FISCAL MULTIPLIERS AND FISCAL CONSOLIDATIONS

Ray Barrell,[*] Dawn Holland[**] and Ian Hurst[**]

In this paper we look at fiscal multipliers in 18 OECD economies. The prospects for fiscal consolidation depend up the problems the country may face with its debt stock, the political will to deal with these problems and on the costs of consolidation. These costs are a function of the impacts of fiscal policy on the economy. Our analysis is based on a series of simulations using the National Institute Global Econometric Model, NiGEM. We first discuss the NiGEM model, as our results depend upon our description of the world. We then go on to decompose some of the factors that might affect our results. We consider the differences between temporary and permanent shifts in fiscal policy, the impact of an interest rate response, the role of expectations and the sensitivity to liquidity constrained consumers. Multipliers are time and state dependent. They are smaller the more open the economy and they appear to have been falling over time. They depend on the offsetting feedbacks in the economy, and in particular on the offsetting reactions of interest rates. A tighter fiscal policy will allow short term interest rates to be lower now and in the future if there is no change to the monetary target, and hence long term interest rates will be lower now, and the exchange rate will fall. Equity prices will rise and forward looking wage bargainers will change their behaviour. Each of these helps offset the contractionary effects of fiscal consolidation.

Introduction

This paper assesses various fiscal consolidation aspects for 18 OECD economies. The prospects for fiscal consolidation depend upon the problems a country may face with its debt stock, the political will to deal with these problems and on the costs of consolidation. These costs are a function of the impacts of fiscal policy on the economy. The analysis is based on a series of simulations using the National Institute Global Econometric Model, NiGEM. The NiGEM model will be discussed first, as the results depend upon the model properties. The key features of the model are that it is estimated and has a common structure across the 18 countries. If the results differ across countries it will be because they are different. Some of these differences, such as the openness of the economy, are important. They change over time and they are not related to estimation. Others, such as the speed of response to changes in income, do depend upon how the model was estimated. Although the model is estimated it has a strong role for expectations, and it is also flexible, as it can be run under different models of expectations formation, depending upon the thought experiment being undertaken.

Then the factors that might affect the results will be decomposed, for instance, by looking at temporary and permanent shifts in fiscal policy. In each case the first year multipliers will be presented. In the first year taxes will be raised or spending cut so that *ex ante* the deficit would improve by 1 per cent of GDP. Government consumption on goods and services and government transfers to individuals (mainly benefits and state pensions) will be changed, as well as income tax and indirect taxes. In the latter two the tax rate will be changed, and this has implications elsewhere

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[*] Brunel University.

[**] National Institute of Economic and Social Research.

Corresponding author: Dawn Holland – National Institute of Economic and Social Research – 2, Dean Trench Street, Smith Square – London SW1P 3HE, United Kingdom. E-mail: dholland@niesr.ac.uk, Tel. +44 (20) 7654 1921.

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in the economy. Each experiment is undertaken with the same set of assumptions, which will be discussed. The effects of government investment or corporate taxes will not be investigated. Government investment and corporate tax receipts are generally a small proportion of the economy, and a 1 per cent of GDP change to either would be a large proportionate change. In a temporary shock, the impact of a shift in government investment would be the same as a government consumption shock of the same magnitude. A long run shock to either government investment or the corporate tax rate would change the real equilibrium of the economy.

When undertaking experiments it is important to be able to dissect the contributing factors. These will be decomposed by removing them or changing them one at a time. Models such as NiGEM have to run with a monetary and a fiscal feedback rule and they use rational expectations. The rules and the assumptions about expectations affect outturns. The impacts of the assumptions will be investigated, looking at the role of forward looking bond and exchange rate markets, forward looking equities, forward looking wage bargainers and forward looking consumers. It is possible to run NiGEM with some or all of these, the effects on the multipliers will be investigated. Multipliers are time and state dependent. As we showed in Barrell, Fic and Liadze (2009), they are smaller the more open the economy and they appear to have been falling over time. They depend on the offsetting feedbacks in the economy, and in particular on the offsetting reactions of interest rates. A tighter fiscal policy will allow short-term interest rates to be lower now and in the future if there is no change to the monetary policy target, and hence long-term interest rates will be lower now. And the exchange rate will fall. Equity prices will rise and forward looking wage bargainers will change their behaviour. Each of these helps offset the contractionary effects of fiscal consolidation. It is also possible that the timing of fiscal consolidation and type of rule applied may affect outcomes. If fiscal policy is expected to be tightened in the future then long rates will fall now, increasing the offset, and perhaps even inducing a short-term expansion of output. Expansionary fiscal contractions are exceptionally rare, however.

The NiGEM model

The National Institute's global econometric model (NiGEM) can be used in a number of ways, from a backward looking structural model to a version that has similar long-run properties as the dynamic stochastic general equilibrium models used by institutions such as the Bank of England.[1] GDP (Y) is determined in the long run by supply factors, and the economy is open and has perfect capital mobility. The production function has a constant elasticity of substitution between factor inputs, where output depends on capital (K) and on labour services (L), which is a combination of the number of persons 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.

$$Y = \gamma(\delta(K)^{-\rho} + (1-\delta)(Le^{\lambda_L tech})^{-\rho})^{-1/\rho} \quad (1)$$

In general, forward looking behaviour in production is assumed 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

[1] 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 Dynamic Stochastic General Equilibrium models, but has the same steady-state equilibrium properties.

Barrell and Dury (2003), and the speed of adjustment depends on (rational) expectations of future inflation unless backward oriented learning is used. Financial markets normally follow arbitrage conditions and they are forward looking. The exchange rate, the long-term interest rate and the equity price will all "jump" in response to news about future events. Fiscal policy making involves gradually adjusting direct taxes to maintain the deficit on target, but it is assumed that taxes have no direct effect on labour supply decisions. Monetary policy making 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 simulations. Some of the key features of the model that determine the outturns of the simulation studies are detailed further below.

