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HOW TO PAY FOR THE CRISIS OR MACROECONOMIC IMPLICATIONS OF PENSION REFORM

We would like to thank Dawn Holland, Martin Weale and Justin van der Ven for helpful discussions

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How to Pay for the Crisis

or

Macroeconomic implications of pension reform

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Abstract The national debt stock of the UK is rising sharply as a result of the economic crisis, and equilibrium output is falling, with the capital stock contracting. Both problems could be alleviated by the rapid introduction (but slow implementation) of a policy to extend working lives. The paper analyses a delayed extension of working lives in the UK. Increasing working lives will in equilibrium raise consumption and tax revenues and reduce pension spending. These gains by the government can be used to improve services, cut taxes or pay off debts.

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Introduction

This paper looks at the effects of changes in retirement ages on tax rates and the national debt stock which is rising sharply as a result of the economic crisis. At the same time equilibrium output is falling because risk premia are being permanently re-evaluated and as a result of an increase in these premia the equilibrium capital stock is contracting. Both problems could be alleviated by the rapid introduction of a policy to extend working lives. Increasing working lives will in equilibrium raise consumption and the equilibrium capital stock. If consumers and firms were aware that they would work longer and hence have higher incomes then consumption and investment would be higher now, helping to offset the recessionary impact of the crisis. If individuals are more forward looking then the increase in consumption now will be larger, and the impacts on output now will be greater. In addition tax revenues would be higher and pension spending reduced. These gains by the government can be used to improve services, cut taxes or pay off debts. We advocate the latter should be considered. It is of course difficult to implement this strategy. Society can choose to have everybody work longer, and this would enable governments to cut taxes. However, individuals acting alone have less incentive to act as they would work longer but if they act in isolation they will have to pay more taxes in order to contribute to the pensions of others. Even if retirement decisions are personal the state can encourage later retirement by changing the state pension age where there is significant bunching of retirements. A coordinated increase in working lives of one effective year could increase tax revenues and reduce retirement spending by enough to reduce the government deficit by 1 per cent of GDP permanently.

Our analysis in undertaken with a large structural rational expectations model, NiGEM, and we discuss this in the first section. We also discuss the implications of a change in expected life in a growing economy where people save for retirement. The supply side of the model is the most important feature that structures the outcomes of the simulations, and we look at the importance of the assumption that the economy is open with mobile capital. There is a discussion of the model of the public sector, where tax receipts and government spending are described. The importance of deficit and debt targets is discussed. The major focus of the paper is on the impact of extending working lives on output, incomes, tax receipts and government outlays in the UK using NiGEM with fully forward looking consumers, and we turn to these analyses in subsequent sections.

Increasing the work force will require that capital accumulates and domestic investment as a percent of GDP will rise for a period. In addition shorter retirement in a growing economy means that the savings rate will be lower. In a closed economy the increase in desired capital and the fall in saving would mean the rate of return on assets would rise, whilst in a small open economy it means that the stock of net foreign assets will decumulate, and the rate of return will stay (approximately) the same. In an open economy an increase in working lives is associated with a fall in the current account surplus (or increase in the deficit). Increasing working lives will in equilibrium raise consumption and hence tax revenues and reduce pension spending. These gains by the government can be used to improve services, cut taxes or pay off debts, and we analyse these possibilities, and look at the structure of effects on taxes and spending. We investigate different fiscal responses to extending working lives and spell out the impact on the budget deficit.

The modelling framework

We utilise NiGEM in a version that has similar long run properties to the dynamic stochastic general equilibrium models in use by institutions such as the Bank of England[2]. Output (Y) is determined in the long run by supply factors, and the economy is open and has perfect capital mobility. The production function is CES, where output depends on capital (K) and on labour services (L) which is a combination of the number of person in work and the average hours of those persons. Technical progress (tech) is assumed to be labour augmenting and independent of the policy innovations considered here

$$Q = \alpha(\delta(K)^{-\rho} + (1-\delta)(Le^{\lambda_L tech})^{-\rho})^{-1/\rho}$$

