has been modest (setting aside the double taxation problem of dividends). Furthermore, although during the 2000s there was probably under-saving in the UK, over the next few years the issue is more likely to be over-savings as households rebuild their balance sheets. There is therefore little reason, starting from here, to suppose that encouraging additional savings would promote growth.

General findings

Dynamic effects make tax rises less attractive. Dynamic effects need to figure more in the discussion about the role of tax rises in correcting the budget deficit. Our modelling suggests that the amount of revenue raised by some of the tax rises considered would fall away over time, as the dynamic effects of the tax rise are felt. Much of the media discussion of potential tax increases is based on the static estimates presented in the Treasury's *Ready Reckoner*. However, these estimates don't do not measure the dynamic effects of tax rises and in most cases don't include behavioural responses either (the basic rate of income tax is one such exception). We find for example, that a 2p increase in the basic rate of tax would raise roughly the same amount as estimated by the Treasury in year one. But after three years it might raise 2.1 billion less than the Ready Reckoner suggests, because growth would be lower and unemployment higher as a result of the tax rise.

Fiscally neutral tax reforms have the potential to boost growth and reduce unemployment. The academic evidence and our modelling work suggest that not all taxes have the same damaging effects on growth and employment. We could potentially get an economic benefit by reducing some taxes and increasing others. For example given our finding that employer NICs are more damaging to economic growth than income taxes or VAT, a cut in employer NICs paid for by a rise in the basic rate of income tax or VAT would tend to promote growth and reduce unemployment. Our analysis investigates seven different possible combinations.

A summary of simulation effects from the Oxford Economics model

Tax rise (2p, unless otherwise stated)	GDP level (% change of simulation from unchanged policy forecast)		Increase in unemployment (ILO definition)		Improvement in Government Balance as % of GDP (change in percentage points)		Total increase in Government Revenue (change in billions)		HMT Tax "Ready reckoner" (2p equivalent revenue raised)
Year	2010	2013	2010	2013	2010	2013	2010	2013	2010/11
VAT	0.0	-0.3	5,100	81,200	0.8	0.5	11.4	9.2	9.4
Basic rate of Income tax	-0.1	-0.1	5,000	16,100	0.5	0.6	6.7	4.7	6.8
Employees' NIC	-0.2	-0.2	0	51,600	0.9	1.0	12.2	8.0	8.5
Employers' NIC	-0.3	-1.9	200,000	1,000,000	0	-0.4	13.1	32.0	10.8
Employers' NIC (alternate specification)	0	0.1	6,900	-68,100	0.8	1.1	5.3	-2.9	10.8
Corporation tax (5p rise)	0	0	100	-100	0.1	0.6	0.8	8.5	1.7
Corporation tax (5p rise, alternate specification)	0	0	0	6,300	0.1	0.6	0.6	6.6	1.7
Increased Personal income allowance (£8000)	0.1	0.1	-3,000	-8,000	-0.3	-0.3	-4.1	-2.5	-9.2
Introducing a carbon tax ($30/tCO$_2$e)	-0.2	-0.5	21,000	98,300	-0.1	-0.3	-0.8	1.0	n/a

1
Introduction

There are many important political issues connected to taxation, and many motivations for imposing taxes. Taxes might be imposed so as to redistribute wealth from the rich to the poor. Taxes might aim to discourage activities considered socially harmful, such as gambling or the paying of bank bonuses, regardless of their economic merits. In imposing taxes one might need to take account of how likely they are to be paid in practice and whether people will change their behaviour to avoid paying the tax.

There are also concerns about public reaction, leading to the famous dictum of Jean Baptiste Colbert that "The art of taxation consists in so plucking the goose as to get the most feathers with the least hissing."

These are all important and legitimate issues. In this report, however, we shall focus upon the effects of taxation on economic growth and employment. We shall include consideration of how changes to taxes affect long-term growth as well as how growth might be affected in the UK in the current economic circumstances. We shall be particularly interested in changes involving increasing a tax by an amount offset by a reduction in another tax, leaving the total tax take unchanged (what is termed a "fiscally neutral" tax reform).

Context

Aggregate tax take

Figure 1.1 illustrates how the tax take has evolved in the UK over a period of 50 years.

Figure 1.1: Total public sector receipts as a % of GDP

Public dector current receipts

Net taxes and national insurance contributions

Source: Public finances databank. Note that the key difference between the two series is that the public sector current receipts series includes the operating surplus of the public sector.
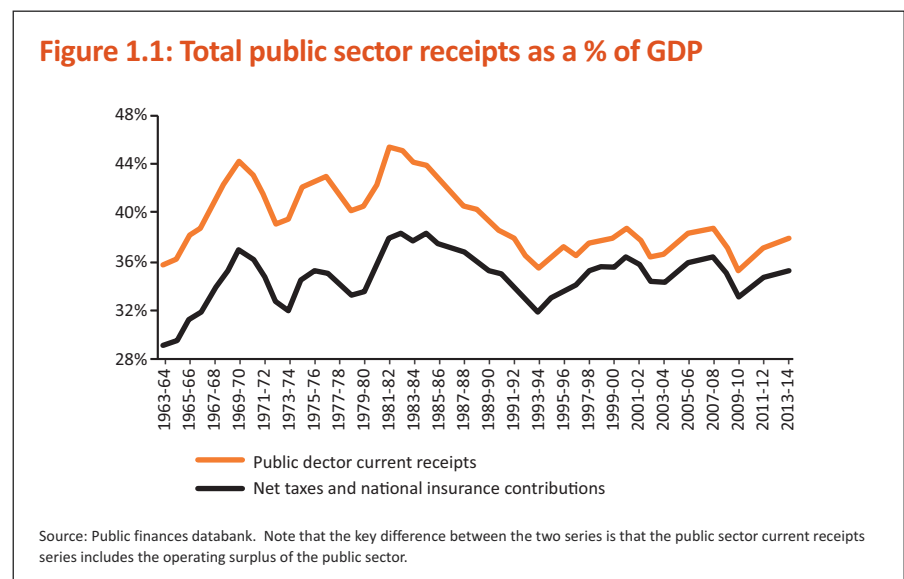
It can be seen that taxes alone have never been significantly above 38% of GDP during this period. Once one includes the operating profits of the nationalised industries, the peak of the past 20 years came in 2007/8, at 38.7% of GDP. Compared to the late 1980s, public sector current receipts were much lower even before the recent recession, so to understand the evolution of tax receipts over this period it is more instructive to focus upon the net taxes and national insurance contributions line.

> " It can be seen that the general trend from around 1999 onward in the euro area was for taxes to fall relative to GDP. In contrast, in the UK taxes began rising strongly from 2003 onwards "

The recent peak in net taxes and national insurance contributions was also in 2007/8, at 36.4%. Taxes dip thereafter, particularly as a result of the recession. However, it is worth noting that the trough proportion of GDP taken in taxes (33.0%) was higher than in either the early 1990s or mid 1970s recessions (31.8%, 1993/4 and 31.9%, 1973/4) and almost identical to that in the late 1970s/early 1980s (33.1% in 1978/9). Furthermore, the drop-off in taxation as a percentage of GDP in this recession, at 3.4% from 2007/8 to 2009/10, was less than that in the early 1990s at 3.6% from 1989/90 to 1993/4. Table 1.1 shows that the fall-off in tax revenues is not a strong explanatory factor for why the deterioration in the deficit in 2007/8 to 2009/10 has been so much worse than that in the previous recessions of the past three decades.

Table 1.1: Contributions to deficits

	Pre-recession level of net taxes and NICs as % of GDP	Recessionary trough (% of GDP)	Fall (% of GDP)	Rise in spending (% of GDP)	Deterioration in deficit (% of GDP)	% of deterioration attributable to falling tax revenues
1971/2 to 1973/4	36.3	31.9	3.1	1.7	3.8	82
1989/90 to 1993/4*	35.4	31.8	3.6	3.8	7.9	46
2007/8 to 2009/10	36.4	33.0	3.4	6.8	10.2	33

Source: Public finances databank

Notes: *1989/90 was not the peak in taxes - that was in 1984/5 at 38.2% of GDP.

During the late 1970s, spending fell as a proportion of GDP, driven particularly by the IMF-required spending cuts. This meant that the deterioration in the deficit was much less than the fall in tax revenues. Tax revenues did not fall relative to GDP during the recession of the early 1980s

Figure 1.2 compares the evolution of total receipts on the OECD definition across the OECD, in the UK and in the euro area. It can be seen that the general trend from around 1999 onwards in the euro area was for taxes to fall relative to GDP. In contrast, in the UK taxes began rising strongly from 2003 onwards, before falling back, somewhat, during the recession. The pattern across the OECD was in some ways similar to that in the UK. However, whilst in the mid-1990s UK taxation was very close to the OECD average, from the mid-1990s onward the UK begins to diverge from the OECD, with UK rises being more pronounced and falls less pronounced than across the OECD, with the overall effect being that UK receipts by 2008 were (at 42.2%) considerably higher than those in 1997 (38.2%) whilst those in the OECD in 2008 (37.9%) were lower than in 1997 (38.6%).

Figure 1.2: General government total tax and non-tax receipts as % of GDP
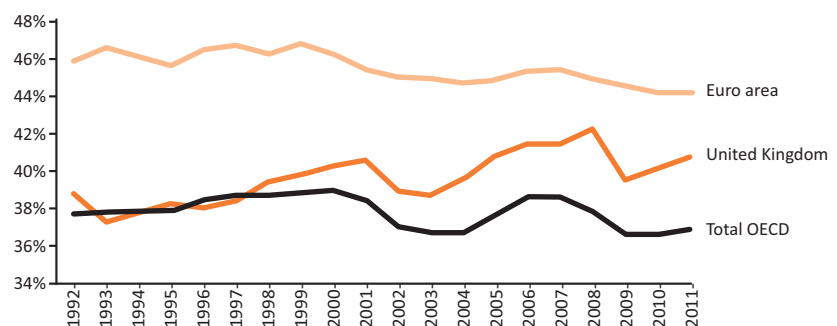
Source: OECD Economic Outlook 85, Annex Table 26

The structure of taxation

The structure of taxation has changed fairly significantly over the past decade as the aggregate tax take has risen. Figure 1.1 demonstrated that the aggregate tax take as a proportion of GDP reached a trough in 2002/3, after which there was a rise to 2007/8. As we shall now demonstrate, this rise in taxes relative to GDP can be almost entirely accounted for in terms of increases in the tax take in just three areas of taxation: National Insurance contributions, corporation tax, and the three wealth and housing related taxes (capital gains tax; inheritance tax, and stamp duty).

Table 1.2 gives the breakdown of taxes in 2002/3 and 2007/8.

Table 1.2: Changing structure, increasing levels

	2002/3		2007/8	
	£bn	*As % of GDP*	*£bn*	*As % of GDP*
Income tax	112.6	10.3%	151.8	10.7%
NICs	64.6	5.9%	100.4	7.1%
VAT	63.5	5.8%	80.6	5.7%
Council taxes, business rates, VED, oil duties, PRT, royalties and misc.	51.3	4.7%	66.6	4.7%
Corporation tax	29.3	2.7%	46.4	3.3%
Fuel duties, Land fill tax, Climate Change levy, Aggregates levy	23.6	2.2%	26.8	1.9%
Interest, dividends, public sector operating surpluses, and other	21.2	1.9%	32.6	2.3%
Excise duties plus customs duties and levies	18.6	1.7%	20.4	1.4%
Wealth-and-housing taxes: Capital gains tax, inheritance tax, stamp duties	11.5	1.1%	23.2	1.6%
Other HMRC taxes, including income tax credits (appearing as -ve)	-0.2	0.0%	-0.3	0.0%
Total receipts	396	36.3%	548.4	38.7%
Total of NICs, corporation tax, and wealth-and-housing taxes	***105.4***	***9.7%***	***170.0***	***12.0%***
Total other	***290.6***	***26.6%***	***378.5***	***26.7%***

Source: Public finances databank

National insurance contributions rose from 16.3% of total receipts in 2002/3 to 18.3% in 2007/8, whilst over the same period corporation tax receipts rose from 7.4% to 8.5% and wealth-and-housing taxes rose from 2.9% to 4.2%.

Future outlook

The UK's deficit in 2009/10 is forecast by the government at £178 billion, more than 12% of GDP. The structural deficit is estimated by the Treasury at 9.0% of GDP, some £125 billion. Policy Exchange has argued previously that about £100 billion of that £125 billion deficit needs to be eliminated fairly quickly, and that this should be done via £80 billion in spending cuts and £20 billion in tax rises.

At the time of writing, the government has already pre-announced £19 billion in tax rises, roughly equating to what we believe are the total tax rises required. Thus the key issue for the short term concerns the structure of taxation.

2
Economic Growth and Taxation: Theoretical Underpinnings

Why Should Taxes Affect Growth?
Taxes would have no effect upon growth if the following two conditions held:

a) if behaviour did not respond to taxation — if people bought the same things[1], produced the same things, worked the same hours, and so on, regardless of how taxes were arranged.

b) if the uses to which the resources confiscated in taxation were put were equally as growth-producing as the uses to which they would be put in the absence of taxation.

It is almost certain that neither of these conditions will hold. No taxation system is completely "neutral" in the sense that it does not encourage or discourage any distortions to behaviour. And the uses to which tax revenues are put is most un-likely to be exactly as productive as the use they would have been put to without being taxed — they may be more productive (e.g. if it is really the case that the pri-vate sector processes involved significant market failure whilst the government processes do not) or they may be less productive (either because the government use is misguided, being less efficient, or because the priority of the government use is not growth-promotion but something else such as re-distribution of wealth); they are unlikely to be precisely equally as productive.

Three Classes of Effects of Taxes upon Growth
Let us distinguish between three ways in which taxes might affect growth:

1. The overall level of taxes in the economy – the proportion of GDP that is taken as tax – may reduce (or, in principle, increase) growth.
2. The structure of taxation – how much some activities or persons or regions are taxed, relative to others – might affect growth rates, particularly through the effects upon incentives.
3. Raising or lowering taxes may have an effect on growth in the short-term – e.g. taxes might be cut during a recession in order to attempt to stimulate the economy, or a particular tax might be cut, temporarily, in order to promote some activity thought desirable. This means that there are also potential tran-sitional effects of changing the structure of taxation.

Over the longer term, there are two categories of question. First, there is the question of whether there is an optimal level of taxation (as is argued by a number of commentators). Second, once we advance beyond our near-term challenges with the deficit and start to normalise policy again, moving towards a tax-cutting stance, which would be the most growth-promoting taxes to cut first?

In the nearer term the key issue is not the level of taxation, but its structure. We have argued that taxes need to be raised by about £20 billion, whilst some £19 billion of tax rises have been announced. So the aggregate level of taxation does not need either to rise or fall except insofar as tax rise plans are implemented. But this leaves the very important question of whether there are useful changes that could be made to the structure of taxation that would encourage faster growth.

Effects of the Aggregate Level of Taxation upon Long-Term Growth

In a modern economy, governments have two basic sources of revenue: taxation and the printing of money. It is important to note that budgets need not balance, even over the long-term, for two reasons:

a) Provided that budget deficits, as a proportion of GDP, are less than growth rates of economies, in principle budgets need never balance in any year, let alone balance on average over time. For example, suppose that an economy grows at 2.5% per year but runs a budget deficit of 1% each year, beginning in the first year with a debt of 40% of GDP, and all debt takes the form of infinite-term bonds (i.e. no debt is ever repaid). Then government debt as a percentage of GDP will remain at 40% of GDP. To see this, suppose that GDP at the start is 100 and debt 40. Then after a year, GDP will be 102.5 and debt 41. But 41/102.5 = 40%. So the percentage of debt is stable, even with deficits every year and no debt ever repaid.

b) In addition, governments can choose to fund deficits by printing money. This will tend to have inflationary (or counter-deflationary) effects over the medium term. But, be that as it may, governments can and do fund deficits by this route.

The upshot of this line of thought is that there are choices to be made over the optimal level of taxation that go beyond the level of spending. Governments can choose to run permanent surpluses (reducing and then eliminating government debt over time, and eventually building up a sovereign wealth fund), to balance budgets or to run deficits on average, even for a constant level of government spending as a proportion of GDP.

Thus, even over the longer term, the effects of higher taxation upon growth might not be exactly the same as the effects of higher public spending. As it happens, however, and as will be outlined in more detail below, recent studies suggest that the growth-reducing effects from taxation are indeed about the same as the growth-reducing effects from increased spending.

Increased spending affects growth both in itself (by replacing private sector activity by whatever the government is spending money on[2]) and by necessitating additional taxation to pay for that spending. If the government spending is justified by a market failure, as opposed to, say, being directed at promoting social

equality, then such spending might, in principle, increase growth rates. On the other hand, when government spending is not more efficient than private spending or when its purpose is the promotion of social welfare in the broader sense, rather than economic efficiency, it will tend to reduce growth.

As with government spending, some taxes might enhance economic growth — e.g. if they tax economically damaging externalities, thereby increasing economic efficiency. However, typically higher taxes will reduce growth. In addition to the sheer effect of displacing private sector activity (which may or may not be offset by the sheer effect of the public spending itself), taxation also distorts economic activity. Standard estimates are that the cost of increased taxation, in terms of GDP lost through distortions created by the imposition of taxes, are around 30% of the tax raised (i.e. if the government raised tax by £100 million and spent £100 million in exactly the same way the private sector would, GDP would fall by £30 million); other estimates go above 50%.[3] Using the 30% figure, the implication is that if the economy has 50% of taxation, it adds the same amount to itself each year as would a 40% taxed economy of only 97% the size.[4]

"Static" vs "dynamic" effects of tax changes

If a tax raises £1 billion and we abolish the tax, then the natural first thought is that the cost to the Treasury of this tax cut will be £1 billion. But matters are not quite so straightforward as this. For the economy will adapt to the fact that this tax has gone. For example, if the tax is applied to a particular product, when the tax is abolished the product's price may fall, leading people to buy more of it, leading output to increase, leading to more jobs being created, leading to greater wage bills in the industry, leading to more income tax being paid. The notional impact on revenues to the Treasury of the tax measure, calculated on the assumption that the economy does not adapt is termed the "static" cost. In contrast, the "dynamic" impact on overall tax revenues takes account of the adaptation of the economy.

> **" What is hotly disputed is the extent to which adaptation might entirely wipe out losses so that tax cuts become "self-funding" "**

Now, it is indisputable that changes to taxes will lead to some adaptation, and such adaptation means that the overall revenue lost from tax cuts will almost always be less than the static effects of the cut (and similarly that revenues raised from tax rises will, likewise, be less). What is more hotly disputed is the extent to which adaptation might entirely wipe out losses so that tax cuts become "self-funding".

The idea here is that certain sorts of taxes (or certain very high levels of taxation) create such distortions in the economy that reducing (or even eliminating) them would stimulate so much additional growth that the extra revenues from income taxes, VAT, corporation tax, and so on at higher levels of economic output would be greater than the revenue lost from the initial tax cut.

The standard view is that, for most countries and for most taxes, tax cuts will not have such large dynamic effects as to be self-funding, at least in the short-term. Over the longer term there is a considerable body of opinion that the scope for improving the structure of taxation is such, and the tendency for governments to over-tax is such, that for many developed economies there are likely to be available tax cuts that are self-funding over the long-term (see Box 2.1 for details).

3 See, for example, p165 of http://www.iea.org.uk/files/upld-book307pdf?.pdf or the following quoted from Smith, D.B., Living with Leviathan: Public Spending, Taxes and Economic Performance, Institute of Economic Affairs: *"the US Congressional Budget Office (CBO) has reported that the 'typical estimates of the economic cost of a dollar of tax revenue range from 20 cents to 60 cents over and above the revenue raised'"*.

4 This effect equates to about a 0.1% fall in the growth rate. We emphasize, again, that this is in addition to the negative effects of the public spending itself on growth. The overall effect might be as much as a 1-1.5% reduction in the growth rate for a 10% rise in the ratio of public spending/tax to GDP (say, from 40% to 50%).

Box 2.1: Dynamic Scoring Models

The existing literature on the dynamic effects of tax cuts uses a "dynamic scoring" model, developed in part by Gregory Mankiw and Alan Auerbach. The essence of this approach is based in standard neo-classical economic growth models, which assume that the long run growth rate of the economy is determined by the capital stock of the economy, the amount of labour supplied by workers and the technological rate of progress. This framework is then adapted to reflect the fact that the amount of labour supplied and the capital stock of the economy are influenced by the rates of taxation of income derived from labour or capital.

According to a paper authored by Gregory Mankiw, under certain conditions some tax cuts can be substantially self-financing in the long run. For example, suppose that the initial tax rates on capital and labour are 25%, the production function is of a standard empirically tested form (Cobb-Douglas), the capital share is 1/3rd and labour supply is inelastic. Then, in the long run, the dynamic effect of a cut in capital income taxes on government revenue is only 50% of the static effect. That is, one-half of a capital tax cut pays for itself through economic growth, whereas 18% of labour tax cut pays for itself. This suggests that capital taxation would have more of an impact on growth rates than taxation on labour; and that cutting capital taxation would raise national income more than labour taxes[5].

Taxation and economic efficiency

The notion of promoting economic growth by means of carefully conducted tax policy is sometimes debated — in particular, there are those that claim that it is only the aggregate level of taxation that is of significance and that the structure of taxation is irrelevant. However, for our purposes here we shall take it as given that taxes can indeed drive behavioural responses and distort economic decisions in both positive and negative ways.

Taxes impinge on the economic choice of individuals and firms by altering the relative prices of the factor inputs and goods and services. In general people purchase less of more heavily taxed inputs (and vice versa). The tax system may thereby distort the following choices:

- work and leisure;
- consumption and savings; and
- domestic and foreign investment.

Tax-induced distortions impede efficient allocation of resources across the economy and lead to a cost over and above the revenue collected. Not only does the tax present a cost to the taxpayer, it also creates an additional welfare loss. This welfare loss is referred to as an 'excess burden' or 'deadweight loss' of taxation.

Modern tax systems cannot help but produce some efficiency losses. For concreteness, let us initially focus upon the effects of an income tax. Broadly, an income tax induces two economic distortions. First, income tax tends to distort people's choices between leisure and consumption, including both *how much* leisure people choose, thereby surrendering some consumption; but also *when*

people take their leisure and when they consume. Income tax distorts these choices because it changes the trade-off – the higher the income tax, the more leisure must be surrendered (the more work must be done) in order to deliver a given amount of consumption. This might mean that *less* work is done, since work offers less consumption return. But under certain circumstances it might, instead, mean that *more* work is done. This could be the case, for example, if an individual is close to the minimum subsistence level of consumption so the option of consuming less and taking more leisure is not feasible – such a person might respond to higher income taxes by working longer hours so as to deliver the minimum required consumption.

Second, if savings income is taxed (if there are not savings tax reliefs), then an income tax is usually thought to distort the choice between consuming today and saving today (and consuming later). Why? Well, people are usually thought to discount the future, so (even setting aside inflation) they need to earn a real return on savings for consumption tomorrow to be equally as good as consumption today. But if that real return from savings is taxed, then the value of consumption tomorrow, for a given amount of labour income today, will be less than if one simply consumes today.[6]

Capital income tax has similar effects to labour taxes with regard to the saving-consumption decision. A positive tax on the return to savings reduces the price of current consumption relative to the price of future consumption. As with labour income taxes, capital income taxes may either encourage people to consume now and save less, or stimulate them to save more to achieve a needed given level of future consumption (e.g. to achieve subsistence pension income at a time in life when obtaining significant labour income is not an option).

As we shall discuss in more detail below, past empirical studies have not produced a decisive universal result concerning the scale (or even the sign) of these behavioural responses (i.e. the evidence is not completely unambiguous even as to whether increasing income taxes increases or decreases the amount of work done, and is certainly not clear as to precisely how much working is reduce by raising income tax (if it is so reduced)). Nonetheless, the bulk of the evidence does tend to indicate that income tax reduces overall labour supply moderately, has a slight negative effect on savings and a larger effect on investment. In addition, most income tax systems contain a mixture of different provisions that create complex distortions. Some of these distortions are discussed more extensively in later chapters.

Brief Literature Review

Aggregate tax take and Economic Growth

Standard economic growth theory tells us that there are various channels through which taxes can affect the level of output and output growth rates. First, taxes alter the size of the capital stock by encouraging or discouraging investment. Second, taxation affects labour supply (that is, participation rates, unemployment and work effort) and the choice to acquire education and skills training. Third, taxes have the potential to influence the level of R&D and thereby the rate of technological innovation. Also, under normal market conditions, capital is allocated to where it is most efficient as measured by the marginal product of capital. However, when we have unequal tax rates, capital may be allocated from

6 It is worth remarking that this is not the only way of looking at this matter, however. According to an alternative view, saving converts labour income into capital, and so savings income is just income from another factor of production (just like labour income). Then without savings income being taxed, there is an incentive to over-produce capital at the expense of labour. Having noted this interesting alternative approach, we shall proceed hereafter on the conventional view presented in the main text.

highly-taxed but nevertheless productive sectors or countries to lower-taxed sectors or countries, even if these lower-taxed sectors or countries have lower pre-tax productivity. In this way, by distorting capital allocation, taxes can reduce the overall level of productivity (high productivity activities are replaced with lower productivity ones).

A number of important studies have been conducted that measured the effect of the overall level of taxation on economic growth. These studies can be broadly divided into the theoretical and the empirical. Empirical studies are mostly econometric in nature and take as given certain fundamental assumptions concerning the nature of growth (different studies taking different such assumptions as given). They offer a quantitative measurement of the effects of tax policy changes. Empirical studies typically compare cross-country and time series data to estimate whether there is a link between taxes imposed and economic growth rates observed.

