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

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The national debt stocks of the Euro Area countries and the UK are 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 Euro Area and the UK. A distinction is drawn between the impacts of these changes on output (GDP) and income (GNP) in open economies with capital mobility. 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.

1 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 increased now, helping to offset the impact of the current recession. 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 policy of paying down government debt. It is of course difficult to implement this strategy. Society could choose to have everybody work longer and this would enable governments to cut taxes. However, as individuals we have less of an incentive to choose to extend our working lives, but this act would actually require us to pay more in tax 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 (18 months on the age of retirement) could increase tax revenues and lower retirement spending by enough to reduce the government deficit by 1 per cent of GDP permanently.

Analysing individual optimising decisions in relation to working lives in a macro economic context is difficult, especially as the most commonly used overlapping generations models do not easily aggregate. We 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 structuring the outcomes of the simulations, and the next section looks 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 major focus of the paper is on the impact of extending working lives on output, incomes and saving in the UK and the

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Euro Area using NiGEM with fully forward-looking consumers. Extending productive working lives means that a lower stock of saving is needed, and in a growing economy the saving rate will therefore be reduced marginally. The implications for incomes depend in part on the rate of return on assets, and especially on foreign assets. Increasing the work force will require that capital accumulates and domestic investment as a per cent of GDP will rise for a period. 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.

2 The modelling framework

We utilise the NiGEM model 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.[1] In this paper we focus on results from the UK and from the Euro Area country models for Germany, France, Italy, Spain, Netherlands, Belgium, Austria, Portugal, Finland and Ireland, all of which have a similar structure.[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 this has no direct effect on the labour supply decision. We investigate different fiscal responses to extending working lives and spell out the impact on the budget deficit. 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

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1 The Bank of England Quarterly model is discussed in Bank of England (2005). NiGEM is discussed in Barrell (2007) and Barrell *et al.* (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.

2 Greece has a similar model, but we do not find the assumption of forward-looking consumers useful in that country. The models of Slovakia and Slovenia are smaller, and the results less interesting.

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) 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 saving 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 their working years consumers save and then 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. The gross stock of financial wealth will depend on the saving rate and on the number of years they expect to be retired.[3] Given that there is an optimal wealth to income ratio, *WR*, in an economy growing at a rate *g* the saving rate will be *g*WR* higher to sustain the equilibrium ratio; 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 increase, and this may raise consumption in the short term, even though real output may not have risen. We assume that consumption is determined by forward-looking behaviour in the long term, but that 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. Their estimates suggest that short-run impact on consumption from changes in housing wealth is five times the impact from changes in financial wealth. They also show that the 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 saving 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 based on the infinite forward recursion of total wealth. 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 as described in Barrell, Hall and Hurst (2006). These feedback rules are known to be in place in the future and hence we can describe the path of future interest rates. Forward-looking long rates should be related to expected future short term rates:

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

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[3] In a stationary world with no risk, no interest rates, a constant level of consumption and no bequests, the saving rate will the proportion of life in retirement (τ) and the number of years in retirement. For instance if 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.

The exchange rate and the equity market are also assumed to be forward-looking, with exchange rates following the open arbitrage path and equity prices moving in line with the discounted future value of expected net of tax profits.

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

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

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, that 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:

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

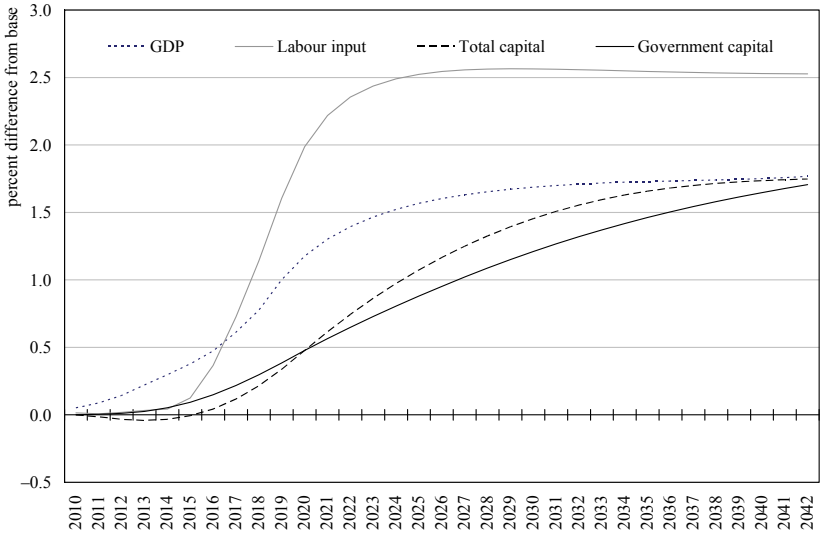
If the Government budget deficit is greater than the target, (e.g. –3 per cent of GDP and target is –1 per cent of GDP) then the income tax rate is increased. However, it is possible to turn off the tax rule and allow deficits to decline in response to increased tax revenues. However, debt stocks cannot expand or contract without bound, and hence in some analyses below we have to put a ceiling on the improvement in the deficit.

3 Extending working lives

We analyse the impact of a one year increase in effective working life in all the Euro Area countries together. Obviously, it might be wise to raise expected working lives by more, the effects of which can be extrapolated from our results. We assume that the working age population begins to increase five years after the start of the scenario and that it takes 5 years to increase the length of working lives by one year. Workers know that they will work longer and hence they need to save less now, and consumption will rise ahead of the increase in incomes. As the availability of increased labour is fully anticipated and comes through slowly in this simulation, the market adjusts and in our simulation there is little impact on the unemployment rate, which is determined by the wage bargain. Employers 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

Figure 1

Impacts of a One-year Increase in Working Lives in the Euro Area



function and hence rises in line with employment given any changes in real wages relative to the user cost of capital. If all capital did the same, then output should rise in exactly in line with labour input in the long run, as we would expect from the production function.

In Figure 1, GDP rises less than labour input in the long run, and continues adjusting. However, in the short run output rises ahead of labour input as demand increased. We also plot capital inputs, if these were to adjust more rapidly output would rise more quickly. These marginal changes could be smoothed if we assumed the government capital stock moved at the same pace as private sector capital, but we consider it useful to demonstrate the effects of budget rules. 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. As a result of these assumptions the capital stock rises less than the workforce, as we can see from Figure 1. Private sector capital rises less than employment as the increase in demand for capital, and hence the reduction in net saving, puts marginal upward pressure on long term real interest rates.

The need to finance capital inflows that go with an increased labour force require current account deficits and hence a build up of foreign liabilities. This will put a wedge between GNP and GDP and net property income from abroad will decline, as we can see from Figure 2. We could see a reduction of around 0.1 percentage points in the household saving rate of the Euro Area in the long run for every extra years working life we add. In the short term an expected (or anticipated) increase in working lives will immediately reduce the saving rate by around 0.3 percentage points. Total wealth rises as people anticipate higher future incomes and the effects are brought forward by rational optimising consumers. In the short run consumption rises ahead of incomes, as we can see in Figure 3.

4 Giving the Government options

The effects on the economy of extending working lives depend upon the assumptions made about government reaction. We consider three possible government reactions. Our main case leaves government investment and consumption 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. The scale of the

reduction would depend upon the numbers involved and the replacement ratio. Hence it is possible to cut taxes or reduce borrowing. In this scenario we allow taxes to fall in order to meet the government budget deficit target. The second case assumes taxes are kept fixed at base levels and government spending an investment rise with GDP. The failure to cut taxes allows the deficit to be reduced. Our third case keeps government investment and consumption at their baseline trajectory with tax rates fixed, at least initially, allowing more debt to be paid off with the increased revenue from higher incomes along with the reduction in spending. Once the improvement in the deficit reaches one per cent of GDP taxes are allowed to fall and the deficit improvement stays at that level. Figure 4 plots possible paths for direct taxes.