We assume forward looking behaviour in production and because of 'time to build' issues investment depends on expected trend output four years ahead and the forward looking user cost of capital. However, the capital stock does not adjust instantly, as there are costs involved in doing so that are represented by estimated speeds of adjustment. The equilibrium level of unemployment is the outcome of the bargaining process in the labour market, as discussed in Barrell and Dury (2003), and the speed of adjustment depends on (rational) expectations of future inflation. Financial markets follow arbitrage conditions and they are forward looking. The exchange rate, the long rate and the equity price will all 'jump' in response to news about future events. Fiscal policy involves gradually adjusting direct taxes to maintain the deficit on target, but we assume that taxes have no direct effect on the labour supply decision. Monetary policy involves targeting inflation with an integral control from the price level, as discussed in Barrell, Hall and Hurst (2006) and inflation settles at its target in all our simulations.

Perhaps the most important feature of the model for our discussion is that consumers react to the present discounted value of their future income streams which we may call total wealth (TW), although borrowing constraints may limit their consumption to their personal disposable income in the short run. Total wealth is defined as

$$TW_t = Y_t - T_t + TW_{t+1}/((1+rr_t)(1+my_t))$$

where TW is real total wealth, Y is real income, T are real taxes, and the suffix t+1 indicates an expected variable which is discounted by the real interest rate rr_t and by the myopia premium used by consumers, my_t. The equation represents an infinite forward recursion, and permanent income is the sustainable flow from this stock. Total wealth and permanent (PI) income can be linked by the stock flow relationship where γ is the rate of return on TW.

$$PI_t = \gamma * TW_t$$

Although consumers know their total wealth and hence their permanent income, they may not consume it all as they are either risk averse or face a probability of death (ρ)

[2] The Bank of England Quarterly model is discussed in Harrison *et al*. (2005). NiGEM is discussed in Barrell, Holland and Hurst (2007), Barrell, Hurst and Mitchell (2007) and in other papers at www.niesr.ac.uk. NiGEM does not impose maximising equilibrium conditions in the same way as DSGE models, but has the same steady state equilibrium properties.

in each time period and also a probability (τ) that they will not make the transition from working to not working. If life span is uncertain, then consumers will have precautionary savings as discussed in Blanchard and Fisher (1989). If the length of working life is also uncertain then they may pay a small premium to insure themselves against early retirement, this premium falls with an increase in working lives. During working years consumers save and use their interest income and run down assets in retirement. The saving rate will depend, amongst other things, on the proportion of life that they expect to work, the level of consumption they prefer in retirement and on their desire to leave bequests. In a stationary economy consumption will equal permanent income, and the savings rate will fluctuate around a mean level of zero. The gross stock of financial wealth will depend on the saving rate and on the number of years individuals expect to be retired[3]. Given that there is an optimal wealth to income ratio, WR, in an economy growing at *g* the saving rate will be g*WR higher to sustain the equilibrium ratio, and consumption will be lower than permanent income.

Total wealth will also change when asset prices change or when accumulation changes. Non-human wealth may rise when, for instance, house prices rise and this may increase consumption in the short term even though real output may not have risen. We presume that consumption is determined by forward looking behaviour in the long term, but short term adjustment depends upon a number of factors. As Barrell and Davis (2007) show, changes in financial (dlnNW) and especially housing wealth (dlnHW) will affect consumption, with the impact of changes in housing wealth having five times the impact of changes in financial wealth in the short run. They also show that adjustment to the long run equilibrium shows some inertia as well. Al Eyd and Barrell (2005) discuss borrowing constraints, and investigate the role of changes in the number of borrowing constrained households. It is common to associate the severity of borrowing constraints with the coefficient on changes in current income (dlnRPDI) in the equilibrium correction equation for consumption, where d is the change operator and ln is natural log. We may write our equation for dlnC as

$$dlnC_t = \lambda(lnC_{t-1} - b_0 - lnPI_{t-1}) + b_1 dlnRPDI_t + b_2 dlnNW_t + b_3 dlnHW_t$$

where the long run relationship between lnC and lnPI depends upon the equilibrium savings rate, and this relationship forms the long run attractor in an equilibrium correction relationship. We should note that permanent income, PI, is a forward looking variable. The log approximation is explained in Barrell and Davis (2007).

Policy reactions are important in the determination of speeds of adjustment. Nominal short term interest rates are set in relation to a standard forward looking feedback rule. Forward looking long rates should be related to expected future short term rates

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

The exchange rate and the equity market are also assumed to be forward looking.