Consumer behaviour

As Barrell and Davis (2007) show, both the level of total asset based wealth ($\ln(TAW)$ or $\ln(NW+HW)$) and changes in financial ($d\ln(NW)$) and especially housing wealth ($d\ln(HW)$) will affect consumption (C).[2] Their estimates suggest that the impact of changes in housing wealth have five times the impact of changes in financial wealth in the short run, although long-run effects are the same. Barrell and Davis (2007) 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 real incomes ($d\ln(RPDI)$) in the equilibrium correction equation for consumption. These coefficients are important in evaluating impact multipliers, and may increase during a severe economic downturn. One can write the equation for $d\ln(C)$ as:

$$\begin{aligned} d\ln(C_t) = \lambda\{\ln(C_{t-1}) - [a + b_0 \ln(TAW_{t-1}) + (1-b_0)\ln(RPDI_{t-1})]\} \\ + b_1 d\ln(RPDI_t) + b_2 d\ln(NW_t) + b_3 d\ln(HW_t) \end{aligned} \tag{2}$$

where the long-run relationship between $\ln(C)$ and $\ln(RPDI)$ and $\ln(TAW)$ determine the equilibrium savings rate, and this relationship forms the long-run attractor in an equilibrium correction relationship. The logarithmic approximation is explained in Barrell and Davis (2007).

Operating in forward-looking consumption mode, consumers react to the present discounted value of their future income streams, which is approximated by total human wealth (TW), although borrowing constraints may limit their consumption to their personal disposable income in the short run. Total human wealth is defined as:

$$TW_t = Y_t - T_t + TW_{t+1}/((1+rr_t)(1+my_t)) \tag{3}$$

Y is real income, T are real taxes, and the subscript $t+1$ indicates an expected variable which is discounted by the real interest rate rr_t and by the myopia premium of consumers, my_t. The equation represents an infinite forward recursion, and permanent income is the sustainable flow from this stock.

Prices

Consumer prices (CED) are modelled as a dynamic weighted average of unit costs of production and import prices, adjusted by the indirect tax rate. A policy shift that changes the indirect tax rate, therefore, has a direct impact on the price level. Unit costs of production (UTC)

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[2] Throughout d is the change operator and ln is the natural logarithm.

are derived from the cost minimization problem around the underlying production function, given by:

$$\text{Minimize } C = WL + rK \tag{4}$$

$$\text{s.t. } Y = \gamma(\delta(K)^{-\rho} + (1-\delta)(Le^{\lambda_L tech})^{-\rho})^{-1/\rho} \tag{5}$$

where the factors of production L and K are associated with factor prices W (wages) and r (user cost of capital).

The first order conditions of the cost minimisation problem give the optimal input ratio, which can be substituted into the production function to derive the cost minimising levels of factor inputs to produce a given level of output. It is assumed that firms operate on their factor demand curves, at least in the long run, which leads to the following expression for marginal costs:

$$\ln(MC) = \theta_1 + \ln(W) - (1+\rho)\ln\left(\frac{Y}{L}\right) + \rho\lambda_L tech \tag{6}$$

where:

$$\theta_1 = \rho\ln(\gamma) - \ln(1-\delta) \tag{7}$$

Marginal costs are treated as a shadow price, whereas observed basic prices (P) incorporate an endogenous mark-up, which is modelled as a function of the output gap.

Government sector

In order to evaluate multipliers a reasonably disaggregated description of both spending and tax receipts is needed. Corporate (*CTAX*) and personal (*TAX*) direct taxes and indirect taxes (*MTAX*) on spending are modelled, along with government spending on investment (*GI*) and on current consumption (*GC*), and transfers (*TRAN*) and government interest payments (*GIP*) are separately identified. Each source of taxes has an equation applying a tax rate to a tax base (profits, personal incomes or consumption). As a default, government spending on investment and consumption are 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 are driven by a perpetual inventory of accumulated debts. Transfers to individuals are composed of three elements, with those for the inactive of working age and the retired depending upon observed replacement rates. Spending less receipts gives the budget deficit (*BUD*), which adds to the debt stock.

$$\text{BUD} = \text{CED}*(\text{GC}+\text{GI}) + \text{TRAN} + \text{GIP} - \text{TAX} - \text{CTAX} - \text{MTAX} \tag{8}$$

It has to be considered how the government deficit (*BUD*) is financed. Either money (*M*) or bond financing (*DEBT*) are allowed:

$$BUD = d(M) + d(DEBT) \tag{9}$$

and rearranging gives:

$$DEBT = DEBT_{t-1} + BUD - d(M) \tag{10}$$

In all policy analyses a tax rule is used to ensure that governments remain solvent in the long run. The default rule is applied to the personal direct tax rate, which is adjusted endogenously to bring the government deficit into line with a specified target. This ensures that the deficit and debt stock return to sustainable levels after a shock. A debt stock target can also be implemented and this is discussed below. The income tax rate (*TAXR*) equation is of the form:

$$TAXR = \text{f(target debt or deficit ratio} - \text{actual debt or deficit ratio)} \tag{11}$$

If the government budget deficit is above the target, (*e.g.*, 3 per cent of GDP and the target is 1 per cent) then the income tax rate is increased.

Monetary policy

Interest rates are set by the monetary authority in relation to a targeting regime, where policy interest rates are set in relation to a rule that is normally forward looking. We distinguish two types of rules, those that target only inflation and those that target the price level or a nominal variable such as GDP or the money stock. During the "great moderation" era central bankers and many economists became convinced that they had changed the world they lived in by adopting simple feedback rules for monetary policy in combination with rules for fiscal policy that kept debt in bounds. The simple feedback rule was based on the Taylor Rule (TR) that suggests that when inflation increases the central bank should increase the interest rate more than in proportion to the rise in inflation, and hence the real interest rate would rise and help choke off demand. In a forward looking world it is possible to improve on this principal. If agents see the central bank as fully credible, then the announcement of a price level target (PLT), rather than just an inflation target, will stabilise fluctuations in output and in inflation. A price level targeting central bank will loosen policy more rapidly as it has to get the price level back to target. The converse will be true in a boom. These two feedback rules are shown in equation (12) below, with int being the intervention rate, ssr being the steady state (endogenous) real interest rate, og being the output gap, inf and $infl$ being the inflation rate and the target, and P and PT being the price level and the price level target.

$$int_t = a_0 + a_1 ssr_t + a_2 og_t + a_3 \left(inf_{t+1} - infl\right) + a_4 \left(P_t - PT_t\right) \tag{12}$$

In a Taylor Rule a_0 is zero, a_1 is 1.0, a_2 is 0.5, a_3 is 1.5 and a_4 is zero, whilst in a PLT regime $a_{(1)}$ is zero, $a_{(2)}$ is also zero, and $a_{(3)}$ is set to 0.7 and $a_{(4)}$ to 0.4. The PLT rule has the advantage of working only on observables. The same is true of a two pillar strategy as embraced by the ECB. The bank responds to deviations of inflation from target and also deviations of a nominal aggregate (*NOM*) – the money stock for instance – as described in equation:

$$int_t = b_0 + b_1 \left(inf_{t+1} - infl\right) + b_2 \left(NOM_t - NOMT_t\right) \tag{13}$$