The outcomes critically depend upon the parameters chosen and whether long-term growth is determined "exogenously" (i.e. purely by factors coming from outside the model) or "endogenously" (i.e. partly by factors that are part of the model). Growth models explaining long-run economic growth by population growth and an exogenous rate of "labour-augmenting technical progress" (i.e. technical advances that have their effects upon growth by increasing the productivity of labour) are known as "exogenous growth models".[7] In contrast, "endogenous growth theory"[8] explains growth from within the model by knowledge spill-overs, human capital and R&D activity.[9] The results generally show that high taxes affect economic growth negatively, though the magnitude of the effects varies significantly.[10]

We shall now see that although different studies in the growth literature have found differing effects, the more recent literature has tended to find larger effects – i.e. early studies suggested very limited effects, whilst more recent studies have tended to suggest that taxes do indeed affect economic growth and that their effects are larger than originally thought.

Robert Lucas (1990), in a seminal early paper, found negligible affects on US growth. He estimated that eliminating the capital tax would change growth by 0.03 percentage points. Using an endogenous growth model, he initially found that eliminating capital income tax would increase the capital stock by 35%. In another key piece of work, Engen and Skinner (1996) find that a 10 percentage point increase in taxation reduces growth rates by 1.4 percentage points from a cross-country sample of 107 countries over a period of 15 years. The most authoritative research measuring the affect of taxation on OECD economies was conducted by Leibfritz et al. (1997). Their results show that a 10% point increase in the tax to GDP ratio reduces the growth rate by 0.5 − 2 percentage points.

It should be noted, however, critics of this literature argue that there is some difficulty in the interpretation of results from cross-country growth regressions. The arguments are based around the idea that causality is difficult to establish due to the fact that one or more of the explanatory variables in the regression are jointly determined, typically through an equilibrium mechanism.[11]

Some of the main results from this literature are summarised in the table overleaf:

7 These are also often called "neoclassical growth models".

8 This is also known as "post-neoclassical endogenous growth theory", as per the notorious reference to this theory by Gordon Brown.

9 See Appendix A2 for more details. A key message often taken from endogenous growth theory by politicians is that it is possible to boot-strap growth by having the government invest in education, R&D, and infrastructure.

10 The results seem to be particularly sensitive to the proportion of factor inputs, the applied depreciation schedule and the elasticity of labour supply and inter-temporal substitution rate. For more details see Stokey, Nancy L. and Sergio Rebelo, "Growth effects of flat-rate taxes", *Journal of Political Economy*, 103.3 (1995): pp 519 - 550

11 This property is also known as simultaneity. For further details see Durlauf, Steven N. "The rise and fall of cross-country growth regressions", *History of Political Economy*, 41.1 (2009): pp315 – 333.

Table 2.1: Literature on Taxation and Economic Growth

Authors	Methodology, coverage and timeframe	Economic impact of taxation on growth
Koester and Kormendi (1989)	63 Countries over 1970s	Holding average tax rates constant, a decrease in marginal tax rates of 10 percentage points increases per capita income by 7.4%
Lucas (1990)	Model simulation (endogenous growth)	Eliminating the capital tax would increase capital stock by 35%, but due to diminishing returns to capital such a capital expansion would lead to only a 0.03% point increase in growth
Easterly and Rebelo (1993)	About 100 countries over 1970 – 88	No discernible relation between taxes and growth
Engen and Skinner (1992)	107 countries over 1970 – 85	10 percentage points increase in taxation reduces growth rates by 1.4 percentage points
Jones et al. (1993)	Model simulations	Eliminating all distorting taxes increases growth rates by 4 - 8%
Cashin (1995)	23 OECD countries over 1971 – 88	1% point of GDP increase in taxation reduces output per worker by 2%
Engen and Skinner (1996)	Model simulation for US economy	5 and 2.5% point increase in marginal and average tax rates, respectively, reduces the growth rate by 0.2 – 0.3 percentage points
Leibfritz et al. (1997)	OECD countries over 1965 – 95	10% point increase in tax to GDP ratio reduces the growth rate by 0.5 – 2 percentage points
Mendoza et al. (1997)	Theoretical and empirical framework	10% tax cut increases investment by 0.5 -2 percentage points; negligible effect on growth
Kneller et al. (1999)	22 OECD countries over 1965 – 95	1% point of GDP decrease of distortionary taxes increases the growth rate by 0.1 – 0.2% per year
European Commission (2000a)	Model simulations by QUEST model	1% point of GDP decrease of distortionary taxes increases GDP between 0.5 and 0.8%
Folster and Henrekson (2001)	Sample of 29 rich OECD countries over 1970 – 95	10% point increase in tax to GDP ratio reduces the growth rate by 1% point
Bassanini et al. (2001)	21 OECD countries over 1971 – 98	1% point increase in tax to GDP ratio reduces per capita output by 0.3 – 0.6%
Padovano and Galli (2001)	23 OECD countries over 1950 – 80	Negative correlation between high marginal tax rates and long run economic growth
Barton and Hawksworth (2003)	18 OECD countries over 1970 – 99	1% of GDP increase in distortionary taxation reduces the growth rate by 0.2 and 0.4 percentage points
Lee and Gordon (2005)	70 countries over 1970 – 97	10% point corporate tax cut increases the growth rate by 1 – 2 percentage points
Afonso and Furceri (2008)	OECD and EU countries 1970 - 2004	1 percentage point increase in the share of total tax in GDP reduces output growth by 0.12 percentage points.

Growth and consumption taxes

Consumption taxes can be categorised as either general consumption taxes, typically VAT or sales taxes, or specific excise and import duties, which are applied on a number of goods and services. A standard thought (which shall be challenged below) is that, in general, consumption taxes and particularly VAT have a less adverse influence on the decisions of households and firms and thus on GDP per capita than income taxes, but that these advantages have to be balanced against equity concerns that arise from their lack of progressivity. Putting it crudely, the usual idea is that income taxes are fair but inefficient, whilst VAT is efficient but unfair.

Since consumption taxes apply the same tax rate on current and future consumption (provided that tax rates are constant over time) they do not influence

the rate of return on savings and individual's savings choices in the same way as income taxes. Hence, consumption taxation is often seen as favouring private savings relative to income taxation. Since savings are not "double taxed", it is argued that a consumption tax is an attractive choice to collect the required revenue. However, the empirical evidence on the sensitivity of the volume of private savings to changes in the after-tax return to such savings (the after-tax interest rate) is inconclusive. Some studies found that the amount of savings increased significantly if savings interest taxes fell, whilst other studies have found no effects at all.[12] In an open economy with mobile capital, any changes in private savings are likely to over-state the resulting change in the capital stock and hence GDP. Nonetheless, increased private savings can be expected to increase future net national income.

It should be noted however, that because consumption taxes lower the purchasing power of real after-tax wages, consumption taxes can also reduce labour demand in the short-term if they add to wages and labour cost.[13] The extent and persistence of this effect depends on labour markets settings. The empirical evidence of the impact of consumption taxes on labour supply and employment is sparse. Most empirical studies that assess the effect of taxation on employment exclude consumption taxes from the relevant wedge.[14] However, a recent study that includes the consumption tax in the overall labour wedge finds that a rise in this wedge reduces market work, though no separate effect of consumption taxes on employment is estimated.[15]

This point is explored in more detail below, in our consideration of fiscally neutral tax reforms.[16]

Growth and labour/personal income taxes

Taxes on labour such as personal income taxes and employers' and employees' national insurance contributions can potentially have adverse effects on labour utilisation by affecting both labour supply and labour demand. Labour taxes affect labour supply through both the decision to work and average hours worked. A decrease in labour taxes can have both a substitution and an income effect on participation and hours worked. The substitution effect of a decrease in labour taxes would increase labour supply as the reward for additional work has increased, while the income effect would reduce labour supply as it increases household income and thus increases the demand for leisure. The net effect on labour supply is then an empirical matter. Labour taxes also influence firms' costs of labour especially when the tax burden cannot be shifted on to lower net wages. In this case, lower taxes bring down labour costs and firms respond by increasing labour demand. Thus, depending on the net effects on labour supply and labour utilisation there will be an effect on the output levels and growth.

It has been argued, that social security contributions have a smaller impact on labour supply than other taxes because the eventual social benefits that workers receive are related to the amount of contributions that they have paid. However, in many countries there is only a loose relationship between the amount of social security contributions paid and the amount of benefits received. A recent study conducted by the OECD concluded there is "only weak evidence that employees' social security contributions have less of an impact than personal income taxes in terms of reducing GDP per capita".[17] Another study finds that a one percent

increase in social security contributions lowers growth for the EU by 0.27 percentage points – much more than the impact of income taxes.[18] One reason for this is that the relationship between social security contributions and benefits is not widely established across OECD countries. Empirical studies have found hours worked to be only modestly responsive to labour taxes while participation is much more responsive to them.[19] Most empirical studies also find that the estimated elasticity of hours worked with respect to the after tax wedge[20] is very small for men. (A natural interpretation here might be that *men's* income is regarded by households as servicing core consumption, whilst the leisure-consumption trade-off factor is more central to decisions about how much *women* work.)

Labour taxes may also affect the relative price of capital and labour and this could lead to a reallocation of inputs within and between firms and industries that could have transitional growth effects. For instance, a change in the relative factor price could lead to less usage of either labour or capital (or possibly both) in a firm or industry. It is possible that all inputs not used in this firm/industry are either re-allocated to other less productive firms or not used at all, thereby lowering the efficiency in the use of production inputs, i.e. the total factor productivity growth. New empirical results from industry level data of certain OECD countries finds evidence that employer and employee social security contributions influence total factor productivity negatively.[21] A simulation experiment indicates that the effect of a ten percentage point decrease in the tax wedge leads to a increase in employment of 3.7 percentage points, and growth by 0.5 percentage points.[22]

It is worth noting that an income tax with savings tax reliefs, such that income is taxed only in the period in which it is consumed, is in a formal sense what the academic literature regards as a "consumption tax". Putting matters more bluntly, the UK's "income tax" is a form of the academic's "consumption tax".

Growth and capital income/corporation tax

Capital income taxes can apply to corporation income as well as personal income. Let us first consider taxation on personal capital income – taxes on personal capital income may affect private savings by reducing their after-tax return. However, the effects of this on savings, and particularly on investment, are uncertain. Nonetheless, differences in the personal income tax treatment of different forms of savings can be expected to distort the allocation of savings and reduce the growth potential of the economy. As many countries do favour certain types of savings over others, there is scope to increase growth by reducing these distortions.

High capital gains taxes may affect both the demand for venture capital through entrepreneurs' career choices and the supply of funds. Since venture capital is one important source for financing high-technology start-ups, financial support for these start-ups may be hindered by capital gains tax, thus lowering the potential contribution of new firm entry to growth. Empirically, there is relatively little evidence for direct forms of this relationship, but there may be more important indirect effects.

The design of the capital income tax system and its interaction with corporate taxation may also influence firms access to finance which in turn can affect risk-taking and total factor productivity. In most OECD countries, profits are

18 Afonso, Antonio and David Furceri. "Government size, Composition, Volatility and Economic Growth", *ECB Working Paper* No. 849 (2008) pg19.

19 See Blundell, Richard, Alan Duncan and Costas Meghir, "Estimating labour supply response using tax reforms", *Econometrica* 66.4 (1998): pp 827 – 861.

20 The tax wedge is the deviation from equilibrium price/quantity as a result of a taxation, which results in consumers paying more, and suppliers receiving less.

21 Vartia, Laura, "How do taxes affect investment and productivity? – Industry level analysis of OECD Countries", *OECD Economics Department Working Paper* No. 656, (2008).

22 "Tax and Economic Growth", *OECD Economics Department Working Paper* ECO/WP 28, (2008).

taxed first at the corporate level and then at the personal level when distributed as dividends. Double taxation might in principle create a bias towards financing investment with debt rather than equity, which may in turn discriminate against firms that can raise finance from foreign investors. While the effects of high dividends taxes on financial structure and on the valuation of firms are widely accepted, it is less clear that raising dividend taxes (whilst leaving corporation taxes unchanged) actually affects investment decisions over the medium term (at least for existing firms), because existing firms have the option of recycling profits (rather than paying out dividends) and building up retained profits stocks out of which future investment can be made (as opposed to funding future investments out of additional equity issuance).[23]

> 66 Double taxation might in principle create a bias towards financing investment with debt rather than equity, which may in turn discriminate against firms that can raise finance from foreign investors 99

Next, let us turn to corporate income taxation. Corporate taxes are levied on the corporation as an entity rather than on the individuals who own the corporation – such taxes can affect the rate of capital accumulation and hence GDP per capita. Since firms' investment decisions are driven by the cost of and the expected return to investment projects, corporate taxes can have a negative effect on corporate investment by reducing the after-tax return. The primary way through which taxes affect investment behaviour is via their impact on the user cost of capital[24], which in competitive financial markets is the minimum required rate of return that an investment has to earn to be viable. (In the same way that wages are a cost for employing labour, the cost of capital is the expense the firm incurs for using capital as a production factor. As a broad rule of thumb, a lower cost of capital encourages investment, while a high cost of capital discourages it.)

The general consensus in the economic literature is that the effect of the cost of capital on investment is significant. The OECD estimates increases in the tax adjusted user cost are found to reduce investment at the firm level. A simulation experiment indicates that a reduction in the statutory corporate tax rate from 35% to 30% reduces user cost by 2.8%. This implies a long-run increase of the investment to capital ratio of approximately 1.9%.[25] On the question of the impact on economic growth, another recently published study found that a 10% point corporate tax cut increases growth by $1 - 2$ percentage points[26].

Here, it is worth mentioning that there is a difference between statutory rates (the legally imposed rate) and effective tax rates. Effective tax rates depend on the statutory tax rate, allowances and the definition of taxable profit. There is a body of literature which measures the effect of corporate taxation on investment using effective tax rates as opposed to statutory tax rates. Recent research conducted by the IFS has shown that while statutory rates in the UK have remained low, changes in tax law may have increased effective tax rates[27]. As taxes typically raise the cost of capital[28], and as the proportionate change in the cost of capital due to taxation is measured by the effective *marginal* rate of taxation, it has been argued that there may be effects of corporate taxation on investment decisions that are better captured by effective rates than statutory rates.

23 For further details see Auerbach, Alan J., "Taxation and corporate financial policy," *Handbook of Public Economics,* in: A. J. Auerbach & M. Feldstein (ed.), *Handbook of Public Economics,* 1st Edition, Volume 3, Chapter 19, pages 1251-1292.

24 The cost that needs to be paid to raise finance for an investment project, where that cost might include interest on loans and dividends on equity

25 "Tax and Economic Growth", *OECD Economics Department Working Paper* ECO/WP 28, (2008)

26 Lee, Young and Roger H. Gordon, "Tax Structure and Economic Growth," *Journal of Public Economics* 89.5 (2005): pp 1027-1043

27 See Devereux et al. "Why has the UK Corporation Tax raised so much revenue?" *IFS Working Paper* WP04/04 (2004)

28 The rate of return must now be sufficient to pay the additional tax as well as compensate the investor and hence reduce investment

3
Growth and Employment Effects of Tax Rises in Oxford Economics' Model

This section outlines the results from a standard economic forecasting model concerning how tax rises affect growth. We shall first state the results, then comment in the second part of this section. In some cases where we feel the forecast results are implausibly large we also look at the effect of varying some of the assumptions in the model.

It is worth mentioning here that the Oxford Economics model is very similar to HM Treasury's own model and the ITEM model which have very similar properties with regards to fiscal policy.

Form of presentation of results

The results will take the form of graphs followed by tables comparing what is forecast to happen if the tax rises (in dotted orange lines on the graphs) with what would happen with policy unchanged (in solid black lines).

It is worth noting that the growth figures are for growth *rates*, not for the level of output. So, for example, if the dotted red line goes below the blue line for some period after a tax rise is introduced and then converges at the right-hand end of the graph, that does not mean that output is expected to be the same, with or without the tax rise, by the end of the period. Rather, it means that by the end of the period the growth *rate* is expected to be the same.

The tables show what the effect of a tax policy change such as a 2p rise in VAT would have on GDP, unemployment and the fiscal balance as a % of GDP compared to the unchanged policy forecast. In particular, the table gives GDP levels, rather than growth rates.

2p rise in VAT

In the Oxford Economics model, a rise in VAT depresses the growth rate over the first few years, as shown in Figure 3.1A. A rise in VAT raises prices and reduces company profits, which reduce growth rates initially. This also raises wage costs, resulting in higher unemployment in the short run. However, as prices rise, real wages fall and this raises firm profits in the medium-term thereby increasing growth.

Figure 3.1A: Impact on medium-term growth rates

Unchanged policy forecast — Simulation
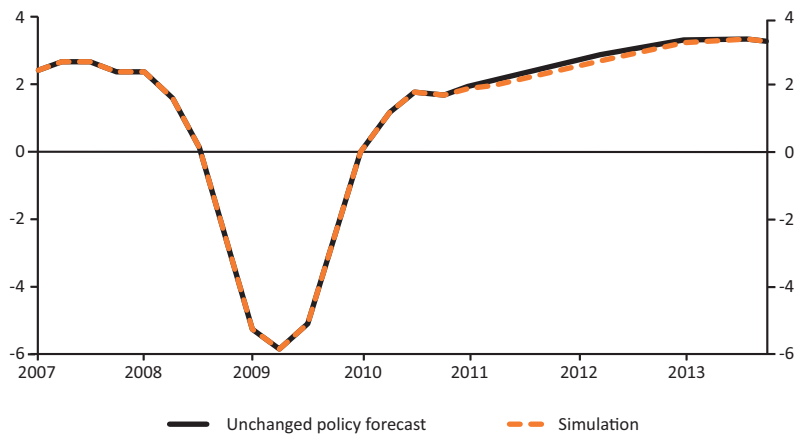
Figure 3.1B: Impact on unemployment ('000s)

Unchanged policy forecast — Simulation
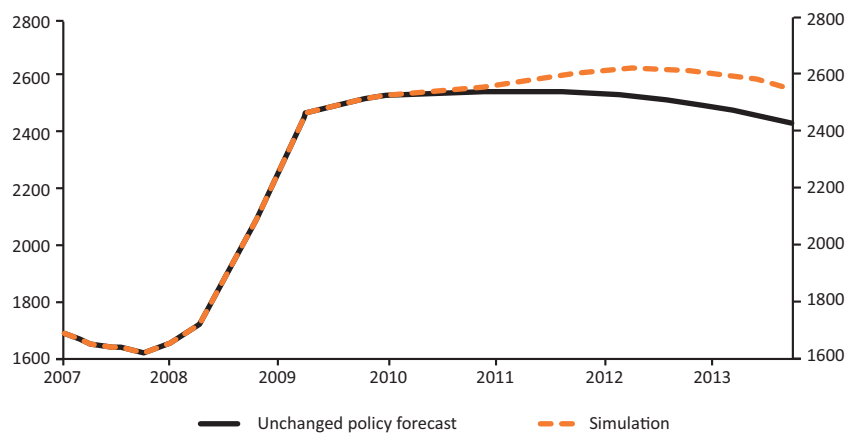
Figure 3.1C: Impact on fiscal balance as a % of GDP

Unchanged policy forecast — Simulation
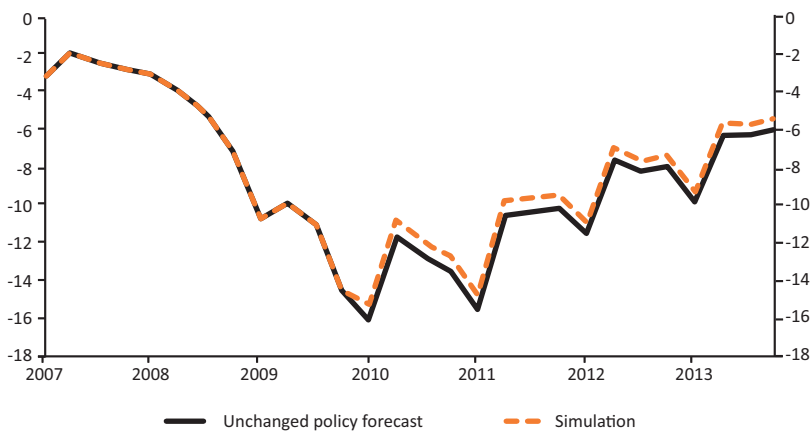
This lower growth rate is associated with a modest rise in unemployment, as can be seen in Figure 3.1B.

The rise in VAT raises money for the Treasury early on, reducing the deficit relative to the unchanged-policy forecast. Over time, because the growth rate is reduced with the tax rise, the reduction in the deficit narrows, as illustrated in Figure 3.1C.

Table 3.1: Differences of simulation from unchanged policy forecast

Year	GDP level (% change of simulation from Unchanged policy forecast)	Increase in Unemployment (ILO definition)	Total increase in Government Revenue (change in billions)	Improvement in Government Balance as % of GDP (change in percentage points)
2010	0.0	5,100	11.4	0.8
2011	-0.1	31,200	11.3	0.7
2012	-0.3	68,700	10.2	0.5
2013	-0.3	81,200	9.2	0.5
2014	-0.2	67,700	8.6	0.6
2015	-0.1	43,800	8.5	0.6

The model suggests that raising VAT generates more revenue than that forecast by HMRC's tax ready reckoner. A 2p rise in tax raises £11.4 billion in the first year according to the model, compared to £8.2 billion suggested by the HMRC in the tax ready reckoner.[29]

2p rise in basic rate of income tax

Raising income tax very slightly depresses growth over the first few months, as illustrated in Figure 3.2A, but within a short time this effect has disappeared and growth converges to the unchanged-policy growth rate.

Figure 3.2A: Impact on medium-term growth rates

Unchanged policy forecast — — — Simulation

The period of reduced growth is associated with a small rise in the unemployment rate, but the unemployment rate has converged back to the unchanged-policy scenario by the end of the period.

Figure 3.2B: Impact on unemployment ('000s)
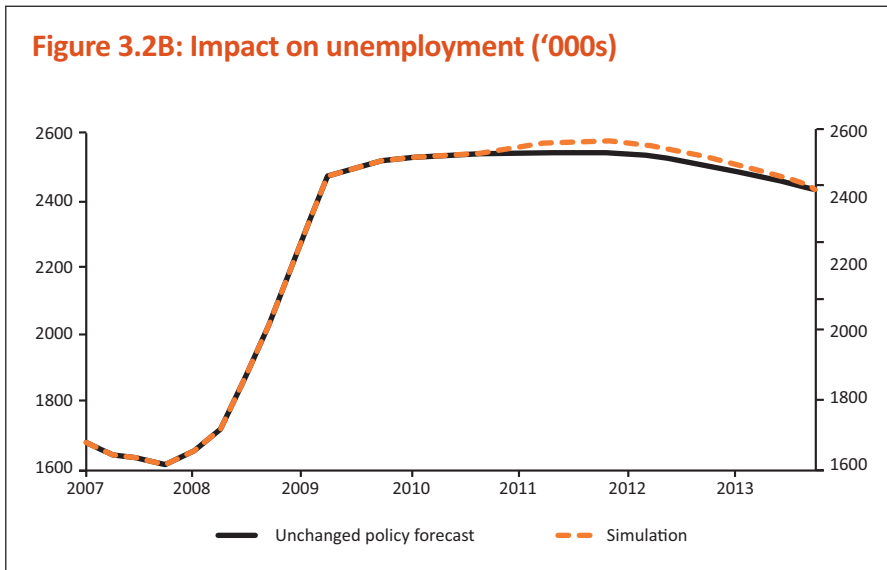
Raising income tax raises revenue in both the short and the longer terms.

Figure 3.2C: Impact on fiscal balance as a % of GDP
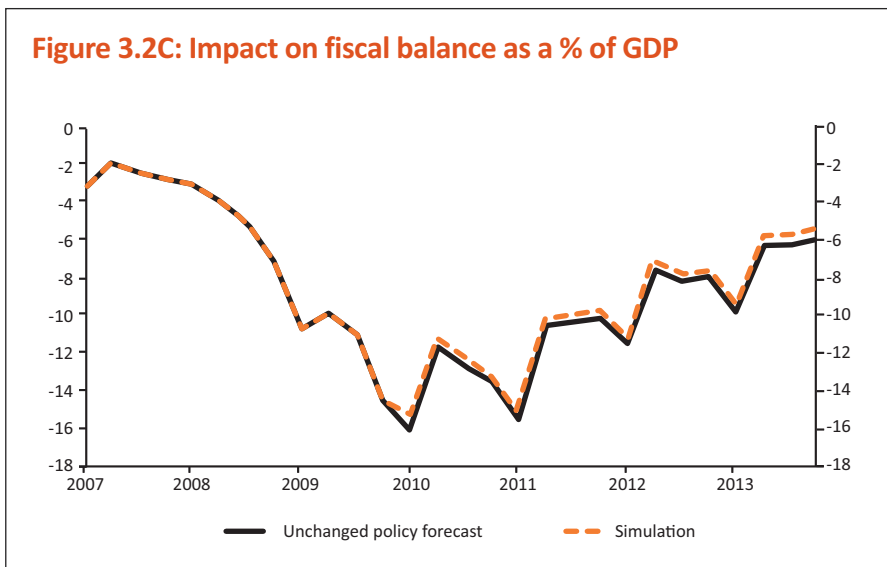
Table 3.2: Differences of simulation from unchanged policy forecast
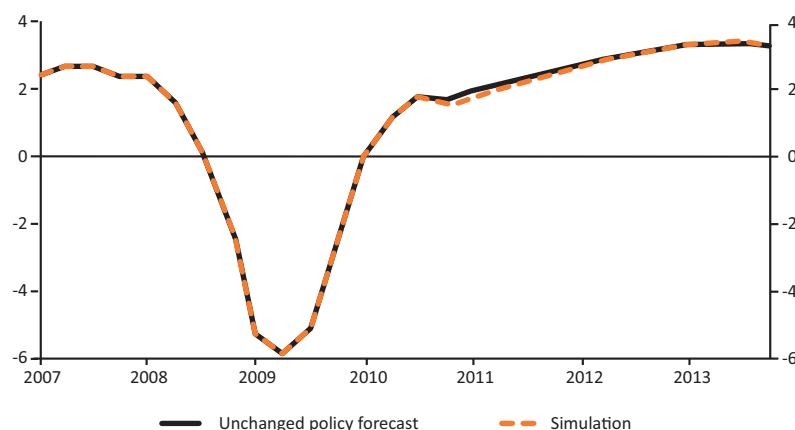
Year	GDP level (% change of simulation from Unchanged policy forecast)	Increase in Unemployment (ILO definition)	Total increase in Government Revenue (change in billions)	Improvement in Government Balance as % of GDP (change in percentage points)
2010	-0.1	5,000	6.7	0.5
2011	-0.2	28,600	5.9	0.5
2012	-0.2	29,500	5.3	0.5
2013	-0.1	16,100	4.7	0.6
2014	-0.1	5,800	4.4	0.6
2015	0	-4,100	4.2	0.7

Comparing the revenue raised by this tax to the HMRC's tax ready reckoner, a 1p increase in the basic rate of income tax, we find that in the first year of the introduction of the increase there would be broadly similar results. The HMRC forecasts that a 2p increase in income tax raises £6.8 billion in the first year, very similar to £6.7 forecast by the Oxford Economics model. However it is worth noting that this revenue does decline in the medium to long-run.

