# ROLLING BACK THE PUBLIC SECTOR – DIFFERENTIAL EFFECTS ON EMPLOYMENT, INVESTMENT AND GROWTH

FREDERICK VAN DER PLOEG

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## Abstract

The macroeconomic effects on growth, investment and private sector employment of different ways of rolling back the welfare state are analysed. Cutting public spending on private goods induces a lower interest rate, a higher wage, a lower capital stock and a fall in employment. Cutting public employment or the income tax rate leads, in contrast, to a lower wage, a higher interest rate and a higher capital stock. Employment rises on impact. If the extra revenues of rolling back the welfare state are handed back via a lower income tax rate rather than a lump-sum subsidy, both cutting public employment and cutting public spending on private goods induce an investment boom. Making the tax system less progressive by cutting tax credits and the income tax rate induces an investment boom as well. The effects of endogenous growth, adjustment costs for investment and non-competitive labour markets are considered as well.

JEL Code: D9, E2, E6, H3.

Keywords: welfare state, public employment, labour market, investment, economics growth.

*Frederick van der Ploeg*
*Robert Schuman Centre*
*European University Institute*
*Badia Fiesolana, Via dei Roccettini 9*
*I-50016 San Domenico di Fiesole (FI)*
*Italy*
*Rick.vanderPloeg@iue.it*

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## 1. Introduction

Many politicians and economists have advocated in the past decade trimming the welfare state in order to permit cuts in tax rates and give better incentives to work and produce. However, it matters very much *how* one rolls back the welfare state. One can do this by scrapping jobs for teachers, nurses and policemen, by cutting government spending on goods produced by the private sector, or by cutting the income tax rate. The first two methods lead to extra public revenue, which can be handed back in the form of tax credits. The third method leads to less public revenue, so tax credits must be cut. In effect, this makes the tax system less progressive. It is worthwile to also consider scrapping public employment or cutting public spending on private goods if the saved public revenue is handed back to the people in the form of a lower income tax rate. In fact, some argue that this is an important reason why one should want to cut back public spending and this boosts incentives to work and produce. Each of these ways of rolling back the welfare state feature on the neo-liberal agenda of many liberal, conservative and 'third-way' social-democratic political parties.

The effects of cutting back public employment on private employment, consumption, investment, wages and interest rates are very different from the macroeconomic effects of cutting back public consumption.[2] Indeed, Alesina et al. (2002) find strong positive effects of cutting back public employment on private investment. A one percentage point cut in ratio of the public wage bill to GDP boosts the investment to GDP ratio by 0.48 percentage points on impact and by 2.56 cumulatively after five years. This way of rolling back the welfare state reduces the demand for labour by more than the fall in labour supply due to the boost to private sector wealth resulting from the extra tax credits. The consequent fall in wages induces firms to substitute away from capital towards labour. The lower capital intensity gives a higher return on private investment and raises the equilibrium interest rate. This stimulates private saving and investment. Both the substitution and the output effect will boost private employment. If the fall in public employment permits a fall in the income tax rate, wages fall and the interest rate rises even further thus boosting private investment and employment even more.

However, if the welfare state is rolled back by cutting back public expenditures on private goods, the story is very different. If the savings in public revenue are handed back to the public in the form of lump-sum subsidies or, alternatively, reductions in tax credits or the basic income, private wealth increases so labour supply and output fall. There is now no cut in public

[2] Yann, Cahuc and Zylberberg (2002) consider how changes in public employment affect unemployment without paying explicit attention to investment and growth.

employment. To ensure equilibrium in the labour market, the real wage must thus rise in order to choke off labour demand and boost labour supply. The rise in the wage encourages substitution away from labour towards capital. The higher capital-labour ratio depresses the interest rate. This chokes off private saving and boosts private consumption. In fact, together with the boost to private consumption resulting from the increase in private wealth, the cut in public spending is more than offset. Hence, there is more than 100 per cent crowding in. The fall in private saving leaves less room for private investment, which contrasts sharply with the investment boom resulting from a cut in public employment.

If the saved public revenue is handed back via a lower income tax rate, there is an additional effect. Effectively, labour supply increases which pushes pre-tax wages down and interest rates up. This stimulates private saving and boosts private investment. The question is whether the direct positive effect of cutting back employment dominates the indirect negative effect of the lower tax rate on private investment.

Rolling back the welfare state by making the tax system less progressive, boosts labour supply and thus lowers wages and raises the interest rate. This leads to the unambigious result that private consumption is postponed and private saving and private investment are increased.

The objective of this paper is to formally demonstrate these differential macroeconomic effects of rolling back the welfare state in a modified Ramsey model of economic growth with endogenous labour supply and mobility between the private and public sector labour markets. The paper thus offers a differential expenditure analysis of the type advocated by Musgrave (1959). It allows a careful analysis of the impact, intermediate and steady-state effects of different ways of rolling back the welfare state. Another possibility for rolling back the welfare state is to reduce transfers to, say, the unemployed or pensioners, but this is better done in economies with non-competitive labour markets - e.g., Atkinson (2000) and van der Ploeg (2003). Section 2 sets up a Ramsey growth model modified to allow for private and public employment and for endogenous labour supply. To capture substitution between private and public provision of goods like child care, education and security, we assume that total leisure and work time for households increases if there is more public employment. Section 3 investigates the macroeconomic short-run and long-run effects of cutting public employment and cutting public expenditures on private goods if the saved public revenue is used to increase tax credits. Section 4 investigates the consequences of three different ways of rolling back the welfare state and cutting the tax rate: cutting public employment, cutting public spending on private goods and making the tax system less progressive by reducing tax credits. Section 5 discusses the

robustness of the results if investment faces adjustment costs, labour markets are non-competitive and growth is endogenous. Section 6 concludes.