Forward looking financial markets

A deflationary shock such as a fiscal tightening will have a weaker interest rate response under a Taylor Rule than under price level targeting, and both may be weaker than a two pillar rule. If actors know the rule is in place then they will form expectations of the future path of short rates, and this will cause the current long rate to change, along with the exchange rate and the equity price. Forward looking long rates (*LR*) should be related to expected future short-term rates:

$$\left(1 + LR_t\right) = \prod_{j=1}^{T} \left(1 + int_{t+j}\right)^{1/T} \tag{14}$$

Forward looking equity prices (*EQP*) are related to future profits (*PR*) in a forward recursion where *eprem* is the equity premium:

$$EQP_t = PR_t + \frac{EQP_{t+1}}{\left(1 + int_t\right)\left(1 + eprem_t\right)} \tag{15}$$

The exchange rate depends on the expected future path of interest rates and the exchange rate risk premia, solving an uncovered interest parity condition, so that the expected change in the

exchange rate is given by the difference in the interest earned on assets held in local and foreign currencies:

$$e_t = e_{t+1}\left(\frac{1+\text{int}^*_t}{1+\text{int}_t}\right)(1+rp_t) \tag{16}$$

where e_t is the bilateral exchange rate at time t (defined as domestic currency per unit of foreign currency), int_t is the short-term nominal interest rate at home set in line with a policy rule, int_t^* is the interest rate abroad and rp_t is the exchange rate risk premium.

Fiscal multipliers

NiGEM is an estimated and calibrated model with a supply side and rational expectations, but is does not go as far in this direction as modern DSGE models which are theory based, but fail in their description of the world. In a model such as ours multipliers are small. They average around 0.3 or less, as can be seen from Tables 1 and 2 below. Even then these estimates probably exceed the multipliers that one would see with any actual consolidation programme, because for some actions implementation speed is faster in the model than in the world. If one allows for more gradual implementation, this would reduce average multipliers to below 0.2. This matters in particular when comparing multipliers for taxes and benefits to those for spending. Taxes or benefits can be cut by 1 per cent of GDP relatively easily both in the model and in the world. Multipliers in response to income tax and benefit adjustments are small, as a part of the decline in personal sector income is offset by a temporary adjustment in the savings rate. As one can see from the tables, multipliers appear larger for cuts in real government spending. This is in part because of the assumption that such cuts can be implemented immediately, and this is certainly not the case. It is also in part because government consumption is part of the income identity and hence when they are cut (and reduce the number of people employed or goods and services bought) measured real output falls. If one were to reduce government spending by as much, but do it through wage reductions, then the impact on real GDP would be much less, and the second round effects of the shock would effectively be the same as an increases in taxes.

In order to determine the effects of an *ex ante* change in fiscal policy one has to avoid offsetting or reinforcing policy effects, but the model must otherwise be allowed to run. In each of our simulations in this section we make the following assumptions:

- Policy reactions are turned off for the first year:
  - The central bank does not change the short-term interest rate for a year, whatever the shock. It then follows a targeting regime that stabilises either the inflation rate or the price level.
  - The government does not target the deficit for the first year. The model has a feedback rule which adjusts the direct tax rate in relation to the gap between actual and target deficits. This is switched off for a year.
  - Government investment is fixed at the baseline for a year and does not respond to long-term factors in the first year. The same, where this is appropriate, is true for government consumption.
  - Other tax rates and all benefit replacement rates are held constant throughout the simulation period.
- Markets work and all quantities and prices can react and there are no exogenous variables in the model, with the exceptions of policy targets, labour supply and risk premia:
  - Financial markets look forward and are assumed to follow arbitrage paths, and expectations for those paths are outturn consistent.

  - Long-term government bond rates are the forward convolution of future short- term policy rates plus an exogenous premium.
  - Long-term real interest rates are the forward convolution of future short-term real policy rates plus an exogenous risk premium made up of the bond premium plus private sector risks.
  - Equity prices are the discounted value of future profits, where the discount factor is the market interest rate plus the exogenous equity premium.
  - Exchange rates "jump" when future interest rates change and they follow the arbitrage path given by nominal interest rates.
- Labour markets are described by an exogenous labour supply, a labour demand equation and by a wage equation based on search theory, where the bargain depends on backward and forward looking inflation expectations.
- Capital stocks adjust slowly towards that associated with expected capacity output four years ahead, which in turn depends upon a forward looking user cost of capital. Expectations are rational and factor demands and capacity output are based on a CES production function.
- Consumers respond to their forward looking financial wealth, but are not fully forward looking.

In the next sections the implications of several of these default assumptions will be tested.

Table 1 reports the estimates of the first year multipliers for 18 OECD countries, under the default assumptions described above, for a 1 per cent (*ex ante*) GDP rise in taxes or cut in spending that is reversed after one year. The multipliers for cuts in government consumption spending and spending on benefits are reported, as well as for rises in indirect taxes and direct (personal) taxes. Simulations are run one country at a time, so there are no spillovers across countries in the reported multipliers. Generally multipliers peak in the first year and then decline, and the *ex post* improvement in government revenues will normally be less than 1 per cent of GDP as tax bases change. Some of the effects of the impulse will be offset by declines in interest rates. Both short and long rates should fall, but the former may be trapped at the lower bound at present. This will have a limited impact on our results as long rates are forward looking and can move even when current short rates are restrained by the zero bound. In NiGEM, investment behaviour is mainly influenced by long real rates through the user cost of capital, and these are free to fall in response to the temporary fiscal tightening.

The multipliers reported in Table 1, illustrate some of the key differences across fiscal instruments, and also highlight important differences across countries. Government consumption spending multipliers tend to be larger than tax or benefit multipliers, as a fraction of any disposable income change is absorbed through a temporary adjustment to savings. However we should bear in mind the caveat mentioned above that it is not necessarily feasible to cut the provision of government goods and services at short notice.

Country size is an import distinguishing factor across country multipliers, as the long term fall in real interest rates that is produced by consolidations that is reflected in current long term real interest rates is an international phenomenon. When capital moves freely between countries, real interest rates are determined largely by the balance between global saving and global investment, and large countries such as the United States have much more impact than small ones such as Greece. In addition the initial interest rate response will be smaller in countries in EMU because the ECB responds to euro area inflation.

