Fiscal Devolution in a Small Open Regional Economy

James Foreman-Peck
Cardiff University

Patrick Minford
Cardiff University and CEPR

Laurian Lungu
Cardiff University

David Meenagh
Cardiff University

April 3, 2006

Abstract

To examine the scope for regional tax devolution this paper develops and simulates a calibrated model of a 'dependent' or regional economy. The economy has some fiscal autonomy but no monetary independence in a model-consistent expectations framework. Competition, homogeneous commodities and constant returns, together with inter-regionally immobile labour are assumed. Capital is (infinitely) mobile at a world cost of capital. The regional government is unable to issue long-term debt but can raise local taxes. The model is examined in steady state and in a dynamic version (with Euler equations for consumption and investment).

1 Introduction

Devolution of public spending may permit local governments to provide public services better adapted to local preferences than their central counterparts (Tiebout 1956; Besley and Coates 1999). They are closer to their residents and information dissipates with distance. Within a given budget possibly they can alter the composition, or change the method of delivery. A second, not exclusive, justification for devolution can be a local predilection for devolved government quite regardless of whether it is more responsive or generally better at meeting local needs. People may prefer to be governed by those with whom they identify, independently of the quality of governance[1].

If expenditure is devolved there is an incentive case that at least some portion of taxes should be also (Sanguinetti and Tommasi, 2004). In practice, while the sub-national government share of public spending has increased in a majority of OECD countries, the share in general government revenues (excluding grants) has failed to rise correspondingly and has even declined in several cases (Journard and Kongsrud 2003). Some institutional arrangements may encourage this trend more than others. An example is where an expenditure ministry bargains on behalf of regional authorities for finance with a ministry that raises national revenue and provides for national level public goods. In this case a regime in which the spending ministry gets political benefits from the expenditure will generate more spending than one where taxes, as well as spending, are devolved (Sato 2002).

On the other hand stabilisation and redistribution weaken the case for tax devolution. When taxes are not devolved and a region experiences a negative demand shock, tax receipts fall and unemployment pay outs increase, boosting government spending and partly offsetting the private sector contraction. This is a form of risk sharing between regions subject to different shocks (Persson and Tabellini 1996). Hughes Hallett (2005) undercuts the normative risk sharing argument by showing that fiscal autonomy for UK regions would reduce volatility of output and inflation[2]. Interpersonal redistribution also may be reflected in inter-regional net subsidies (Melitz and Zummer 2002; Decressin 2002). Tax competition from other jurisdictions anyway

[1] One part of this condition apparently is satisfied for Wales and Scotland according to the 'British Identity' MORI poll for the Economist in November 1999. The Welsh and Scottish have a stronger identification with Wales and Scotland than with Britain, in marked contrast to residents in England.

[2] Unless all shocks are on the supply side.

limits the extent to which taxation can effectively be devolved. The extent of factor mobility between fiscally devolved administrations is the principal constraint (Wildasin 2003).

Without devolved taxation, income smoothing by the federal or central government spending, rather than by built-in tax stabilisers, can give rise to higher centrally funded state spending long after negative shocks have dispersed, preventing adjustment (Obstfeld and Peri 1998). Stabilisation presupposes some recovery from shocks and redistribution similarly has no reason to be trended. Soft budget constraints and overspending biases embedded in political institutions exacerbate a tendency towards upwards drift in devolved public expenditure (Pisauro 2001).

The present paper therefore simulates a CGE model of a regional economy, such as the devolved administrations of the UK, to assess the scope for devolved taxes as effective policy instruments, when spending decisions are also devolved. The following section (2) outlines the fiscal position of the UK regional governments. Section 3 formulates and simulates the model, and the final section (4) offers some provisional conclusions.

2 The Devolved Administrations of the United Kingdom

The UK devolved administrations at present exercise no tax-raising powers but are primarily funded with block grants from the central government that levies taxes[3]. By contrast the English regions lack authority for devolved spending, as well as for levying taxes. Taxes are typically proportional or progressive (in the UK with the exception of the only local tax, the community charge that accounts for a small proportion of total tax payments). They therefore permit contributions to the finance of services such as health and education to a common standard according to ability to pay by individual and by jurisdictions. These tax arrangements mean that, unlike central government, there are no electoral advantages for administrations in terms of tax restraint from public spending economy.

	1959/60	1962/63	1965/66	1968/69	1971/72	1974/75	1976/77	1977/78
England	229	244	319	322	333	424	412	394
Scotland	241	288	352	431	417	502	506	503
Wales	218	241	299	324	346	413	416	393
NI	202	224	308	332	369	475	559	556

Table 1: Government Expenditure per head in 1975 prices 1959-1977

Even before the decline of manufacturing and mining that particularly affected the economies of the now devolved administrations, by 1962/3, Scotland had achieved substantially higher public spending per head than England, Wales or Northern Ireland (Table 1). The Scottish Office was a force to be reckoned with in UK central government. Northern Ireland's rise in spending is primarily a consequence of security-related spending. Public spending in Wales remains below that in England throughout this period 1959-77.