Rise in income tax personal allowance to £8,000

Raising the personal income tax allowance works similarly to a fall in income tax rates. We should note that whereas the rest of our simulations are tax rises, this simulation is effectively a tax cut. The model employs an effective rate of tax in its equations meaning that a rise in the tax allowance would broadly have the same effect on the effective rate as a fall in an income tax. There is a slight increase in growth rates due to an increase in average earnings initially.

> **"The model employs an effective rate of tax in its equations meaning that a rise in the tax allowance would broadly have the same effect on the effective rate as a fall in an income tax"**

However, this is effect is offset by rising wage costs and lowered firm profits. The model is not a detailed model of welfare systems, so it does not allow us to explore many of the more interesting questions about such a policy change in detail – in particular its effects on participation tax rates and people leaving welfare for work.

Figure 3.3A: Impact on medium-term growth rates

Legend: Unchanged policy forecast — Simulation
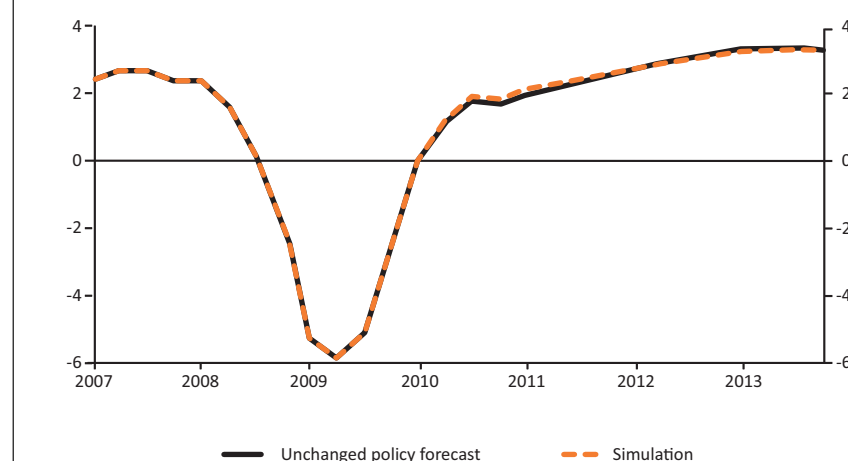
Unemployment falls initially as there is a behavioural response on labour utilisation of higher earnings, but as wage costs begin to rise in the medium-term leading to a rise in unemployment.

There is an overall loss to revenue and this worsens the fiscal balance as a percentage of GDP initially but the losses begin to taper off in the longer term.

Figure 3.3B: Impact on unemployment ('000s)

Legend: Unchanged policy forecast — Simulation
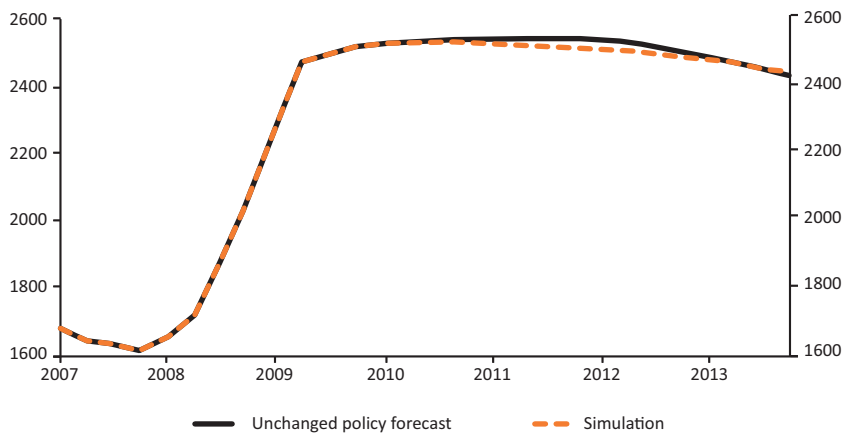
Figure 3.3C: Impact on fiscal balance as a % of GDP

Legend: Unchanged policy forecast — Simulation
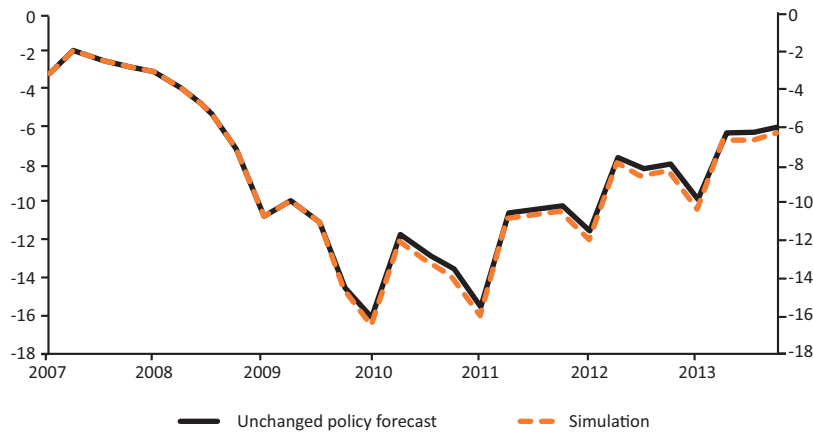
Table 3.3: Differences of simulation from unchanged policy forecast

Year	GDP level (% change of simulation from Unchanged policy forecast)	Increase in Unemployment (ILO definition)	Total increase in Government Revenue (change in billions)	Improvement in Government Balance as % of GDP (change in percentage points)
2010	0.1	-3,000	-4.1	-0.3
2011	0.1	-21,100	-3.3	-0.3
2012	0.1	-20,700	-2.8	-0.3
2013	0.1	-8,000	-2.5	-0.3
2014	0	200	-2.2	-0.4
2015	0	3,100	-1.9	-0.4

Roughly, raising the income tax threshold leads to a loss of revenue of about £4.1 billion in the model where as the HRMC suggests that such an increase in the threshold would cost £9.2 billion of revenue.

2p rise in Employers' National Insurance contributions

The impacts of increases in Employers' NI are extraordinarily and probably implausibly high in the Standard Oxford Economics model.

First, growth rates fall dramatically as wage costs rise, average earnings fall and profits are down.

Figure 3.4A: Impact on medium term growth rates

Unemployment increases by more than one million as wage costs rise.

Figure 3.4B: Impact on unemployment (000's)
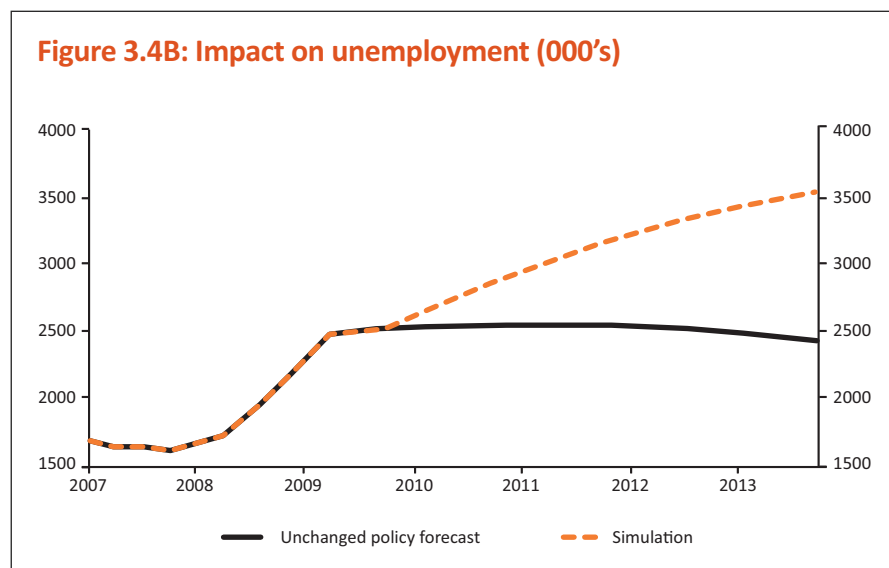
Initially, the tax raises revenue and improves the fiscal balance, but as the GDP growth falls and unemployment shoots up the revenue generated from this tax falls dramatically and worsens the fiscal balance as a % of GDP.

These results are clearly implausible — though it is of interest to note that similar results are produced by the Treasury's own model. The model forecasts that a 2p increase employers' NIC will raise £13.1 billion in 2010 compared to £10.8 billion suggested by the tax ready reckoner.

Figure 3.4C: Impact on fiscal balance as a % of GDP

Legend: —— Unchanged policy forecast   - - - Simulation

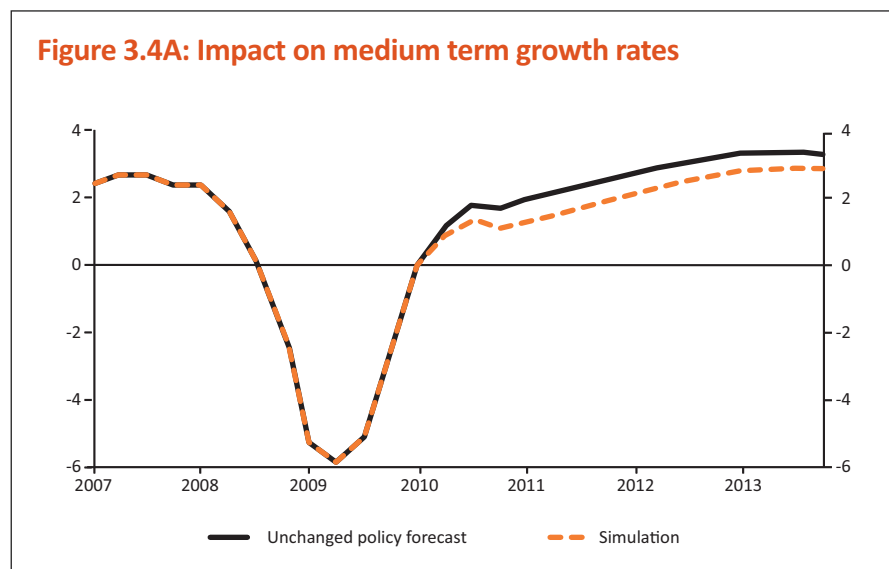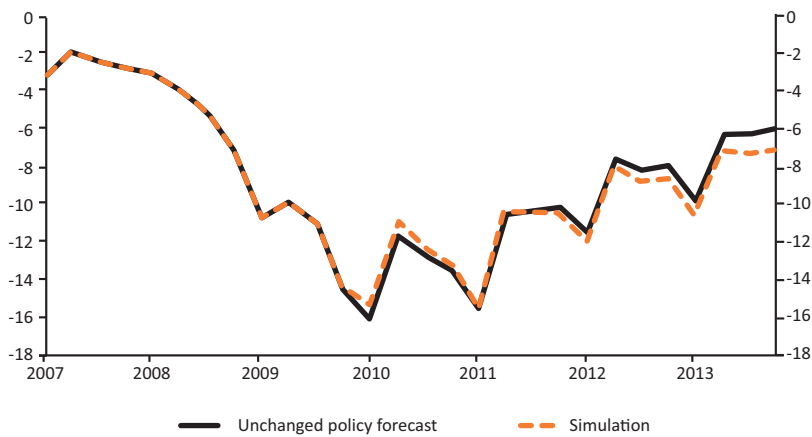**Table 3.4: Differences of simulation from unchanged policy forecast**

Year	GDP level (% change of simulation from Unchanged policy forecast)	Increase in Unemployment in millions (ILO definition)	Total increase in Government Revenue (change in billions)	Improvement in Government Balance as % of GDP (change in percentage points)
2010	-0.3	0.2	13.1	0
2011	-0.9	0.5	17.2	0.6
2012	-1.4	0.8	24.4	0.1
2013	-1.9	1.0	32.0	-0.4
2014	-2.3	1.2	39.1	-0.8
2015	-2.4	1.4	47.4	-1.2
2016	-2.2	1.5	58.4	-1.5

Alternative specification

Though it is of interest to note that the Oxford Economics model (and hence, by extension the Treasury model) produces such large effects for employers' national insurance contributions, given that the Treasury has indeed introduced such a rise in the rate (indicating its lack of confidence in this modelling result), we consider the answers so implausible as not to constitute a useful basis for policy analysis.

In our alternative specification we introduce the same increase in employers' NIC into the average earnings equation, which means that any rise in employers NICs will lead to a squeeze on pay. If we have full pass through into wages, the tax works similarly to an income tax, although it operates through a different structure and has different effects in terms of wage bargaining. Therefore it has comparable effects on employment and growth to those of an income tax.

Growth rates fall initially and then rise for a brief period as wage costs rise, but as earnings fall wage costs begin to fall and GDP growth begins to rise again.

Figure 3.5A: Impact on medium term growth rates
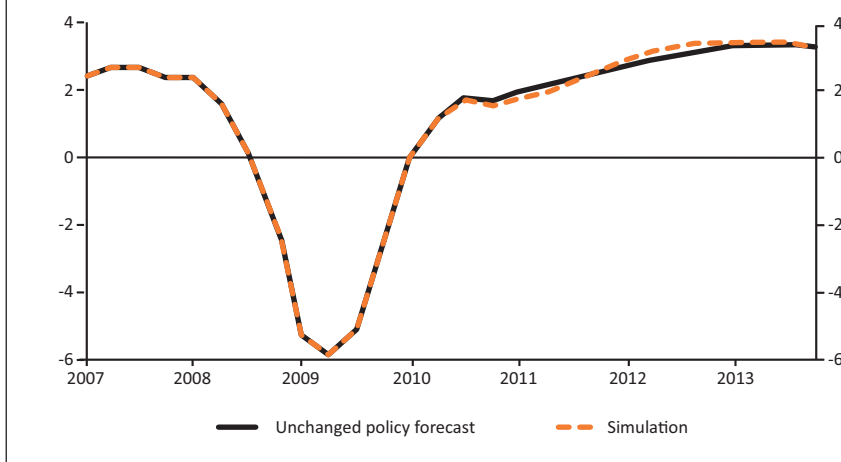
Unemployment rises initially as wage costs rise, but as average earnings fall in the medium-term employment increases.

Figure 3.5B: Impact on unemployment (000's)
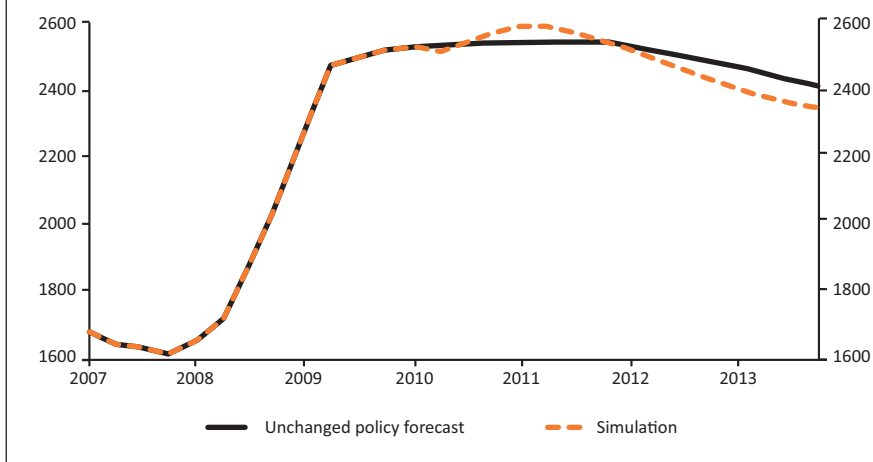
The revenue generated from this tax falls after two years but the gains made through economic growth and rising employment ensure that the fiscal balance improves as a % of GDP.

Although not so absurd as the standard model results, we are unclear as to how robust the foundation is of this model – there is the danger that we have simply moderated implausibly high impacts without providing a robust basis for an alternative forecast. In later sections we go on to review wider academic evidence on the subject, and we believe that it is natural to suppose that increases in employers' NIC should be expected to have a materially negative impact on employment – though perhaps not on the scale in the standard model.

Figure 3.5C: Impact on fiscal balance as a % of GDP
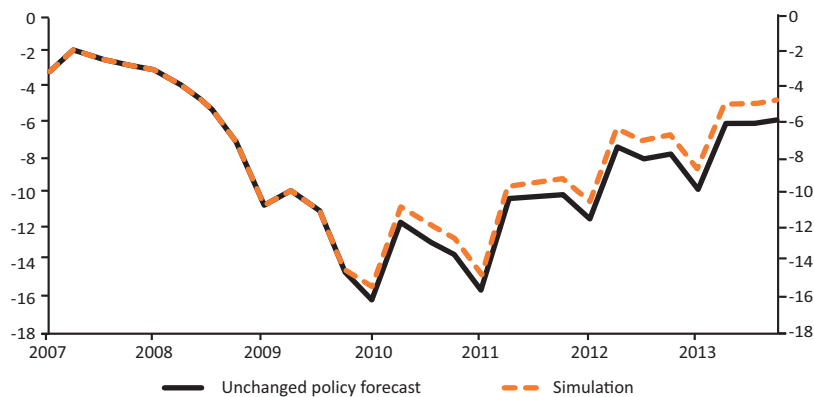
Table 3.5: Differences of simulation from unchanged policy forecast

Year	GDP level (% change of simulation from Unchanged policy forecast)	Increase in Unemployment (ILO definition)	Total increase in Government Revenue (change in billions)	Improvement in Government Balance as % of GDP (change in percentage points)
2010	0	6,900	5.3	0.8
2011	-0.1	26,300	0.1	0.7
2012	0.1	-33,900	-2.3	0.9
2013	0.1	-68,100	-2.9	1.1
2014	0	-44,100	-3.1	1.1
2015	-0.1	-7,300	-3.5	1.1

2p rise in Employees' National Insurance contributions

The effects of rises in Employees' National Insurance contributions are fairly similar to raising income tax, as might be expected. Growth is depressed for the first few months, but by the end of the period is about the same as the unchanged-policy scenario. The growth lost is slightly more than from income tax rises.

Figure 3.6A: Impact on medium term growth rates
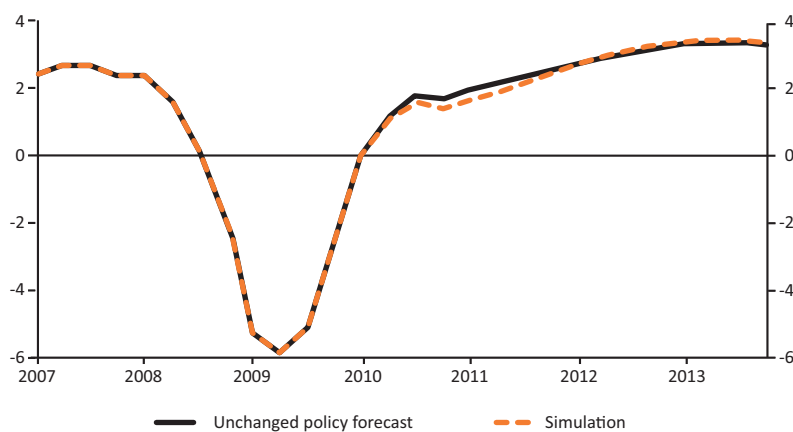
This period of reduced growth is associated with a small rise in unemployment, but this is gone by the end of the forecast period.

Figure 3.6B: Impact on unemployment (000's)
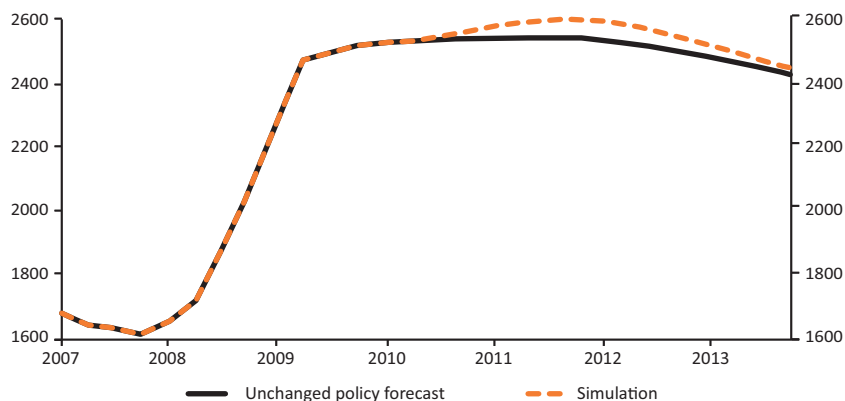
The measure raises money, and those funds are still there at the end of the forecast period. According to the model, the amount raised is a little more than from an equivalent rise in income tax.

Figure 3.6C: Impact on fiscal balance as a % of
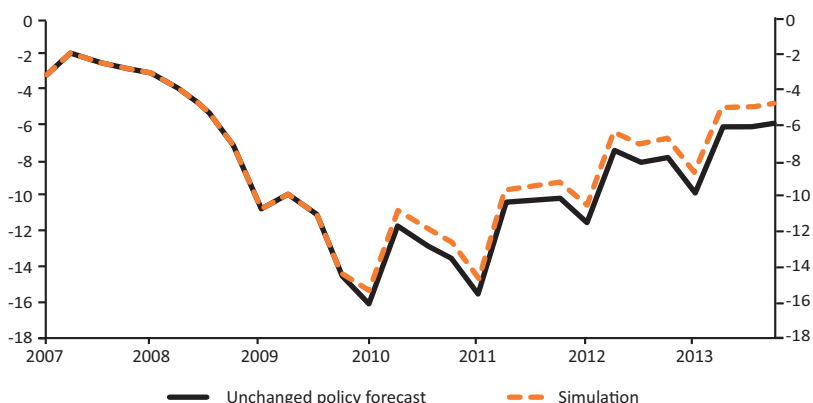
Table 3.6: Differences of simulation from unchanged policy forecast

Year	GDP level (% change of simulation from Unchanged policy forecast)	Increase in Unemployment (ILO definition)	Total increase in Government Revenue (change in billions)	Improvement in Government Balance as % of GDP (change in percentage points)
2010	-0.2	0	12.2	0.9
2011	-0.3	9,300	10.2	0.8
2012	-0.3	52,000	8.9	0.9
2013	-0.2	51,600	8.0	1.0
2014	-0.1	25,800	7.2	1.1
2015	-0.1	7,900	6.6	1.2
2016	-0.1	-5,400	6.3	1.3

A 2p rise in employees' NIC raises £12.2 billion in the first year of introduction compared to £8.5 billion suggested by the tax ready reckoner.

5p rise in Corporation Tax

In the standard Oxford Economics model, corporation tax has its effects in the model by changing the relative return on investment. The modelled impact of a change in the rate of corporation tax on business investment is quite small and, therefore, the impact on GDP growth is much smaller still. Again, we will go on to test how the results in the model would be affected by different assumptions.

Growth rates are unaffected in the medium-run, whereas in the long run GDP levels rise marginally compared to the unchanged policy forecast scenario.

Figure 3.7A: Impact on medium-term growth rates

Unemployment is virtually unaffected.

Figure 3.7B: Impact on unemployment ('000s)
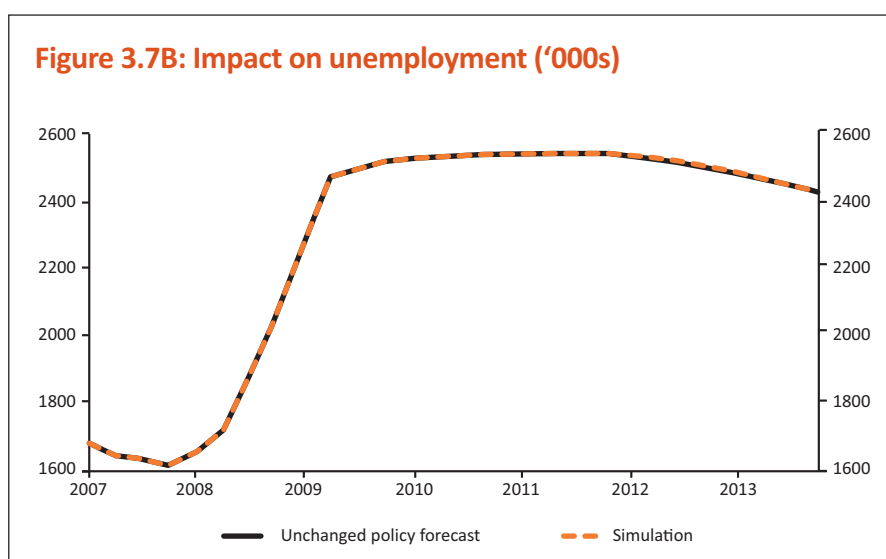
The tax rise raises a little revenue, which is still there at the end of the forecast period improving the government balance.