[3] In a stationary world with no risk, no interest rates, a constant level of consumption and no bequests, the saving rate will be related to the proportion of life in retirement (τ) and the number of years in retirement. For instance if interest rates are zero, one third of adult life is in retirement and there are 60 years of adult life then the equilibrium wealth to income ratio will be 6.666. It will be lower if interest rates are positive or desired consumption in retirement is lower than in work.

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

$$BUD = CED*(GC+GI)+TRAN+GIP-TAX-CTAX-MTAX$$

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

$$BUD = \Delta M + \Delta DEBT$$

rearranging gives:

$$DEBT = DEBT_{t-1} - BUD - \Delta M$$

In all policy analyses we use a tax rule to ensure that Governments remain solvent in the long run. This ensures that the deficit and debt stock return to sustainable levels after any shock, as is discussed in Blanchard and Fisher (1989). A debt stock target can also be implemented. The tax rate equation is of the form:

$$TAXR = f(\text{target deficit ratio} - \text{actual deficit ratio})$$

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

Extending working lives

In our analysis we assume that legislation and other measures are put in place to allow the retirement age to be increased by one year in three years time. Hence we have an effective increase of one working year or around a 2 ½ percent increase in labour supply. In the long run output will rise (approximately) in proportion to the increase in the supply of labour, as in a small open economy with capital mobility that factor of production will be available to work with labour at round about the existing capital labour ratio and rate of return. An increase in the supply of labour puts downward pressure on wages and temporarily raises the real return to capital and hence capital inflows will take place until returns are back down at world levels. Net capital inflows require a current account deficit, and this will be brought about by the increase in demand for imports and downward pressure on export prices as supply increases.

Our analysis of the impact on output of extending working lives depends upon the assumption that productivity does not decline with age. Although it is clear that earnings do peak, then decline towards retirement, it is not absolutely clear that productivity does the same. Physical strength may decline after 45, but few occupations derive their product purely from this input. Physical dexterity may not decline in quite the same way and its decline may be compensated for by increases in experience. Robinson (2003) plots the average earnings profiles for British men and women in full time employment broken down by skill levels, with three levels of skill for men and two for women. These are abstracted from the General Household Survey, and represent a large sample of the population. They suggest that there is little impact of age, as indexed by years of experience, on full time earnings. Of course, as people approach retirement they may work fewer hours and hence their average earnings will fall, and those who become less productive when they get older are more likely to exit the workforce. However, it appears that those who stay in full time work suffer no productivity loss as they become older.

The age earnings profile may be influenced by regulation and by institutions such as unions. Over the period from which the data are derived there was no effective minimum wage in the UK, and the regulation of hours was relatively lax. Although trade unions were relatively strong in the first half of the period covered they were more important in male unskilled occupations than they were in either female or skilled groups. There is no evidence that the pattern of earnings profiles differ between these groups and hence we can conclude that productivity per person hour stays roughly constant with age, but that incomes fall as average hours start to fall before retirement.