Concern about the rise particularly in Scottish spending triggered the introduction of a budgetary rule. Since 1979 the size of the block grant has supposedly been governed by the Barnett formula, intended virtually to eliminate the spending per head gap with England in the very long term. The grant per head of the devolved population increases in absolute terms with spending per head in England. Since the administrations spend more per head than England, their percentage increases in budgets would be less under the formula. However political bargaining, 'formula bypass' (Heald 1994; 2003), ensured that the spending gap was more likely to increase than to diminish[4]. A study of Scottish education spending found that using the English Local Authority approach to assessing 'need', Scottish pupils would receive about 3 percent more than the English – but actual spending is considerably higher (King, Pashley and Ball 2004).

With lower regional incomes the same spending per head gives rise to a higher ratio of public expenditure to GDP; a region with a 20 percent lower than average income per head would exhibit a ratio of 1.25 if this

[3] 'Annual managed expenditure', that portion of public spending that cannot be planned accurately, for sample because dependent on the state of the economy, is provided centrally

[4] For Scotland, Midwinter (2002 108) points out that the Scottish Executive was able to accommodate free personal care for elderly and teachers' pay increases within Treasury allocated expenditure growth totals, because its share of the UK budget was rising- despite the Barnett 'squeeze'.

principle were followed. (Let average income per head be 100, then the region's income per head is 80. If standard government spending per head is G, the region's ratio of spending to income relative to the average is (G/80)/(G/100)=100/80=1.25) While temporarily higher ratios might be warranted in response to shocks, permanently higher real government spending, taking the ratio above the warranted level would be a symptom of inefficiency, or of 'gold-plating' relative to rest of the economy, unless the spending ratio in other regions has risen similarly. Stabilisation presupposes some recovery from shocks and redistribution similarly has no reason to be trended.

Table 2 shows that the ratio of government spending to output (in per capita terms) in the devolved administrations is substantially higher than in England and the ratios for Wales and Scotland have risen relative to England since 1992. The ratio is highest for Northern Ireland, where it has been fluctuating around 60 percent since 1976, despite the narrowing of the income gap over the period. England's poorest region, the North East with approximately the same income per capita as Wales, showed a slightly higher government spending ratio than Wales in 2001, though lower in earlier years. Wales exhibits the strongest trend increase in ratio since 1976, albeit from a low level. Relative to England, the government spending to output ratio has risen from 1.2 in 1976 to 1.54 in 2000. Wales is therefore a suitable candidate for examining the consequences of rising central government dependency in a devolved administration.

	England	Scotland	Wales	NI	North East England
1992	35.0	43.6	51.0	64.0	n.a
1993	35.1	44.0	51.2	63.6	n.a
1994	34.5	43.8	50.3	61.8	n.a
1995	34.1	43.1	49.4	60.2	n.a
1996	33.4	42.3	49.0	60.0	n.a
1997	32.2	40.8	48.0	57.4	n.a
1998	31.1	40.5	47.8	56.6	n.a
1999	32.1	42.0	48.9	57.1	48.9
2000	32.6	42.9	50.2	58.7	49.7
2001	34.4	46.2	51.8	61.8	53.7
2002	34.7	45.5	53.4	60.9	52.1
2003	36.4	47.7	54.6	61.2	53.4
2004	37.2	48.2	55.0	63.5	n.a

Table 2: Government Spending as a Percentage of Gross Value Added 1992-2004

As suggested in section 1, policy responses can ensure that temporary shocks have permanent effects. In attempting to alleviate hardship from the negative shock, incentives to adjust may be removed. Merthyr Tydfil, at the beginning of the nineteenth century the largest town in Wales and a world leader in metallurgy, by the end of the twentieth century had the lowest labour force participation rate in Wales, one of the highest invalidity claimant percentage in the UK and high unemployment ,despite years of public sector initiatives (Table 3). What these tax financed projects and subsidies had achieved was to turn the area into a net recipient of commuters; more people daily travelled into the zone to work than journeyed out even though it was supposedly depressed (National Statistics 2002). An alternative strategy for areas stuck by negative shocks is simply to alter tax rates to change incentives to individuals and firms; Ireland's corporation tax policy seems to have been especially effective (Barry 2004).

	Unemployment Rate (%)	Economic Activity Rate (%)
Merthyr Tydfil	6.7	52.3
Wales	4.8	58.3
United Kingdon	4.7	62.8

Source: Stats Wales, Econ0006: Labour Force Survey Summary of Economic Activity

Table 3: Economic Activity Rates 31 December 2004

Both the drawback and the advantage of such policy instruments is that they cannot be precisely tar-

geted. When authorities can judge who will and who will not change their behaviour as a result of a policy intervention, then a general policy instrument is a drawback because unnecessarily expensive. When authorities cannot so judge, as the Merthyr Tydfil case suggests, or when there is a concern about treating equals unequally, the general policy instruments are an advantage. The following section therefore formulates a model that allows an assessment of the effectiveness of general tax instruments.

3 The Model

We begin from a standard intertemporal utility function and a perfectly competitive firm sector with a Cobb-Douglas production function, from which households derive wages for their labour and dividends for their capital; under constant returns to scale gross dividends and wages add up to total GDP. Government taxes both in order to make transfer payments back to households (for redistributive purposes) and there is no government spending. The economy is open but is 'small' in the strictest sense; that is, it can borrow on world markets at the world real interest rate and its goods prices are also set on world markets. .