**2. A Ramsey growth model with private and public employment**

Assume a closed economy with competitive goods and labour markets. There is no government debt, so financial assets of households consist of equity only. There is mobility between private and public sector labour markets, so employees get paid the same independent of in which sector they work. For simplicity, we abstract from population growth and technological progress. Households live forever and have the following concave utility function:

$$\int_0^{\infty} [U(C, 1 + \phi L_G - L) + V(G)] \exp(-\rho t)\, dt$$

where $C$, $L$, $L_G$, and $G$ denote private consumption, labour supply, public employment and public spending on private goods (i.e., public consumption), respectively, and  stands for the pure rate of time preference. More public employment means that households have to spend less time on nursing, teaching and safe-guarding themselves and their next of kin, so that they have more time available for leisure and work (i.e., 1+  $L_G$ with 0 <  < 1). We assume that utility $U$(.) is logarithmic in private consumption, leisure and public consumption. The household budget constraint states that private saving of financial assets equals the sum of interest income, after-tax wage income and basic income minus private consumption:

$$\dot{A} = RA + (1-t)WL + T - C$$

where $W$ and $R$ denote the wage rate and the interest rate, respectively, $t$ and $T$ stand for the income tax rate and tax credits (lump-sum subsidy or basic income), respectively, and $A$ denotes the stock of financial assets held by households. The tax system is progressive if $T$>0 and becomes less progressive if both the income tax rate and tax credits are cut together.[3] Households set the marginal rate of substitution between private consumption and leisure equal to the after-tax wage. This yields labour supply:

[3] The coefficient of residual income progression is defined as $S \equiv (1-t)/(1-t_A)$ where $t_A \equiv t - T/WL$ and $t$ stand for the average and the marginal tax rate, respectively. For a progressive tax system $t > t_A$ or $T > 0$ and thus $S < 1$. Increasing the tax progressivity, e.g., by cutting both $t$ and $T$ and leaving $t_A$ unaffected, reduces $S$.

$$U_{1+\phi L_G - L} / U_C = (1-t)W \;\Rightarrow\; L = 1 + \phi L_G - \gamma\, C/(1-t)W,\; \gamma > 0.$$

A higher after-tax wage encourages more labour supply. More public employment gives households more time and thus labour supply is larger as well. A higher level of private wealth or consumption implies a greater marginal utility of leisure, so labour supply is lower.

Growth in private consumption is determined by the familiar Ramsey condition:

$$-\dot{U}_C/U_C = R - \rho \;\Rightarrow\; \dot{C}/C = R - \rho.$$

so that a high interest rate relative to the rate of time preference induces households to postpone consumption and save.

Firms in the private sector face a constant-to-returns production function $F(K,L_P)$, where $K$ is the capital stock and $L_P$ is private sector employment. Capital accumulation follows from:

$$\dot{K} = I - \delta K$$

where $I$ denotes private investment and  the depreciation rate. Managers choose employment and investment to maximise the stock market value of their firm:

$$\int_0^{\infty} [F(K, L_P) - W L_P - I] \exp(-\int_0^t R(v)dv)\; dt,$$

so the marginal productivity of capital and labour equal the user cost of capital and the producer wage, respectively. This gives the conditional demand for labour and the factor price frontier:

$$F_{L_P} = W \;\Rightarrow\; L_P = K l(W),\; l' < 0$$
$$F_K(1, l(W)) \equiv g(W) = R + \delta \;\Rightarrow\; R = h(W) + \delta,\; h' < 0.$$

Clearly, both labour demand in the private sector and the interest rate fall if the wage rises.

We assume that the wage adjusts to clear the labour market, so that the supply of labour must match the sum of private and public demand for labour:

$$1+\phi L_G-\gamma\ C/[(1-t)W]=K\,l(W)+L_G\ \Rightarrow\ W=W(\overset{+}{K},\overset{+}{C},\overset{+}{L_G},\overset{+}{t}),$$

where

$$W_K=l/\Delta>0,\qquad W_C=\gamma/[(1-t)W\Delta]>0,$$

$$W_{L_G}=(1-\phi)/\Delta>0,\qquad W_t=[C/(1-t)]W_C>0$$

(LME)

and $\equiv -Kl'+\ C/[(1\text{-}t)W^2]>0$. The following factors determine the market-clearing levels of the wage and employment. First, a higher capital stock pushes up private demand for labour and thus exerts upward wage pressure and boosts labour supply. Alternatively, a higher capital stock implies a greater 'ability to pay' and thus a higher wage. Second, a higher level of private consumption depresses labour supply and thus pushes up the wage. Effectively, this corresponds to a higher level of household wealth so that people work less and the wage has to rise in order to clear the labour market. Third, a bigger demand for public employees leads to excess demand for labour which induces a rise in the wage. The rise in the wage is attenuated if public sector employment generates more private time for households and thus raises labour supply somewhat. In that case, the initial excess demand for labour will be smaller and thus the rise in the wage will be smaller. Fourth, a higher income tax rate lowers the after-tax wage and thus lowers labour supply. The resulting excess demand for labour is choked off by a rise in the wage.

The government budget constraint states that public spending on public consumption, public employment and tax credits must be financed by labour income tax revenues:

$$G+W\,L_G+T=\ t\ W[1+\phi L_G-\gamma\ (C/(1-t)W)].$$

(GBC)

Goods market equilibrium requires production $Y$ to equal total demand for goods by households, government and firms, $F(K,L_P)=C+I+G$. We define output net of depreciation as $Y\equiv F(K,L_P)-\ K$. Household assets consist of equity only, $A=K$. Walras' law says that, say, the household budget constraint can be derived from the other equations and can thus be dropped. With lump-sum finance of public spending, tax credits $T$ adjust and follow residually from the government budget constraint. Alternatively, the income tax rate $t$ adjusts to balance the government budget.

**3. Consequences of scrapping public employment and cutting public consumption**

The macroeconomic effects of changes in public employment and public consumption with *T* as residual mode of government finance follow from the reduced-form dynamic system:

$$\dot{K} = K\,F(1, l(W(K, C, L_G, t))) - C - G - \delta\,K$$

$$\dot{C} = [h(W(K, C, L_G, t) + \delta\ - \rho]C$$

Since *K* is predetermined and *C* is a jump variable, this system must display saddlepoint stability. This requires a negative determinant of the Jacobian. The steady-state comparative statics are straightforward. The steady-state interest rate equals the rate of time preference, hence the wage rate and the labour-capital intensity are unaffected by government policy in the long run (i.e., $r^o =$ , $W^o = h^{-1}(\ -\delta)$). The steady-state effects on capital and private consumption are:

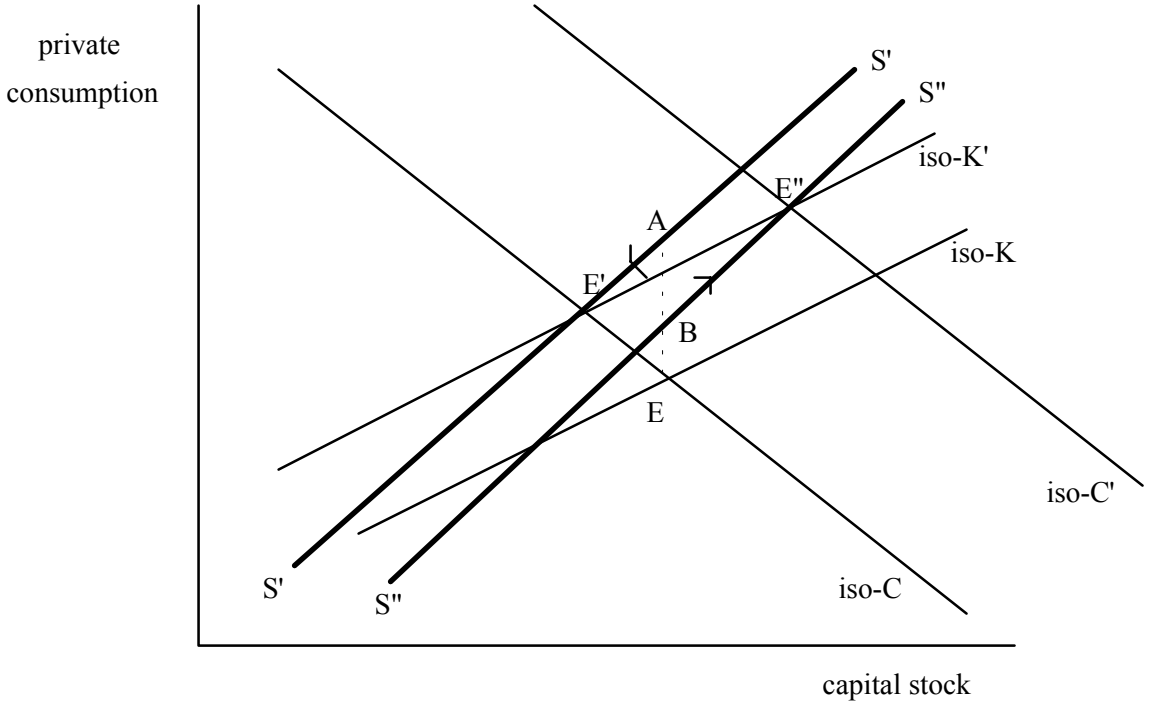
$$\partial K^o / \partial G = W_C / \Delta' > 0, \quad \partial K^o / \partial i = -W_i / \Delta' < 0, i = L_G, t$$

$$\partial C^o / \partial G\ = -W_K / \Delta' < 0, \quad \partial C^o / \partial i = -W_i Y / K\Delta' < 0, i = L_G, t$$

where $\Delta' \equiv W_C Y/K + W_K > 0$. Hence, higher public spending on goods produced by the private sector boosts the long-run capital stock and reduces private consumption while higher public employment or a higher tax rate depresses long-run capital and raises private consumption.

Figure 1 gives the phase-plane diagram. The iso-*K* locus slopes upwards, since the higher level of aggregate demand induced by more private consumption requires a higher level of aggregate supply induced by more capital. The iso-C locus requires $R=\rho$ and slopes downwards. Effectively, a higher capital stock implies a higher wage and lower interest rate. This requires lower levels of private consumption and private wealth, so that labour supply is boosted and the wage is pushed down again in order to maintain a constant *W* and thus a constant *R* and *C*. A cut in public spending on private goods gives rise to the path EAE' in Figure 1. The associated boost to basic income in the form of extra tax credits implies that households have more to spend and thus private consumption rises on impact. In fact, Figure 1 shows that private consumption overshoots its steady-state value so that private consumption falls subsequently over time. The short-run boost to private consumption is thus bigger than the long-run boost. Since households prefer consumption now to consumption tomorrow and thus dissave in the transient phase, there

is a temporary dip in the interest rate and an associated temporary increase in the wage rate. This induces firms to lower their capital intensity and to invest less, so that the boost to private consumption is greater than the cut in public consumption. The short-run rise in the wage depresses labour demand, while labour supply on impact falls as households become wealthier due to the extra tax credits. Employment falls both on impact and in the long run.




Key: Cut in public consumption gives path EAE' and cut in public employment gives path EBE"

**Figure 1: Phase diagram for Ramsey growth model with public and private employment**

The effects of a cut in public employment are given by the path EBE". If the government withdraws from the labour market, it causes excess supply of labour and induces downward wage pressure. Although the increase in basic income raises private sector wealth and depresses labour supply, this fall is less than the fall in public employment. The remaining excess supply of labour is choked off by a lower wage. As a result, firms prefer to use relatively more labour and lower their capital intensity. This pushes up the marginal productivity of capital and the interest rate, which induces firms to invest and households to save. On impact, the increase in basic income also raises private consumption and private wealth, which reduces labour supply and thus attenuates the initial excess supply of labour and the fall in the wage. The transient effects are as

follows: private consumption rises further to its new steady-state value and the capital stock rises also until the interest rate and the wage rate are back to their old equilibrium values. Private sector employment rises both in the short and long run. Labour supply falls, since private consumption and wealth increase and less time is available as people now have to spend time on matters the public sector previously provided for. Hence, in the long run the increase in private sector employment is insufficient to offset the fall in public sector employment and total employment falls. The effects of these shocks are contrasted and summarised in Figure 2.