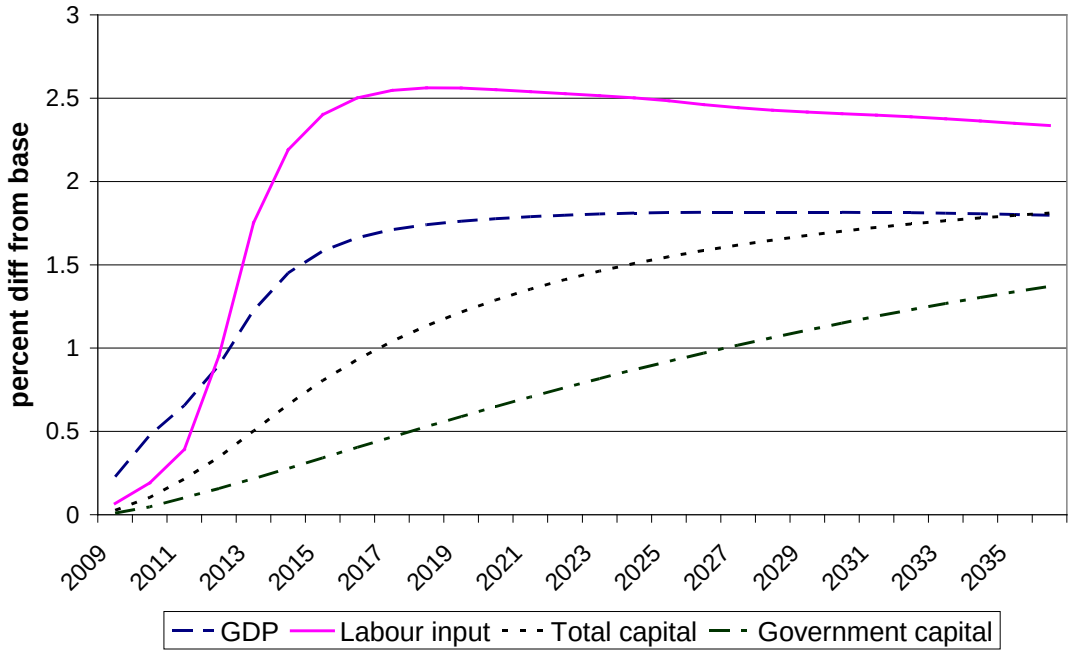
We should treat the assumption of constant productivity with care, as it depends upon the assumption that the extension of working lives takes place in all skill groups. This would be particularly the case if the reason for the extension were purely voluntary and resulted from changes in the law that enabled people to work longer or as a result of a campaign to persuade people that their life expectancy exceeded their own expectations of length of life. If the extension of working lives is purely the result of compulsion then our results would differ, and the output effects would be lower. As Sefton, van der Ven and Weale (2008) show, increasing the compulsory retirement age is likely to have a greater effect on the poorest, and least productive, groups of workers in the economy, as they are more dependent on state retirement pensions rather than their own assets than the average member of the population. They show that retirement decisions in the UK depend upon a calculation of the adequacy of assets to produce a retirement income, and wealthier groups have more assets and hence choose to retire earlier. Their decisions will not be impacted much by a change in the state retirement age, but would be influenced by a successful campaign to raise awareness of misperceptions of expected lives.

Although the availability of increased labour and longer periods for earning are fully anticipated, the market does not adjust instantly, and as a consequence in our simulation there is an initial impact on the unemployment rate, which is determined by the wage bargain. Employers do not have enough time to raise investment in advance of the anticipated increase in labour supply so that the capital stock can grow approximately in line with employment. The business sector capital stock is assumed to be determined by the underlying production function and hence rises in line with

employment given any changes in real wages relative to the user cost of capital. We also assume that government investment rises to accommodate the need for more infrastructure, but that other government spending plans and tax rates stay on their initial trajectories. We investigate the importance of these assumptions as we proceed.

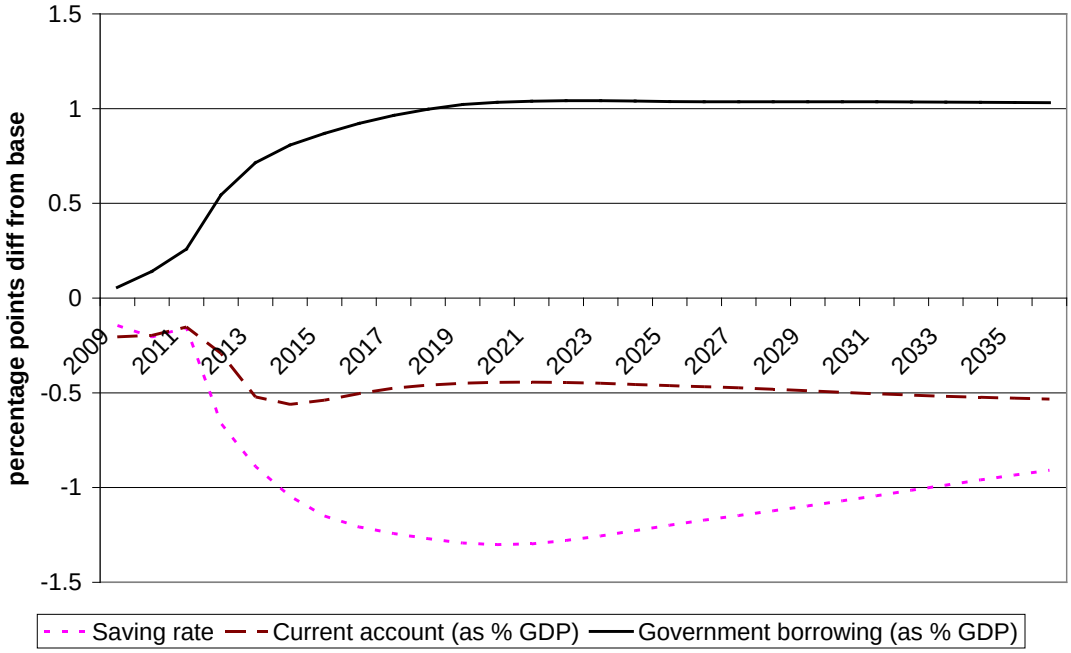
In Figure 1 GDP rises marginally less than labour input, but changes in advance of the increase in labour supply in response to higher consumption and investment. We plot capital inputs, and if these were to adjust more rapidly output would rise more quickly, especially if we assumed the government capital stock increased at the same pace as private sector capital. We assume that government investment rises with expected capacity output, and hence the government capital stock increases more slowly than business sector capital but eventually adjusts. All private sector investment plans are assumed to depend on capacity output anticipated for 4 years ahead as well as the forward looking user cost of capital.