3.1 Derivation of the model:

The representative household's utility function seen from period 0 is:

$U_t = E_0 \sum_{t=0} \beta^t (\ln c_t + \alpha_t \ln x_t)$

subject to

$(1+\tau_t)c_t + k_t - (1-\delta)k_{t-1} + b_t = d_t k_t + (1+r_t)b_{t-1} + w_t(1-x_t) + B_t x_t + \Gamma_t - \pi_t$

where:

τ is the tax rate on consumption- this is assumed to be the sole general tax (so that dividends and wages are taxed indirectly through consumption);

π is tax levied on innovation (with effects on growth to be discussed at a later stage),

the dividend rate per unit of capital is d, wages are w, benefits per hour for disability/unemployment are B;

consumption (c), capital stock (k), foreign bonds (b), leisure (x) and government transfers (Γ) are all expressed per capita;

δ is depreciation and r is the real rate of interest on foreign bonds. Goods are bought by some system of organised barter and so we ignore the role of money in this economy..

The household's first order conditions familiarly yield (where λ are the Lagrangean parameters):

$\lambda_0 = \frac{1}{c_0(1+\tau_0)}; \lambda_1 = \frac{\beta}{c_1(1+\tau_1)}$

(from the first derivatives of the Lagrangean with respect to current and future consumption)

$E_0\lambda_1[1-\delta] = \lambda_0[1-d_0]$ (from the first derivative with respect to capital, k_t)

$E_0\lambda_1[1+r_0] = \lambda_0$ (from the first derivative with respect to foreign bonds, b_t)

$\lambda_0(w_0 - B_0) = \frac{\alpha_0}{x_0}$ (from the first derivative with respect to leisure)

From these conditions (letting time zero be generalised to any t) we can derive the consumption condition:

$(1) c_t = \frac{1}{\beta(1+\tau_t)} E_t \frac{c_{t+1}(1+\tau_{t+1})}{1+r_{t+1}};$

the condition relating expected dividends to world real interest rates:

$(2) 1 - \delta + d_t = 1 + r_t, \therefore d_t = r_t + \delta$

and the labour supply function:

$(3) x_t = \frac{\alpha_t c_t (1+\tau_t)}{w_t - B_t}$

Firms:

We now turn to firms, who maximise current profits

$\Pi_t = y_t - d_t k_t - w_t(1-x_t)$

where

$y_t = A_t k_t^{\gamma}(1-x_t)^{1-\gamma}$ is Cobb-Douglas;

The first order conditions give routinely (given existing productivity and exogenous profits tax):

$(4) k_t = \frac{\gamma y_t}{d_t}$ and $(5) w_t = \frac{(1-\gamma)y_t}{(1-x_t)}$

Using the first of these (the marginal productivity of capital condition), we can replace capital in the production function by terms in the world real interest rate.

$(5) y_t = A_t^{\frac{1}{1-\gamma}}(\frac{\gamma}{d_t})^{\frac{\gamma}{1-\gamma}}(1-x_t)$

What this means is that the firm can obtain whatever capital it needs to produce its desired output at a fixed price on world markets; thus it is only limited in the output it can produce by the supply of labour offered at the going wage. Its demand for labour and household supply is then equated by movements in that wage.

To complete the model, we require:

(1) the government budget constraint which brings together (in per capita terms) the revenues it raises from households and the transfer it pays over; the government too can borrow from abroad via foreign bonds but for simplicity we assume it does not as it has no impact on the model's workings.

(6a) $\tau_s c_t + \pi_t = \Gamma_t + B_t x_t$

(2) goods market clearing in which households buy consumption and investment goods (gross investment=$k_{t+1} - (1-\delta)k_t$) from firms who may supply them either from their own output or from net imports (m) purchaseable on the world market at going (exogenous) world prices. If firms have excess output they export it onto the world market at these prices. We set world prices at unity, ignoring terms of trade changes as an exogenous variable with no impact on the model's workings.

$(6b) y_t + m_t = c_t + k_t - (1-\delta)k_{t-1}$

It can easily be verified that the balance of payments constraint is implied (via Walras' Law) by the household and government budget constraints, the constraint that firms have no surplus profits (all earnings are distributed via wages and dividends) and goods market clearing.[5]

[5] Thus taking the household budget constraint $(1+\tau_t)c_t + k_t - (1-\delta)k_{t-1} + b_{t+1} = d_t k_t + (1+r_t)b_t + w_t(1-x_t) + B_t x_t + \Gamma_t - \pi_t$ we note that the tax terms cancel with the government transfer via the government's budget constraint so that
$c_t + k_t - (1-\delta)k_{t-1} + b_t = d_t k_t + (1+r_t)b_{t-1} + w_t(1-x_t)$.
Then we note that via firms' first order conditions $d_t k_t + w_t(1-x_t) = \gamma y_t + (1-\gamma)y_t = y_t$ so that.
$c_t + k_t - (1-\delta)k_{t-1} + b_t = y_t + (1+r_t)b_{t-1}$
Now we use market clearing to substitute out for y_t so that
$c_t + k_t - (1-\delta)k_{t-1} + b_t = c_t + k_{t+1} - (1-\delta)k_t - m_t + (1+r_{t-1})b_{t-1}$.
Cancelling terms yields the balance of payments
$b_t - b_{t-1} = r_{t-1}b_{t-1}. - m_t$
where net lending abroad (the capital account deficit) equals net interest from abroad minus net imports (the current account surplus).