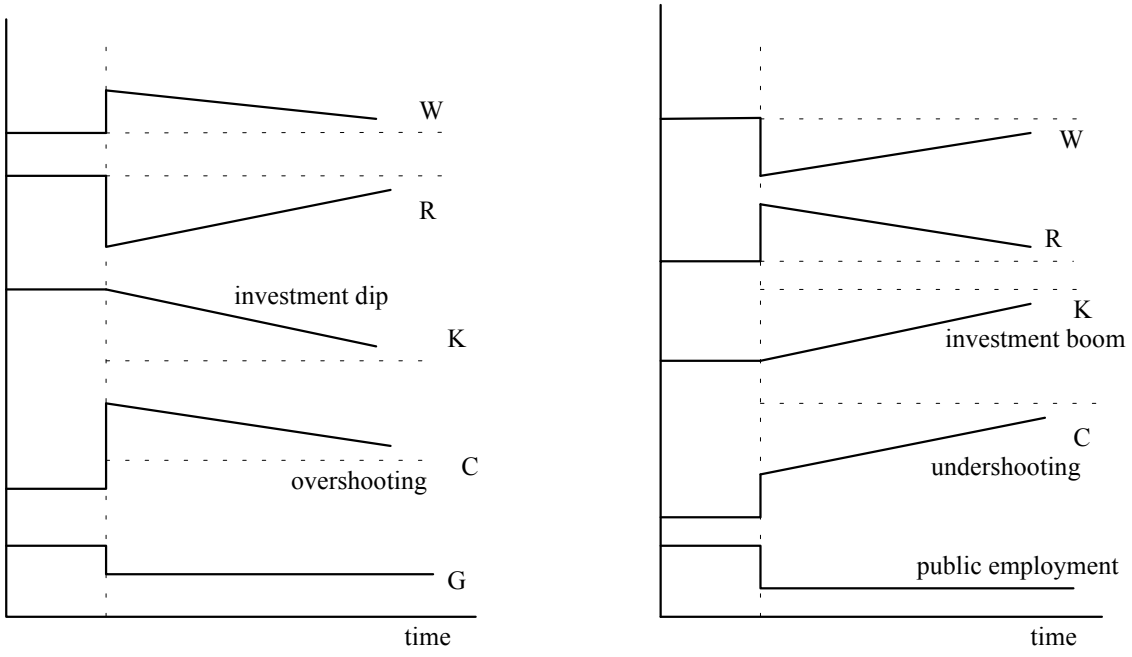



**Figure 2: Contrasting a cut in public consumption with a cut in public employment if saved public revenues are handed back as extra tax credits**

A cut in public spending on private goods thus leads to a fall in investment and employment. In contrast, scrapping public employment induces an investment boom and extra jobs in the private sector (but not as many as are lost in the public sector).

If labour supply is inelastic, $\quad = 0$, $L = 1 + L_G$ so that the market-clearing wage $W(.)$ and the equilibrium interest rate do not depend on private consumption or the income tax rate. Hence, the iso-$C$ locus is vertical (as in the standard Ramsey growth model). Since labour supply is inelastic, a cut in the tax rate on labour income associated with an increase in tax credits (a less progressive tax system) does not affect any real outcomes now. A cut in public spending on

private goods is immediately offset by a corresponding 100% increase in private consumption, so that the real wage, the interest rate, employment and investment are unaffected. However, if labour supply is inelastic, a cut in public employment still leads to a boom in saving and investment, a larger capital stock, extra private sector jobs and a higher level of private consumption. In this sense, the effects of changes in public employment are 'first order' while those of public spending on private goods are 'second order'.

**4. Three ways of rolling back the welfare state and cutting the income tax rate**

Many politicians believe that an important reason for rolling back the welfare state is cuts in the income tax rate and thus better incentives to work and to produce. Three ways of doing this are: (1) cutting public spending on private goods; (2) reducing public employment; and (3) cutting tax credits and thus making the tax system less progressive. In each case the savings in public spending are handed back to the public by lowering the income tax rate.

To obtain the macroeconomic effects, one must solve for $t$ and $W$ simultaneously from (GBC) and (LME) – see Figure 3. The LME-locus described by $W=W(K,C,L_G,t)$ slopes upwards, because a high tax rate implies low labour supply and thus requires a high wage to get rid of the excess labour demand. The LME-locus shifts up if $K$, $C$ or $L_G$ falls. The induced excess supply of labour must be choked of by a lower wage or a higher tax rate.

The government budget constraint gives:

$$d(G+T) + (1-\phi t)W\, dL_G = WL(1-t'\varepsilon)\, dt + [tL(1+\varepsilon) - L_G]\, dW, \qquad \text{(GBC')}$$

where $t'=t/(1-t)$, and $\varepsilon>0$ stands for the (uncompensated) wage elasticity of labour supply. We assume that there are no Laffer-curve effects, which requires that the tax rate is not too high (i.e., $t'<1/\varepsilon$). In that case, the GBC-locus slopes downwards. The left-hand side of (GBC') shows changes in the costs of public spending on private goods, tax credits (or basic income) and public employment, minus the tax base effect of lower labour supply caused by higher public employment. The right-hand side shows, on the one hand, the direct tax rate effect minus the indirect effect of a lower tax base on public revenues, and, on the other hand, the direct tax base plus indirect tax base (due to higher labour supply) minus the labour costs of public employment of a rise in the wage rate on public revenues. The GBC-locus thus shifts down if public consumption, public employment or tax credits are cut back. Effectively, the lesser need for public revenue is then met by a lower tax rate or a lower tax base. The GBC-locus also shifts

down if private consumption falls, because then the boost to labour supply raises the tax base and permits a cut in the tax rate.

Using (LME) and (GBC') to solve for the wage and the tax rate, we obtain:

$$W = W^*(\overset{+}{K}, \overset{+}{C}, \overset{+}{L}_G, \overset{+}{G+T}), \qquad t = t(\overset{-}{K}, \overset{-}{C}, \overset{+}{L_G}, \overset{+}{G+T})$$