Multipliers tend to be smaller in more open economies, because the more open an economy is the more of a shock will spread into other countries through imports, and small open economies such as Belgium have small multipliers. Another structuring factor is the degree of dependence of

Table 1

First-year Multipliers from 1 Percent of GDP Temporary Innovations

Country	Government spending		Taxes	
	Consumption	Benefits	Indirect	Direct
Australia	–0.82	–0.27	–0.25	–0.22
Austria	–0.53	–0.17	–0.09	–0.13
Belgium	–0.17	–0.04	–0.05	–0.03
Canada	–0.53	–0.16	–0.05	–0.12
Denmark	–0.53	–0.10	–0.06	–0.04
Finland	–0.64	–0.14	–0.09	–0.08
France	–0.65	–0.32	–0.09	–0.27
Germany	–0.48	–0.29	–0.09	–0.27
Greece	–1.07	–0.44	–0.22	–0.32
Ireland	–0.33	–0.09	–0.07	–0.08
Italy	–0.62	–0.17	–0.07	–0.12
Japan	–1.27	–0.65	–0.34	–0.57
Netherlands	–0.53	–0.19	–0.07	–0.16
Portugal	–0.68	–0.15	–0.08	–0.11
Sweden	–0.39	–0.14	–0.06	–0.16
Spain	–0.71	–0.15	–0.17	–0.09
United Kingdom	–0.74	–0.22	–0.16	–0.15
United States	–1.12	–0.35	–0.35	–0.25

Note: No shift in the budget target. Experiments conducted in one country at a time.

consumption on current income. This is often related to liquidity constraints, with a higher current income elasticity more common in financially unliberalised economies such as Greece than in Belgium or the United States. Finally the speed of response of the economy depends in part on the flexibility of the labour market and the speed at which policies, such as a rise in VAT feed into prices.

Barrell, Holland and Hurst (2012) compare the temporary government consumption spending and direct tax multipliers from Table 1 to some of the key factors determining the differences in the magnitude of multipliers across countries: country size, import penetration and the estimated short-term income elasticity of consumption. This identifies a strong correlation between country size and the tax and spending multipliers, suggesting that the larger the economy the bigger the multiplier. The large economy impact on world interest rates must be more than offset by other features of large economies, such as the tendency to be less open to imports than the smaller economies, as the interest rate change in response to a temporary shock is very small. Import penetration has a very strong correlation with the impact multipliers, suggesting that more open economies tend to have smaller multipliers, both in response to spending cuts and tax rises.

Figure 1 illustrates the strength of this correlation with the temporary spending on goods and services multiplier.

The short-term income elasticity of consumption has little relationship with the first year government consumption multipliers, but shows a 50 per cent correlation with income tax multipliers, which feed directly into personal income. This relationship is illustrated in Figure 2. The indirect tax multiplier will also depend upon the speed at which real wealth effects reduce consumption. An indirect tax increase reduces real wealth, and as it affects consumption in the long run, it affects the multipliers.

A permanent fiscal consolidation also involves changing the budget deficit target. The reported multipliers in Table 2 are derived from the shocks applied in Table 1, but with the cut in spending or increase in taxes being permanent and also the deficit target is shifted by 1 per cent of GDP. This changes the shape of the multiplier, as income taxes will rise in all scenarios from the second year of the simulation to cover any shortfall in the 1 per cent of GDP consolidation, and long-term interest rates will fall by more than for a temporary consolidation. The impact of tax increases in the second year varies across shocks, depending on the degree of shortfall in the *ex post* budget improvement compared to the *ex ante* estimates.

In general, permanent multipliers should be smaller than temporary ones, as the impact of the fiscal contraction on long rates will be larger, and the fall in long rates will induce increases in asset prices and in investment.[3] Country size plays a much more direct role in determining the offset on a permanent consolidation relative to a temporary one than in determining the size of the multiplier itself. Figure 3 plots the ratio of permanent to temporary multipliers in response to an innovation in government consumption. There is a 60 per cent correlation between these ratios and economy size, measure as GDP in prices and PPPs of 2005. Larger countries, such as the United States, which has an important role in determining global interest rates, sees a much bigger decline in the magnitude of the multiplier when the consolidation is permanent, compared to small EMU countries such as Finland, where monetary policy is not independent. The five countries with the largest differences between temporary and permanent multipliers all have independent monetary policies and hence a fiscal contraction will induce a larger decline in long rates and in the exchange rate than is observable in the countries within EMU.

US fiscal multipliers under different monetary policy reactions

The fiscal multipliers reported in Tables 1 and 2 above are based on the series of assumptions detailed in the previous section. However, multipliers are not immutable, and in the next two sections the implications of some of these assumptions will be assessed, and the impact on the estimated multipliers from adopting an alternative set of assumptions reported. In this section the focus is on the choice of the monetary policy response to a fiscal consolidation. We use the United States as an example, but similar results can be expected in other large advanced economies.

Under the default assumptions, nominal short-term interest rates are initially fixed for one year. Thereafter, the monetary authority is assumed to follow the standard feedback rule, which applies a combined target to both inflation and a nominal aggregate. If one allows interest rates to respond immediately, the monetary authority will cut interest rates in the first year to offset part of the contractionary impact of the fiscal consolidation. This reduces the fiscal multiplier slightly in

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[3] The impact of the consolidation on risk premia is not taken into account. These are largely absent currently for large countries such as the United States, the United Kingdom, France and Germany. For small countries such as Greece, Ireland and Portugal this is important.