If tax rates are fixed but spending rises then the government deficit will be reduced by around 0.4 per cent of Euro Area GDP, as we can see from Figure 5. The government debt stock falls, and after 30 years the debt stock will have fallen by 6 per cent of (the value in 2043 of) GDP. With spending and

Figure 2

Current Account Effect of a One-year Increase in Working Lives in the Euro Area

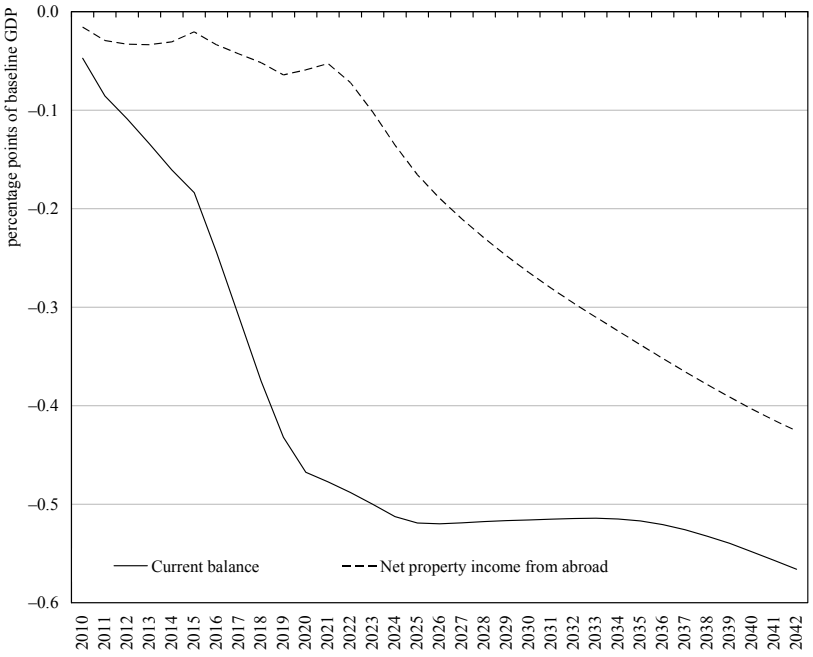


Figure 3

Impacts of a One-year Increase in Working Lives on Consumption

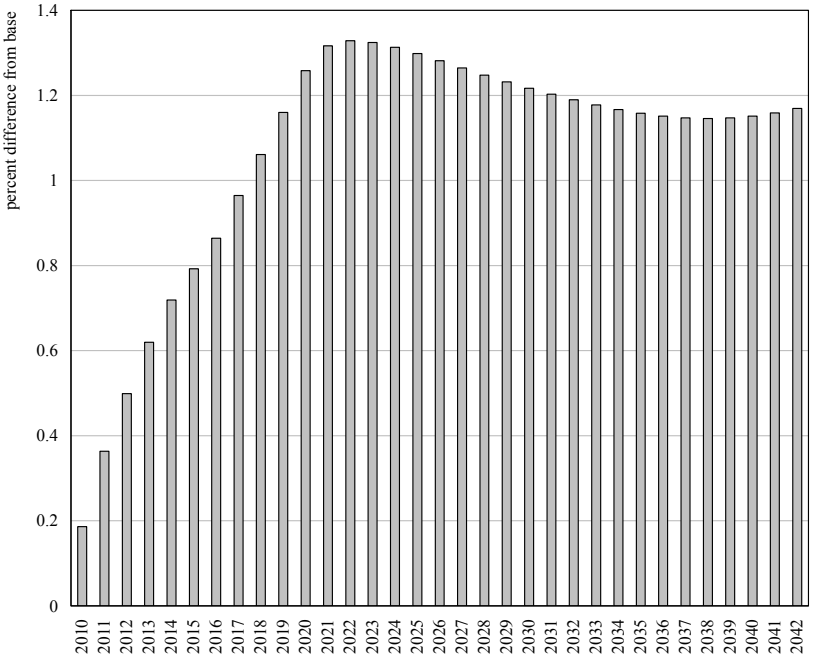


Figure 4

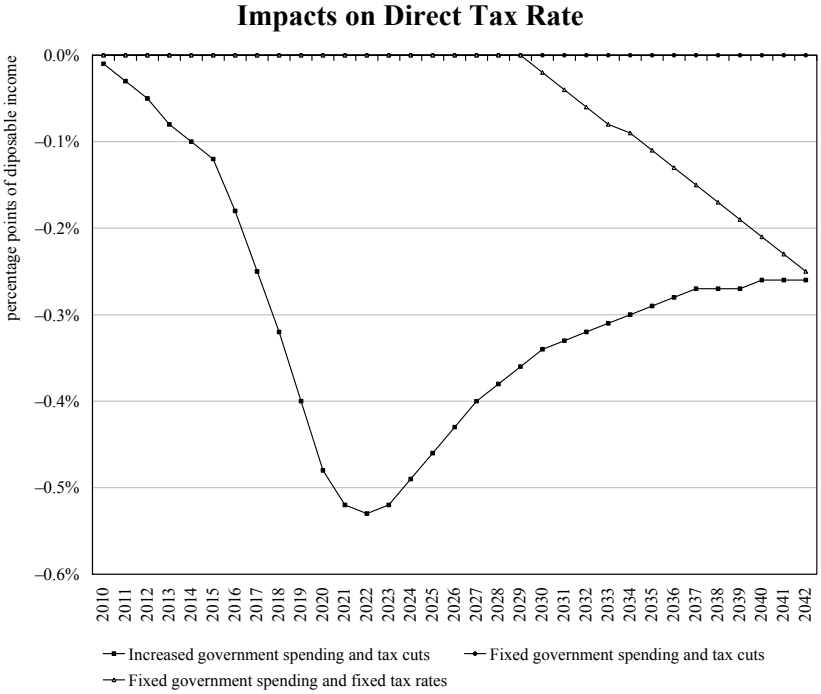
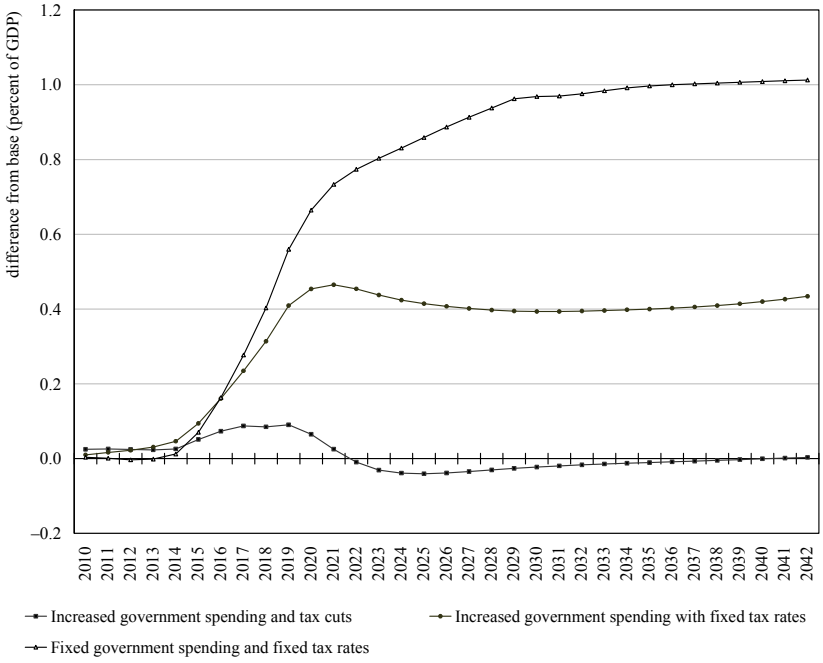


Figure 5



investment fixed, the budget deficit improves by 1 per cent of GDP after 20 years and stays higher in part because we impose the target at this level in all countries once the begin to reach it. Hence taxes are cut in order to ensure the budget deficit is kept different from base by a constant one per cent of GDP. As a result the government debt stock falls more rapidly and after 30 years it is 14 per cent of GDP lower. The choices available to the government are clear. Extending working lives can be absorbed into lower taxes, or it can finance higher spending, or it can be utilised to pay off the government debt accumulated in the recession.

5 Modelling Europe

NiGEM has a model of each of the 12 main European countries, and each has a complete supply side and rational expectations. The forward projection of population depends on Eurostat data both for the total population and the breakdown into the population of working age, the retired and those below working age. In each country government transfers to individuals depend on three factors:

*Transfers = a*ytrend + inactive*replacement rate + pensioners*pension replacement rate*

where *ytrend* is capacity output in nominal terms since transfers are also nominal.