3.2 Solution of the model:

There are a variety of programmes available for solving this model, including Dynare (which uses second order tay;lor series approximations) and exact nonlinear algorithms (that use second order Taylor series approximations for these and then suppress the risk-premia/covariance terms) as used in the Liverpool Model The model is however most conveniently analysed and solved in loglinear form.We have from (1):

(7) $\ln c_t = -\ln(1+\tau_t) + E_t \ln c_{t+1} + E_t \ln(1+\tau_{t+1}) - E_t \ln(1+r_{t+1}) + constant$

Here we have made use of the fact that when x is lognormally distributed $\ln Ex = E \ln x + 0.5 var \ln x$. We assume throughout that our errors are lognormal and have a constant variance, so that the variance and covariance terms are included in the constant term above.Then from (3) we have:

(8)$\ln x_t = \ln c_t - \ln(w_t - B_t) + \ln \alpha_t + \ln(1+\tau_t) = \ln c_t - v \ln w_t + (v-1) \ln B_t + constant + \ln \alpha_t + \ln(1+\tau_t)$

where we used the first order approximation $\ln(x_t+y_t) \approx \frac{x_0}{x_0+y_0} \ln x_t + \frac{y_0}{x_0+y_0} \ln y_t + constant; v = \frac{w_0}{w_0 - B_0} > 1$.

Now loglinearise the production function (6) as

(9)$\ln y_t = \frac{1}{1-\gamma} \ln A_t - \frac{\gamma}{1-\gamma} \ln d_t + \ln(1-x_t)$

Then using (5) above to substitute out wages in (9) and using (10) to substitute out output, yields:

(10) $\ln x_t = \ln(1+\tau_t) + \ln c_t + (v-1) \ln B_t + \ln \alpha_t - \frac{v}{1-\gamma} \ln A_t + \frac{v\gamma}{1-\gamma} \ln d_t + constant$

In order to solve the model and eliminate expected future terms it is necessary to make assumptions about the behaviour of the exogenous variables. We assume that world real interest rates, r, are stationary and autoregressive of order 1: $r_t = (1-\lambda) r^* + \lambda r_{t-1} + \epsilon_t$. We assume that all the policy variables, essentially the tax rates, are random walks, which is frequently found empirically since tax changes are generally the result of policy change which is by construction unexpected.

We can now write out the two basic solvable equations of the model, given that we have exogenously the paths of $d, r, \tau, \Gamma, \pi, B, A$:. These are (8) and (11) viz:

(7) $\ln c_t = -\ln(1+\tau_t) + E_t \ln c_{t+1} + E_t \ln(1+\tau_{t+1}) - E_t \ln(1+r_{t+1}) + constant$

(10) $\ln x_t = \ln(1+\tau_t) + \ln c_t + (v-1) \ln B_t + \ln \alpha_t - \frac{v}{1-\gamma} \ln A_t + \frac{v\gamma}{1-\gamma} \ln d_t + constant$

These can be solved backwards from a terminal condition on $E_t \ln c_T$ to give the complete path of log consumption and log leisure; therefore also of all the other variables in the model by suitable deployment of the other equations. Note that via the household budget constraint these equations will also yield the path of b_t, cumulating in b_T.

To find the terminal value of consumption we write out the terminal household budget constraint under steady state. Using the derivations in foootnote 1 we obtain:

$c_T = y_T - \delta k_T + r^* b_T = (\text{using 4}) \left\{1 - \frac{\delta\gamma}{r^*+\delta}\right\} y_T + r^* b_T$

in other words consumers can spend the economy's net output plus the interest on their accumulated foreign bond holdings (remembering that any income the government collects from them in tax must be equal to the payments it makes to them in benefits or other transfers). In logs this can be usefully approximated by

$\ln c_T = \ln y_T + r^* (\frac{b_T}{y_T}) + constant$

After substituting for $\ln y_T$ from (10), using the approximation (assuming the leisure and working time are roughly equal) $\ln(1-x_t) \approx -\ln x_t$, and using (11) for $\ln x_t$, yields us a compact expression for $\ln c_t$ as:

$$(11)\ \ln c_T = 0.5\left\{-\ln(1+\tau_T) - (v-1)\ln B_T - \ln\alpha_T + \tfrac{1+v}{1-\gamma}\ln A_T - \tfrac{1-v\gamma}{1-\gamma}\ln(r_T+c) + r^*(\tfrac{b_T}{y_T})\right\} + constant$$

To find this we merely use all the terminal values of exogenous variables, plus the accumulated b_T.

Thus the model can be solved in three sections:
a) (7) and (10); taking $\ln c_T$ as given by the last iteration

b) the consequent path of all variables, using the whole model, so that b_T can be recalculated by accumulation

c) the new terminal $\ln c_T$ from (11).

The three steps have to be iterated until they converge.

What this solution makes clear is the way in which the various work disincentive terms reduce labour supply, output and consumption, while higher productivity raises labour supply by a large factor reflecting the presence of benefits (because as higher wages are paid, the margin over benefits widens, thus disproportionately raising the marginal return to work). In terms of Wales Assembly policy it reveals how important policy towards transfers is.