Figure 1

Temporary Spending Multiplier and Import Penetration

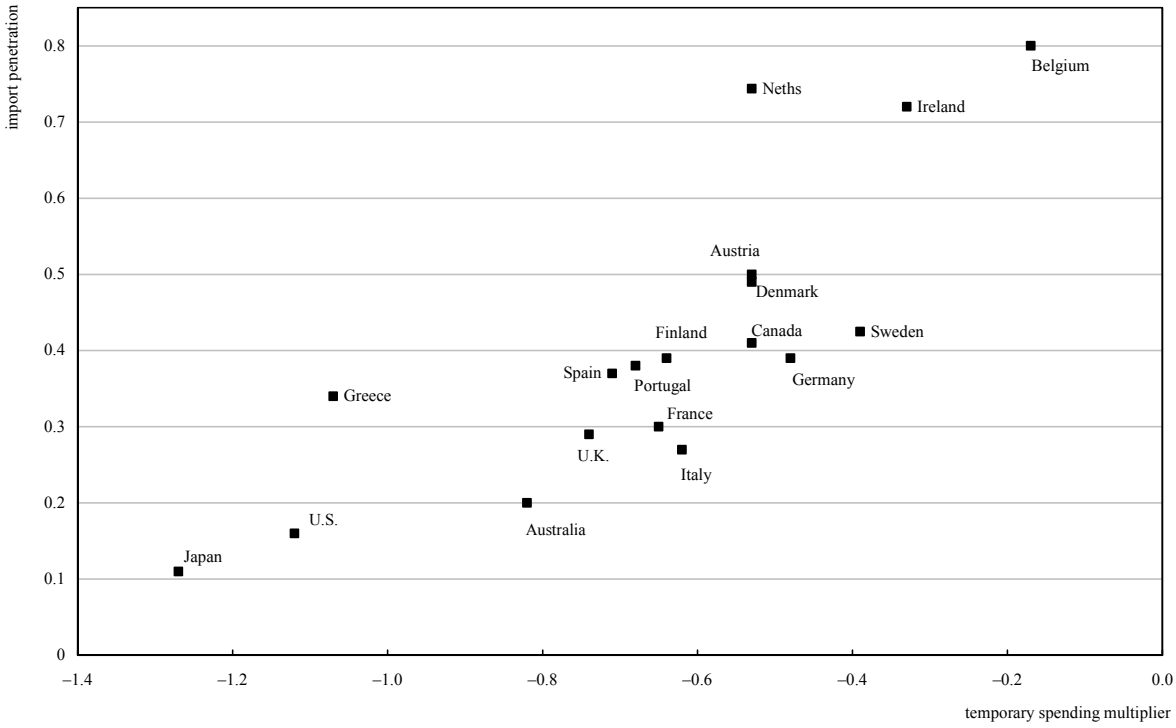


Figure 2

Temporary Tax Multiplier and Income Elasticity of Consumption

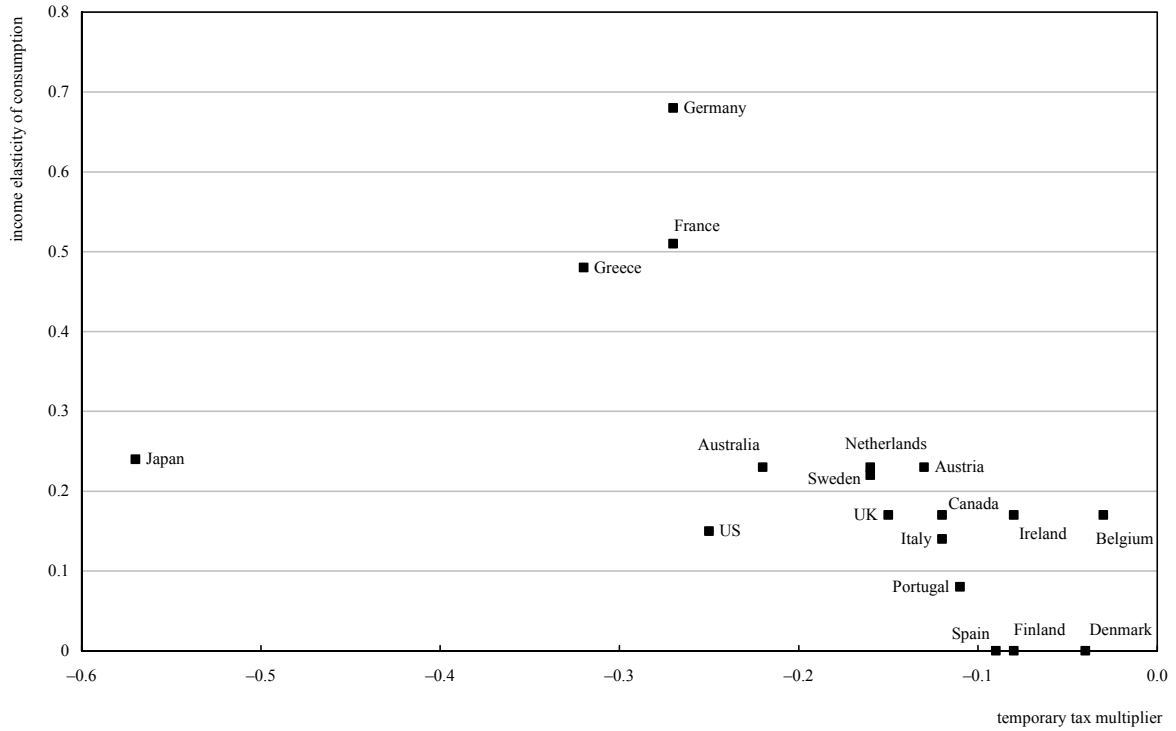


Table 2

First-year Multipliers from 1 Percent of GDP Permanent Consolidation

Country	Government Spending		Taxes	
	Consumption	Benefits	Indirect	Direct
Australia	–0.61	–0.17	–0.32	–0.12
Austria	–0.55	–0.18	–0.05	–0.13
Belgium	–0.16	–0.04	–0.02	–0.03
Canada	–0.43	–0.13	–0.10	–0.08
Denmark	–0.54	–0.10	–0.02	–0.05
Finland	–0.67	–0.16	–0.05	–0.10
France	–0.65	–0.33	–0.11	–0.26
Germany	–0.46	–0.29	–0.12	–0.25
Greece	–1.02	–0.44	–0.29	–0.37
Ireland	–0.33	–0.11	–0.06	–0.08
Italy	–0.62	–0.17	–0.06	–0.12
Japan	–1.15	–0.58	–0.43	–0.48
Netherlands	–0.51	–0.19	–0.05	–0.15
Portugal	–0.70	–0.17	–0.06	–0.12
Sweden	–0.40	–0.17	–0.05	–0.13
Spain	–0.74	–0.17	–0.16	–0.12
United Kingdom	–0.55	–0.14	–0.14	–0.08
United States	–0.90	–0.25	–0.27	–0.16

Note: Budget target shifted by 1 percent of GDP. Simulations conducted in one country at a time.