Figure 3.7C: Impact on fiscal balance as a % of GDP
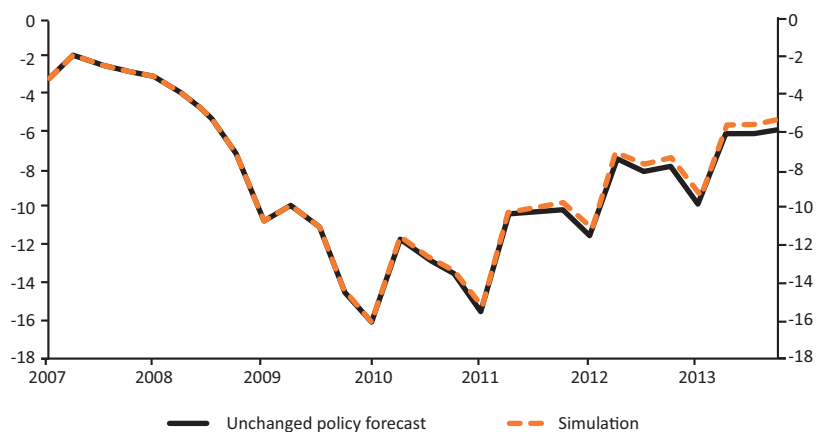
Table 3.7: Differences of simulation from unchanged policy forecast

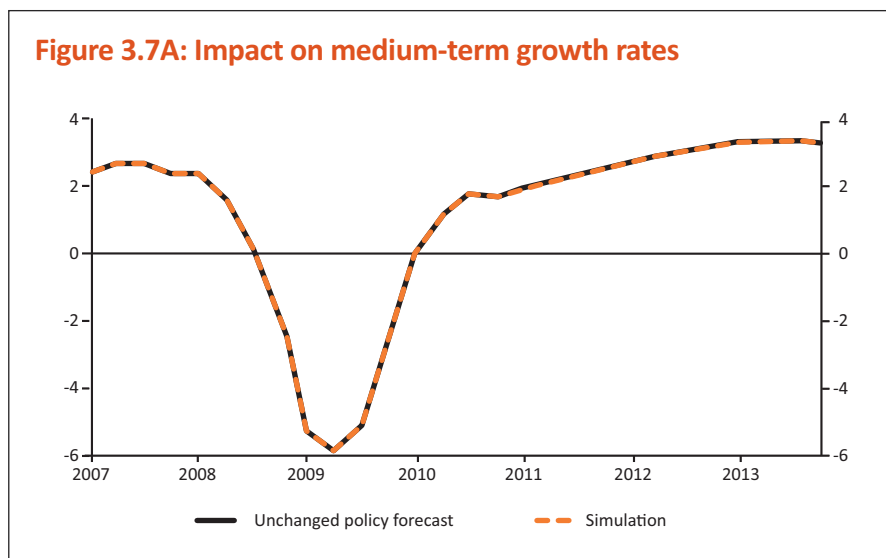| Year	GDP level (% change of simulation from Unchanged policy forecast)	Increase in Unemployment (ILO definition)	Total increase in Government Revenue (change in billions)	Improvement in Government Balance as % of GDP (change in percentage points)
2010	0	100	0.8	0.1
2011	0	1,200	3.9	0.3
2012	0	1,400	6.5	0.4
2013	0	-100	8.5	0.6
2014	0	-2,200	10.0	0.7
2015	0	-3,700	11.2	0.7
2016	0.1	-6,400	12.5	0.8
2017	0.1	-10,100	13.8	0.8
2018	0.1	-13,100	15.4	0.9
2019	0.1	-16,500	17.3	0.9

The tax rise raises £0.8 billion in the first year of its introduction compared to £1.7 billion forecast by the HMRC.

Alternative specification

Here we run a slightly different specification from the standard model, altering the private sector business investment equation by adding a retained earnings term (that is the after tax company profits of the firm). In this specification, an increase in corporate taxation will decrease retained earnings and lower private sector business investment. Even on this alternative specification, we might question the lack of response to the tax hike.

We can see from the table that in the long run there is a negative impact on GDP levels and growth as private sector business investment decreases.

Figure 3.8A: Impact on medium-term growth rates
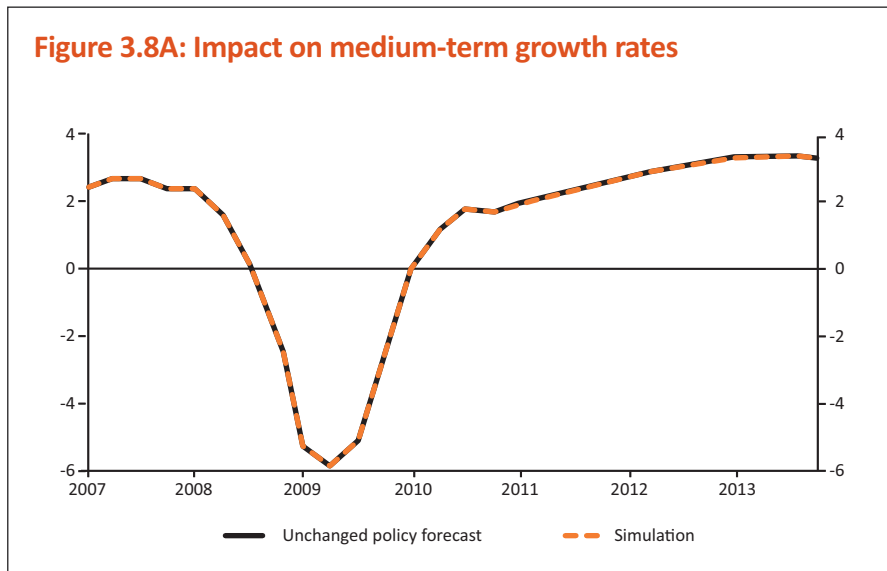
Unemployment rises marginally in the long run as jobs are lost due to lowered investment.

Figure 3.8B: Impact on unemployment (000's)
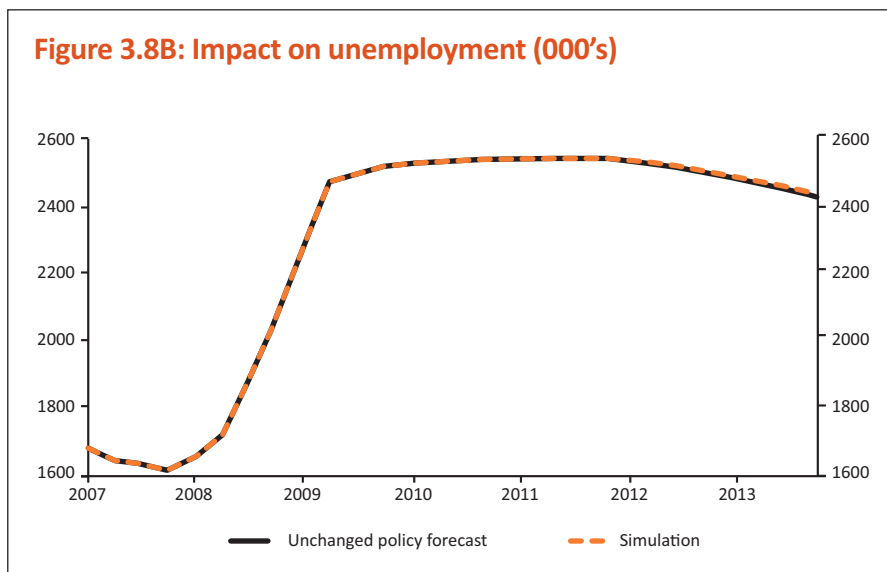
There is a sustained improvement in the fiscal balance as revenue raised by this tax increases over time.

The alternate specification of the model suggest that a 5p rise in the tax raises £0.6 billion where as the tax ready reckoner suggests this number is more like £1.7 billion. However, even in our alternative specification, the model generates very little impact of a 5p rise in corporation tax, which is somewhat implausible. It would be reasonable to expect the magnitudes of the change to be greater (though we expect the change to be broadly in the same direction, i.e. GDP levels would be lower in the long run with a higher rate of corporation tax) than reflected by the alternative specification in the model.

Figure 3.8C: Impact on fiscal balance as a % of GDP
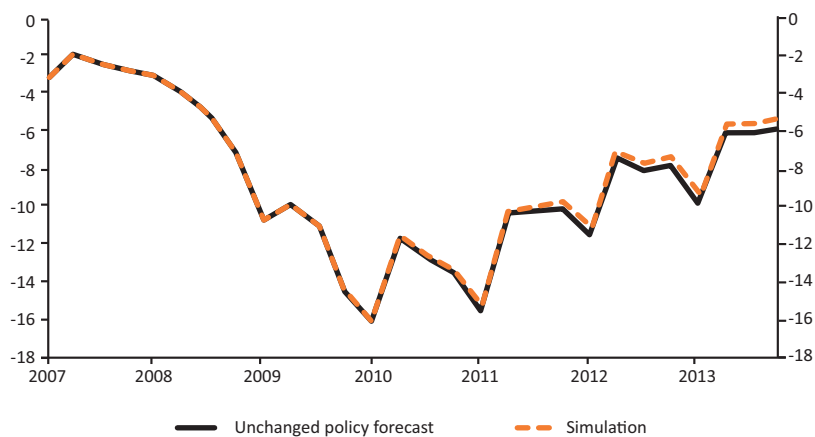
**Table 3.8: Differences of simulation from unchanged policy forecast**

Year	GDP level (% change of simulation from Unchanged policy forecast)	Increase in Unemployment (ILO definition)	Total increase in Government Revenue (change in billions)	Improvement in Government Balance as % of GDP (change in percentage points)
2010	0	0	0.6	0.1
2011	0	800	3.2	0.3
2012	0	3,700	5.2	0.4
2013	0	6,300	6.6	0.6
2014	0	6,900	7.6	0.6
2015	-0.1	6,800	8.2	0.7
2016	-0.1	7,800	8.7	0.7
2017	-0.1	7,400	9.3	0.8
2018	-0.1	7,100	10.0	0.8
2019	-0.1	7,400	10.7	0.8

Introduced carbon tax of $30/tCO₂e

We now look at the results on the Oxford Economics model of an introduced carbon tax of $30/tCO$_2$e.[30] This value is known as the shadow price of carbon which represents the social cost of environmental damage from carbon dioxide emissions. In the model carbon taxes work to raise the price of fuels, which in turn increase firm costs and lowers profitability, which acts to lower return on investments and thus lowers investment and economic growth. The figure below shows that the introduction of a carbon tax reduces growth in the medium term, though in the long term growth returns to the unchanged policy level.

Unemployment is higher as well, suggesting that lowering labour taxes from the proceeds of an introduced carbon tax could reduce the distortionary affects of labour taxes and improve welfare.

30 This is the shadow price of carbon, as given in Chapter 13 of the "Stern Review on the Economics of Climate Change", HM Treasury.

Figure 3.9A: Impact on medium term growth rates

Unchanged policy forecast — — Simulation

Figure 3.9B: Impact on unemployment (000's)

Unchanged policy forecast — — Simulation

In the Oxford Economics model, the impact of an introduced carbon tax actually reduces the fiscal balance due to large effects on GDP through raised fuel prices, however, evidence from research we quote later suggests otherwise.

Figure 3.9C: Impact on fiscal balance as % of GDP

Unchanged policy forecast — — Simulation

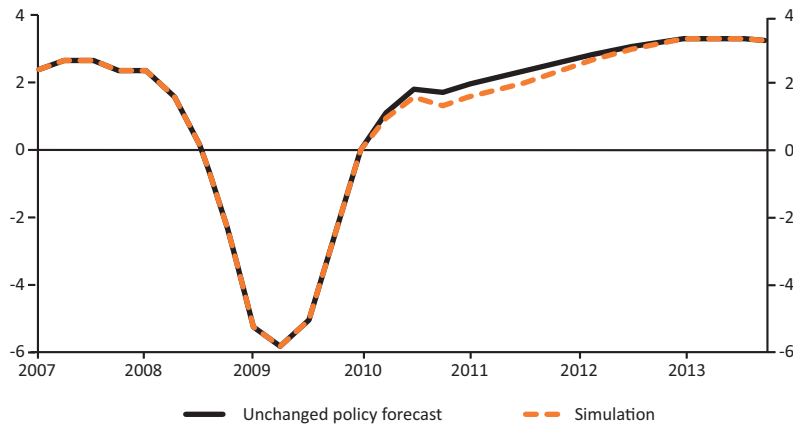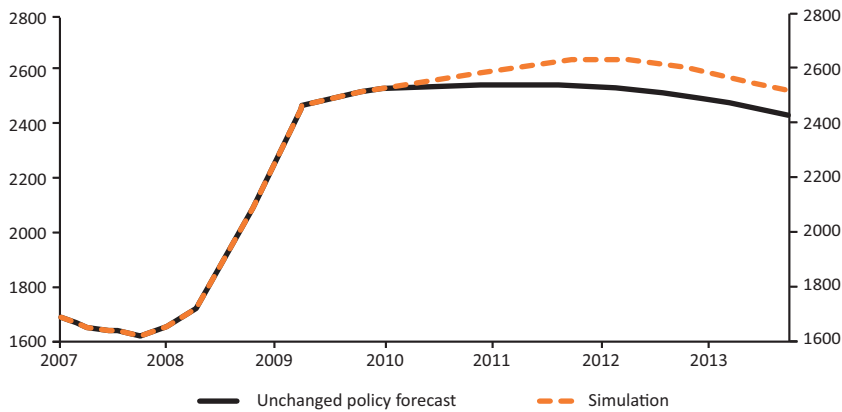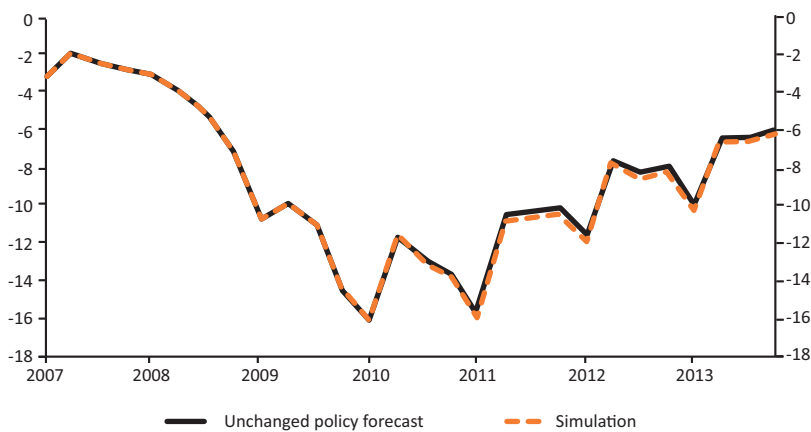## Table 3.9: Differences of simulation from unchanged policy forecast

Year	GDP level (% change of simulation from Unchanged policy forecast)	Increase in Unemployment (ILO definition)	Total increase in Government Revenue (change in billions)	Improvement in Government Balance as % of GDP (change in percentage points)
2010	-0.2	21,000	-0.8	-0.1
2011	-0.5	75,000	-0.3	-0.2
2012	-0.5	106,000	3.6	-0.3
2013	-0.5	98,300	1.0	-0.3
2014	-0.5	83,600	1.7	-0.3
2015	-0.5	66,000	2.1	-0.2
2016	-0.4	50,500	2.4	-0.2
2017	-0.4	40,900	2.8	-0.2
2018	-0.4	36,300	3.3	-0.2
2019	-0.5	33,500	3.9	-0.2

Summary Table

The results of the above simulations are summarised in the following table, showing the affect on GDP, unemployment and the fiscal balance in the first year of introduction and 3 years after introduction. We also compare the revenue raised by the tax in the model to that forecast by the HMRC in the tax ready reckoner.

Table 3.10: Effects of different tax rises on GDP, unemployment and the fiscal balance

Tax rise (2p unless otherwise stated)	GDP level (% change of simulation from Unchanged policy forecast)		Increase in unemployment (ILO definition)		Improvement in Government Balance % of GDP (change in percentage points)		Total increase in Government Revenue (change in billions)		HMT Tax "Ready reckoner" (2p equivalent revenue raised
Year	2010	2013	2010	2013	2010	2013	2010	2013	2010/11
VAT	0.0	-0.3	5,100	81,200	0.8	0.5	11.4	9.2	9.4
Basic rate of Income tax	-0.1	-0.1	5,000	16,100	0.5	0.6	6.7	4.7	6.8
Personal income allowance (Increased to £8000)	0.1	0.1	-3,000	-8,000	-0.3	-0.3	-4.1	-2.5	-9.2
Employers' NIC	-0.3	-1.9	200,000	1,000,000	0	-0.4	13.1	32.0	10.8
Employers' NIC (alternate specification)	0	0.1	6,900	-68,100	0.8	1.1	5.3	-2.9	10.8
Employees' NIC	-0.2	-0.2	0	51,600	0.9	1.0	12.2	8.0	8.5
Corporation tax (5p rise)	0	0	100	-100	0.1	0.6	0.8	8.5	1.7
Corporation tax (5p rise, alternate specification)	0	0	0	6,300	0.1	0.6	0.6	6.6	1.7
Introduced carbon tax ($30/tCO$_2$e)	-0.2	-0.5	21,000	98,300	-0.1	-0.3	-0.8	1.0	n/a

Having addressed the affect of rises in various taxes on economic growth, unemployment and the fiscal balance, we now assess the net affects of fiscally neutral tax reforms on the economy. In the following section will bring in wider evidence from academic research.

4
Fiscally Neutral Tax Reforms

We now turn to the question of how changes to the structure of taxation affect the rate of growth in the economy. As we have already stated, the pre-budget report has already announced a rise in taxes by £19bn, thus the primary concern for policy-makers in the short term will be how to structure the rise in taxation to maximise growth (i.e. to minimize how much growth is damaged by a rise in taxes on this scale).

In this section we shall sketch how the following structural changes would be expected to affect growth:

a) Increased VAT with reduced basic rate of income tax
b) Increased basic rate of income tax with increased personal allowance
c) Increased basic rate of income tax rate, reduced employers' NIC
d) Increased VAT, reduced employers' NIC
e) Reduced savings taxes relative to other taxes
f) Increased tax on debt interest, reduced corporation tax
g) Introduced carbon tax, reduced VAT

Motivation for the choice of reforms
- Increasing VAT rates relative to income tax rates has been a core government policy approach since the late 1970s.
- The concept of rebalancing income tax by raising the personal allowance funded by a rise in the basic rate or as an alternative to cuts in the basic rate has been floated repeatedly since the early 2000s and became Liberal Democrat policy in April 2009.[31]
- Rises in Employer National Insurance contributions were announced in the 2009 pre-Budget Report. We will consider the merits of such a change relative to both a rise in income tax rates and also a rise in VAT, the two main personal taxes.
- With the very low savings rates recorded during the 1990s and 2000s (set out in the section below), a policy discussion evolved concerning whether there should be tax incentives for people to save. Indeed, a proposal along these lines even became one of the Conservative Party's anti-recession policies during 2009.
- Proposals to reduce corporation tax rates are widely mooted and are current Conservative Party policy, whilst the possibility of increasing the taxation on debt interest was discussed in a speech by Shadow Chancellor George Osborne.

- A number of commentators have proposed a rebalancing of the tax system towards a greater role for green taxes. Policy Exchange has is currently carrying out work on the use of a carbon tax, as mooted by authors such as William Nordhaus.[32, 33]

We shall now consider each of our seven structural reforms in turn. Our approach will be to discuss first the ways in which the particular tax structure reform would be *expected* to affect growth, and then look at empirical evidence and simulations[34] concerning the impacts of the reform in question.

Increased VAT with reduced basic rate of income tax

Back in the 1970s, it used to be popular amongst economists to believe that it would be more economically efficient to tax consumption than income. The idea was, approximately, that by taxing income one reduced the incentive to work hard (or at all) and earn more. Therefore, the thought went, taxing income would tend to reduce growth by increasing incentives to take more leisure and do less work and therefore to produce less output.

When the top rate of tax on income was 83% and VAT stood at 8%, the notion that it might be a good idea to rebalance taxation more towards consumption taxes and away from income taxes seemed pretty compelling – so much so that the notion of the relative efficiency of VAT entered into the political consciousness. The standard presumption appears to be that VAT is more economically efficient but less "fair", since poor and rich pay alike, whereas income tax is fairer but less efficient – a fairly classic efficiency/equity political trade-off.

In reality, though, neither of these ideas is as powerful as one might at first suppose. Issues of the fairness of taxation are not our main topic in this piece, but it is worth noting that many necessities, such as food or children's clothing, are zero-rated for VAT purposes, and these necessities form a much larger proportion of the expenditure of the poor than of the rich, with the consequence that VAT is a much less regressive tax than is often assumed, in fact certain studies even suggest that it is slightly progressive.

Turning our attention to the central focus of this report, we find that the idea that taxes on income discourage work more than do taxes on consumption is unconvincing. For, given that income is the overwhelmingly dominant source of consumption across the economy (few people simply consume out of their previous-accumulated wealth), one should expect the effects of a perfect consumption tax upon incentives to work to be broadly equivalent to those of an income tax. Why? Well, let us first assume that the VAT, say, simply raises prices. Workers are interested in their incomes so that they can consume. But if prices are raised when VAT is imposed, then the real value of income falls by the value of the tax by the same amount it would fall if the tax were imposed directly on the income.

A numerical example may help. Suppose that a worker earns £100 and pays income tax of £20 on it, and that there is no VAT or other taxes. Then she has £80 to spend, and her £80 goes on goods with a real value of £80 – i.e. the final real value of her consumption is £80. Suppose, now, that the income tax is abolished and instead a flat VAT of 25% is imposed. Then she earns £100, and she uses it to buy goods with a real value of £80 on which a 25% tax is imposed, raising their price from £80 to £100.[35] So the final real value of her consumption is, again, £80.

Since the final real value of her consumption is unaffected by whether she pays the £20 in the form of income tax or VAT, she clearly has no more incentive to work when the tax comes out as VAT than when it comes out as income tax.

Box 4.1: Unearned income

Some readers may feel we have been a little too swift to simplify away the case of unearned income. After all, a consumption tax applies to income that does not come from work such as investment income or benefits – the idea is that a consumption tax applies over a broader base. But a little thought shows that this is not right. For increasing taxes on investment income either (a) reduces the labour income of active investors, and hence is a special case of the argument in the main text; or (b) reduces income from savings. But if savings income in the future is going to be less, then I must save more today to achieve the same amount of consumption tomorrow, and the labour income I earn is worth less in terms of consumption today and tomorrow. So with predictable consumption taxes, the argument above that consumption and income taxes are broadly equivalent still applies. (Uncertain or volatile taxes have slightly different effects – almost always worse than predictable taxes.)

As regards benefits, most benefit rates in the UK have been index-linked to prices since the 1980s. Most are linked to the RPI or "Rossi" measure which excludes housing costs. A few are linked to earnings and only a few rates like earnings disregards are not linked to inflation. This means that rises in VAT, compared to income tax, no longer have the effect of reducing real benefit rates and increasing work incentives.

The other key potential difference arises if savings taxes are poorly structured so as to constitute double taxation — in particular if the income out of which the savings arise is taxed and then the income from the savings itself is also taxed. The tax structure that least distorts behaviour (and hence least reduces advantageous economic growth) will avoid double taxation — so, either there will be tax relief on savings or savings income will not be taxed. Similar points arise with other tax reliefs such as tax relief on pensions (somewhat misleadingly described as a "subsidy" for pensions in the 2009 Budget). Insofar as savings taxes generate double taxation distortions and hence result in under-saving, consumption taxes will tend to be more efficient (and hence more growth-promoting) than labour income taxes. This might be particularly relevant in situations of high inflation (as in the 1970's) in which a large component of savings income is interest just to maintain the real value of savings. Distortion will be lower when inflation is lower (as is the case today).

As noted above, insofar as savings tax reliefs *do* avoid double taxation, with the consequence that income is taxed only in the period it is consumed (which is broadly the case in the UK), then an "income tax" is what the academic literature regards as a "consumption tax". Hence much of the (particularly American) academic literature concerning the merits of "consumption" versus "income" taxes is actually an argument for an income tax of the UK form.

Matters may well be worse for VAT than this. Because there may be firms that try to absorb some of the effects of the VAT rise – e.g. because they do not operate in competitive markets, or because the firms concerned are in financial difficulties and need to maintain turnover. Consequently, when the VAT is imposed, not all prices will necessarily rise by the same amount. The imposition of VAT will tend to distort relative prices, re-directing economic activity inefficiently and thereby reducing growth.

Further complexities arise because not all goods attract the same level of VAT – e.g. some are subject to reduced rates of VAT, others are zero-rated, and some may be VAT-exempt. Such complexities increase the extent to which rises in VAT distort relative prices.

Of course, income taxes are also subject to complexities and income-tax-free personal allowances and so on. And when labour markets involve monopoly power (e.g. because of unionisation), then income tax rises and falls may not be fully reflected in wage changes. So when, as in the 1970s, rates of income were high, complexities excessive, and union power high, whilst rates of VAT were low (so that the effects of distortions were small), the trade-off may well have been favourable to increasing VAT and reducing income tax.