3.3 Steps in estimation and simulation

The model can be estimated by the method of FIML using assisted grid search over calibrated parameter values (Minford and Webb, 2004). It can be fitted this way to Welsh data, to generate the implied residuals of the model equations; the exogenous variable processes can be separately estimated. The model can then be bootstrapped to generate implied pseudo-samples over the period; these can generate 95% conifidence limits for a VAR to be estimated on Welsh data. The parameters of this VAR can be checked to see whether they lie in the range predicted by the model; this would constitute the model's dynamic test. After this the model can be used for policy analysis and simulation.

3.3.1 Deterministic simulations

To check the model's performance we ran some deterministic shocks. These consisted of permanent shocks to consumption tax (τ), productivity (A) and benefits (B), and a temporary shock to the real interest rate (r). All shocks involved increasing the variable by 1%.

The model reaches its steady state within a few periods if it is hit by a permanent shock. The reason is that there is no lag in the construction of capital goods (time to build or adjustment costs) included here. This dynamic mechanism will be added at a later stage as we pay more attention to internal dynamics and the business cycle- for the time being the bulk of the dynamics is going to come from the dynamcis of the shocks themselves. Our main focus at this stage has been on the effects in steady state of tax, benefit and productivity changes. These are shown in the following Table 4. It can be seen that an increase in consumption tax causes output and consumption to decrease and leisure to increase. The effect of the productivity shock is to increase output and consumption, but decrease leisure. A benefits shock decreases output and consumption, but increases leisure. We observe the permanent income hypothesis at work here with consumption changing by the extent of income; remember that in this model all tax revenues are refunded to households via transfers because the regional budget is forced to be balanced in effect by the central government transfer. Another thing to notice is that when tax and benefits change the way in which output is lowered is via the effect on labour supply/unemployment. When productivity rises it raises labour supply somewhat because the income effect in the model is slightly less than the substitution effect; output therefore rises by more than productivity for two reasons. First because capital flows in to augment

Permanent shocks	GDP (%)	Cons (%)	Unemp (%)
Tax shock (1% of GDP)	−0.50	−0.51	0.49
Productivity shock (1%)	1.93	1.88	−0.50
Benefits shock (1%)	−0.33	−0.34	0.33

Table 4: Steady State Effects of Permanent Shocks

the effect of higher productivity; the total effect on output inclusive of the effect of higher capital is 1.4% (1/0.7). Second because labour supply rises by 0.5%.

Clearly much of the interest in the model's analysis will be in variations of these balanced budget assumptions.

In the rest of this section we chart the dynamic paths for the 4 shocks adn go through them in more detail. Figure 1 shows the impulse response functions for the consumption tax shock for the first 15 periods. This causes consumption to decrease as the shock enters the terminal condition for consumption. From equation 11 we can see that consumption will decrease by $0.5\Delta\tau$. The effect on leisure can be seen from equation 10, the shock will increase leisure by $\Delta\tau$, but the effect on consumption enters leisure causing it to decrease by $0.5\Delta\tau$, so the overall effect of the consumption shock on leisure is an increase of $\Delta\tau$. This then follows through to output in equation 9 so the output decreases by $0.5\Delta\tau$.