Figure 1 Impacts of a one year increase in working lives on inputs and outputs



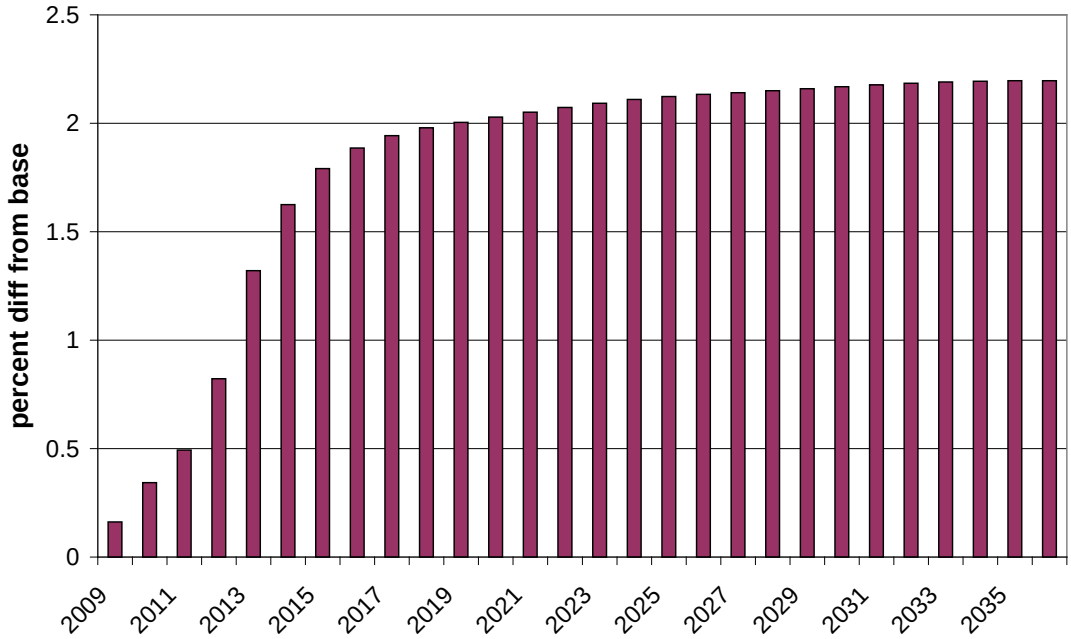
As a result of these assumptions, the capital stock rises less than the workforce. Private sector capital rises less than employment as the increase in demand for capital and the reduction in net saving puts marginal upward pressure on long term real interest rates. Because people plan to work longer they need to save less for their retirements, as a result the saving ratio falls for up to a decade to around 0.7 percentage points as wealth is adjusted downwards. The extra revenue and reduced transfers are allowed to incrementally reduce government borrowing until 2019, and then tax rates adjust, and the deficit improvement stabilises at 1 percent of GDP. The need to finance the capital that goes with an increased labour force in the face of lower domestic saving means that the economy requires a current account deficits and hence a build up of foreign liabilities (or a run down in assets), and Figure 2 plots the impact of a one year increase in working lives on the current balance and on the personal sector savings rate and government borrowing in the UK. The cumulation of the current account deficits needed to finance capital inflows will mean GNP (income) will rise less than GDP (output).