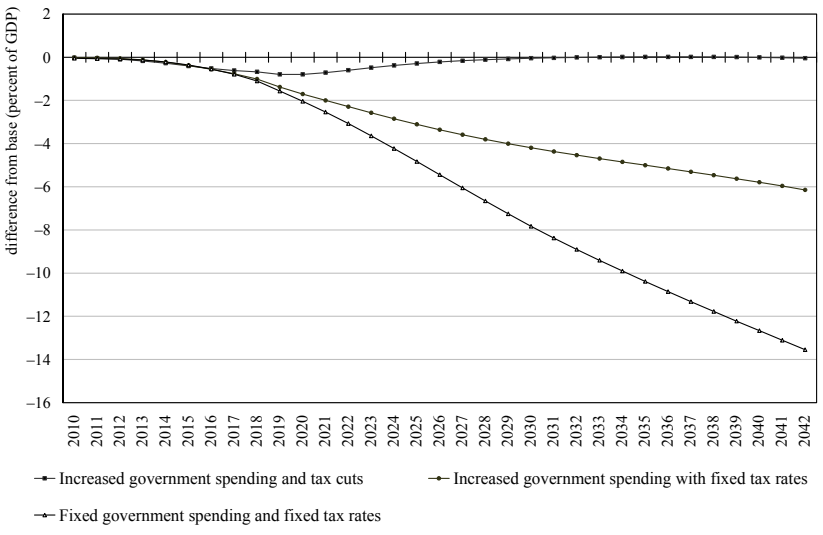
The replacement ratios are uprated with trend output in nominal terms. As a result of the uprating rule and the increase in the dependent population transfers rise as a share of GDP, and taxes rise to finance this in order that governments are solvent. If the retirement age is raised then transfers for pensions are reduced but initially unemployment rises, and the net effect on government spending depends on the two replacement ratios. We assume that over the first five years of the scenario working lives are raised progressively to be 2½ per cent longer than on the baseline. This is equivalent to an additional year of working life. The increase in the workforce is relatively quickly absorbed, and output rises in all cases.

The impact on interest rates in the rest of the world depends in large part on the projected change in the current account, and in the first case we can expect it to deteriorate. Figure 7 plots the output effects, whilst Figure 8 plots the impact on long term real interest rates in the steady state. We report numbers for the Euro Area, but similar changes take place in the US and the UK because the model allows for complete capital mobility and world real interest rates change approximately together. In Barrell, Hurst and Kirby (2009) we discuss similar policy initiatives in the UK, which is a small open economy, and hence global real interest rates are little affected. However, the Euro Area, like the US is not a small open economy, but a large one, and when it changes its saving and investment balance would real interest rates will change. If the increase in working lives were to be associated with higher government spending and lower taxes, and hence a similar government budget deficit, then world real interest rates would rise. Saving in the Euro Area would fall and the demand for capital would rise, and the market would have to find a new equilibrium. The larger the share of increased income that is used to pay down debt, the smaller is the increase (or larger the fall) in steady state real interest rates.

In each country we have details on the effects on output and direct tax rates, and these are plotted in Figures 9 and 10 for the base case where spending rises and the budget deficit is fixed, and hence taxes are cut. The increases in labour input are similar across countries in the long run but in the short run depend on how quickly labour markets adjust to increased labour input. The more forward-looking the wage bargain, the faster the increase in the supply of labour is absorbed. The effects on output vary more across countries, especially in the short run, where the dynamics of the trade equations will also have an impact. In the long run the effects depend mainly on the parameters of the production function (and the impact on the user cost which feeds into the production function).