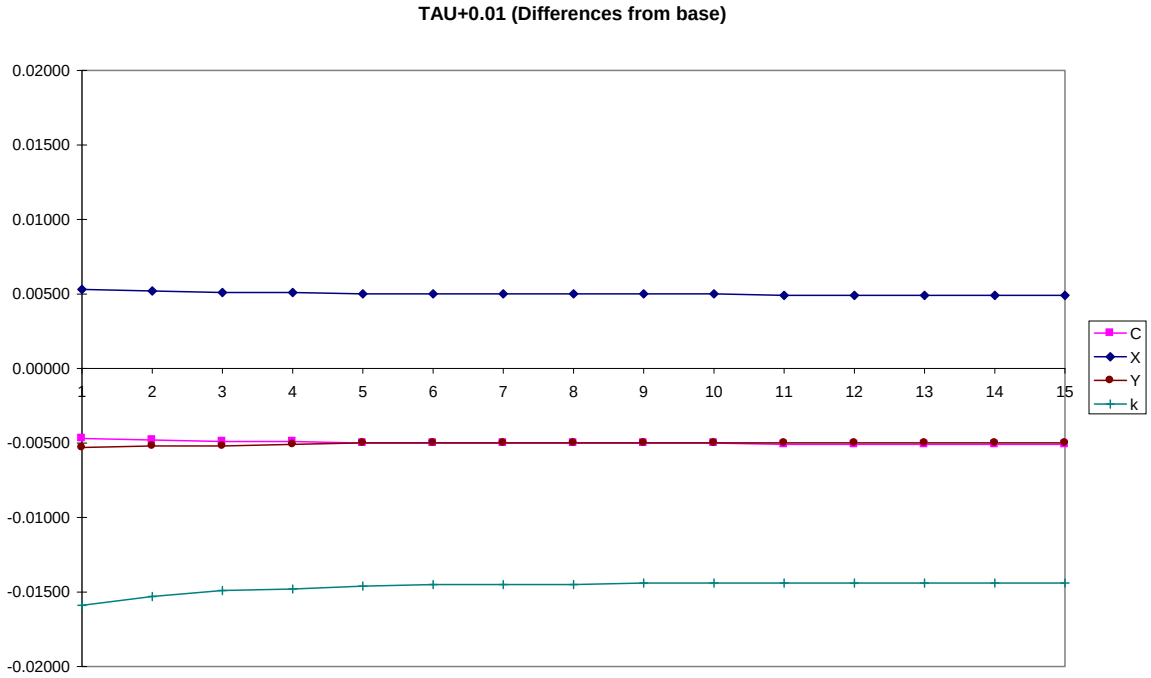

Figure 1: Permanent shock to consumption tax

The impulse response functions for the productivity shock are shown in Figure 2. Again from equation 11 we can see that productivity enters the terminal condition for consumption, so the effect on consumption is an increase equal to $0.5\left(\frac{1+\nu}{1-\gamma}\right)\Delta A$. This feeds in to leisure, as well as the direct effect of the shock to productivity. The overall effect on leisure is $0.5\left(\frac{1+\nu}{1-\gamma}\right)\Delta A - \frac{\nu}{1-\gamma}\Delta A = 0.5\left(\frac{1-\nu}{1-\gamma}\right)\Delta A$, which is negative since $\nu > 1$. Again for output there is the direct effect of the shock $\left(\frac{1}{1-\gamma}\Delta A\right)$, and the indirect effect through leisure $\left(0.5\left(\frac{1-\nu}{1-\gamma}\right)\Delta A\right)$ which gives an overall effect of $\left(\frac{1}{1-\gamma}\Delta A\right) - \left(0.5\left(\frac{1-\nu}{1-\gamma}\right)\Delta A\right) = 0.5\left(\frac{1+\nu}{1-\gamma}\right)\Delta A$.