Figure 2 A one year increase in working lives; saving and borrowing



In the short run consumption rises, effects are initially small but build up as we can see from Figure 3. In our simulation, consumption rises ahead of the increase in activity and incomes because consumers are presumed to be able to look forward and face only short term borrowing constraints. Consumption increases well above base as the wealth to income ratio is adjusted downwards and higher anticipated incomes are spent.

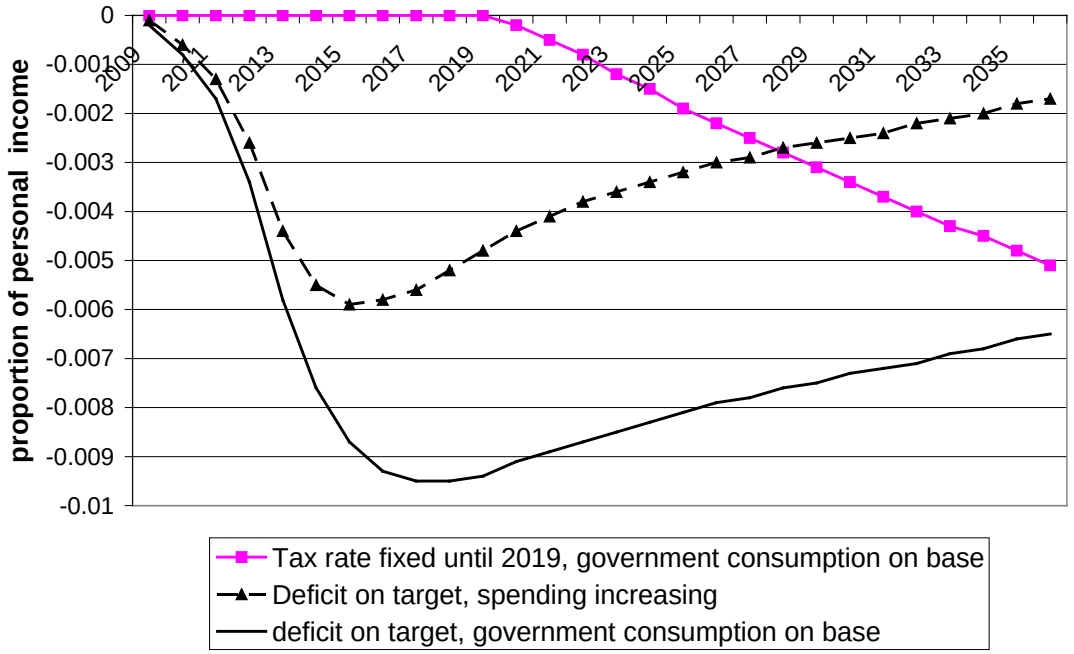
Figure 3 Impacts of a one year increase in working lives on consumption



Giving the Government options

The effects on the economy of extending working lives depend upon assumptions about government reactions. Our main case leaves government investment rising in line with, but not ahead of, trend output. Government transfers to the elderly (pensions and other social security payments) would be reduced because the number of retired people would fall relative to baseline, but this would be partly compensated for because some of those who come off retirement benefits would move into other benefit categories such as disability allowance recipients rather than into work. The scale of the reduction would depend upon the numbers involved and the replacement ratio they achieve, but spending will fall. Hence, it is possible to cut taxes or reduce borrowing. In our main case we allow tax rates to change after ten years in order to ensure that the debt stock does not implode. Figure 4 plots the effect on the direct tax rate (the standard rate of income tax would be three times this number) in our main case when investment spending rises, and compares it to the effects on tax rates if the deficit target is kept constant at its baseline throughout the simulation. Taxes start to fall immediately, as they do when we assume government spending on investment and current consumption as well as the deficit target are kept at base levels. As the budget deficit target is the same in the last two cases, the cut is larger when spending is frozen. In the UK a one year increase in working lives would allow us to reduce income tax by around percentage points of nominal income which is almost pence in the pound on the standard rate of income tax.