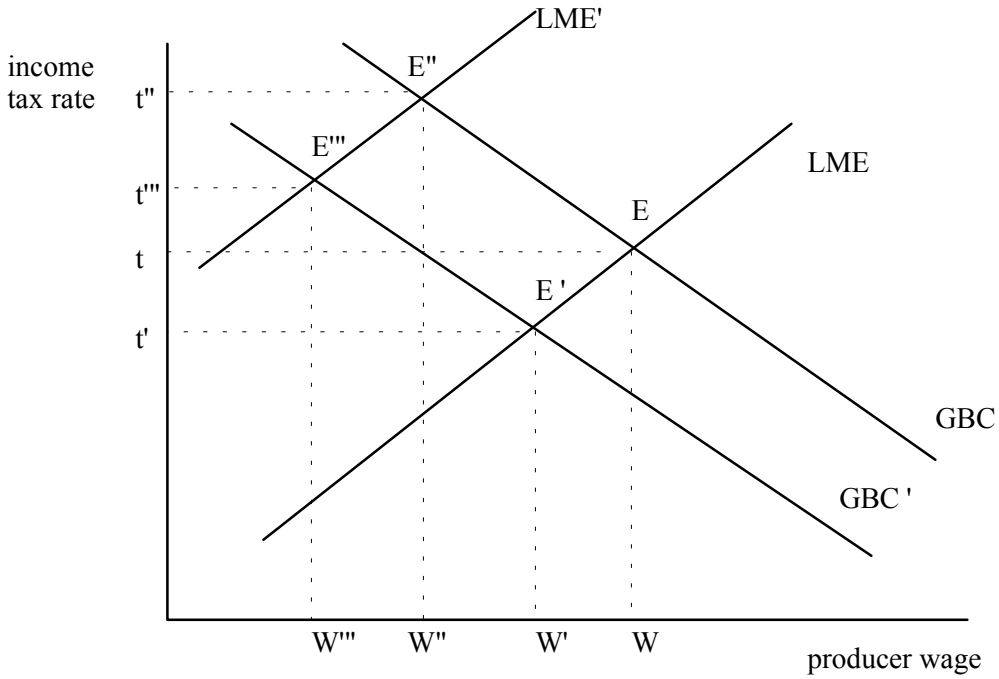
where

$$W^*_i = W_i WL(1-t'\varepsilon)/\Delta'' > 0,\ i = K, C, \qquad W^*_{L_G} = [(1-\phi t)WW_t + W_{L_G}WL(1-t'\varepsilon)]/\Delta'' > 0$$

$$W_{G+T} = W_t/\Delta'' > 0, \qquad t_i = -W_i(G+T+tWL\varepsilon)/\Delta'' W < 0,\ \ i = K, C$$

$$t_{L_G} = [(1-\phi t)W - (G+T+tWL\varepsilon)W_{L_G}/W]/\Delta'', \qquad t_{G+T} = 1/\Delta'' > 0$$

and $\Delta'' \equiv [tL(1+\ )-L_G]W_t + WL(1-t'\ ) > 0$.




Key: lower $G$ or $T$ gives E'; lower $K$ gives E"; and lower $C$ or $L_G$ gives E'"

**Figure 3: Solving for the income tax rate and wage rate**

Cutting back tax credits $T$ or public consumption $G$ shifts back the GBC-locus. It permits a cut in the income tax rate, which boosts labour supply and thus induces a fall in the wage in order to clear the labour market (shift from E to E'). A lower capital stock $K$ shifts up the LME-locus. The resulting fall in the demand for labour pushes down the wage and depresses labour supply and

the tax base. Consequently, the tax rate must rise in order to balance the government budget (shift from E to E"). A lower value of private consumption boosts labour supply and has two effects. First, it requires a lower wage or a higher tax rate in order to clear the labour market, so the LME-locus shifts up. Second, the bigger tax base yields more public revenue and thus permits a cut in the tax rate or a lower wage to balance the government's books again. Consequently, the GBC-locus shifts back. Since the shift in the LME-locus dominates the shift in the GBC-locus, the result is a lower wage and a higher tax rate (shift from E to E'"). Lower public employment $L_G$ also shifts back the GBC-locus and shifts up the LME-locus. It causes an excess supply of labour, which is removed by a lower wage and a higher tax rate. The saved public revenue permits a lower tax base, i.e., lower wage, and a lower tax rate. The net result is that the wage rises and, provided $G+T$ and $t$ are not too large, the tax rate is likely to fall.

The general equilibrium comparative statics and dynamic follows from the reduced-form dynamic system:

$$\dot{K} = K\,F(1, l(W^*(K, C, L_G, G+T)) - C - G - \delta\,K$$

$$\dot{C} = [h(W^*(K, C, L_G, G+T)) + \delta - \rho]C.$$

Since $K$ is predetermined and $C$ a jump variable, this system exhibits saddlepoint stability and the determinant of the Jacobian matrix of the above system $\Delta'''$ must be negative. Cramer's rule gives the comparative statics of the steady state:

$$\partial K^o / \partial i = -h'C\,W^*{}_i / \Delta''' < 0,\ \ i = L_G, T,$$
$$\partial K^o / \partial G = -h'C(W^*{}_{G+T} - W^*{}_C) / \Delta''' \ = \ -[h'C\,W_C / (1-t)\Delta''\Delta'''](RA + T + t\,WL\,\varepsilon) < 0$$

and

$$\partial C^o / \partial i = -h'C\,W^*{}_i Y / K\Delta''' < 0,\ \ i = L_G, T, \quad \partial C^o / \partial G = -h'C[(Y/K)W^*{}_{G+T} + W^*{}_K] / \Delta''' < 0.$$

Use has been made of the correspondence principle, that is saddlepoint stability helps to sign the

comparative statics results. To assess the steady-state effects of changes in public consumption on steady-state capital, one needs to use the partial derivatives of $W^*(.)$. This leads to

$$\partial K^o / \partial G = -\Omega\,[C-(1-t)WL] < 0, \quad \partial K^o / \partial T = -\Omega\, C < 0,$$

where is a positive constant. Armed with these results, we derive the comparative dynamics from the phase diagram. The qualitative difference with section 3 is that a cut in public spending on private goods now also leads to an investment and employment boom. The investment boom induced by the cut in the tax rate thus more than offsets the fall in investment caused by the cut in public consumption. Also, a cut in public employment yields a bigger investment boom if the saving in public revenue is handed back through a cut in the tax rate instead of a rise in the tax allowance. Making the tax system less progressive boosts investment as well.

If labour supply is inelastic, reducing tax progressivity has no real effects. Also, it does not matter whether a cut in public spending on private goods or public employment is associated with a rise in basic income or a cut in the tax rate. Hence, the effects are as in section 3.

**5. Extensions**

*A. Adjustment costs for investment*

For simplicity, we assume a zero rate of depreciation and inelastic labour supply (i.e., = = =0). To avoid infinite infinite investment rates, we allow for convex adjustment costs $I^2/2$ where >0.[4] Private investment rises with Tobin's marginal $q$, that is $I=(q-1)/$ . The condition for the marginal productivity of capital and the factor price frontier are replaced by the arbitrage condition:

$$F_K(1, l(W)) \equiv h(W) = R\,q - \dot{q}.$$

The marginal productivity of capital must thus equal the user cost of capital, which is the rental charge minus the capital gains. Goods market equilibrium requires that production minus adjustment costs should equal aggregate demand. The resulting condition can be solved for

[4] If we allow for homogenous internal adjustment costs for investment decisions of the firms, say $I^2/2K$ capture internal adjustment costs for investment decisions of the firm, Tobin's marginal $q$ and average $q$ coincide and the value of the equity market is given by $qK$ - see Hayashi (1982). This specification complicates the analysis, but does not change the qualitative conclusions.