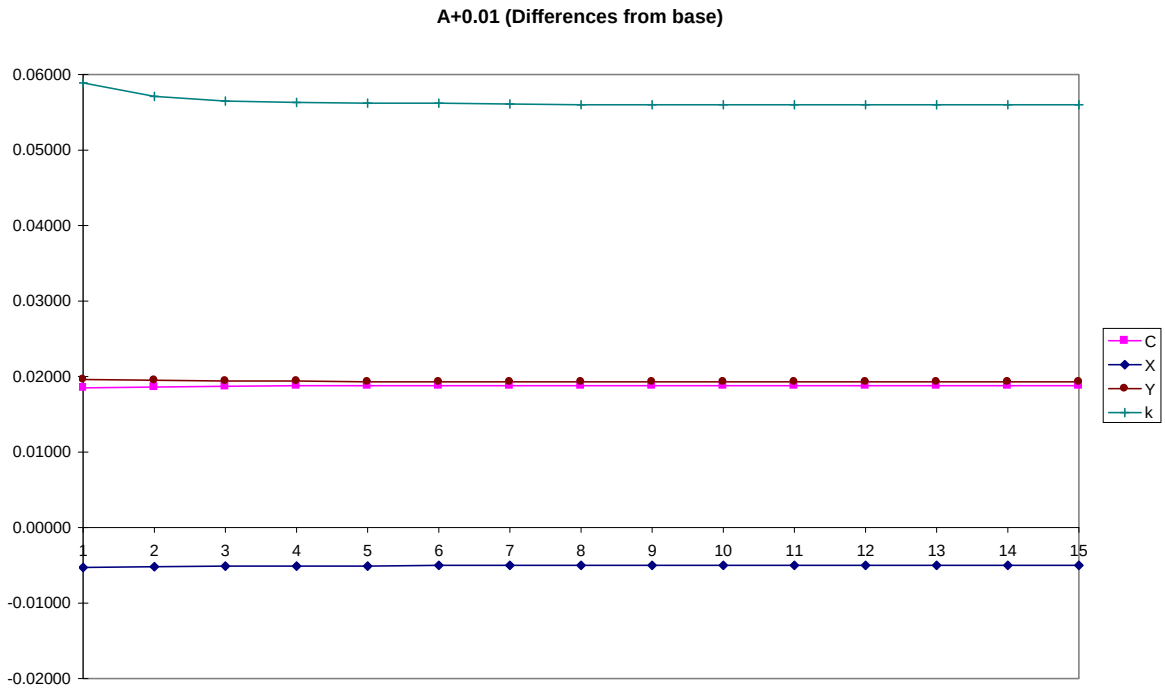

Figure 2: Permanent shock to productivity

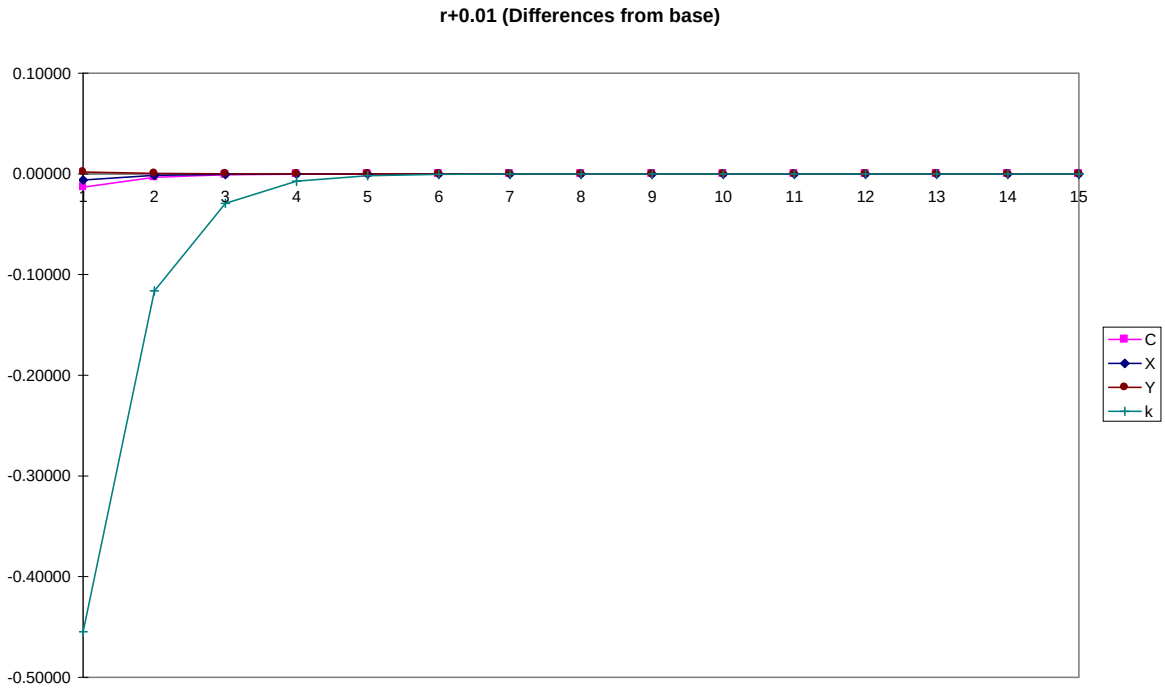

Figure 3: Temporary shock to real interest rate

Figure 3 shows the impulse response function for a shock to the real interest rate. This is only a temporary shock because the real interest rate has an $AR(1)$ parameter of 0.25 so the shock dies out quite quickly. The shock to the real interest rate has a direct effect on consumption equal to $-\Delta r$, so consumption decreases (being temporary there is no effect on terminal consumption). The effect on consumption follows through to leisure so leisure decreases by Δr, but there is also the effect of dividends since $d_t = r_t + \delta$, so this will increase leisure by $\frac{\nu\gamma}{1-\gamma}\Delta r$, for a net decrease in leisure and hence increase in output..

The effect of a permanent shock to benefits can be seen in Figure 4. The effect on consumption again comes through the terminal condition which has the effect of decreasing consumption by $0.5\,(\nu-1)\,\Delta B$, which enters into leisure along with the direct effect of the shock ($(\nu-1)\,\Delta B$), giving an overall effect equal to $-0.5\,(\nu-1)\,\Delta B + (\nu-1)\,\Delta B = 0.5\,(\nu-1)\,\Delta B$, therefore leisure increases. This follows through to output giving a decrease in output of $-0.5\,(\nu-1)\,\Delta B$.