Figure 3

Ratio of Permanent to Temporary Government Consumption Multipliers

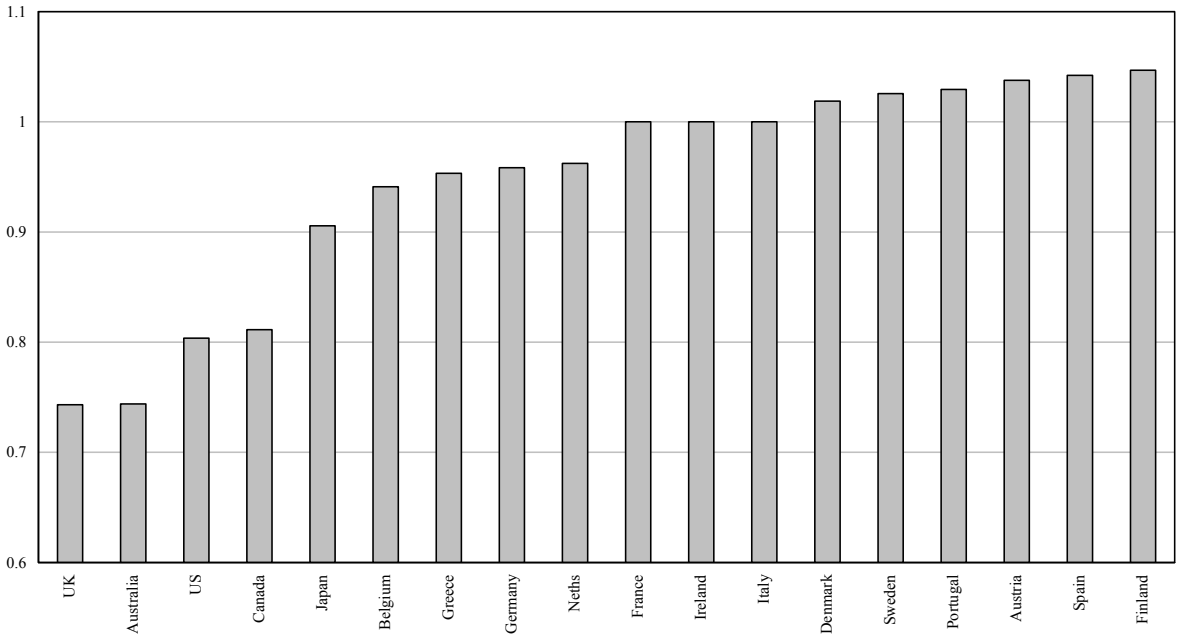
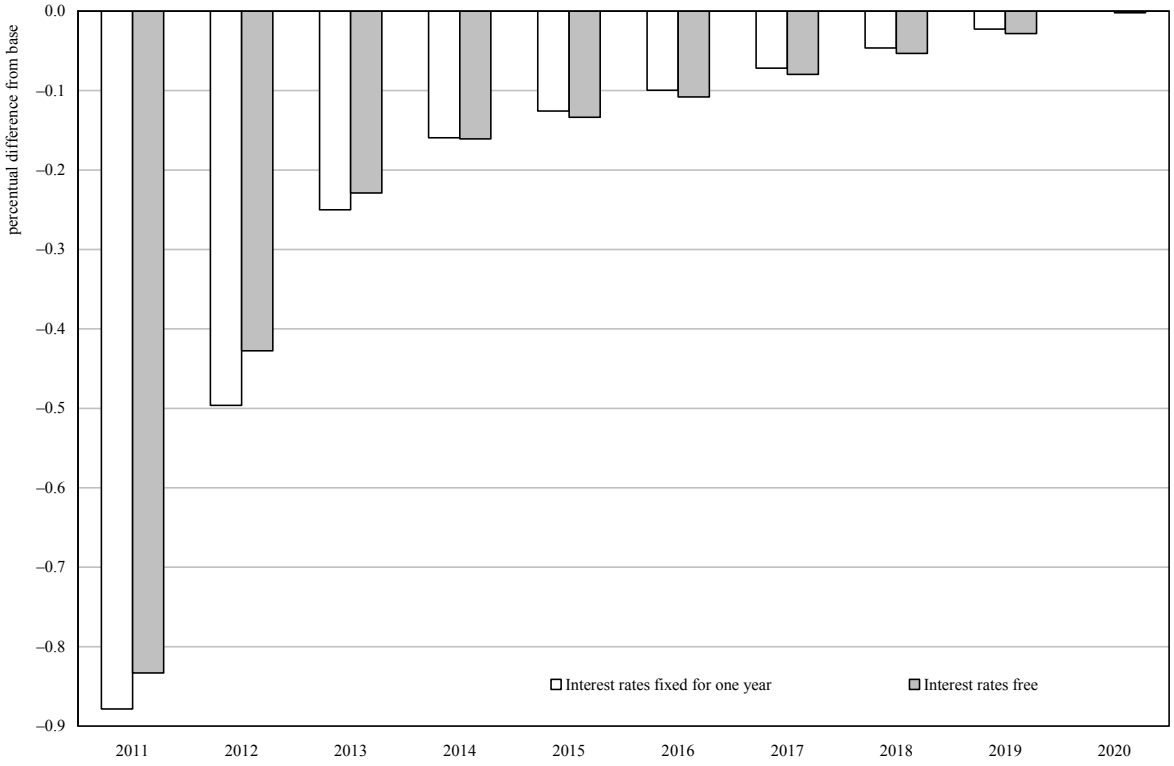


Figure 4

Impact on US GDP of 1 Percent Permanent Spending-based Consolidation

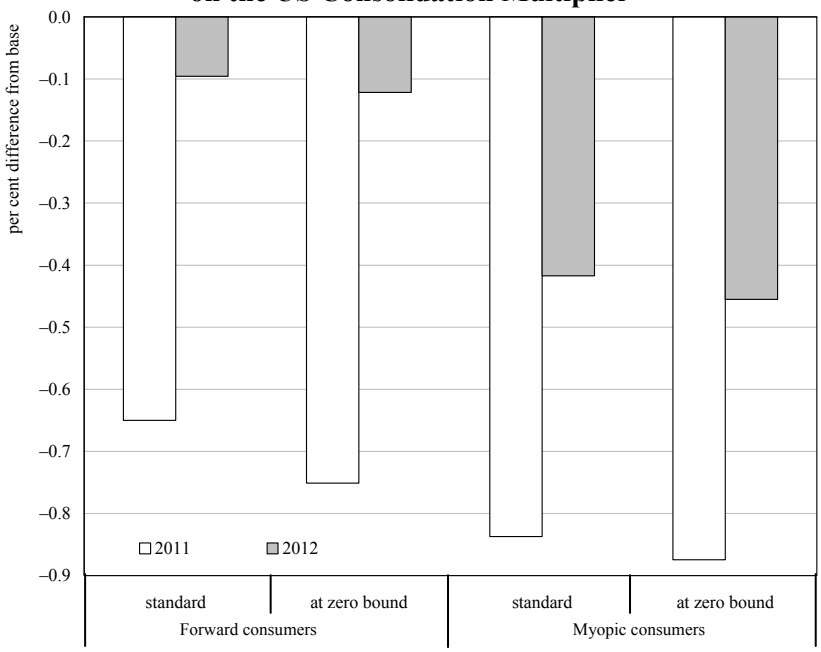


the first three years, as illustrated in Figure 3, but raises it slightly in subsequent years, so that the net cumulative impact of this speed of interest rate response is negligible.