Tobin's $q$, that is $h(W) - I^2/2 = C + G + I$ gives $q = q(C+G, K, W)$ with $q_{C+G}$=- <0, $q_K$>0 and $q_W$<0. A higher wage or a lower capital stock depresses production, so leaves less room for investment and requires a smaller $q$. A higher aggregate demand from households or the government also leaves less room for private investment and thus demands a smaller $q$.

Since conditional labour demand and the government budget constraint are unaffected, the market-clearing wage is given by $W(K, L_G)$. Upon substitution into the expression for marginal $q$, one obtains $q=q^*(C+G,K,L_G)$ where $q^*_{C+G}$= - < 0, $q^*_K$= $(Y-WL_P)/K$>0 and $q^*_{LG}$>0. Hence, Tobin's $q$ and private investment fall if the other components of aggregate demand rise and the capital stock falls. A boost to public employment boosts wages and lowers $q$, so private investment is cut back. Ramsey and capital accumulation rules are unchanged.

The steady-state interest rate ( ), investment rate (zero), Tobin's $q$ (unity) and the wage rate ($h^{-1}$( )) are unaffected by government policy. In steady state labour market clearing requires $W(K^o, L_G) = h^{-1}$( ), hence the steady-state capital stock $K^o$ decreases if public employment goes up or if households become more impatient. Clearing of the goods market requires in steady state $q((C^o+G)/K^o, h^{-1}( ))$=1, which gives $C^o$. This yields the same steady-state results as in sections 3 and 4. Rolling back the welfare state, in order to cut the tax rate by cutting public spending on private goods or cutting tax allowances, thus depresses both steady-state private consumption and the capital stock. However, cutting back public employment lowers private consumption and raises the capital stock in the long run. Upon differentiation of $q=q^*(C+G,K,L_G)$ with respect to time and substitution into the arbitrage condition for equity, one can solve for the interest rate and obtain the dynamic system:

$$\dot{K} = [q^*(C \overset{-}{+} G, \overset{+}{K}, \overset{+}{L_G}) - 1]/\zeta$$

$$\dot{C} = [(Y - WL_P)(q-1)/K + h(W(K, L_G)) - \rho\, q^*(C+G, K, L_G)]C/(q + \zeta C)$$

where $h(.)$ denotes the reduced-from marginal productivity of capital. The system displays saddlepoint stability and the speed of adjustment around the steady state can be shown to equal:

$$\frac{1}{2}\sqrt{\rho^2 - 4h'CW_K/(1+\zeta C)} - \frac{1}{2}\rho.$$

The speed of adjustment is smaller if the rate of time preference is larger (i.e. consumers are more impatient and save less) and if the costs of adjustment for investment are larger. The main difference is thus that with adjustment costs for investment the speed of adjustment is smaller. The qualitative insight that cutting back public spending on private goods reduces employment, capital and output is unaffected.

*B. Non-competitive labour markets*

Alesina et al. (2002) mention a different channel by which public employment may lower private investment in a unionised labour market. More public employment makes it easier to find a job if one cannot find a job in the private sector. Also, a higher public sector wage makes this option more attractive. Since the outside option improves, trade unions demand a higher wage. This induces a higher capital-labour intensity and a lower marginal productivity of capital and thus reduces private sector investment. Again, the effects of public consumption are less clear. Calmfors and Horn (1986) study the effects of one union covering both private and public sector employees, while Holmlund (1997) considers two separate unions. Neither study looks at the effects on capital and investment.[5] Typically, the wage mark-up is high if the demand for labour is very inelastic. Consequently, if public employment is exogenous and does not depend on the wage, the effective wage elasticity of labour is low if public employment is high relative to private sector employment. In that case, the wage mark-up is high. Also, cutting public employment has the additional effect of reducing monopoly power in the labour market. The result is a further reduction in the wage and rise in the interest rate, thus giving rise to an even larger investment boom.

Non-competitive labour markets may also be characterised by efficiency wages if firms pay more than the market-clearing wage in order to recruit, motivate, discipline and/or retain workers - e.g., Shapiro and Stiglitz (1984). Another possibility is to allow for costly search and imperfect matching on the labour market - e.g., Pissarides (1990). In each of these non-competitive theories of the labour market a reduction in tax progressivity, obtained by cutting allowances and the tax rate simultaneously, may actually lead to a *rise* in the pre-tax wage. Under a progressive tax system it is not attractive to bargain for higher pre-tax wages, because most of the gain will be taxed away. Hence, reducing tax progressivity in a second-best world raises the pre-tax wage and reduces employment - cf., Lockwood and Manning (1993) and van

[5] Van der Ploeg (1987) shows that one must take account of credibility issues, since unions have an incentive to renege and demand higher wages once firms have invested in capital and are locked in.

der Ploeg (2003). Since the higher pre-tax wage implies a lower interest rate, less tax progressivity reduces saving and investment as well. This further reduces employment.

Van der Ploeg (2003) shows within the context of a shirking model of efficiency wages that raising conditional unemployment benefits boosts employment and lowers unemployment. This surprising result occurs, because unemployed are only entitled to benefits if they have been dismissed without fault of their own and not if they have been sacked for shirking or other forms of misconduct. In that case, a higher level of conditional benefits raises the penalty for shirking and other forms of misconduct so that firms need to pay less to discipline and motivate workers. Consequently, the social policy of high benefits only for those who really need it does *not* harm employment. The general principle is that the welfare state should have checks and balances, i.e., a just and efficient benefit system is tough on entitlements and does not grant benefits to those who do not deserve it.

*C. Endogenous growth*

With a broad definition of capital, including human capital, and knowledge spillovers in production, the effectivity of labour increases with the economy-wide capital stock $K'$ - e.g., Barro and Sala-i-Martin (1999, chapter 4). The production function is then $F(K, K' L_P)$. Firms take the economy-wide capital stock as given and still face constant returns to capital and labour. Equilibrium requires $K=K'$. Labour demand, the interest rate and the output-capital ratio are now negative functions of the ratio of the wage rate to the capital stock: $L_P=l(W/K)$, $R=h(W/K)-\delta$ and $Y/K=F(1,l(W/K))$. The wage that clears the labour market can be written as $W/K=\Pi(C/K,L_G,t)$ with $\Pi_i > 0$, all $i$ and $\Pi_{C/K}<1$. The dynamics is decribed by one unstable differential equation for $C/K$, since $C/K$ is a jump variable. For unanticipated permanent changes in policy the economy immediately moves to its new steady state. The growth rate of the economy $\gamma$ and the equilibrium consumption-capital $C/K$ ratio follow from the expressions for the growth rate in capital (goods market equilibrium) and the growth rate in private consumption (the Ramsey rule), respectively:

$$\gamma = F(1, l(\Pi(C/K, L_G, t)) - C/K - \delta - G/K = h(\Pi(C/K, L_G, t)) - \rho.$$

Figure 4 shows the comparative statics. More impatient households (higher $\rho$) boosts private consumption, depresses employment and lowers the rate of economic growth (shift from E to E'). The interest rate falls and the wage-capital ratio rises. A cut in public expenditures on private goods relative to the capital stock leads to a bigger ratio of private consumption to financial

assets and a lower rate of economic growth (shift from E to E"). The rise in the wage-capital ratio and the corresponding fall in the interest rate depress saving, investment and economic growth and induce a fall in private sector employment. These are, in contrast to the results of the modified Ramsey growth model, permanent rather than temporary effects.