Figure 6

Debts after Extending Working Lives



The effects on tax rates will depend in the

Figure 7

European GDP

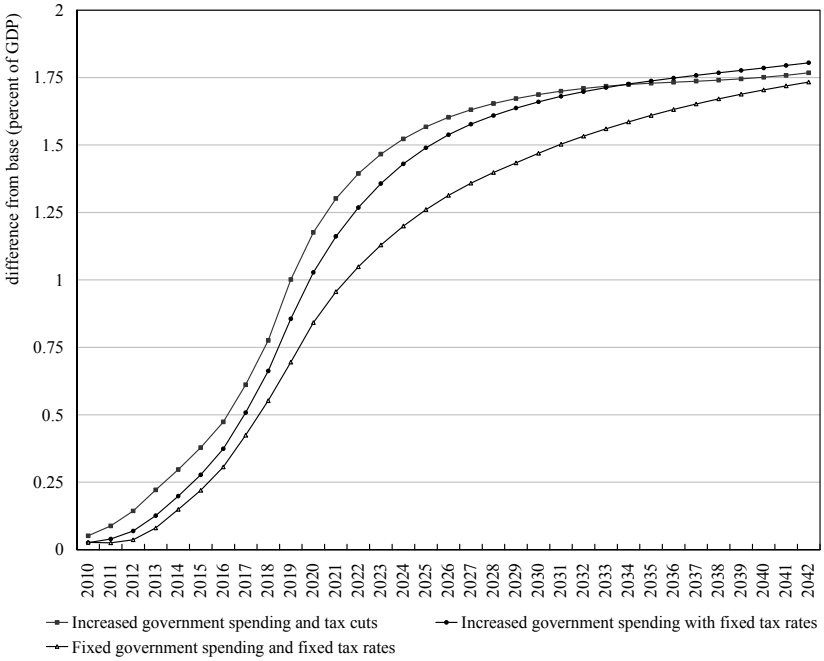
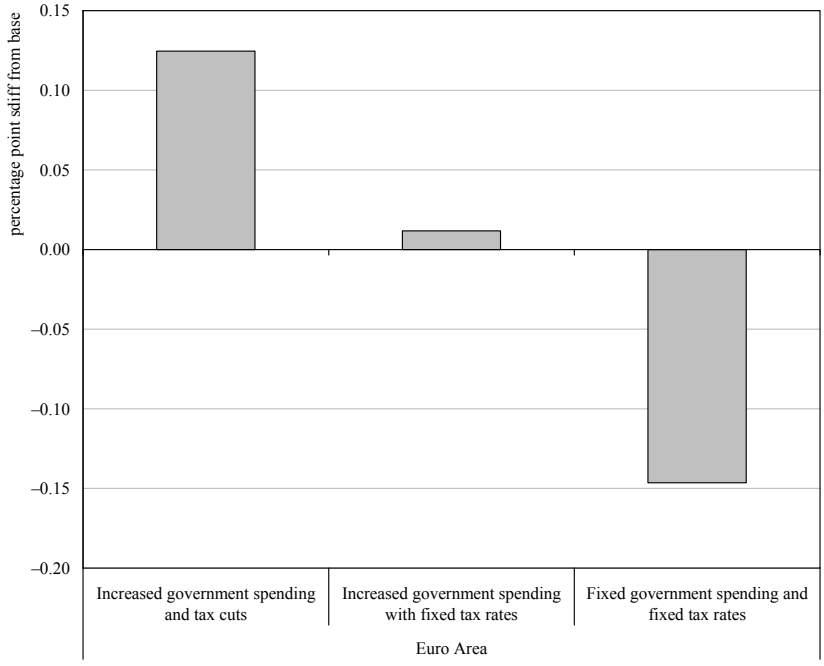


Figure 8

Changes in Real Interest Rates in the Euro Area



long run on the generosity of the state in the amount of transfers to households in relation to average incomes. The effects are least in the less generous countries such as Italy, but also in Germany. There is a correlation of –0.38 between our estimates of replacement ratios and the impact on tax rates, with higher ratios giving larger negative tax cuts. The short run effects depend on the relative generosity of state aid to the unemployed as an increase in the labour force might take a short while to absorb into increased employment. The speed of absorption of the retained workers depends on the degree of labour market flexibility. A shift to a more flexible labour market should increase the speed of adjustment.