It may of course be the case that monetary policy cannot react immediately because interest rates are at zero. In the baseline in mid 2011 interest rates in the US start to rise from the very low level seen since 2009, and hence a cut is possible. However, this January 2011 baseline included a significant increase in oil prices which would raise inflation in the United States and induce an interest rate response. Hence that baseline cannot be used to evaluate the importance of a zero lower bound, but it is possible to construct a counterfactual history where this is possible by removing the oil price shock and creating a new baseline. If we undertake this simulation then interest rates in the United States would be trapped at 0.001 until the first quarter of 2012, and hence one can evaluate the role of the zero bound over this period. The fiscal consolidation was simulated on the standard base and the counterfactual base with forward looking consumers and with myopic consumers. Forward looking consumers (discussed below) take the net present value of their future incomes and spend in relation to this. In a normal baseline a fiscal consolidation reduces interest rates in the short term and hence consumption rises as a result. At the zero bound interest rates cannot fall (for at least five quarters in our experiment) and hence consumption does not absorb as much of the shock and output falls by 0.1 percentage points more than in the normal case with forward looking consumers. In NiGEM myopic consumers are less influenced by short-term interest rates and investment decisions depend upon the user cost of capital. Hence the zero bound raises the multiplier by less if consumers are myopic, as can be seen from Figure 5. In general, the lower bound is not very important, but the longer it is expected to last the greater the effect on the consolidation multiplier.

Figure 5

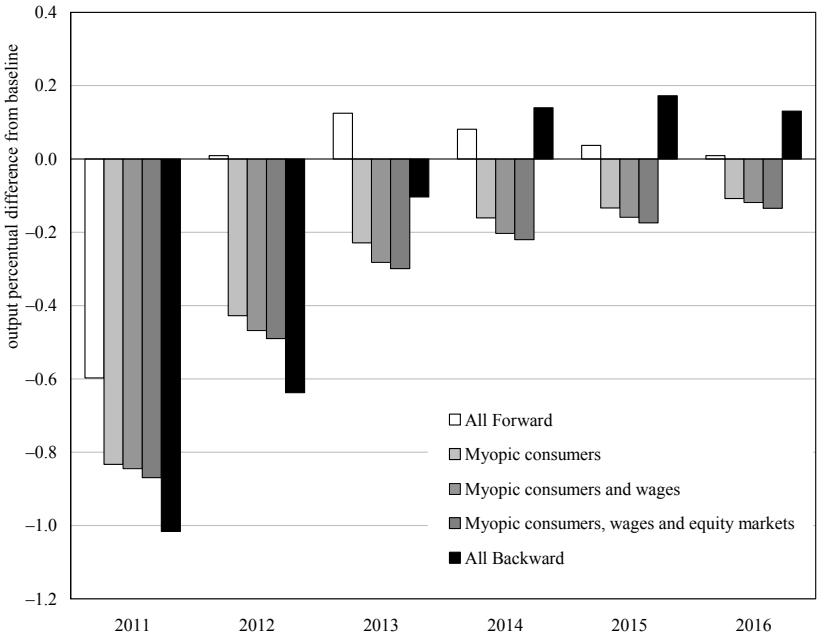
Impact of the Zero Lower Bound on Interest Rates on the US Consolidation Multiplier



Note: Forward consumers use forward-looking model-consistent expectation whereas myopic consumers are backward looking.

Figure 6

Fiscal Multipliers in the US Under Different Forms of Expectations



Note: the figure shows the deviations from baseline following a permanent fiscal shock.

Fiscal multipliers and expectations

Perhaps the most important set of assumptions affecting the size of the multiplier concern the role of expectations. In the standard set of simulations, the assumption is made that financial markets are forward looking. Long-term interest rates, equity price and exchange rates follow a forward looking arbitrage path, which is consistent with the simulation outturns. Wage setting is also partly forward looking, with wage settlements driven by a weighted average of current and expected inflation. Consumers are assumed to be myopic, but respond to their forward looking financial wealth, albeit rather slowly.

In this section some of these assumptions are relaxed in order to assess their impact on the estimated fiscal multipliers. Figure 6 shows the US multiplier in response to a permanent spending consolidation under the default assumptions (labelled as myopic consumers in the figure) and compares this to a range of alternative sets of assumptions regarding expectations. If one turns labour markets and equities backward looking so that they do not depend upon

expectations about the future then the multiplier path is little affected. This is illustrated by the lines labelled myopic consumers and wage setters, and myopic consumers, wage setters and equity markets in the figure. The size of the multiplier is marginally larger under these assumptions, but not significantly so. The shock still operates with a monetary feedback rule and slower growth will reduce inflation and hence interest rates in the future will be lower. This will cause the forward looking exchange rate to jump down and forward looking long rates to do the same. If one turns long rates backward looking and fixes the exchange rate in the first period (and thereafter in this experiment), the multiplier in response to the consolidation programme in the US increases to over one in the first year. This is labelled "All backward" in the figure. Short term interest rates still fall and if one did not allow this to happen then the multiplier would be marginally larger still.

One can also move in the other direction and assume consumers are forward looking and react to the expected value of their future incomes. As taxes will be lower in the future and hence the net present value of incomes is higher, consumption is initially higher with forward looking consumers than it is with myopic ones. There is estimated inertia in the adjustment to the long run even with our forward looking consumption equations. Reducing the mark up would shrink the multiplier further from the –0.6 in the chart, but it would still be negative. However, as the myopia premium shrinks to zero the model comes close to be fully Ricardian in that future tax liabilities are more fully taken into account.