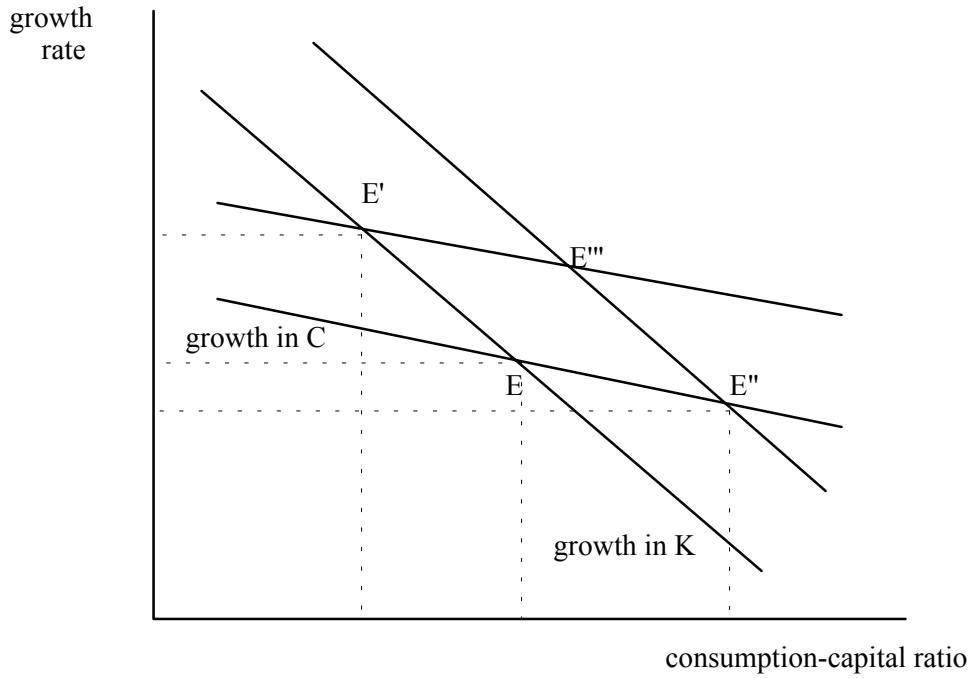



**Figure 4: Endogenous growth and rolling back the welfare state**

A cut in public employment induces different results: a fall in the wage-capital ratio, a rise in the interest rate and thus saving, investment and the growth rate are boosted (a shift from E to E'''). Private sector employment increases, but is insufficient to make up for the loss of jobs in the public sector. A less progressive tax system also reduces the wage-capital ratio and raises the interest rate, hence leads to a boost to the growth rate and employment.

*D. Optimal government policy and endogenous growth*

For simplicity, we assume inelastic labour supply with no effect of public employment on labour supply ($\gamma=\phi=0$). Instead of a (non-distortionary) tax on labour or basic income, there is a distortionary tax on capital $t$ which finances public goods and public employment. Let small letters denote variables expressed as a ratio of the capital stock. The market-clearing wage-capital ratio rises with public employment, i.e. $w \equiv W/K = \Pi(L_G)$ with $\Pi' = -1/l' > 0$. The government

budget constraint amounts to

$$g \equiv G/K = t - w\, L_G = t - \Pi(L_G)\, L_G \tag{GBC}$$

Hence, the Ramsey rule for the growth rate in private consumption becomes

$$\gamma = R - t - \rho = h(\Pi(L_G)) - \Pi(L_G)\, L_G - g - \rho.$$

The equilibrium consumption-capital ratio is thus given by:

$$c = F(1, L_P) - \delta - \gamma - g = \rho - h(\Pi(L_G)) + F(1, l(\Pi(L_G)) + \Pi(L_G) L_G - \delta \equiv c(L_G) \tag{CC}$$

where $c' = (L_G - h')\Pi' > 0$. A higher level of public employment pushes the wage up and the interest rate down. Hence, people save less and the consumption-capital ratio is higher. Also, the wage income of civil servants rises which raises the consumption-capital ratio as well.

With logarithmic preferences social welfare along the balanced growth path equals:

$$[\log(c) + \eta \log(g) + (1+\eta)(\gamma / \rho + K(0))] / \rho.$$

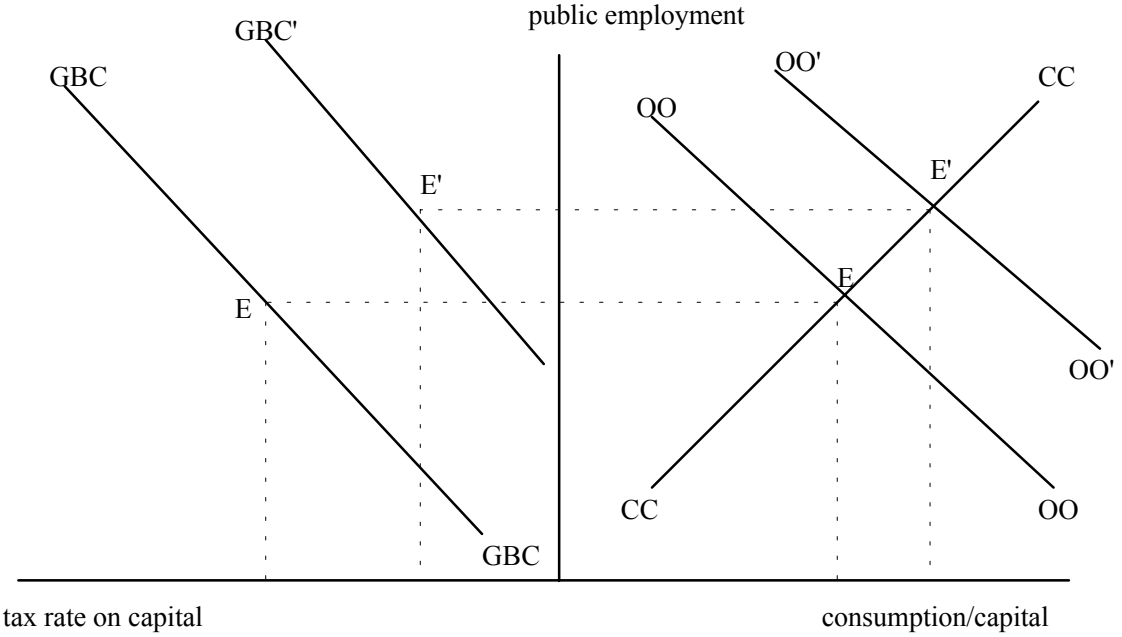
Maximising social welfare subject to the GBC, the Ramsey rule and $c=c(L_G)$ with respect to the tax rate yields $g = \rho\, \eta/(1+\eta)$. The optimal public spending on private goods must rise pro rata with the capital stock and the pure rate of time preference, in particular if its valued a lot in the social welfare function. Impatience thus implies more public consumption.