6 Conclusion

It is widely acknowledged that the many countries have a shortfall of savings and an accumulation of government debt. The natural consequence is a shortfall in the resources available to cover retirement incomes. Extending working lives can be used to address this issue. Fewer assets are needed in order to provide an income stream over retirement

Table 1

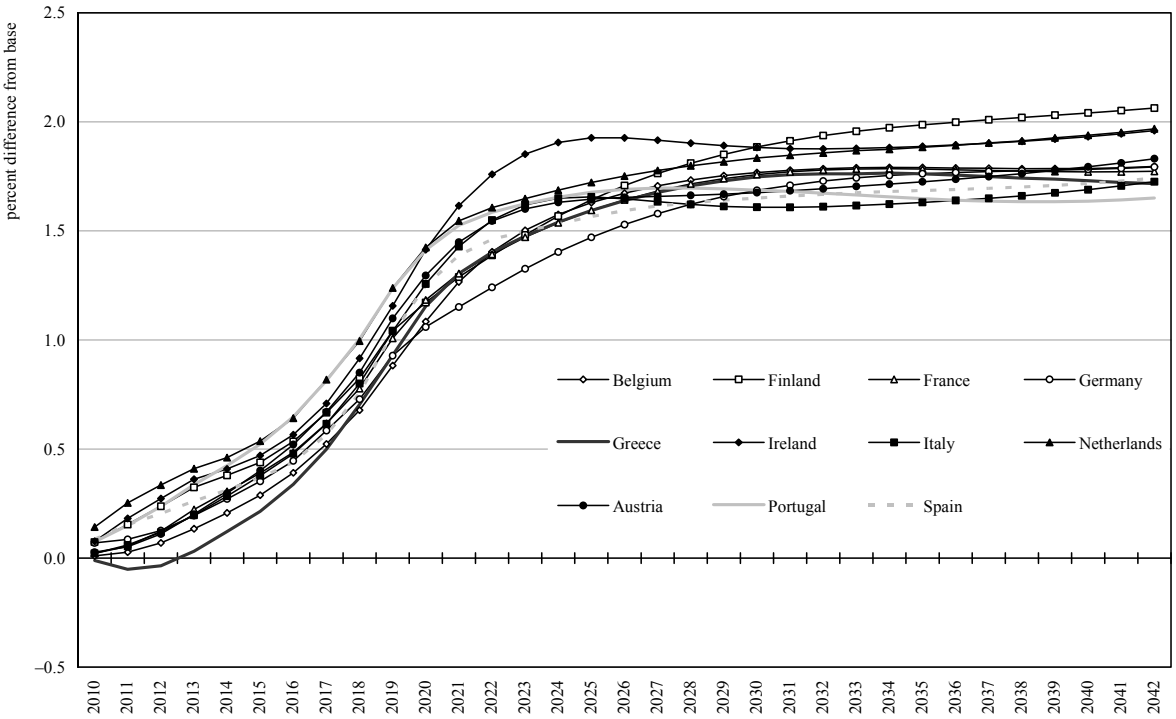
Replacement Rates and Tax Changes with Extended Working Lives

	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Neths	Austria	Portugal	Spain
Replacement rate	0.119	0.138	0.167	0.152	0.1225	0.1032	0.1621	0.076	0.245	0.1861	0.1391
Change in direct tax rate											
Fixed spending	–0.0075	–0.016	–0.0127	–0.0084	–0.0092	–0.0104	–0.0118	–0.0087	–0.0105	–0.0175	–0.0115
Increased spending	–0.002	–0.0095	–0.0061	–0.003	–0.0038	–0.0063	–0.0066	–0.0019	–0.0063	–0.0098	–0.005

Source: Eurostat social spending data, NiGEM simulations.