But in current circumstances, when rates of income tax have become very low and rates of VAT now approach the basic rate of income tax, and especially given the increase in monopoly power and the number of firms in financial distress that both arise in recessions, it becomes much more likely that the distortions to relative prices created by monopoly effects and financial distress interacting with VAT rises will dominate over income tax-related distortions.

Economic theory suggests that it is therefore more likely that in current circumstances it would be growth-promoting to increase the basic rate of income tax and reduce VAT than the reverse.

Simulation results

To illustrate the impact of increasing VAT and reducing income tax, let us consider what the Oxford Economics model forecasts would be the impact if VAT were raised to 20% and income tax cut to 18%.

First let us see that this is indeed a broadly revenue-neutral change. That is illustrated in Figure 4.1 where we see that, after 3 years, the fiscal balance is virtually the same under this structural reform — i.e. with VAT at 20% and the basic rate of income tax 18% — as it would have been without the reform.

Figure 4.1: Impact on fiscal balance

Legend:
— Unchanged policy forecast (income tax 20%, VAT 17.5%)
- - - Simulation (income tax 18%, VAT 20%)
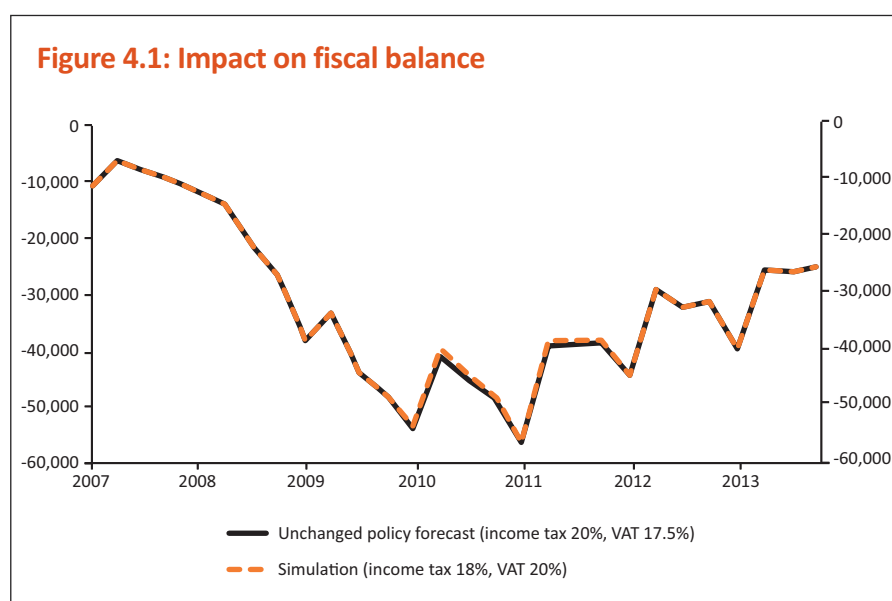
So, what is the impact on growth? This is illustrated in Figure 4.2. We see that in the first few months there is a very slight rise in the growth rate under this reform, but after about a year the growth rate with the higher rate of VAT/lower rate of income tax falls noticeably below the unchanged policy forecast and stays there until almost the end of the forecast horizon, eventually converging back (as one would expect from the underlying theory, since we have argued that the long-term effects of VAT and income tax are the same).

Figure 4.2: Impact on medium term growth rates
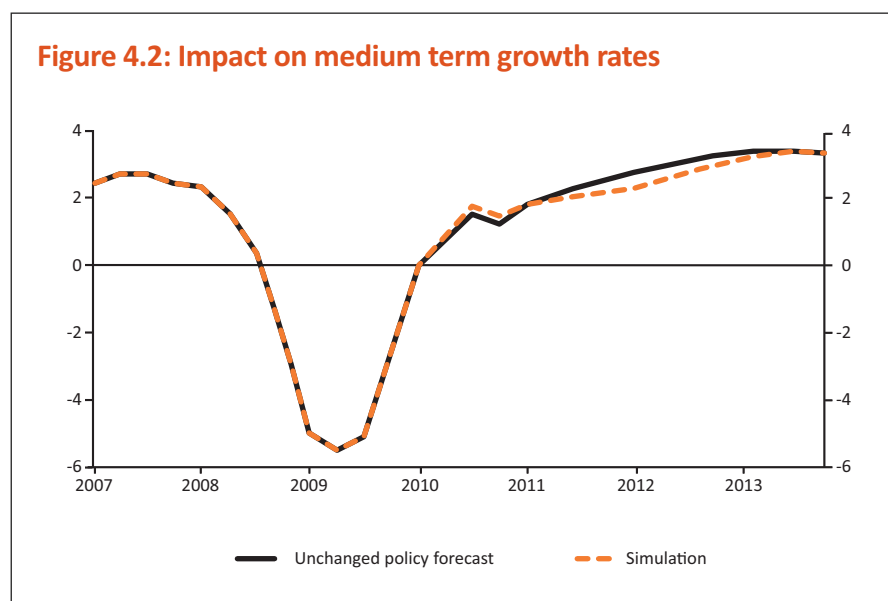
The effects upon unemployment are fairly clear, as shown in 4.3. The period of reduced growth leads to unemployment being higher, by about 100,000.

Figure 4.3 Impact on unemployment ('000s)
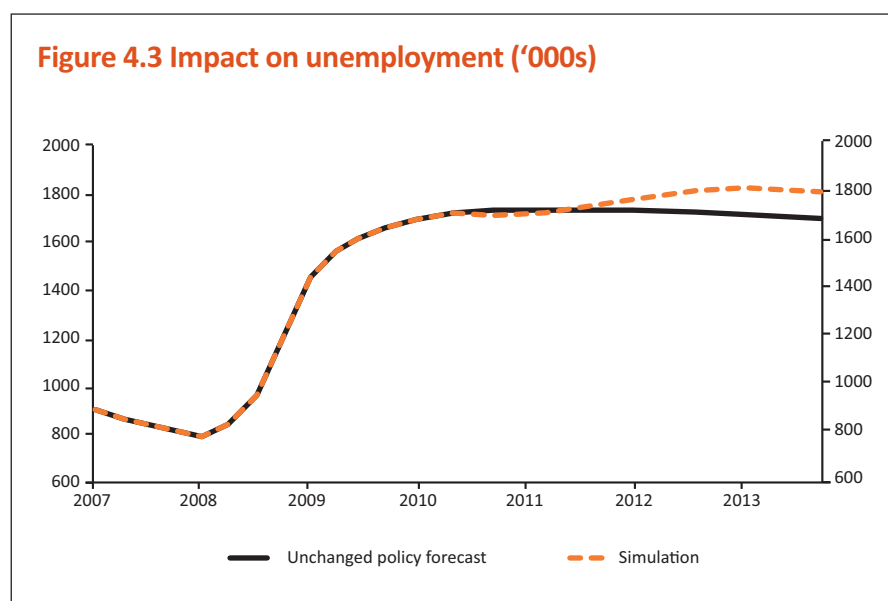
Our result here broadly matches the findings of other recent studies. Afonso & Furceri (2008), for example, find that whilst indirect taxes (such as VAT) decrease

growth (each additional percentage point of GDP taken in indirect taxes reducing growth by 0.34-0.38 per cent), by contrast "direct taxes [such as income tax]...do not seem to affect growth significantly". It is worth noting that Afonso & Furceri's result might be affected by automatic wage indexing factors that we do not discuss above — specifically, VAT rises may feed automatically into wages through the bargaining process in a number of EU states. This may be less obviously applicable to the UK. However, that the result appears in UK macroeconomic models, also, suggests that it does not depend upon inapplicable labour market structures.[36]

That much the dominant effect in our simulation is the negative effect on growth of the VAT rise can be illustrated by considering that rise in isolation, as in Figure 4.4 and 4.5.

Figure 4.4: Increase in VAT rate to 20%

A: Impact on medium-term growth rates
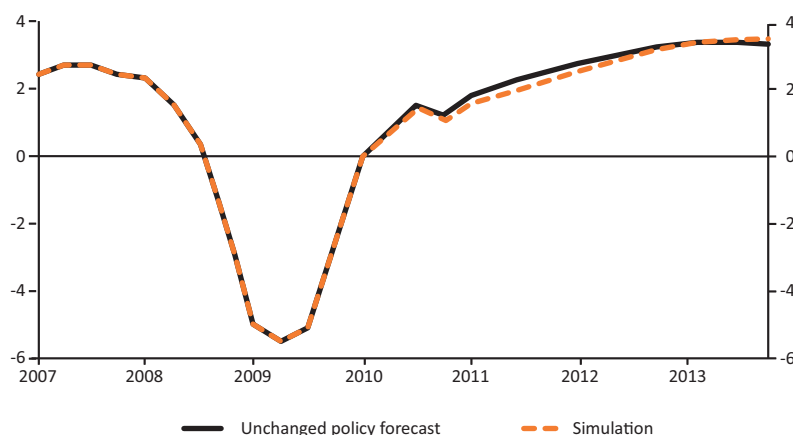
Figure 4.5: Impact on unemployment (000's)
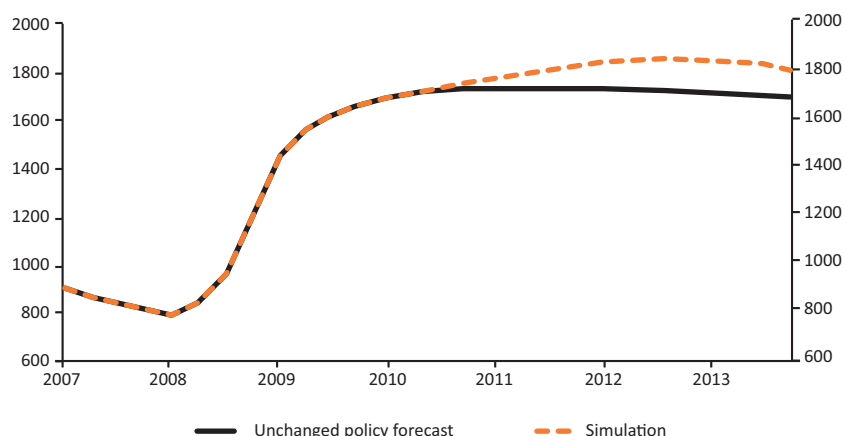
36 t is also worth noting that the Afonso & Furceri result relates to average tax rates, not marginal rates.

Increased basic rate of income tax with increased personal allowance

In essence, this reform would involve a return to a principle Geoffrey Howe argued for as Chancellor, and away from the concept of the 1990s. The Howe concept was that the best way to assist the poor in income tax terms was for them not to pay any; this had the added benefit of reducing administrative costs since fewer people needed to interact with the tax authorities at all. In contrast, under Major and then Brown the idea arose that the poor could be assisted by the use of a "lower rate" band below the basic rate.

Bodies such as the IFS criticised this line, pointing out that those that gained the most from a lower rate band, relative to the raising of thresholds, were those earning above the upper threshold of the band. Thus, for a given degree of financial support to the poor, the use of a lower rate band is much less efficient than a raised threshold.

The issue here, however, is not the raising of thresholds versus a lower rate band, nor, as such, the impact on the poor (though the impact on the poor may itself have an impact on growth for reasons we shall explore below). Our interest is in the impact on growth of rises in personal allowances versus rises in the basic rate. An alternative way to consider the problem is: if taxes must rise, is it worse for growth if those tax rises take the form of increases in the basic rate or of reductions or freezes in the real value of personal allowances? (Note that, when there is real wage growth, a freeze in the real value of personal allowances means that the proportion of income covered by the allowance falls – this is part of the process known as "fiscal drag".)

To address this question, it is useful to divide up the impact between the different types of income tax payers:

- Those paying no income tax previously are unaffected
- Those that earn less than the new higher personal allowance are clearly better off — before they paid income tax and now they do not. Furthermore, small increases in their salaries will not attract any income tax — we say that their "marginal tax rate" is zero — whereas before the marginal income tax rate would have been 20%. They may, however, receive benefits such as tax credits that have tapers, meaning that their overall marginal tax rate is still positive — indeed, for some of them it may still be rather high.[37]
- Those that earn just above the new higher personal allowance are financially better off, because they gain from paying no tax on their income up to the allowance and only pay the higher marginal rate on the small amount of income they receive above the threshold. This higher marginal rate does, however, mean that the marginal gain to them of increasing their incomes (e.g. by working overtime) is reduced.
- Since the measure is neutral, and since there are gainers that no longer pay income tax, then somewhere within the basic rate band there must be a crossover point above which the higher rate paid on the earnings above the higher threshold more-than-offsets the gains from the higher threshold. Those with higher earnings than this who are still basic rate taxpayers are worse off financially, and now also face a higher marginal rate of tax (so have less incentive to increase their incomes).

● Finally, higher rate (and above) taxpayers will be worse off financially (since they earn above the cross-over point that must lie within the basic rate band) but there is no effect upon their marginal incentive to earn (the higher rate is not changed).

The effects here are clearly complex. What the overall effect is upon growth would seem to turn on a combination of three points:

1. whether the positive incentives for the lowest-paid — the 20% tax cut for them — outweigh the negative incentive effects for the middle earners;
2. how significant is the reduction in spending costs as a consequence of not needing to assess the lowest-paid for income tax and because of reduced means-tested benefits bills (means tests are typically based on post-tax income);
3. what the interaction is between reductions in the marginal rate of tax and the taper rates of benefits.

Given that the lowest-paid experience the largest marginal impacts (a reduction in the marginal rate of 20%) and that the lowest-paid often face the highest effective marginal tax rates anyway (because of the effects of benefit tapers), it might be natural to assume that the positive growth effects from more work by the lower paid would predominate. However, since it is benefit tapers that are the key determinant of effective marginal tax rates for many of the lower-paid, the incentive effects might be muted unless the measure were accompanied by benefits reforms that fall outside the scope of our analysis here.

"If taxes must rise, is it worse for growth if those tax rises take the form of increases in the basic rate or of reductions or freezes in the real value of personal allowances?"

Even a brief analysis of the likely effects on people both affected by the social security and the tax systems shows how an increase in the financial incentives to work provided by an increase in the income tax threshold would be partially offset by the withdrawal of benefits. For example, a person under 25 years of age working 30 hours per week at the National Minimum Wage and not claiming any benefits might see an increase in income of up to £17 per week, i.e. they would be allowed to keep more of the £5.80 per hour that they are earning. But once we look at examples of people who have been claiming benefits and have decided to work – thus giving up some of their earnings in lost income from benefits – the effect on incentives is weakened.

A lone mother with two children would, for example, see her Housing Benefit claim reduced as her income from work is boosted by the increase in the income tax threshold. This is because Housing Benefit is withdrawn by 60p for every £1 earned. On top of this her likely extra money from tax credits would also be reduced as 39p is withdrawn on every £1 earned. In short, depending on the person in question, the incentive effects of an *expansion* of gross earnings as a result of an increase in the income tax threshold could be *reduced* by anything from 39% to 60%.

Having at least a small increase in the amount of money that people are allowed to keep would, though, be likely to reduce some of the administration costs in the tax and benefits system. A household with an income of £25,231 in 2006/07 receiving £2,073 in cash benefits, for example, would have paid out £5,900 in direct taxes (income tax and National Insurance contributions). In other words, the household is receiving around a third of its tax payments back again in benefits. By lessening the extent to which the government has to manage this circular movement of money, we would expect it to save some money.[38]

It is thus unclear what the net effects on growth would be of such a measure. This in itself is an interesting conclusion as, other things equal, policy makers might want to pursue such a change for other reasons, for example considerations about equity. However, it may be of interest to note that, in our models, increasing the basic rate of income tax to 25% is broadly fiscally equivalent to an increase in personal allowance to £10,000, as a percentage of GDP. And much of the economic effect would come from factors which we have discussed but not modelled here.

Increased basic rate of income tax rate, reduced employers' NIC

In some high unemployment countries there have been calls for reducing the tax burden on labour, especially employer payroll taxes where the link to jobs is most direct, in order to help alleviate the unemployment problem. There have been proposals to fund such labour-tax reductions via increases in allegedly less distortionary taxes, notably value added taxes or green taxes, though some have also argued for a higher basic rate of income tax.

Taxes on labour such as personal income taxes and employers' and employees' social security contributions can potentially have adverse effects on labour utilisation by affecting both labour supply and labour demand. Labour taxes affect labour supply through both the decision to work (economists refer to this as the "extensive margin") and average hours worked (this is called the "intensive margin"). A decrease in labour taxes can have two effects. First there is a "substitution effect", whereby people substitute more labour for less leisure because when income taxes are lower each additional hour worked produces relatively more consumption. Second, there is an "income effect", whereby when taxes are lower, post-tax income is higher, so people may not work as much. Since these effects work in opposite directions, the net effect on labour supply is an empirical issue. Labour taxes also influence firms' cost of labour especially when the tax burden cannot be shifted on to lower net wages. In this case, lower taxes bring down labour costs and firms respond by increasing labour demand.[39] In equilibrium, employment and average hours worked can, therefore, be affected by changes in personal income taxes and contributions.

It has been argued that social security contributions have a smaller impact on labour supply than other taxes because the eventual social benefits that workers receive are related to the amount of contributions that they have paid – making them less like a tax. However, in many countries there is only a

38 Office for National Statistics, *The Effects of Taxes and Benefits on Household Income, 2006/07*, Office for National Statistics, 2008

39 For more details see Pissarides, Christopher,"The impact of employment tax cuts on unemployment and wages: The role of unemployment benefits and tax structure", *European Economic Review* 24.1 (1998) – There is evidence that high labour taxes at the lower end of the earnings distribution price low-skilled, low-productivity workers out of work, especially when these taxes interact with relatively high (statutory or contractual) minimum wages, since this limits the possibility of increases in non-labour costs being passed onto lower net wages

loose relationship between the amount of social security contributions paid and the amount of benefits received (particularly in the UK, which has effectively abandoned the contributory principle). A recent OECD working paper finds only weak evidence that the employees' social security contributions have less of an impact than personal income taxes in terms of reducing GDP per capita.[40] One reason for the difficulty to identify such differential effects in the data could be that the relationship between the contributions and benefits vary widely across the OECD.[41] Repeated reforms in social security schemes have sometimes made the link between contributions and benefits even less evident, increasing the tax character of the contributions, weakening this argument.[42] And on the other hand, as we have quoted earlier, a recent study finds that a one percent increase in social security contributions lowers growth for the EU by 0.27 percentage points – much more than the impact of income taxes.

Labour taxes, as has been stated already, can also affect the relative price of capital and labour, and this could lead to a reallocation of inputs within and between firms and/or industries that could have transitional growth affects. For instance a change in the relative factor price could lead to less usage of one of the production inputs (or both) in a firm or industry. It is possible that all inputs not used in this firm or industry are either re-allocated to other less productive firms or not used at all, and in so doing, lowering the efficiency in the use of the production inputs. This could amount to a lowered total factor productivity growth (TFP).[43] New empirical results based on industry level data for a subset of OECD countries, find some evidence that employer and employee social security contributions negatively influence TFP.

Empirical and simulation evidence from the 2007 reassessment of the OECD Jobs Strategy explored the direct impact of taxation and possible interactions between taxation and other policies on employment and unemployment (the extensive margin of labour supply). After controlling for other policies (e.g. product market regulations, employment protection legislation, union density and corporatism, childcare and leave weeks) the tax wedge between labour cost and take-home pay is found to have a negative effect on the employment rate: according to the results from the baseline specification, in the study a ten-percentage-points reduction of the tax wedge in an average OECD country would increase the employment rate by 3.7 percentage points.[44] Furthermore, tax incentives for second-earners to start working, either full or part-time, are also found to have a significant impact on prime-age female employment rates.

It is also possible that labour taxes influence foreign direct investment adversely by increasing labour costs in the host country. For instance, recent studies have found that the impact on FDI of labour taxes is generally larger than that of cross-border effective corporate tax rates.[45] This can hinder technology transfers and spill-over of best practices from multinational to domestic firms, reducing TFP.

Regarding the relative effects upon economic growth of income taxes and NICs, Afonso & Fuceri (2008) find that whilst income taxes have no measurable effects upon economic growth, reducing social security contributions will increase growth.

40 "Tax and Economic Growth", *OECD Economics Department Working Paper* 28 (2008).

41 Attempts have been made to empirically assess the effect of social security contributions on GDP per capita by splitting personal income taxes into social security contributions and other personal income taxes. In some of these regressions, there was some indication that social security contributions are less harmful to GDP per capita than personal income taxes, with this difference being primarily driven by the less adverse effects of social security contributions levied on employees. Although these findings were significant in some specifications, they were not robust to slight changes in the sample or year coverage, or to minor redefinitions of the indicators.

42 Meghir, Costas and David Phillips, "Labour supply and taxes", *IFS Working Paper* WP08/04 (2008).

43 Total factor productivity measures the change in output that cannot be accounted for by a change in inputs and is thus a measure of how efficiently the inputs are used.

44 "OECD Jobs Strategy: Lessons from a decade's experience", OECD Economics Department Working Paper, CPE/WP1(06)1, (2005).

45 Hajkova, Dana et al. "Taxation and Business Environment Drivers of Foreign Direct Investment in OECD Countries", *OECD Economic Studies* No.43/2 (2006) – The effect of FDI of a one standard deviation change in the tax wedge on labour income is around ten times larger than the effect of a similar change in the marginal and average cross-border effective tax rate.

In the Oxford Economics model, labour income taxes affect wages fairly directly — as income taxes are increased there is upward pressure on wages. The implication is that changes to income tax have relatively little impact upon employment levels — worker welfare falls and worker consumption falls, so there is an indirect impact upon employment, but this is limited. In contrast, employer NIC contributions in this model affect firm profitability directly, but have no direct impact upon wages. So reductions in NICs straightforwardly increase the profitability to firms of using labour, and the amount of labour hired increases materially. This mechanism might be thought of particular relevance in circumstances where the wage rises are already very low (perhaps there may even be wage cuts). Under such circumstances it might be particularly difficult for employers to cut wages further in response to employer NICs rise, and so the key effect might be raised costs of employment resulting in greater unemployment as per the Oxford Economics model. The net effect is that cuts in employer NICs paid for by rises in income tax tend to promote growth. These effects can be seen in figures below.

Figure 4.6: Impact on growth rates

Unchanged policy forecast   Simulation
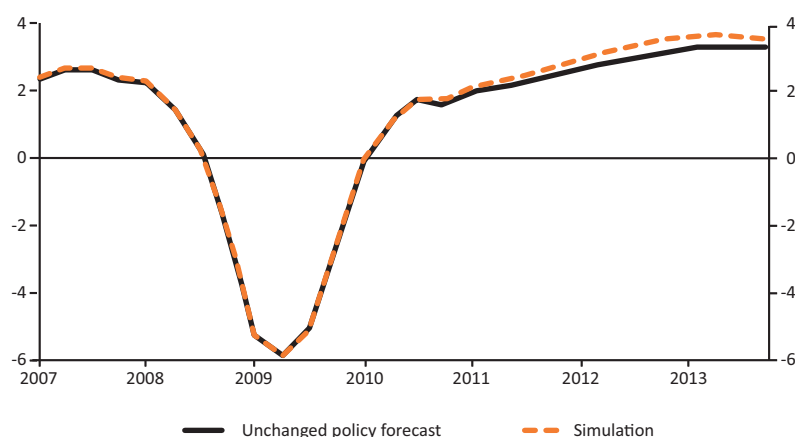
Figure 4.7: Impact on unemployment ('000s)

Unchanged policy forecast   Simulation
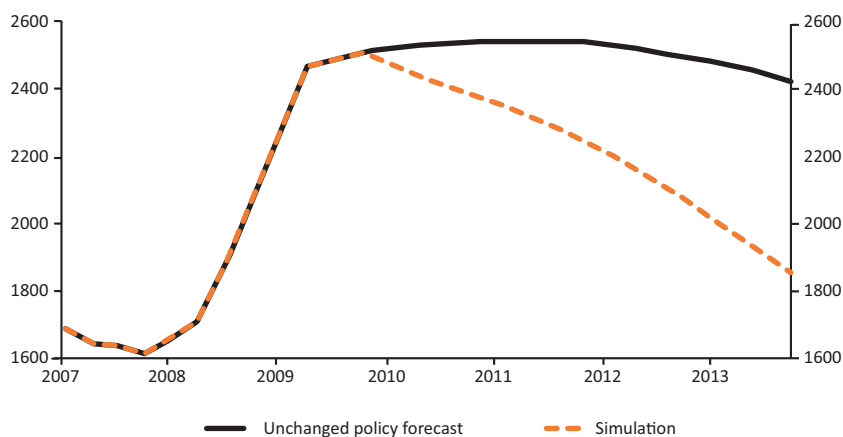
Figure 4.8: Impact on fiscal balance as a % of GDP
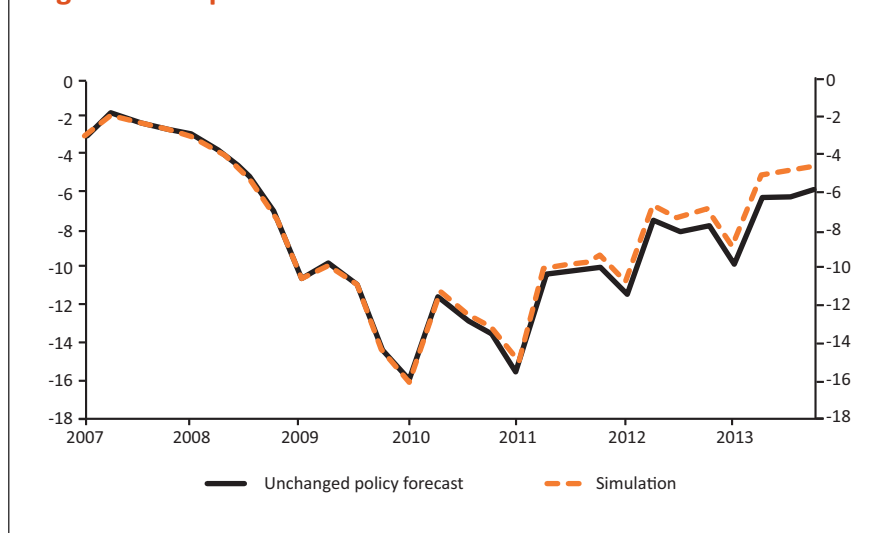
Increased VAT, reduced employers' NIC

Economists have often recommended that in order to alleviate unemployment social security contributions should be reduced. One popularly discussed option for covering the revenue shortfall would be a rise in the VAT rate. As stated earlier, social security contributions drive a wedge between labour costs and disposable income. Indeed, within continental Europe their increase over recent decades has been suggested as one contributing factor towards rising unemployment.