Maximising social welfare with respect to public employment yields:

$$c = \left(\frac{\rho}{1+\eta}\right)\left(\frac{c'(L_G)}{\Pi(L_G) + c'(L_G)}\right) > 0. \tag{OO}$$

This expression follows from the optimality condition which demands that the marginal increase in utility of private consumption and social welfare on account of a marginal increase in public employment should equal the marginal decrease in social welfare arising from the fall in utility of public consumption and the fall in the interest rate and economic growth rate. The slope of

(OO) is given by $dc/dL_G = [\rho/(1+\eta)\,(w+c')^2]\,(wc'' - c'\Pi')$ (>0).




Key: Lower preference for public consumption shifts E to E'

**Figure 5: Optimal government policy and endogenous growth**

Figure 5 solves for optimal levels of the tax rate, public employment and the consumption-capital ratio. A fall in the preferences for public spending on private goods shifts out (OO), leaves (CC) unaffected, and shifts (GBC) backwards. This results in a boost to public employment, a fall in private employment and a rise in the consumption-capital ratio. Also, the wage rate rises and the interest rate falls. The lower incentive to save and invest tends to lower economic growth. However, the fall in the tax rate on capital dominates so that the net effect of a lesser preference for public spending on private goods is a higher rate of economic growth.

**6. Concluding remarks**

It matters how *one* rolls back the welfare state. If labour supply is inelastic, cutting public expenditures on private goods leads to immediate 100% crowding out of private consumption and thus leaves investment and capital accumulation, on the one hand, and wages and employment, on the other hand, unaffected. If labour supply is elastic, one has a temporary wage hike with a corresponding dip in the employment-capital ratio. The associated dip in the capital intensity and the interest rate depresses saving and leads to a fall in private investment. In the

short run there is more than 100% crowding out of private consumption. In the long run the lower capital stock depresses labour demand and the extra wealth of households reduces labour supply, hence long-run employment falls.

Firing public employees leads to temporary wage moderation and a lower capital intensity. The temporary hike in the interest rate boosts private saving and investment, thus raising capital in the long run. In the short run there is less than 100% crowding out of private consumption. In the long run the output effect boosts private sector labour demand while the wealth effects depresses labour supply. Hence, the fall in public sector employment is in the long run not offset by the rise in private sector employment. The results may be used to comment on the recent Dutch experience where the government desparately tried to hire more nurses, teachers and police personnel in a tight labour market. This contributed to higher wages and lower interest rates, thus reducing the incentives to save and depressing private investment. In the end employment increases, because the fall in private sector employment did not fully offset the gain in public sector employment. These results for changes in public employment hold even if labour supply is inelastic. This suggests that changes in public employment have 'first-order' welfare effects, while changes in public expenditures on private goods have 'second-order' welfare effects. Cuts in public employment, in contrast to cuts in public spending on private goods, produce non-Keynesian effects in the sense that a fiscal contraction induces higher growth and more private sector employment.

If the savings in public revenue are handed back to the public in the form of a lower tax rate rather than a lower tax allowance, there is a further fall in the pre-tax wage and rise in the interest rate. This strengthens the investment boom resulting from a cut in public employment and attenuates the fall in saving and investment resulting from a cut in public spending on private goods. If a cut in public spending on private goods is associated with a cut in the tax rate, there is now also an investment boom and increase in capital. The positive effects of the tax cut outweigh the negative effects of a cut in public spending on private goods. Reducing the progressivity of the tax system, by cutting the tax rate at the same time as cutting the tax allowance, lowers the pre-tax wage and pushes up the interest rate. This results in a short-run and long-run gain in employment and a boost to saving and investment.

Adjustment costs of investment does not change the steady-state comparative statics, but does slow down the speed of adjustment towards the steady state. If there are economy-wide knowledge spill-overs in production, the possibility of endogenous growth arises. In that case, cuts in public employment and a more progressive tax system lead to permanent boosts to the

rate of economic growth but cuts in the ratio of public spending on private goods to capital lower the growth rate. The optimal ratio of public spending to capital declines if society becomes more patient and attaches less preference for such spending. In the latter case, public employment rises and the tax rate fall. The resulting upward wage pressure lowers private employment. It also reduces the interest rate and thus lowers incentive to save and invest. The net effect on the rate of economic growth is, however, positive due to the fall in the tax rate on capital.

With imperfect labour markets the differential effects of cuts in public employment and public spending on private goods are qualitatively unchanged. However, the qualitative effects of a reduction in tax progressivity are markedly changed. Now unions have less of an incentive to moderate wages and thus employment falls. The resulting boost to the pre-tax wage induces a fall in the interest rate, hence saving and investment fall. The resulting reduction in the capital stock further reduces employment.

To understand the macroeconomic effects on growth and employment of fiscal contractions one must be specific how it is done. Rolling back the welfare state by cutting public employment lead to non-Keynesian booms to employment and investment, but cutting public expenditures on private goods reduce employment and investment unless the saved public revenue is used to cut the distortionary tax rate on labour income. Making the tax system more progressive boosts employment and growth under a competitive labour market, but can lower employment and growth in a non-competitive labour market.

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