Figure 9

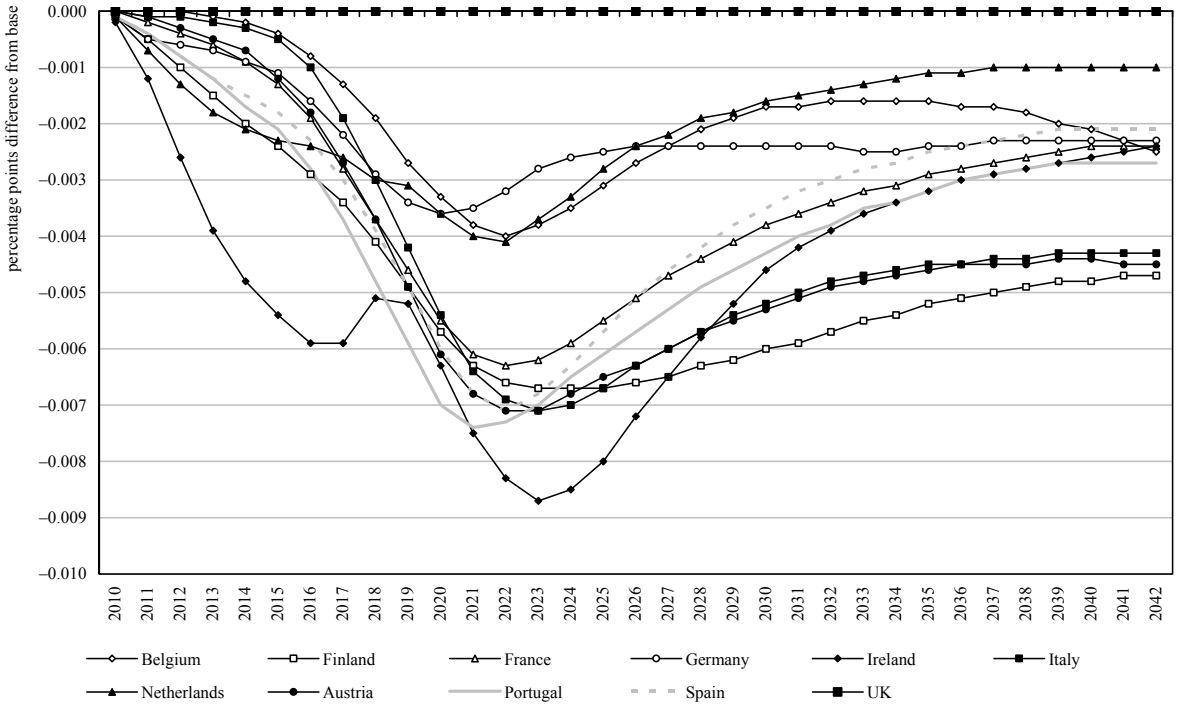
GDP across Countries with Extended Working Lives



reducing the necessary level of saving. Extending working lives gives governments a number of options for taxes and spending. It reduces transfer payments to pensioners without need to reduce their generosity, a policy option which may be politically easier than the alternatives of reducing the generosity of state contributions or raising taxes on the employed. It also increases tax revenues through increased incomes and consumption. These increased net revenues can be used to actually reduce the tax burden, increase spending or both together. It is also possible they could be used to pay down the national debt. Increased working lives raises output and hence the demand for capital to accompany more workers. Forward-looking consumers will adjust both their consumption patterns and their saving at the same time, with those who anticipate working longer increasing their consumption well before they approach retirement. The increase in consumption comes from

Figure 10

Tax Rates across Countries with Extended Working Lives



both increased output and a reduced the need to save for retirement. In a small open economy increasing working lives reduces net saving and hence reduces the current account surplus and foreign assets de-cumulate. In a large open economy such as Europe, an increase in the demand for capital and a reduction in saving will impact on the price of saving – the steady state real interest rate. Extending working lives in Europe by one year could raise the steady state real interest rate by 0.1 percentage points.

Increasing spending and cutting taxes are not the only options available to governments. If tax rates and spending plans were kept constant but working lives were to increase by one year then European general government budget deficits would, on average, improve by 1 per cent of GDP after 15 years. If this were maintained, in around 30 years national debt would be reduced by the equivalent of 16-20 per cent of GDP. Given the enormous increase in government debt induced by the banking crisis and the subsequent severe global recession policy options to reverse this accumulation of government debt need to be implemented. Extending working lives is a practical and feasible solution to this issue. We argue that the extension of working lives by 2 years in Europe would be enough to pay off government debt equivalent to around 40 per cent of GDP, which is what we expect the current crisis to have cost. If government debt were to be run down real interest rates would not rise by as much as we suggest. This is the case even if consumers are forward-looking, since they use a higher discount factor in their decision making than that observed in bond markets. This condition alone is enough to ensure "Ricardian equivalence" does not hold.

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