Fiscal multipliers and liquidity constraints

In the presence of perfect capital markets and forward-looking consumers with perfect foresight, households will smooth their consumption path over time, and consumer spending will be largely invariant to the state of the economy or temporary fiscal innovations. However, some fraction of the population at any given time is liquidity constrained with little or no access to borrowing, so that their current consumption is largely restrained by their current income. The share of the population that is liquidity constrained will affect the short-term income elasticity of consumption, given by parameter b_1 from equation (2), which we reproduce below:

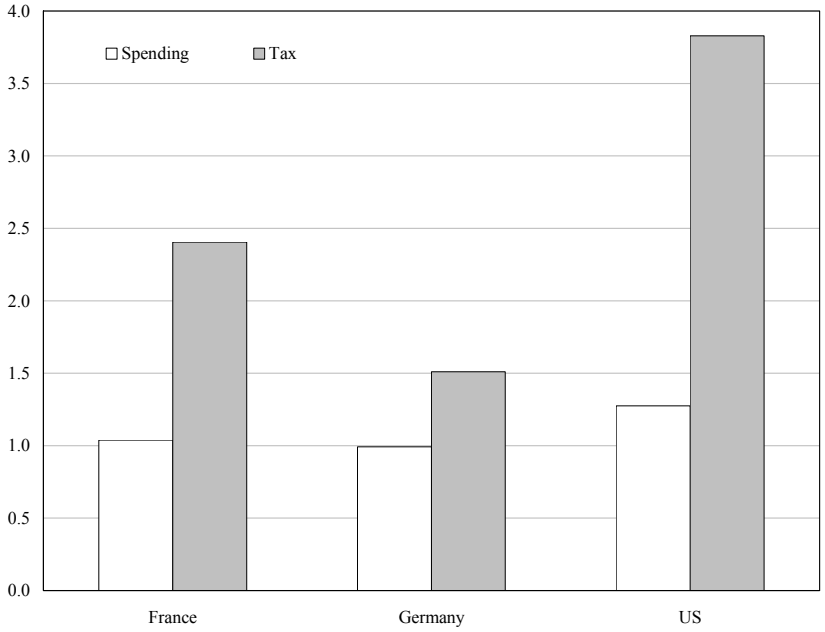
$$\begin{aligned} d\ln(C_t) = \lambda\{\ln(C_{t-1}) - [a + b_0 \ln(TAW_{t-1}) + (1-b_0)\ln(RPDI_{t-1})]\} \\ + b_1 d\ln(RPDI_t) + b_2 d\ln(NW_t) + b_3 d\ln(HW_t) \end{aligned} \tag{2}$$

Cross-country differences in the average short-term income elasticity of consumption have a strong correlation with the tax multipliers, as illustrated in Figure 2. However, access to credit is dependent both on credit history and on current income, and so is necessarily sensitive to the state of the economy. As unemployment rises, a greater share of the population will be unable to access credit at reasonable rates of interest – at precisely the moment when they are in need of borrowing to smooth their consumption path. This means that consumption is likely to be cyclical, and that b_1 is likely to be time varying and dependent on the position in the cycle. Following a banking crisis the effects can be expected to be particularly acute, as banks tighten lending criteria, as discussed by Barrell, Fic and Liadze (2009). This also suggests that fiscal multipliers are dependent on the state of the economy – especially tax innovation multipliers – and this is consistent with recent studies such as Delong and Summers (2012) and Auerbach and Gorodnichenko (2012).

In order to assess the sensitivity of fiscal multipliers to the magnitude of the liquidity constraints parameter, b_1, we compare our standard multiplier for a 1 per cent of GDP innovation to government consumption and income tax to one where the liquidity constraints parameter is increased by 0.5. The ratio of the multipliers is illustrated in Figure 7. The spending multipliers are not affected dramatically – although the effects in the US are somewhat stronger than in France or Germany. The tax multipliers, on the other hand, are significantly increased when liquidity

Figure 7

Ratio of Multiplier with Heightened Liquidity Constraints to Baseline Multiplier



constraints are high – by nearly 4-fold in the US, 240 per cent in France and 150 per cent in Germany. This will significantly narrow or eliminate the gap between spending and tax multipliers during a downturn. This suggests that there may be little scope to apply a balanced-budget stimulus through an adjustment to policy instruments, especially during a banking crisis-driven recession.

Conclusion

In general in most countries fiscal policy multipliers are small, but are negative when fiscal policy is tightened. These effects are likely to be magnified during a recession, especially when banking systems are impaired. Tighter fiscal policy reduces growth in the short run in almost all circumstances, but a lower debt stock reduces pressures on real interest rates and hence in the longer term can raise sustainable output. This effect is larger for larger countries, and there are noticeable spillovers through real interest rates from policies in the United States (or from the euro area as a whole). If fiscal policy were to be noticeably tightened in the United States and Japan, as it should be, this could boost activity in the euro area as lower long-term real interest rates may well stimulate demand.

REFERENCES

Al-Eyd, A. and R. Barrell (2005), "Estimating Tax and Benefit Multipliers in Europe", *Economic Modelling*, Vol. 22.

Auerbach, A.J. and Y. Gorodnichenko (2012), "Fiscal Multipliers in Recession and Expansion", mimeo.

Barrell, R., D. Holland and A.I. Hurst (2007), "Correcting US Imbalances", NIESR, Discussion Paper, No. 290.

——————(2012), "Fiscal Consolidation Part 2: Fiscal Multipliers and Fiscal Consolidations", OECD, Economics Department, Working Paper, No. 933.

Barrell, R. and E.P. Davis (2007), "Financial Liberalisation, Consumption and Wealth Effects in Seven OECD Countries", *Scottish Journal of Political Economy*, Vol. 54, No. 2.

Barrell, R. and K. Dury (2003), "Asymmetric Labour Markets in a Converging Europe: Do Differences Matter?", *National Institute Economic Review*, No. 183.

Barrell, R., A.I. Hurst and J. Mitchell (2007), "Uncertainty Bounds for Cyclically-adjusted Budget Balances", in M. Larch and L.N. Martins (eds.), *Fiscal Indicators,* European Commission, Brussels.

Barrell, R., S.G. Hall and A.I. Hurst (2006), "Evaluating Policy Feedback Rules Using the Joint Density Function of a Stochastic Model", *Economics Letters*, Vol. 93, No. 1.

Barrell, R., T. Fic and I. Liadze (2009), "Fiscal Policy Effectiveness in the Banking Crisis", *National Institute Economic Review,* No. 207.

Delong, J.B. and L.H. Summers (2012), "Fiscal Policy in a Depressed Economy", mimeo.

Harrison, R., K. Nikolov, M. Quinn, G. Ramsay, A. Scott and R. Thomas (2005), *The Bank of England Quarterly Model*, Bank of England, London.