One theoretical account of why this might be is that of so-called "efficiency wages". According to this idea, managers have an incentive to pay their employees more than the minimum required to attract them to work for the company, because such excess payments increase their productivity (making them value being in employment more, striving to work hard to secure it).

The question of how a reduction in social security contributions, funded by an increase in VAT, should be expected to affect growth has previously been studied using an efficiency wage-based model. The finding was that employment and growth increase if VAT rises are not completely absorbed into rises in consumer prices.[46] Other studies have found that a shift from payroll taxes to VAT might reduce unemployment if benefits are not taxed.[47] The reason for this is that, in these models, VAT is assumed not to affect the difference between the value of working income and out-of-work benefits, and hence does not affect the incentive to find work.

The employment effects of tax policy will depend upon the impact of tax and price changes on whatever income is available to non-workers (e.g. benefits or savings income). Since prices might change with variations in the VAT, this may affect unemployment and growth as well. Moreover, it is plausible that the employment effects of restructuring labour taxation depend upon whether unemployment benefits take the form of replacing a percentage of in-work income or income sufficient to deliver a threshold minimum level of consumption.[48]

Broadly, in an efficiency wage setting, an increase in employers' NIC would increase the costs to firms of workers, meaning that firms hire fewer workers,

46 Goerke, Laszlo, "Value added Tax versus Social Security Contributions", *IZA Discussion Paper Series* 55 (1999)

47 See Hoon, Hian Teck and Edmund S. Phelps, "Payroll taxes and VAT in a labour-turnover model of the 'natural rate'", *International Tax and Public Finance*, 3.1 (1996): pp 369 – 83.

48 Pissarides, Christopher, "The impact of employment tax cuts on unemployment and wages: The role of unemployment benefits and tax structure", *European Economic Review* 24.1 (1998)

increasing unemployment. This greater unemployment would put downward pressure on wages. But in the efficiency wage model, lower wages mean lower worker productivity (as explained above – with lower wages, workers will be less nervous of the risk of becoming unemployed, and so be less diligent in consequence). Conversely, a reduction in employers' NIC would have the opposite effect – increasing employment (reducing unemployment) and increasing productivity.

Let us now turn to considering VAT. At first sight, it might seem that VAT should have little impact on employment, because in competitive product markets a rise in VAT will simply lead to an equivalent rise in retail prices (the VAT rise is "passed on" to consumers), so from the firm's point of view although its costs rise, its prices rise by an exactly equivalent amount, so its willingness to hire labour would be unaffected.

However, matters do not quite stop there. The idea above was that, at higher prices, although in competitive product markets, since everyone is raising their prices by the same amount, consumers will not switch to other suppliers. Furthermore, if VAT applies to most products, prices of other products will increase, also, so even the incentive to switch between products at higher prices is limited. But if all prices rise, then, if their wages and savings stay the same in cash terms, consumers will have less aggregate resources available to purchase products. Putting matters more straightforwardly, if aggregate prices are higher then aggregate demand will fall. Since aggregate demand is lower, firms will not be producing so much, so their demand for labour will fall.

At the same time, consumers are unlikely to be content to be able to buy less at the higher aggregate price level. They may respond by either increasing their leisure (it become less attractive to work if the real value of work is reduced) or demand higher wages. If workers choose more leisure, then employment falls. If workers secure higher wages, then costs to firms rise and so demand for labour falls. Thus, even if VAT is perfectly reflected in consumer prices, it still may lead to a reduction in employment.

However, it can be seen from the chain of reasoning above that the process by which VAT tends to reduce unemployment is more circuitous, and it is natural to suppose that the more direct impacts of employers' NICs (increased costs of employing workers leading to fewer workers being employed) will typically be greater.

Simulation results

Here we run an increase of 1p in the standard rate of VAT, and reduce employers' NIC by 1p on Oxford Economics' model. We can see that the economy grows at a greater rate than it would have before the structural change in tax policy introduced in the model. In the model a change in the VAT rate directly affects firm profits, and the price level in the economy. An increase in VAT will lower firm profits, having an effect on private sector investment and employment, and decreasing GDP levels. However this effect is offset by the large increase in growth due to the reduction in employers' NIC. We have already stated that the magnitude of the increase in growth and decrease in unemployment is implausible, though we do expect the trend to be similar, i.e. a reduction in employers' NIC would be growth and employment enhancing.

Figure 4.9: Impact on growth rates
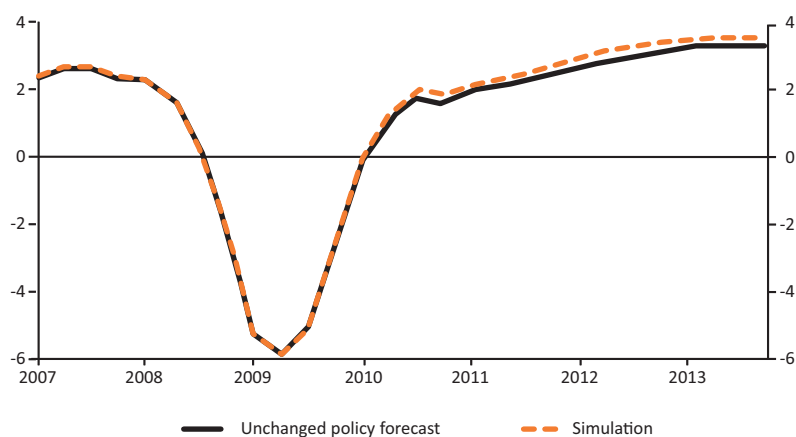
Figure 4.10: Impact on unemployment ('000s)
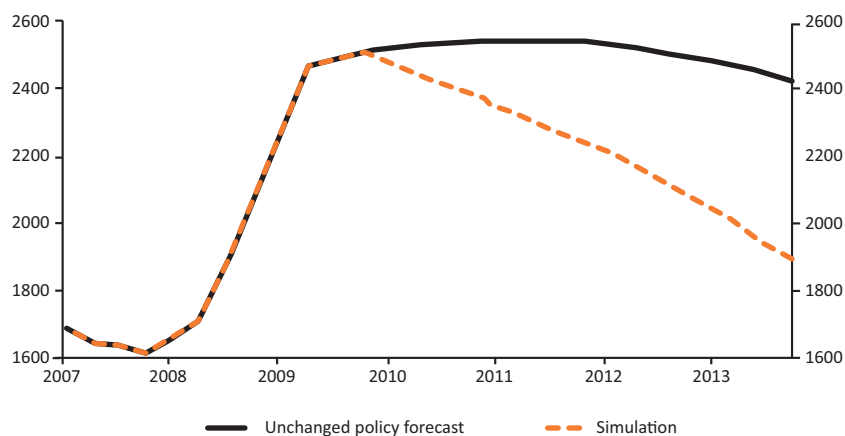
The tax reform is broadly fiscally neutral, though in the long run this revenue begins to rise as the economy grows and the tax base increases.

Figure 4.11: Impact on fiscal balance as a % of GDP
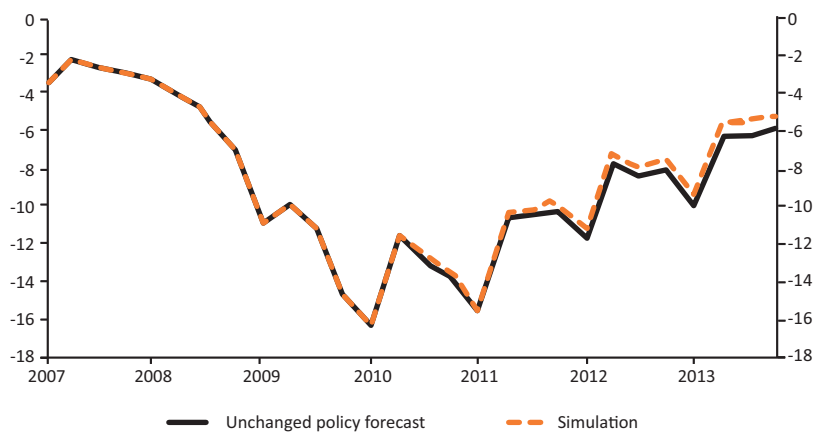
Reduced savings taxes relative to other taxes

As can be seen in Figure 4.12, the savings rate in the UK fell markedly during the 1990s and 2000s, to levels not seen since the late 1950s. There was considerable debate about why, with many commentators considering the fall in the savings ratio the natural pair of the rise in house prices (households were effectively saving through the rise in their housing wealth). Related to this was the idea that the fall in the savings ratio and the rise in house prices were both symptoms of changed (and more optimistic) future expectations for consumers — if their future wage growth was going to be higher then they would smooth their consumption better by borrowing more today and paying the debts back later once their wages had grown; similarly, if their work prospects were more secure (less chance of unemployment) then they needed less in the way of cash savings to secure them through low-income periods (e.g. associated with joblessness).

Others attribute the fall to regulatory and tax policies alleged to disincentivise savings. This led to a further debate about potential changes to savings taxation that might encourage savings — proposals that extended even into 2009.

Figure 4.12: UK savings ratio

UK total available household resources not consumed, by quarter, seasonally adjusted
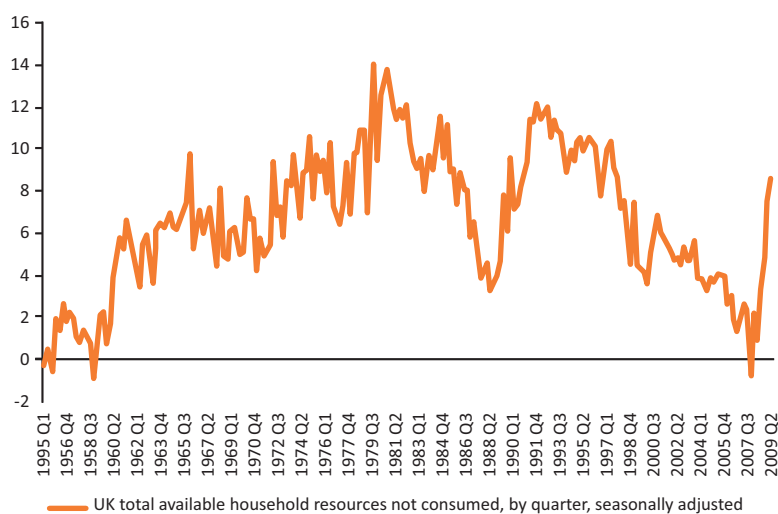
Source: *Economic and Labour Market Review*, January 2010, Table 1.07, http://www.statistics.gov.uk/elmr/01_10/downloads/Table1_07.xls

Effects of increased savings upon growth

A natural first thought is that taxes upon savings reduce growth more than do other types of taxes (such as taxes on income or consumption) because savings taxes reduce the return from setting money aside that is invested, and so lead to less accumulation of capital and less long-term growth.

As with most categories of taxation, however, the picture is much less clear. For taxing consumption, for example, reduces the amount household's purchase, and so reduce the profitability of businesses. But if businesses are less profitable, then the returns from investment are less, so the incentive to invest is reduced.

Empirical Evidence and Simulations

There is a fairly well-established research literature examining the effects of savings taxation upon economic growth. During the 1980s and 1990s there was much focus on this question in the context of the standard neoclassical economic growth models. The results appeared to be fairly unequivocal in contending that, as matter stood at that time, long-term sustainable economic growth would be promoted by increasing the level of savings through reducing taxes (see Box 4.4 for more details).

The level of saving determines the capital that is available for investment. It follows from this that the rate of growth can be increased by a policy that raises the level of saving. Such a policy will only be successful if the level of saving is responsive to the changes in the net interest rate. This reasoning provided the motivation for numerous studies of the interest elasticity of saving.

The first major contribution to this literature was Boskin (1978) who estimated an aggregate consumption function on US data for the period 1929 − 69. The estimated range of the elasticity was between 0.3 and 0.6, with the preferred estimate being 0.4. This value was much larger than the consensus of opinion from earlier estimates. The key feature of this work was the construction of an expected interest rate based on previous values of the interest rate (using an autoregressive process). Howry and Hyman modified this approach by using the actual interest rate and adding lagged unemployment at a explanatory variable. Their result was that the interest rate had virtually no effect on consumption. The estimated value of the elasticity was then increased by the work of Summers (1982) who found the size of the elasticity to a value possibly in excess of 1.[49]

A more recent analysis of the effect of taxation upon the aggregate household savings rate is provided by the OECD.[50] The paper uses data from 21 OECD countries over the time period 1970 − 1994. This data includes the saving rate plus the revenue for a number of countries over the time period 1970 − 1994. This data includes the saving rate, plus the revenue for a number of taxes as a proportion of GDP. The econometric results are obtained by regressing the saving rate on various combinations of the tax variables.[51] In every case the coefficients on the tax variables are negative and, in almost all cases, significant. This is claimed to be evidence that taxes impact upon savings. It should be noted that whereas the regressions do establish a strong correlation, they do not prove causality. For example, some countries could have high taxes in order to finance generous state pensions. The provision of generous pensions would reduce the need to save for retirement, hence causing a negative correlation between tax rates and saving.

The nature of the analysis of taxation and savings has now changed. This reflected a move from the estimation of aggregate consumption functions on long time series to the study of the consequences of policy changes.

> **" The level of saving determines the capital that is available for investment. It follows from this that the rate of growth can be increased by a policy that raises the level of saving "**

49 For more detail, see Summers, Lawrence H. "Tax Policy and the Return to Savings." *NBER Working Paper Series* 995 (1982).

50 For more details, see Tanzi, Vito and Howell H. Zee, "Taxation and the Household Saving Rate: Evidence from OECD countries", *IMF Working Paper*, WP/98/36 (1998).

51 Results are presented for levels, logs and first differences.

Box 4.2: Effect of Savings on Growth in a Neoclassical model

In 'A new view of economic growth', Maurice Scott (1991) finds that average growth rates were 0.6 percent less due to taxation on savings. The substitution of expenditure taxes for income taxes has been advocated by various writers, and this would exempt savings from tax, while still leaving labour and business consumption taxed. In the Scott framework, the increase in growth obtained by eliminating the tax on savings would not be quite as much as the 0.6 per cent per annum if this were the only change made. If the tax on savings alone were eliminated, according to a standard neoclassical growth model the increase in the growth rate would be around 1/2 per cent per annum in both the UK and the USA. This requires an increase in the share of investment of 5 percentage points, which would be accompanied by a rise in the (pre-tax) share of wages of about 3 percentage points and, of course, by an increase in the rate of growth of real wages per worker of about 1/2 per cent per annum. Even if all the tax on savings were transferred to labour, and even if one ignores the benefit resulting from the faster growing government expenditure made possible if tax revenues share in the general growth, labour's wealth would be substantially increased, as would that of entrepreneurs. These estimates of the benefits flowing from the replacement of taxes on savings by taxes on labour are considerably larger than those made by some earlier writers.

Reviewing this work in the context of a life-cycle savings model, King concluded that the optimality of an expenditure tax (i.e. a system that did not tax saving) depended sensitively on the parameters of the model, about which little firm information was available. It was difficult to argue strongly for either an income tax or an expenditure tax on efficiency grounds, and the main argument in favour of the latter was that given in the Meade Report (Institute for Fiscal Studies, 1978) that it represents the only practicable alternative to an unworkable distinction between capital and income. To bolster this argument the Meade Committee has drawn attention to the enormous range of effective tax rates on capital income according to the type of asset and financial medium through which savings are channelled'.

The existence of this "enormous range" was further documented in King and Fullerton (1984). While agreeing that its removal, and the resultant simplification of the tax system, and its inflation-proofing, constitute powerful arguments for expenditure taxation, Scott (1991) maintains that there are likely to be substantial benefits to growth as well. King's life-cycle model makes it uncertain whether the rate of saving will rise or fall when taxes on savings are reduced. This perhaps is due to the fact that King's growth model makes the rate of growth in the long run independent of the rate of investment.

Outlook for savings in the UK

As can be seen in Figure 4.12, the savings ratio rose markedly during the recessions of the 1970s and early 1980s, and again during the recession of the early 1990s. There are several reasons for this:

- Households may save against the risk that they experience unemployment in a period when unemployment is rising.
- The recession may cause households to become more pessimistic about their future wage growth prospects. This might increase the savings ratio in two

ways. First of all, the economy's optimal long-term level of indebtedness will fall if the growth rate is lower. Secondly, if this renewed pessimism follows a recent period of optimism to which the economy was still adjusting, households may shift quite dramatically from a period of unusually low savings to a position of unusually high savings, as they try to unwind their previous errors.

- The early part of recessions might be periods of relatively high real interest rates, as either (a) the recession arises partly as a by-product of tight monetary policy intended to counter inflation; (b) the recession arises partly as a by-product of tight monetary policy intended to counter a dangerous boom; (c) the recession arises following a financial market crisis that leads to sudden deflationary pressures and hence a rise in real interest rates for any given nominal interest rate (with enough deflation, real interest rates might even become high if nominal interest rates are zero). When real interest rates are high, it becomes more attractive to save and less attractive to borrow to consume.

Evidence from past recessions associated with banking crises; in particular, suggest that protracted periods of high savings are often the result.

We see that the recent movements in the savings ratio are quite noteworthy. In the first quarter of 2008 (the final period of growth before the recession began), the savings ratio actually went negative. This was a period of relatively rapid rises in household costs, as oil prices soared towards $150 per barrel. Presumably households either did not anticipate such high costs persisting (and hence responded rationally, by borrowing their way through the temporary cost shock) or were unable to reduce their consumption rapidly enough to respond. The savings ratio then began to rise very rapidly, going up by the third quarter of 2009 by 9.3 percentage points in six quarters and seeming likely to rise further. The previous most rapid rise in such a short period was the 6.8 percentage points between the second quarter of 1979 and the fourth quarter of 1980.

Such a rapid rise in savings is, of course, incompatible with rapid rises in consumption unless wage growth is already high. (Wage growth had fallen to just 1.5% over the three month period August to October 2009.) It thus might seem economically unattractive, as without consumption growth wider economy recovery is unlikely to be rapid. On the other hand, insofar as a rise in the savings ratio reflects well-informed and reasonable expectations about future wage growth and employment prospects, then a rise in the savings ratio is in the best interests of consumers. Furthermore, a rise in the savings ratio may allow consumers to rebuild their balance sheets, reducing their indebtedness. If there is the risk of future financing challenges — e.g. a significant rise in interest rates — then it will be economically prudent for households to be saving. It would not be good policy to encourage households to take on additional debts or to avoid paying debts down during a period of extremely low interest rates if the consequence were that when interest rise again (as they must), consumers struggled to service their debts.

Policy Exchange has modelled how much further deleveraging should be expected from the position at late 2009.[52] The results can be seen in Table 4.1.

Table 4.1: Results of Policy Exchange model of savings

Optimal indebtedness...	Absolute	Index
Wage growth = 2%	137%	100
Wage growth = 3%	212%	155
Wage growth = 2.5%	174%	127
Contraction in consumption vs. planned	-5%	
(Actual increase, 2000-2007)		158
Approximate position so far		141

Source: Policy Exchange

What the table says is that, according to our model, one would expect households to take on a little more than one and half times (1.55 times) as much debt if they believe their wages will rise at 3% over their lifetimes as if they believe their wages will rise about 2%. If they subsequently downgrade their wage expectations over their lifetimes, that would be expected to result in indebtedness falling by a little under 20% (from 1.55 times the level when wage expectations were for 2% growth to just 1.27 times). This would result in a contraction in consumption of about 5% (of around the order of magnitude of the recession. Actual indebtedness rose by 1.58 times from 2000-2007 (suggesting that the 2% to 3% scale-up is about the right order of magnitude) and has now fallen back to about 1.41 times its 2000 level relative to income. This means that a little more than half of the deleveraging required is already in place, so there should be quite substantial deleveraging yet to come.

Thus, although it seems unlikely that a key policy question over the next few years will be how to encourage *more* savings (policymakers are likely to become worried, shortly, about whether households are over-saving), it is by no means obvious that absolutely any measure that encourages additional saving should be avoided — as yet, there is still additional deleveraging to do.

Furthermore, we find no clear effect of narrowly defined savings taxes on the overall rate of saving on savings rates. While regressions of the kind carried out by the OECD establish correlation, they do not establish causation. Interestingly, as we discuss below, other tax reforms which are not specifically aimed at affecting the savings rate (like changes to 'Advanced Corporation Tax') may have an effect on the savings rate.

Increased tax on debt interest, reduced corporation tax

Commentators typically distinguish between two main forms of system for corporate taxation. In a "classical" corporate tax system, company profits are subject to corporation tax, and those that receive dividends paid out of those profits are additionally subject to income tax at their own marginal rates. This means that, apart from shareholders that are not subject to income tax (e.g. pension funds) and perhaps also apart from multinationals under a dividend exemption system[53], dividends are subject to a form of double taxation.

In contrast, under an "imputation" corporate tax system, the double taxation is removed — for example, because those paying income tax may be entitled to

53 Under a dividend exemption system, foreign income can be repatriated tax free (or perhaps experiencing only a relative low withholding tax) and therefore only (mainly) bears tax once on distribution to the individual shareholder. Similarly, if there is a "substantial shareholding exemption" there may be some scope for retaining earnings and thereby avoiding immediate tax on gain.

claim back corporation tax paid. Until the late 1990s, the UK employed a form of partial imputation. Corporation tax was paid on all profits, but when receiving their dividends, shareholders were allowed to assume that basic rate income tax had already been paid on their dividends. The specific mechanism for achieving this was the "advance corporation tax" (ACT) regime.

Under the ACT system, companies paying dividends made an advance payment of tax. In general this payment meant that the recipient of the dividend was considered to have already paid basic rate tax on their dividend income. Dividend recipients that would not pay income tax on the dividend income (in particular, pension funds) were entitled to claim back the excess amount paid. Firms were entitled to offset their ACT payments against standard corporation tax. If their standard corporation tax obligations were not large enough to allow offsetting, they were said to have "surplus" ACT and were entitled to offset this surplus against standard corporation tax obligations for later periods (up to six years).

Up to 1993 the rate of income tax rate payable on dividends was the same as that on any other form of income, with the ACT rate being adjusted to keep it in line with the basic rate of income tax. Then, in 1993, the ACT rate was cut to 22.5%, whilst at the same time the rate of income tax payable on dividends went to 20%, a different rate, for the first time, from that payable on other income (25%). The tax relief that could be claimed was tied to the 20% rate rather than the ACT rate meaning that non-taxpayers could no longer reclaim the full amount of the ACT paid.

In the late 1990s, certain economists and policy-makers had developed the view that the UK tended to under-invest. It was noted that the pension funds, as non-income-tax payers now paid no tax on their dividends. The implication was that profits reinvested into businesses were subject to corporation tax whilst those distributed to shareholding pension funds were not taxed. It was alleged that this led to an over-emphasis on short-term profits and the paying out of dividends at the expense of longer-term investment.

In 1997 the tax relief for non-taxpayers (except charities and PEPs) was scrapped completely, though 10% tax relief on dividends continued. This had a particular impact on pension funds which were no longer able to reclaim any of the money taxed as ACT from their dividend income.

This reform may have tended to equalise incentives to distribute profits as dividends as opposed to reinvesting, but the component of profits distributed as interest income were claimable as a company cost and hence offset against corporation tax. The consequence was the increased neutrality between reinvesting profits in a company and distributing them as dividends came at the price of increased tax incentives to invest in companies in the form of debt rather than equity. Moreover, it should be noted that it is by no means obvious that this affects aggregate investment, especially in a global capital market – for example, the marginal investor might be a US pension fund for which UK taxes are irrelevant.

It is interesting to reflect upon to what extent it is really a problem whether companies have tax incentives to distribute as opposed to reinvesting profits. From the investor point of view, the key impact will be an incentive to vote for profits to be paid as dividends rather than reinvested within the company, and then to invest those dividend payments in new companies. When these investments in these new companies yield profits, the incentive is again to distribute these profits as dividends and invest in another new company rather than reinvest into the same company.

Consequently, if we believe that enhancing or maintaining competition is relatively unimportant versus ensuring that investment exploits economies of scale, we will be concerned if there are tax incentives working against firms growing (by reinvesting profits) but in favour of new firms arising. In contrast, if we are relatively unconcerned about economies of scale but interested in maximising competition and the arising of new firms, or if we believe that there is a natural tendency amongst firms towards damaging increases in market power, we may favour profits being distributed over being recycled.[54]

The effect of the current tax treatment of debt

It is also interesting to reflect upon the implications of the tax favouring of debt over equity. Both debt and equity are integral parts of a capitalist system and have their desirable features. But if the tax system favours debt[55], there will be an incentive on firms to use higher levels of debt in their capital structures.