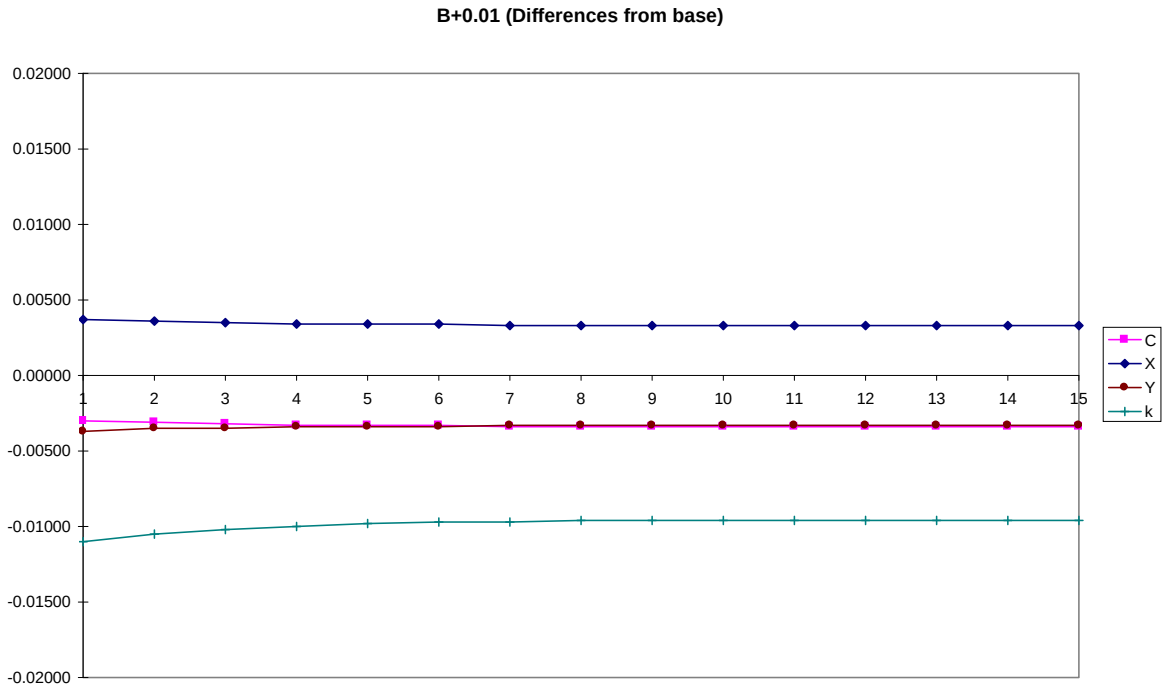

Figure 4: Permanent shock to benefits

4 Conclusions

Policy concerns driving regional models typically stem from initial negative productivity shocks that reduce employment and output. The simulations conducted with the present model indicate that (negative) productivity shocks are indeed extremely powerful in small open economies, thanks to the induced capital flows. The implication is that expenditure policies to offset them will be very expensive or ineffective unless they target productivity itself. Such policies must draw in or expand firms more productive than the average, rather than simply increasing the employment and output of average firms. Unfortunately recent tests with panel data show that there have been no positive productivity effects of UK regional subsidies (Harris and Robinson 2005). By default tax policy looks more attractive.

The consumption tax simulation here implicitly assumes that a tax cut is matched by a reduction in transfers to households. Nonetheless consumption, employment and output all increase, suggesting that a consumption tax cut could be a useful policy instrument to offset regional industrial decline. Corporation

tax cuts also might contribute by, in effect, lowering the cost of capital to firms in the region and the real interest rate- as the Irish have demonstrated.

Government spending in the model at present is limited to transfers. These transfers can reduce the recuperative powers of an economy experiencing an adverse shock. Higher unemployment benefit rates reduce the supply of labour and cut output and consumption.

In the current state, the model does not distinguish between more labour stemming from greater labour force participation and from migration. When migration responses to tax changes are taken into consideration, it is probable that the elasticity of labour supply, and therefore the effectiveness of the tax policy instrument, will increase.

The pace of adjustment, both to shocks and to policy, is rapid in the model. Most effects are obtained within two years, but they are likely to be more drawn out when the model includes an allowance for the time necessary to adjust the capital stock.

References

[1] Barry F (2004) 'Export-platform foreign direct investment: the Irish experience' EIB Papers Vol 8-9 N° 2

[2] Besley T and Coates S. (1999) 'Centralised Versus Decentralised Provision of Local Public Goods: A Political Economy Analysis' NBER working paper 7084.

[3] Decressin J (2002), 'Regional Income Redistribution and Risk Sharing: How Does Italy Compare in Europe?' Journal of Public Economics 86 (2002) 287–306.

[4] Harris R and Robinson C (2005) Impact of Regional Selective Assistance on Sources of Productivity Growth: Plant-Level Evidence from UK Manufacturing, 1990-98 Regional Studies, August 39, iss. 6, pp. 751-65

[5] Heald D (2003), 'Funding the Northern Ireland Assembly: Assessing the Options', Research monograph 10 Northern Ireland Development Office.

[6] Heald, D. (1994), 'Territorial Public Expenditure in the United Kingdom', Public Administration, 72, Summer, 148-175.

[7] Hughes Hallett, A. (2005), 'Political Devolution without Fiscal Devolution', Vanderbilt University, Department of Economics,Working paper 0505.

[8] Journard, I. and P.M. Kongsrud (2003), 'Fiscal Relations Across Government Levels', OECD Economic Studies 36, 2003/1.

[9] King D, Pashley M, and Ball R (2004) 'An English Assessment of Scotland's Education Spending Needs' Fiscal Studies 25 4 439-467.

[10] Melitz , J and Zummer F (2002) 'Regional Redistribution and Stabilization by the Center in Canada, France, the UK and the US: A reassessment and new tests' Journal of Public Economics 86 263–286

[11] Midwinter A (2002) 'The Limits to Fiscal Autonomy under the Devolution Settlement' Scottish Affairs 41 102-120

[12] National Statistics (2002) 'Commuting in Wales 2001' Statistical Bulletin 64/2002 2 July

[13] Obstfeld M and Peri G (1998) Asymmetric Shocks; Regional Non-Adjustment and Fiscal Policy, Economic Policy 207-259

[14] Persson T and Tabellini G (1996) 'Federal Fiscal Constitutions: Risk Sharing and Redistribution' Journal of Political Economy October

[15] Pisauro, Giuseppe, (2001), 'Intergovernmental Relations and Fiscal Discipline – Between Commons and Soft Budget Constraints', IMF Working Paper 01/65.

[16] Sanguinetti P and Tommasi M (2004) 'Intergovernmental Transfers and Fiscal Behaviour: Insurance versus Aggregate Discipline', Journal of International Economics 62 149– 170

[17] Sato M (2002), 'Intergovernmental Transfers, Governance Structure and Fiscal Decentralization', Japanese Economic Review 53 1 March 55-76.

[18] Tiebout, C M. (1956). 'A Pure Theory of Public Expenditures', Journal of Political Economy 64, 416-424.

[19] Wildasin D E (2003) 'Fiscal Competition in Space and Time', Journal of Public Economics 87, pg. 2571– 2588.