Figure 4 Impacts of a one year increase in working lives on income tax as a proportion of total income with different spending and borrowing assumptions



Given that current projections are that public sector debt could reach as much as 100 per cent of GDP by 2015, cutting tax rates may not be the wisest way to use the extra net revenue from extending working lives. In the current crisis it is necessary to react quickly to ensure that the public finances are put on a sustainable trajectory but enact policies slowly to ensure no disruption takes place. Figure 5 plots the effects on government borrowing of the three scenarios above plus one where tax rates are fixed over the whole run.

Figure 5 Effects of different reactions on public borrowing extending working lives

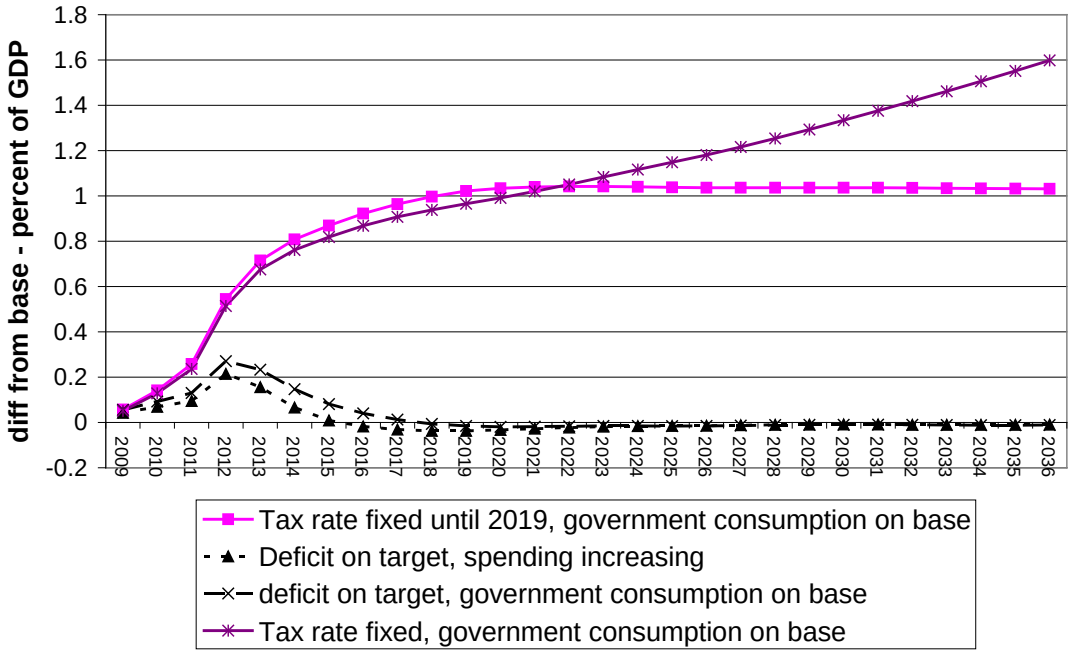
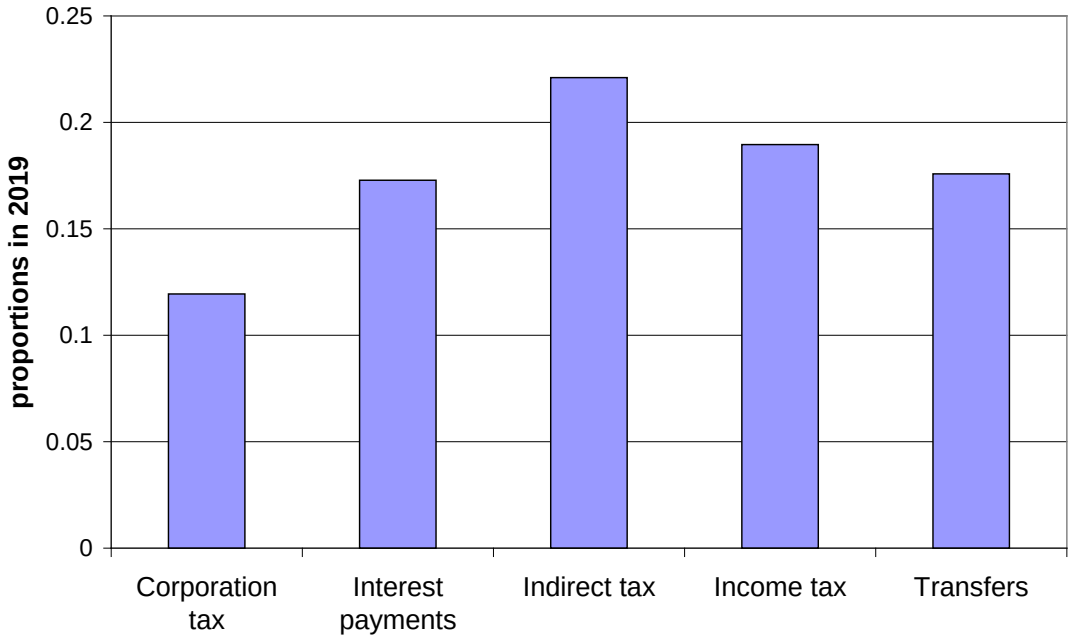