It is often casually assumed that if high levels of debt are used, then an economy becomes more risky. This is a much less straightforward proposition than is usually assumed. A key insight of modern finance theory is that the riskiness of a financial asset is given by the real volatility in costs and revenues of the underlying real asset. Unless it affects the management of the underlying real assets (and hence the real returns and volatility in those returns), all that the capital structure does is to distribute the returns from the real assets between different financial claimants.[56] One standard thought is that equity provides a more direct form of monitoring of management than does debt, and that this may be a determinant of the degree of leverage (ceteris paribus, when the value of monitoring is higher, the leverage will be lower). An interesting corollary is that, when the nature of equity is different (e.g., when the form that equity takes intrinsically involves a more intimate relationship between shareholders and management, as is the case, for example, with private equity as opposed to, say, listed shares) that may have an effect on the efficient degree of leverage (e.g., theory would predict that when there is private equity, the economically efficient level of leverage will be higher than when there are listed shares[57]).

The implication, then is that, from the point of view of the individual company, risk is merely re-allocated (rather than increased or decreased *simpliciter*) through increased leverage. However, such re-allocation could potentially come with its own implications. For, of course, increased leverage does increase the risk on debt (i.e., increases the risk of default on debts). And an argument could be offered that when there is more debt overall, the risk of discontinuities in returns (non-smooth adjustments, potentially involving transitional costs and unemployment) might be greater, because debt is intrinsically subject to less smoothness in its returns – either returns are constant, or there is default. If debt is bearing more risk, equity (which has a smoother returns profile, albeit with greater volatility and greater risk) is bearing less risk than it would otherwise. (This must be so, since the total risk is unchanged, *ceteris paribus*.) It might be argued that, therefore, if debt bears more risk then, even if overall risk is unchanged, the likelihood is increased that downside events will not be able to be absorbed smoothly, but will instead result in crises, transitional costs, and unemployment.

It is not, however, obvious that the above argument really goes through as written. For it is not abnormal for debts to be renegotiated when companies might otherwise default, particularly during significant recessions. This reduces the

54 We note in passing a complication arising in the above reasoning. It does not of course follow automatically that a smaller number of firms means less effective competition. Two large firms might compete very intensively against one another, achieving a fully competitive outcome. Indeed, if entry into an industry is easy enough and threats of entry are credible (i.e. if the market is "contestable"), then the fully competitive outcome can even be achieved with just one firm. But we shall assume this important caveat away in what follows.

55 As noted above, in terms of particular forms of capital – such as that internationally invested – this is not so clear as is sometimes assumed.

56 To paraphrase one of the favourite illustrations of Merton Miller, who co-authored the Modigliani-Miller theorem, no matter how many pieces you carve the pizza into and to whom you give those pieces, the total amount of pizza there is the same.

57 This is not, of course, to endorse any and every level of gearing for private equity. Neither is it to comment on wider issues regarding the tax treatment of private equity, such as whether treating carried interest as capital gain rather than income is a form of tax forbearance. It is simply to note that, *ceteris paribus,* theory would suggest that private equity will be associated with higher levels of efficient gearing than publicly listed equity.

discontinuity of returns. It is simply naïve to imagine that the only alternative to debts being serviced as originally promised is for there to be total default and lengthy liquidation. It also should be noted that, even if the structure of capital taxation does tend to encourage debt, few studies suggest that this tax-related incentive was a significant factor in the build-up to the Credit Crunch.

Despite the difficulties in accounting for precisely why, let us assume for our purpose here that if leverage is higher then, indeed, risk-taking increases and hence economic volatility is increased. And let us, for the sake of the discussion, also assume that tax incentives to employ debt might in principle make some contribution to excessive leverage (albeit probably not a dominant role). Because there is more risk-taking, economic growth will be higher, also. It is crucial to note that the overall result is unattractive from a welfare point of view. In any economy, there is a trade-off between reducing volatility and maximising growth. The risk-taking that promotes growth also, intrinsically and by its very nature, also increases volatility. Since volatility is socially damaging — leading to unemployment, for example — the volatility/growth trade-off that maximises growth with maximum volatility is unlikely to be optimal from a social welfare point of view.

This is not completely obvious, though, and in any event another factor might intervene. Taken to the extreme you might argue that at some point, volatility might be so high that normal economic processes might break down and social order might be materially threatened. Perhaps more realistically, if the political system allows it, excessively high volatility might lead to enough of the population suffering that they vote for intervention, so that even if the gains of the gainers from high volatility would more-than-offset the losses of the losers, in practice these very high-growth/very high-volatility policies are not feasible.

We thus might be searching not for either the highest level of growth possible or the socially optimal trade-off between growth and volatility according to standard models but, rather, the highest level of growth compatible with the political system tolerating the volatility implied.

Furthermore, the above discussion of a trade-off between greater growth and more volatility implicitly assumes that the policy response to recessions will be efficient. However, experience suggests that recessions lead to many economically inefficient policy responses. Amongst many others these might include:

● taxes imposed upon the prudent to subsidise the mistaken decisions of those that took risks that would have gone bad without intervention
● interventions in particular sectors, distorting the functioning of the price mechanism

Consequently, it is likely that excessive volatility itself tends to reduce long-term economic growth.

The upshot of the discussion above is that a reform that increased the taxation of debt interest relative to dividend taxes, perhaps reducing the corporation tax rate at the same time, might be expected to have some of the following effects:

● Reduced volatility in growth (as risk-taking is lower)
● Reduced growth (as risk-taking is lower) if policy responses to recessions are excellent or increased growth in the perhaps-more-plausible case that policy responses to recessions are inefficient and damaging to growth in the long term

- Reduced competition (as the incentive to hold debt with fixed obligations falls, rather than holding equity, the incentive rises to recycle profit by investing within the company and hence have higher returns to equity later — increased profit recycling versus distribution, and hence reduced competition, would thus be an expected consequence)
- Increased exploitation of economies of scale (for the same reason that competition would reduce)

General effects of corporate taxes

Corporate income taxes can affect the rate of capital accumulation and hence GDP per capita.[58] Since firms' investment decisions are driven by the cost of and the expected return to investment projects, corporate taxes can have a negative effect on corporate investment by reducing its after-tax return. The extent of this effect can, in turn, be expected to depend on the degree of openness of the economy, with a more open economy likely to suffer more from an excessively high corporate tax than a more closed economy — capital is mobile between countries, and if it is taxed highly it will migrate elsewhere. It is also possible that taxes on personal capital income affect investment decisions by small firms that are only able to access domestic savings, but since most investment is undertaken by large firms with access to international funds, personal capital income taxes are likely to have a small effect on GDP.

Foreign direct investment (FDI) is affected in a similar way as domestic investment by corporate taxation – in particular by the effective rate.[59] However, it is also affected by the tax treatment of cross-border income (see below). Moreover, the effect of corporate taxes on capital formation through FDI can also depend on the size of the economy, with larger economies able to attract FDI aimed at supplying their large markets even if they maintain relatively high tax rates. Also, the proportionate effect of FDI on the domestic capital stock may be larger in smaller economies. The effect of corporate taxes on investment may also depend on other policies and institutions. For instance, tight product market regulations and a large administrative burden on firms can make firms' investment decisions less responsive to cuts in corporate tax rates as these administrative and regulatory barriers increase the adjustment cost of capital.[60]

Empirical Evidence for the effects of reduced corporation tax

Empirical evidence obtained from both firm-level and industry level data suggest that investment is adversely affected by corporate taxation through the user cost of capital.[61] One of the interesting findings on the firm level is that increases in the tax adjusted user costs are found to reduce investment at the firm-level.[62] A simulation experiment shows that a reduction of the statutory corporate tax rate from 35% to 30% reduces the user cost by approximately 2.8%. This implies a long-run increase of the investment to capital ratio of approximately 1.9% (given a long run cost elasticity of 0.7) — in other words, reductions in corporation tax should be expected to have the result that, for any given stock of capital in the economy, there will be more investment. Also the size of the negative on investment appears to be similar for small and large firms (measured by the number of employees). In contrast, only older firms' investment appears to be negatively af-

fected by increases in the tax adjusted user cost. One possible explanation is that young firms are generally less profitable than older firms and are less affected by corporate taxation. The other explanation may be that among young firms there is a disproportionately high share of small firms that benefit from exemptions or reduced rate.

Results from industry level data indicate that the investment to capital ratio is negatively affected by increases in corporate taxation. The long-run user cost elasticity is estimated to vary between -0.4 and -1, depending on the empirical specification. A simulation experiment indicated that a cut in the statutory corporate tax rate from 35% to 30% would increase the long-run investment to capital ratio by 1.0% and 2.6% depending on the specification. These are lower and upper bound estimates at the industry level and the firm-level estimate lies between this interval. The estimated effect of this tax reduction is equivalent to an increase in the average investment to value added ratio by 0.2 and 0.5 percentage points.[63]

The corporation tax rate enters non-linearly into the user cost formula and as a result the magnitude of the effect of a change in the tax depends on the level of corporate taxes. Countries with a higher corporate tax rate experience a somewhat larger negative effect from the same increase in tax than countries with a lower tax rate.

Empirical Evidence on Debt Bias and other distortions

Tax distortions may have made some modest contribution to the high levels of leverage evident in the Credit Crunch. Taxation can result, for example, in a net subsidy to borrowing of hundreds of basis points, raising debt-equity ratios and tendencies towards significant capital flows. Corporate-level tax biases favouring debt finance, including the financial sector are pervasive, often large – and hard to justify given the potential impact on financial stability. According to a recent IMF paper, there is a case for dealing more decisively with this bias; for example, by also allowing a deduction of an imputed equity cost.[64] The paper also finds that tax measures have significant effects on asset price dynamics, but are unlikely to be the best way to deal with bubbles.

Table 4.2: Effective Marginal Tax Rates (2005, in percent)

	France	Germany	Italy	U.K	U.S
Equity	20	29	19	20	24
Debt	-36	-37	-48	-28	-46

Source: Updated data from Devereux et al. (2002)[65] and "Debt bias and other Distortions", IMF (2009)[66]

The empirical evidence suggests that tax distortions have caused leverage to be substantially higher than it would have been under a neutral tax system. Econometric studies tend to confirm that taxation significantly affects financial structure, one recent survey concluding that a 10 percentage point increase in the corporation tax rate increases the debt-asset ratio by 1.4 to 4.6 points. Roughly, the debt bias from a corporation tax rate at 20% rather than 10% (ignoring personal taxes) would be to increase a debt-equity ratio that would otherwise be

63 Tax and Economic Growth." *OECD Economics Department Working Paper Series* ECO/WKP 28 (2008)

64 "Debt Bias and Other Distortions: Crisis-related Issues in Tax Policy", *Fiscal Affairs Department, International Monetary Fund*, June 12, 2009.

65 Devereux et al. "Corporate Income Tax: Reforms and tax competition", *CEPR Economic Policy* 17.35 (2002) pp 449 - 495.

66 "Debt Bias and Other Distortions: Crisis-related Issues in Tax Policy", *Fiscal Affairs Department, International Monetary Fund*, June 12, 2009.

40% to 45-60% if there was no corporate tax. One way of thinking about this is that there would be a greater incentive to "distribute" profits via debt than dividends.

It is important to note, however, that the degree of excess implied by this increased leverage level might be much less than the headline number suggests. As noted above, a key insight of modern finance theory is that under a wide range of circumstances the capital structure should be irrelevant to the value of a firm. Even if this is far from true at the extremes of very high or very low leverage, and even if there is some difference even at moderate levels (so that there is a unique optimal level of gearing), it is certainly plausible that the cost of capital is very flat over a wide range of gearing — i.e. that in the middle range of gearing, even if it is not true that it doesn't matter at all, it might nonetheless be true that the level of gearing doesn't matter very much. In consequence, quite large changes in gearing could be associated with very little underlying economic effect. Thus, though the economic significance of changing debt-equity ratios from 40% to 60% (or indeed to 45%) might be very great indeed, it might also be negligible.

Overall effects of combined package

We estimate the total stock of corporate debt in the UK at £1,900 billion, made up of £400 billion of corporate bonds[67] and of £1,500 billion in bank loans.[68] Let us assume an average cost of debt of 6.5% (including both corporate bonds at a somewhat lower rate than this and bank loans that are more expensive), so we estimate the corporate debt interest income at £124 billion per year. Let us assume that a tax rate of 10% was imposed upon this. Let us also, for simplicity of exposition, assume that the stock of debt is not reduced as a consequence of this tax, rather than there being a switch into equity (which would be an effect).[69] Thus the tax would raise around £12.5 billion.

According to HM Treasury, each percentage point cut in corporation tax would cost about £800 million in revenues. So if debt interest taxation raised £12.5 billion, taking into account the loss to company profits from this additional taxation, we would have scope to cut the corporation tax rate by around 11% - from 28% to 17%. This suggests that the overall effect would reasonably place us with an arrangement of corporation tax at 17% and debt interest and dividends tax at 10% after a transitional period.

The complexity of these different effects make it hard to quantify the benefits. However, since the measure overall should extract the same aggregate taxes from the corporate sector, whilst leading to greater neutrality between debt and equity, it is natural to suppose that the key effects on long-term growth are simply those from reducing the inefficient incentive to over-use debt.

Introduced carbon tax, reduced VAT

The effects of the structure of carbon taxation on growth are complex to disentangle. We should start by recognising that there are many different ways we could introduce a carbon tax, which would have radically different economic effects. Generally speaking, carbon taxes tend to hit heavy users disproportionately, leading to investment in new technologies to reduce energy consumption or,

67 Source: Bonds Markets 2009, IFSL Research, Table 3

68 Source: Office of National Statistics Economic and Labour Market Review, January 2010, sum of columns B to E in Table 5.07, http://www.statistics.gov.uk/elmr/01_10/downloads/Table5_07.xls

69 Note that for the purposes of our calculation, namely estimating the amount raised by such a tax, this assumption is not so strong as it may at first appear, for if debt capital were converted into equity capital, taxes would be paid on the dividends instead of the debt interest.

more usually, relocation to lower carbon tax areas, or areas with no carbon price. For this reason, most environmental levies tend to grant opt-outs for certain industries which are trade-sensitive despite the significant impact this has on their effectiveness.

Depending on the offsets arising from such a tax, some sectors, such as services, could gain a net benefit from reduced payroll or corporate taxes; others, particularly in industry, would be badly hit. Interestingly, were this concept applied to fuel, motorists might actually benefit since most studies have found that fuel is overtaxed relative to its emissions.[70]

Environmental taxes seem to be an attractive instrument to enhance environmental quality without seriously damaging the growth possibilities. By increasing environmental taxes to curb pollution and using the revenues to cut distortionary taxation on capital and labour[71], it has been argued that it is possible to obtain a "double dividend," not only a better environmental standard but also a less distortionary tax system.

Environmental taxes reduce the real wage rate and increase costs and with endogenous labour supply and wage competition, both labour supply and employment fall, generating a net welfare loss.[72] However, it has been shown in static settings, using revenues from a carbon tax to reduce highly distorting capital taxes can lead to non-environmental welfare improvements.[73]

Studies that look at revenue neutral green tax reforms in dynamic settings have found that introducing a carbon tax whilst reducing income tax, as compared to a lump sum rebate, has less of an effect on CO_2 emissions (though the efficiency costs of substituting other goods for fossil fuels and labour for capital are increased). Employment is higher, but the total effect on consumption is uncertain due to both the reduction in the stock of capital and the modification of the terms of trade gain.[74]

One potential tax reform might pair a new carbon tax with a reduction in VAT. This has been suggested by, *inter alia*, the IFS.[75]

Simulations and Empirical Evidence

Earlier, in chapter 3, we looked at the results on the Oxford Economics model of introducing a carbon tax of $30/tCO_2e$.[76] Now, we will run a simulation of an introduced carbon tax against a reduced VAT rate. In the model carbon taxes work to raise the price of oil, natural gas and coal, which in turn increases costs and lowers profitability of firms, which acts to lower return on investment. The model results show that an introduction of a carbon tax of $30/tCO_2e$ reduces growth in the medium term, though in the long term there are growth returns to the unchanged policy level. This, however, indicates that introducing a carbon tax requires counterbalancing affects in other distortionary taxes to be growth enhancing, such as reducing VAT. The following graphs show the effect of on growth, unemployment and the fiscal balance of introducing a carbon tax of $30/tCO_2e$ and a reducing the VAT rate by 0.5 percentage points.

The economy grows at a slower at first through the impact of an introduced carbon tax on firm costs and profitability, though the affect is mitigated in the medium by a reduction in VAT which should have the opposite effect on firm costs and profits.

70 It does not follow from this that fuel is over-taxed per se, however. Fuel is very inelastic (demand varies little, in the short-term, with price). The standard theory of optimal taxation suggests that it is efficient to tax inelastic products the most.

71 As in previous sections, by "distortionary taxation" here we mean taxation that changes behaviour. Such behavioural changes might be desirable, of course – not all "distortions" are, in this sense, bad. But typically it is assumed that behavioural changes reduce efficiency.

72 Bovenberg and de Mooij (1997) make environmental quality a multiplicative constant on the production function (it can be interpreted as a variable A in the AK production function). In addition, both pollution and abatement are also inputs into the production process. They study the effect of an increase in the tax rate on pollution with the government budget balanced by an offsetting change in the output tax. This lowers the level of pollution but the effect on the growth rate depends on a number of elasticities, and there is no obvious reasoning or available data that can evaluate these or resolve the competing effects. For more details see Bovenberg, Ary L. and Ruud A. de Mooij, "Environmental tax reform and endogenous growth", *Journal of Public Economics* 63.2 (1997): pp 207 – 237.

73 See Bovenberg, Ary L and Lawrence H. Goulder, "Optimal environmental taxation in the presence of other taxes: General equilibrium analyses", *American Economic Review* 86.4 (1996): pp 985 – 1000.

74 Bye, Brita. "Taxation, Unemployment and Growth: Dynamic Welfare Effects of Green Policies." *Journal of Environmental Economics and Management* 43.1 (2002): 1 – 19. Print.

75 Symons, Elizabeth, John Proops and Philip Gay, "Carbon taxes, consumer demand and carbon dioxide emissions: A simulation analysis for the UK", *Fiscal Studies* 15.2 (1994): pp 19 - 43

76 This is the shadow price of carbon, as given in Chapter 13 of the "Stern Review on the Economics of Climate Change", HM Treasury.

Figure 4.13: Impact on medium term growth rates
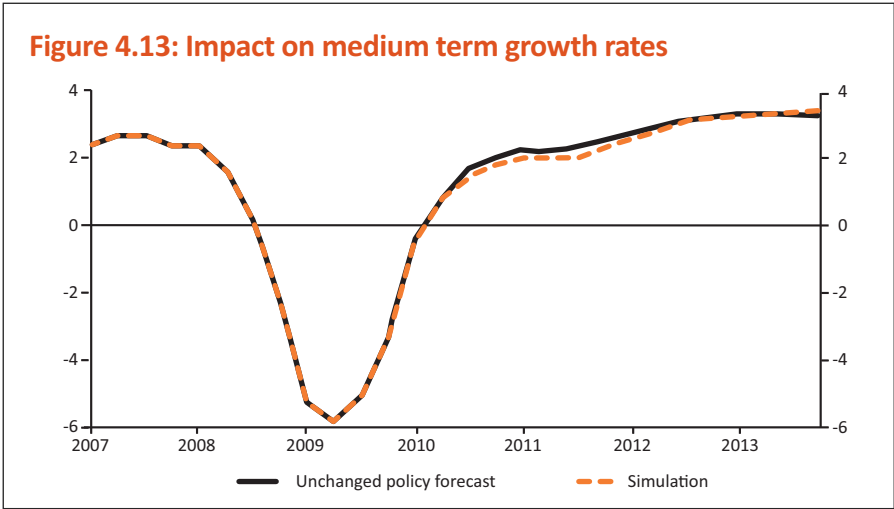
The initial decline in economic growth results in higher unemployment as well, though this also begins to fall as the economy returns to higher economic growth.

Figure 4.14: Impact on unemployment (000's)
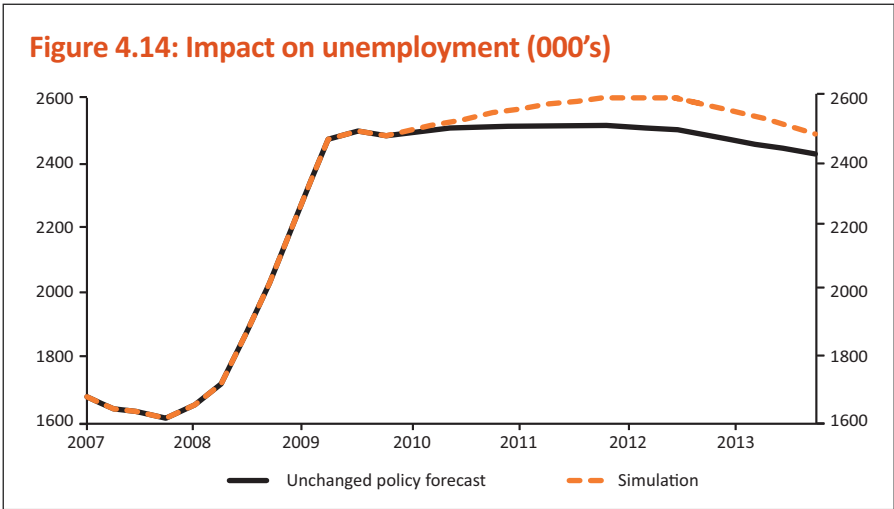
Introducing a carbon tax of $30/tCO₂e, in the Oxford Economics Model, does not raise enough revenue to compensate for a 0.5 percent decrease in standard rate of VAT. This is partially due to lower economic growth in the initial period and a reduction in the tax base.

Figure 4.15: Impact on fiscal balance as % of GDP
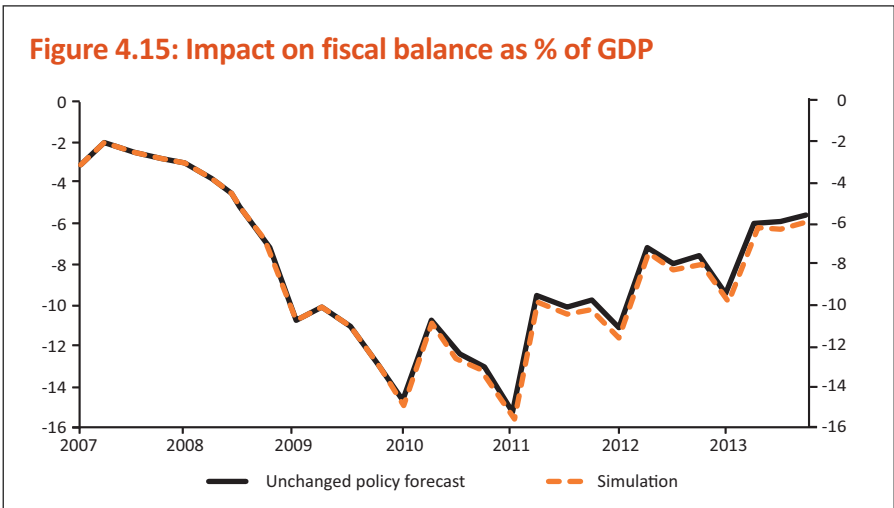
5
Conclusions and Options

In this report we have considered the impact of taxation upon economic growth. We have seen that the aggregate level of taxation has an effect upon economic growth, and that when deficits are modest (in contrast to, say, the current situation in the UK) there is a case for employing tax cuts as an instrument of macroeconomic policy.

A detailed review of the literature shows that there is plenty of empirical evidence to suggest that a higher level of overall taxation affects economic growth negatively. We can see from the evidence presented in this paper that raising taxes can be a short-term solution for raising revenue, but not a long term policy for dealing with the current fiscal crisis we face. Some of the interesting results we find by raising different taxes are:

a) **Consumption taxation** is often seen as favouring private savings relative to income taxation, and thus favouring growth but our modelling suggests that even though the tax raises a fair amount of revenue in the first year of its introduction compared to the rest of taxes we look at, this revenue tapers away with time and that there is a negative impact on growth and unemployment.

b) **Raising the basic rate of income tax** raises revenue and improves the fiscal balance as a % of GDP. It does have a negative impact on growth in the short-run, however, this is temporary and in the medium to long-run growth picks up again.

c) **Increasing employees' NIC** depresses growth and raises unemployment in the short-run, however both growth and employment rise in the long run to level higher than those in the unchanged policy forecast. This tax raises the most revenue in the first years after introduction from all the tax rises we have considered improving the overall fiscal balance as a % of GDP, though this revenue declines sharply in the long run.

d) **Increased corporate tax** in our alternative specification shows that the effects of raising the level of corporate has no significant short-term effects but lowers GDP in the long run. The tax also generates a fairly small amount of revenue in the first year of introduction, and has a negligible effect on the fiscal balance.

We have considered how seven potential changes to the structure of taxation might affect growth:

a) *Increased VAT with reduced basic rate of income tax*
We found that, contrary to what is widely assumed amongst journalists and politicians, increasing VAT would be more damaging to economic growth than

increases in the basic rate of income tax. Indeed, this effect is so clear that there must be a case not merely for avoiding raising VAT if further tax rises are necessary but, indeed, for considering deliberating restructuring taxes by raising the basic rate of income tax and cutting VAT.

b) *Increased basic rate of income tax with increased personal allowance*
We have found that the cost of raising personal allowances to £10,000 is a little higher than some previous studies have suggested — broadly equivalent to a 5p rise in the basic rate of income tax — but find no clear impact on growth, neither positively nor negatively.

c) *Increased basic rate of income tax rate, reduced employers' NIC*
We find that empirical evidence and the workings of standard macroeconomic models suggest that employer NICs are more damaging to economic growth than income taxes, and thence that a cut in employer NICs paid for by a rise in the basic rate of income tax rates would tend to promote growth.

d) *Increased VAT rate, reduced employers' NIC*
We find that the process by which VAT tends to reduce employment is more circuitous and the impact of direct effects on employment from a fall in employers' NIC will be typically greater. This offsets the negative effects from a VAT rise, promoting growth and employment.

e) *Increased tax on debt interest, reduced corporation tax*
This measure should be expected to reduce growth during booms and reduce the scale of recessions. Since, in practice, policy responses to deep recessions are likely to be damaging to growth in the long term, we believe that the net effect of increasing the neutrality of the tax treatment of debt versus equity will be to promote more rapid economic growth. The effects of increasing the degree of neutrality between recycled and distributed profits are unclear — there would be an increase in exploitation of economies of scale at the expense of fewer business start-ups and less competition. Despite this, we believe that the overall effect should be expected to be positive for growth.

f) *Reduced savings taxes relative to other taxes*
When there are significant distortions in savings taxation — in particular, when savings are subject to material double taxation — then reductions in savings taxes tend to promote growth. Until recently, in the UK the extent of double taxation of savings has been modest (setting aside the double taxation problem of dividends, covered under the discussion of option 1.d). Furthermore, although during the 2000s there was probably under-saving in the UK, over the next few years the issue is more likely to be over-savings as households rebuild their balance sheets. There is therefore little reason, starting from here, to suppose that encouraging additional savings would promote growth.

g) *Introduced carbon tax, reduced VAT*
Broadly speaking we find that a carbon tax would be likely to depress economic growth, unless the tax revenue can be used to reduce other distortionary taxation. As environmental taxes increase costs and reduce the real wage rate, we see the counterbalancing effect would be more likely to occur when distorting taxes are reduced on labour rather than on capital. Reducing VAT would be a natural route to this.

Many of the structural reforms discussed in this paper have merits that go beyond the promoting of economic growth, such as promoting equity, concern for the environment, or self-reliance. However, in terms of the central focus of this paper some conclusions are that.

- Employer's NIC is potentially a very damaging tax. The Treasury should re-examine the evidence on this issue urgently and the decision to raise employers NICs.
- It is not clear that raising VAT is less damaging than rises in the basic rate of income tax – it may even be worse.
- Long term, increasing the tax on debt and cutting corporation tax ought to reduce economic volatility (albeit probably only modestly), potentially increasing economic growth.
- There are a number of fiscally neutral tax reforms have the potential to boost growth and reduce unemployment.
- A fuller understanding of the dynamic effects of tax increases make tax rises look like a less attractive to address Britain's fiscal problem.

Appendix

A1. Tax ready reckoner

<div>

Table A1.1: Main tax rates

	Percent 2009/10
Income tax[77]	
basic rate[78]	20
higher rate[79]	40
Capital gains tax	18
Inheritance tax	40
Corporations tax[80]	
small companies rate	21
main rate	28
VAT	
standard rate	17.5
reduced rate	5

Source: Tax ready reckoner, HMRC

</div>

<div>

Table A1.2: Allowances and limits

	£	
	2009-10	**2010-11**
Income tax		
Personal allowance	6,475	6,475
Personal allowance (age 65 - 74)	9,490	9,490
Personal allowance (age75 and over)	9,640	9,640
Married couple's allowance (born before 6 April 1935)	6,835	6,835
Married couple's allowance (age 75 and over)	6965	6965
Minimum married couple's allowance	2,670	2,670
Aged income limit	22,900	22,900
Blind person's allowance	1,890	1,890
Starting rate limit for savings income	2,440	2,440
Basic rate limit	37,400	37,400
Adjusted net income above which personal allowances are tapered	-	100,00
Higher rate limit	-	150,000
Inheritance tax threshold		
Standard threshold	325,000	325,000
Combined threshold for couples	650,00	650,000
Capital gains tax		
Annual exempt amount: individuals	10,100	10,100
Annual exempt amount: trustees	5,050	5,050

Source: Tax ready reckoner, HMRC

</div>

77 The rate to trusts is 40 per cent, unless it is dividend income or similar income, which is chargeable at the dividend trust rate of 32.5%. However the first £1000 of trust income is charged at the basic, savings or dividend ordinary rate, depending on the nature of the income.

78 There is a 10 per cent starting rate for savings income up to the starting limit within the basic rate band. Where taxable non-savings income does not fully occupy the starting rate limit the remainder of the starting rate limit is available for savings income. For dividend income below the basic rate limit the rate of tax is 10 per cent.

79 The rate applicable to dividend income above the basic rate limit is 32.5 per cent. An additional rate of income tax of 50 per cent (per cent for dividends) will apply from 2010 – 11 to income over £150,000

80 A smooth transition is achieved between taxing profits at the small companies rate and taxing them at the main rate by applying a marginal rate on profits in excess of £300,000 but not exceeding £1.5 million. For 2009 – 10 this effective rate is 29.75 per cent

Table A1.3: Direct effects of illustrative changes in income tax

	£ million		
	20010-11	2011-12	2012-13
Rates			
Change starting rate for saving income by 1 pneg	10	20	
Change savings basic rate by 1 p	70	130	170
Change basic rate by 1 p	3,400	4,050	4,100
Change higher rate by 1 p	340	400	400
Change additional rate by 1 p	670	950	950
Allowances			
Change personal allowance by £100	510	650	650
Change age-related personal allowances by £100	70	80	85
Change aged income limit by £500	20	25	25
Change all personal allowances by 1 per cent	400	470	460
Change all personal allowance by 10 per cent	3,900	4,650	4,700
Limits			
Change starting rate limit for savings income by £100	neg	5	5
Change basic limit by 1 per cent	180	250	220
Change basic rate limit by 10 per cent:			
Increase (cost)	1,650	2,500	2,500
Decrease (yield)	2,100	3,150	3,300
Change higher limit by 1 per cent	20	50	50
Change higher rate limit by 10 per cent:			
Increase (cost)	200	450	450
Decrease (yield)	250	550	550
Allowances, starting and basic and higher rate limits			
Change all main allowances, starting, basic and higher rate limits by 1 per cent	590	740	730
Change all main allowances, starting, basic and higher rate limits by 10 per cent			
Increase (cost)	5,550	7,300	7,650
Decrease (yield)	6,350	8,450	9,050

Source: Tax ready reckoner, HMRC

Table A1.4: Direct effects of illustrative changes in other direct taxes

	£ million		
	20010-11	2011-12	2012-13
Corporation tax			
Increase in small companies rate by 1 percentage point	20	420	580
Increase in main rate by 1 percentage point	400	800	850
Increase small and main rate threshold by £10,000	0	10	20
Capital gains tax			
Change rate by 1 percentage point	0	100	110
Increase annual exempt amount by £500 for individuals and £250 for trusts	0	15	20
Inheritance tax			
Change rate by 1 percentage point	20	50	55
Increase threshold by £5,000	15	30	35

	£ million		
	20010-11	**2011-12**	**2012-13**
National Insurance contributions			
Rates			
Change Class 1 employee main rate by 1 percentage point	3,850	4,050	4,250
Change Class 1 employee additional rate by 1 percentage point	950	1,000	1,050
Change Class 1 employer rate by 1 percentage point	4,900	5,150	5,400
Change Class 2 rate by 1 percentage point	150	155	165
Change Class 4 main rate by 1 percentage point	330	345	360
Change Class 4 additional rate by 1 percentage point	185	190	200
Limits			
Change employee entry threshold by £2 per week	230	295	290
Change employer threshold by £2 per week	275	355	345
Change lower profits limit by £104	20	20	20
Change upper profit limit by £520 per year	10	10	10
Change upper earning limit by £10 per week	125	130	135

Source: Tax ready reckoner, HMRC

Table A1.5: Direct effects of illustrative changes in indirect taxes

	£ million		
	20010-11	**2011-12**	**2012-13**
One Percent change			
Beer and cider duties (Pint of beer: 39p)	30	35	35
Wine duties (75cl bottle of table wine: £1.610	20	25	25
Spirits duties (70cl bottle of whiskey: £6.14)	5	neg	neg
Tobacco duties (20 king size cigarettes: £3.69)	35	35	35
Petrol (Litre of petrol: 56.19p)	130	120	120
Diesel (Litre of diesel: 56.19p)	0	100	110
Rebated oil (Litre of gas oil: 10.80p)	0	15	20
Vehicle Excise Duty (Petrol/diesel cars band G: £150)	60	60	60
Air passenger duty (Band A economy flight: £11)	25	25	30
Landfill tax (Tonne of waste: £2.50/£48)	10	10	10
Climate change levy (100kWh of business electricity: 47p	5	5	5
Aggregates levy	5	5	5
VAT			
VAT: change reduced rate by 1 percentage point	290	310	330
VAT: change standard rate reduced by 1 percentage point	4,100	4,500	4,700
Insurance Premium Tax			
Change standard rate by 1 percentage point	330	440	450
Change higher rate by 1 percentage point	10	10	10
Stamp duty and land tax			
Change 1 per cent rate by 1 percentage point	910	1110	1260
Change 3 per cent rate by 1 percentage point	600	780	1030
Change 4 per cent rate by 1 percentage point	750	940	1180
Change rate on leases by 1 percentage point	280	330	390
Increase £125,000 threshold by £5,000 (cost)	20	25	30
Increase £250,000 threshold by £5,000 (cost)	45	55	65
Increase £500,000 threshold by £10,000 (cost)	10	10	10

Source: Tax ready reckoner, HMRC

Changes in key rates over time

The next table shows how certain key rates and thresholds have evolved over time.

	1979/80	1990/1	1997/8	2002/3	2007/8	2010/11
Basic rate of income tax (p)	30p	25p	23p	22p	22p	20p
Income tax personal allowance (£)	£1,165	£3,005	£4,045	£4,615	£5,225	£6,475
Personal allowance as % of median income	12.4%	27.3%	30.6%	29.2%	29.5%	n/a
Main rate of VAT (%)	15%	15%	17.5%	17.5%	17.5%	17.5%
Headline corporation tax rate (%)	52%	34%	31%	30%	30%	28%
Rate of fuel duty (p/litre)[81]	n/a	28p/litre	42p/litre	49p/litre	54p/litre	n/a
Employee NICs rate (%)	6.75%	9%	10%	10%	11%	11%
Employer NICs rate (%)	10%	10.45%	10%	11.8%	12.8%	12.8%

Source: Tax ready reckoner, HMRC

A2. Economic Growth Models and Taxation

Growth Models and Fiscal Policy

The development of the neoclassical model provided students of public finance with a theoretical construct suitable to think about the growth effects of fiscal policy. Since, in the neoclassical model steady state (or long-run) growth is driven by exogenous factors – the dynamics of population and of technological progress – fiscal policy can only affect the rate of growth during the transition to the steady state. That is, the path the economy takes to return to its long run rate of growth will be affected by taxation policy, but the actual value will not be affected by fiscal policy. Because of this fact, conventional wisdom based on the neoclassical model has been that differences in tax systems; and in debt and expenditure policy can be important determinants of the level of output but are unlikely to have an important effect on the rate of growth.[82]

Another class of growth models, namely endogenous growth models tend to transform the temporary growth effects of fiscal policy implied by the neoclassical model into permanent growth effects. The strength of these effects varies, however, from model to model, depending heavily on the elasticity of labour supply and on aspects of the technology to accumulate human capital and to create new goods about which very little is known.

In order to isolate the effect of each fiscal instrument it is standard in public finance to assume that the impact of a change in a fiscal variable on government revenue or expenditure is compensated with lump sum taxes of subsidies. We will now describe briefly the long run effect of permanent changes in various fiscal instruments under this assumption.

Most growth models predict that taxes on investment and income have a detrimental effect on growth. These taxes affect the rate of growth through a simple, direct, channel – they reduce the private returns to accumulation. But not all taxes affect the rate of growth. In models with exogenous labour supply the growth rate is immune to the level of consumption taxes; these taxes do no distort the relative price of consumption today versus tomorrow, leaving unaffected the incentive to accumulate capital.

The effect of an increase in government consumption should also be nil if we view this component of public expenditures as leaving the productivity of the private sector unaffected. In contrast, the effect of public investment should be positive since this type of activity is likely to enhance the productivity of the private sector.

81 Average of petrol and diesel pence/litre of hydrocarbon fuels

82 In the standard neoclassical model with a conventional value for the share of capital in output the transitional dynamics can only be important if the real interest rate takes on implausibly high values (See King and Rebelo (1993)).

When more than one instrument is changed at a time we get a combination of these various partial effects. Previous research by a leading growth theorist, Robert Barro shows that the effect of an increase in government investment financed by income taxes is ambiguous.[83]

The effects of government deficits are more complex. In overlapping generations models government deficits tend to reduce the savings rate and the rate of growth. In infinite horizon models, the effects of deficits depend on the variables that have to be adjusted in the future to compensate for the deficits. If a higher deficit today will later be compensated by higher consumption or income taxes the rate of growth will decline.

Another class of neoclassical growth models, known as dynamic scoring models can be used to see the structure of taxation between capital income and labour income taxes can affect the long-run steady state level of national income and the short and medium term growth rates in transition to the long run equilibrium.

Standard Neoclassical Growth model
Set up of the model Ramsey/Cass-Koopmans[84]

1. Households

Households provide labour services in exchange for wages, receive interest income on assets, purchase goods for consumption, and save by accumulating assets. The basic model assumes identical households – each has the same preference parameters, faces the same wage rate (because all workers are equally productive), begins with the same assets per person, and has the same rate of population growth. Given these assumptions, the analysis can use the usual representative agent framework, in which the equilibrium derives from the choices of a single household. We discuss later how the results generalize when various dimensions of household heterogeneity are introduced.

Each household contains one or more adult, working members of the current generation. In making plans these adults take account of the welfare and resources of their prospective descendants. This intergenerational interaction is modelled by imagining the current generation maximises utility and incorporates a budget constraint over an infinite horizon. That is, although individuals have finite lives, we consider an immortal extended family. This setting is appropriate if altruistic parents provide transfers to their children, who give in turn to their children, and so on. The immortal family corresponds to finite-lived individuals who are connected through a pattern of operative intergenerational transfers based on altruism.

The current adults expect the size of their extended family to grow at the rate n because of the net influence of mortality and fertility, where n is exogenously determined and constant. If we normalize the number of adults at time 0 to unity then the family size at time t, which corresponds to the adult population is

$$L(t) = e^{nt}$$

If $C(t)$ is total consumption at time t, then $c(t) = C(t)/L(t)$

Each household maximises utility over time, given by:

$$U = \int_0^\infty u[c(t)].e^{nt}.e^{-\rho t}$$

where ρ is the rate of time preference, or subjective discount rate. We assume that u(c) is increasing in c and concave, i.e. $u'(c) > 0, u''(c) < 0$. The concavity assumption generates a desire to smooth consumption over time: household prefer a uniform pattern to one in c is very low in some periods and very high in others. This desire

to smooth consumption drives household saving behaviour because they will tend to borrow when income is relatively low and save when income is relatively high. We can also assume that $u(c)$ satisfies certain conditions that ensure the stability of the system (also known as Inada conditions). ρ is the subjective discount rate, or the rate of time preference. A value greater than 0 implies that utility is valued less the later is received. We also assume $\rho > n$ which ensures U is bounded if c is constant over time.

2. Firms
Firms produce goods, pay wages for labour input, and make rental payments for capital input. Each firm has access to the production technology,

$$Y(t) = F[K(t), L(t), T(t)]$$

Where Y is the flow of output, K is capital input (in units of commodities), L is labour input (in person-hours per year), and $T(t)$ is the level of the technology, which is assumed to grow at the constant rate $x \geq 0$.

3. Government
The RCK model can be modified in a straightforward way to incorporate functions of government. Suppose that the government purchases goods and services in the aggregate quantity G. We imagine, for now, that these purchases do not influence households' utility or firms' production. We allow later for these kinds of effects. The government also makes transfer payments to households in the real aggregate amount V. These transfers are lump sum, in the sense that the amount received by an individual household does not depend on the household's income or other characteristics.

The government is assumed to run a balanced budget in which it finances its total outlays, G + V with various taxes. The taxes considered here are proportional levies on wage income, τ_ω, private asset income, τ_a, consumption, τ_c, and firms' earnings, τ_f. We also assume that the tax rates are constant over time.

The governments' budget constraint is:

$$G + V = \tau_\omega \omega L + \tau_a r. \ (assets) + \tau_c C + \tau_f. \ (firms' \ earnings)$$

ω is the wage rate and r is the rate of return on assets. The variables L and C are aggregates of labour and consumption, respectively. We consider later the definition of firms' earnings. The tax rate on asset returns, τ_α, is the same irrespective of whether the returns come from internal loans payments from ownership capital. We also assume that the tax rates are constant over time.

The presence of taxes and transfers in the model alter the representative household's budget constraint to be:

$$\dot{a} = (1-\tau_\omega). \ \omega + (1-\tau_a). \ ra - (1-\tau_c).c - na + v$$

Where a, c, and v are the per capita amounts of assets, consumption, and transfers, respectively. We still assume that each household works a fixed amount, set at one unit per unit of time, and n is the growth rate of population and the labour force.

Equilibrium: The Steady State
Solving the above system of equations through dynamic optimization (Hamiltonian) we can characterize our equilibrium by the following equations:

$$\dot{\hat{k}} = f(\hat{k}) - \hat{c} - (x + n + \delta). \ \hat{k} - \hat{g}$$

Where $\hat{c} \equiv \frac{C}{L} = ce^{-xt}$, and $\hat{k} \equiv \frac{K}{L}$, $\hat{k}(0)$ is given.

This equation is a resource constraint for the overall economy: the change in capital stock equals output less consumption and over depreciation, change the change in $\hat{k}$ also takes account of the growth in $\hat{L}$ at the rate $x + n$.

Using the conditions $r = f'(k) - \delta$ and $\hat{c} = ce^{-xt}$, we get:

$$\frac{\dot{\hat{c}}}{\hat{c}} = \frac{\dot{c}}{\hat{c}} - x = \frac{1}{\theta} \{(1 - \tau_a).(1 - \tau_f).[f'(\hat{k}) - \delta - \rho - \theta x]\}$$

These two equations form a system of differential equations in $\hat{c}$ and $\hat{k}$. This system together with the initial condition, $\hat{k}(0)$ and the transversality condition, determine the time paths of $\hat{c}$ and $\hat{k}$.

The steady state is given by:

$$\hat{c}^* = f(\hat{k}^*) - (x + n + \delta).\hat{k}^*$$

Therefore, in the steady state where $\hat{k} = \hat{k}^*$, the net marginal product of capital, $f'(\hat{k}^*) - \delta$, must exceed $(x + n)/[1 - \tau_a].(1 - \tau_f)]$.

Effects of tax changes in the model

The tax rate on wage income, τ_ω, does not enter into any of the equilibrium conditions. This result follows because we assumed that households worked a fixed amount. In this case, a wage tax amounts to a lump-sum, non-distorting tax. With labour − leisure choice, c would no longer be equivalent to a lump-sum tax and would affect the equilibrium.

τ_c, the consumption tax rate, does not affect the choice of consumption over time − and therefore does not affect the path of consumption, as τ_c is constant. With labour − leisure choice, even a constant τ_c would affect the equilibrium by influencing labour supply. However, this effect does not operate in the present setting because households are assumed to work a fixed amount. Therefore, τ_c does not affect the equilibrium and works like a lump-sum tax.

Turning to taxes on asset income and firms' earnings, the model shows that the imposition of taxes on the income of capital leads to reductions in $\hat{c}^*$ and $\hat{k}^*$ in the long run. These effects arise because the taxes reduce incentive to save. Increase in taxes reduces the after-tax rate of return, thereby motivating people to substitute consumption towards the present.

A3. Outline of Oxford Economics UK Macro Model

The structure of the model is based on the income-expenditure accounting framework. In the long run, each of the economies behaves like the textbook description of a one sector economy under Cobb-Douglas technology in equilibrium. The economy has a natural growth rate, which is ultimately beyond the power of governments to alter, and is the result of population and productivity growth. Output cycles around a deterministic trend, so at any point in time we can define the level of potential output, corresponding to which is a natural rate of unemployment. Firms assumed to set prices given output and the capital stock, but the labour market is imperfectly competitive. Firms bargain with workers over wages, but they get to choose the level of employment. Countries with high real wages get unemployment in the long run, and countries with rigid real wages get persistently high unemployment in the long run, and countries with rigid real wages get persistently high unemployment relative to the natural rate.

Inflation is a monetary phenomenon in the long run in the model. All models have vertical Phillips curves, so expansionary demand policies put upward pressure on inflation. Unchecked, these pressures would cause the price level to accelerate away without bound, and this is prevented by the use of endogenised monetary policy. Monetary policy is summarised in an inflation target, and interest rates are assumed to move up whenever inflation is above the target rate, and/or output is above potential (a so-called 'Taylor rule'). The coefficients in the interest rate reaction function, as well as the inflation target itself, reflect Oxford Economics perceptions of how hawkish the monetary authority is about inflation.

Demand is modelled fairly straight forwardly. Consumption is a function of real incomes, real financial wealth, real interest rates and inflation. Investment equations are influenced by "q-theories", in which the investment rate is determined by its opportunity cost, after taking taxes and allowances into account. Countries are assumed to be "small", in the send that exports are determined by demand and a country cannot ultimately determine its own terms of trade. Consequently, exports are a function of world demand and the real exchange rate, and the world trade matrix ensures adding up consistency across countries. Imports are determined by real domestic demand and competitiveness.

The models' financial sector models total rates of return on cash, stocks and bonds. The treatment of asset holdings by sector has been greatly simplified. The private sector is broken down to personal and corporate components. General government net debt is identified, and both net overseas assets and net IPD flows are derived by residual.

Select Bibliography

Aghion, Phillipe, and Peter Howitt. "Growth and Unemployment." *Review of Economic Studies* 61.3 (1994): 477-95. Print.

Bye, Brita. "Taxation, Unemployment, and Growth: Dynamic Welfare Effects of Green Policies." *Journal of Environmental Economics and Management* 43.1 (2002): 1-19. Print.

Barro, Robert J. and Xavier Salai-Martin. *Economic Growth, 2nd Edition.* Cambridge, MA: MIT P (2003). Print

Daveri, Francesco, and Guido Tabellini. "Unemployment, Growth and Taxation in Industrial Countries." *CEPR Discussion Papers* 1681 (1997). Print.

Diamond, Peter A., and James A. Mirrlees. "Optimal Taxation and Public Production I: Production Efficiency." *The American Economic Review* 61.1 (1971): 8-27. Print.

Diamond, Peter A., and James A. Mirrlees. "Optimal Taxation and Public Production II: Tax Rules." *The American Economic Review* 61.3 (1971): 261-78. Print.

Easterly, William and Sergio Rebelo. "Fiscal Policy and Economic Growth: An Empirical Investigation." *NBER Working Paper Series* 4499 (1993). Print

Feldstein, Martin. "The Effect of Taxes on Efficiency and Growth." *NBER Working Paper Series* 12201 (2006). Print.

Fullerton, Don, John B. Shoven, and John Whalley. "Replacing the US Income Tax with a Progressive Consumption Tax." *Journal of Public Economics* 20.1 (1983): 2-23. Print.

King, Mervyn A., and Don Fullerton. "The Taxation of Income from Capital: A Comparative Study of the US, UK, Sweden and West Germany." *NBER Working Paper Series* 1073 (1983).

Kocherlakota, Narayana R. *The New Dynamic Public Finance.* Princeton UP, 2009. Economics Department, University of Minnesota. Web. <http://www.econ.umn.edu/~nkocher/ndpf_0916.pdf>.

Leibfritz, Willi, John Thornton, and Alexandra Bibbee. "Taxation and Economic Performance." *OECD Economics Department Working Papers* 176 (1997). Print.

Mankiw, Gregory, and Matthew Weinzierl. "Dynamic Scoring: A back-of-the-envelope guide." *Journal of Public Economics* 90.8 (2006): 1415 − 1433. Print.

Mendoza, Enrique G., Assaf Razin, and Linda L. Tesar. "Effective Tax Rates in Macroeconomics: Cross-Country Estimates of tax rates on factor incomes and consumption." *Journal of Monetary Economics* 34.1 (1994): 297-323. Print.

Mendoza, Enrique G., Gian M. Milesi-Ferretti, and Patrick Asea. "On the ineffectiveness of tax policy in altering long-run growth: Harberger's superneutrality conjecture." *Journal of Public Economics* 66.1 (1997): 99-126. Print.

Robert, Barro J. "Determinants of Economic Growth: A Cross-Country Emprical Study." *NBER Working Paper Series* 5698 (1996). Print.

Saez, Emmanuel. "Using Elasticities to Derive Optimal Income Tax Rates." *Review of Economic Studies* 68.1 (2001): 205-29. Print.

Slemrod, Joel, and Wojciech Kopczuk. "The Elasticity of Taxable Income." *Journal of Public Economics* 84.1 (2002): 91-112. Print.

Stiglitz, Joseph E., "The Corporation Tax." *Journal of Public Economics* 5.2-3 (1976): 303 − 311. Print.

The question of how to achieve the maximum level of economic growth over the next decade is presently a high policy priority. In this report we consider how taxes affect economic growth and employment. Specifically, we consider how the level of taxation, changes to specific taxes and changes to the structure of taxation affect economic growth and employment in both the short and longer terms.

We examine which taxes are growth and employment enhancing in two main ways. First we survey the academic literature from around the world, looking at the effect of different taxes on growth and employment. We then run a number of experiments using a standard model of the UK economy. Finally, using theoretical arguments, model simulations and empirical evidence, we consider certain fiscally neutral tax reforms that may boost growth and/or employment.

Drawing on this analysis, we make specific recommendations concerning which taxes should be raised, and which should be priorities for tax cuts – now and later.