Figure 6 Sources of budget improvement in 2019 with fixed direct tax rates



If government spending on consumption is kept fixed then the budget deficit will improve by 1 per cent of GDP after around 10 years, and in our main case we hold borrowing at that level, and allow taxes to change. We compare after that we hold it there. As a result, the debt stock starts to fall and 25 years after the completion of the extension of working lives it would be between 18 and 21 per cent of GDP lower, depending on the length of time over which direct tax rates were exogenous. The improvement in the deficit comes from lower transfers, lower interest payments and higher tax receipt. The longer we leave the deficit endogenous (tax rates fixed) the larger the share of government interest payments in the budget improvement. Figure 6

gives a snapshot of the structure of the 1 percent of GDP improvement in the budget deficit in 2019 when the direct tax rate is still fixed.

The current crisis is not only raising the government debt stock, but is also reducing sustainable output, as discussed in Barrell and Kirby (2009). The equilibrium capital stock is being reduced because there has been a rise in risk premia, and this has led to a rapid reduction in output and in trade. The adjustment of the capital stock to a new lower level has induced a major recession. For every one percent reduction in sustainable output driven by premia we must expect the equilibrium capital stock must fall by around 2 percent. However, for every effective years more working life we anticipate, there will be a 2 percent or more increase in the required capital stock. Hence, an anticipated increase in working lives would not only increase consumption but would help to prevent the capital stock reduction we are currently seeing. Extending working lives would induce an increase in consumption and investment now, ameliorating the effects of the crisis.

Conclusion

It is widely acknowledged that the many countries have a shortfall of savings and a build up of government debt and as a result have a shortfall in the resources available to cover retirement incomes. Debt stocks are also rising because of the current financial crisis and the equilibrium capital stock is falling as well. If the crisis is to reduce equilibrium output by 4 to 5 percent, as Barrell and Kirby (2009) suggest, then the sustainable capital stock might fall by up to ten percent, whilst the sustainable lifetime level of consumption would be reduced by the same proportion as the level of output. If an extension of working lives were to be announced now then rational consumers would start to spend their higher lifetime incomes, and rational firms would be looking for a higher capital stock to employ them when they work longer in future. Although both firms and individuals are more borrowing constrained than usual at present an extension of working lives from say 2012 would help alleviate the reduction in both consumption and the capital stock we are currently seeing. If working lives were to be extended by 4 years (in effective terms) this could offset the effects of the crisis on desired capital stock and slow the collapse of the economy significantly.

Extending working lives reduces saving as it reduces the need for assets to cover a shorter retirement. It can also be used to reduce taxes or to reduce the government debt stock and increase the credibility of any expansionary fiscal policy. An announcement now that the net increase in potential tax revenues (lower transfers, higher taxes) would in part be used to pay off the debt stock we are accumulating. Longer working lives would be very welcome to the markets, and would reduce interest costs. Increasing working lives can be driven either by a statutory increase in the age at which state retirement pension is available, or by changes in the legal system and in the perception of expected life. It is indeed possible that increasing the state retirement age would change perceptions of expected life more effectively than any other policy. However, many policies should be pursued.

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