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8

Government Spending: Volume and Composition

Up to now we have disregarded the role of government. In this chapter we extend the analysis by incorporating government into the model. There are various layers through which the introduction of government impacts on the economic system. First, from the perspective of the representative individual the public goods provided by the government enter directly into the utility function. Further, the taxes used to finance government spending enter directly into the individual's budget constraint. Second, from the perspective of the economy as a whole, the activities of the government absorb resources and provide public consumer and producer goods. Thereby the government alters the amount of resources available to the private sector, and the availability of public goods may alter the intertemporal pattern of private consumption and production. Third, from the perspective of the rest of the world, the activities of the government are transmitted internationally through its direct and indirect effects on world goods and capital markets. In what follows we examine the implications of government spending as they operate through the various layers. We start with the formal analytical framework.

8.1 The Analytical Framework

In the presence of government the representative individual's utility function, U, is $U(C_0, C_1, G_0, G_1)$, where G_0 and G_1 denote government spending in periods zero and one, respectively. For ease of exposition we assume that the utility function U takes the form of

$U(C_0, G_0) + \delta U(C_1, G_1)$, where as before δ denotes the subjective discount factor. To highlight the pure effects of government spending, we abstract from possible distortionary effects arising from government finance. Thus throughout this chapter we assume that the government finances its budget with lump-sum taxes T_0 and T_1. Hence the individual seeking to maximize lifetime utility solves the following problem:

$$V(G_0, G_1, T_0, T_1) = \max_{\{C_0, C_1\}} U(C_0, G_0) + \delta U(C_1, G_1) \tag{8.1}$$

subject to

$$C_0 + \alpha_1^p C_1 = (\bar{Y}_0 - T_0) + \alpha_1^p(\bar{Y}_1 - T_1) - (1 + r_{-1}^p)B_{-1}^p = W_0, \tag{8.2}$$

where α_1^p denotes the present-value factor applicable to the private sector. The formulation in equation (8.1) indicates that, as usual, the individual who chooses the utility-maximizing path of consumption $\{C_0, C_1\}$ treats the paths of government spending $\{G_0, G_1\}$, and taxes $\{T_0, T_1\}$ as given. The function $V(\cdot)$ denotes the maximized value of utility given the paths of spending and taxes. The lifetime constraint in equation (8.2) indicates that the discounted sum of life-time consumption equals the discounted sum of lifetime disposable income net of initial private debt commitment $(1 + r_{-1}^p)B_{-1}^p$. For simplicity we assume that there is no investment.

The specification of equation (8.2) indicates that as long as the discounted sum of taxes $(T_0 + \alpha_1^p T_1)$ remains unchanged, the timing of taxes does not influence the individual's behavior.

As usual, the first-order condition for utility maximization requires that the marginal rate of substitution between consumption in two consecutive periods equals the reciprocal of the market discount factor applicable to the private sector. It is important to emphasize, however, that in the present case the marginal rate of substitution also reflects the interaction between government spending and private consumption. Hence

$$\frac{U_c(C_0, G_0)}{\delta U_c(C_1, G_1)} = \frac{1}{\alpha_1^p}, \tag{8.3}$$

where U_c denotes the marginal utility of consumption. It can also be shown (using the envelope relations obtained by constructing the Lagrangian form associated with equation 8.1 and the implied first-order conditions) that

$$\frac{\partial V(\cdot)}{\partial G_0} = U_G(C_0, G_0), \quad \frac{\partial V(\cdot)}{\partial G_1} = \delta U_G(C_1, G_1),$$
$$\frac{\partial V(\cdot)}{\partial T_0} = -U_c(C_0, G_0), \quad \frac{\partial V(\cdot)}{\partial T_1} = -\delta U_c(C_0, G_0). \tag{8.4}$$

These equalities state that the change in the maximized level of utility induced by a marginal change in government spending and by a marginal change in taxes equals, respectively, the marginal utility of public goods and the negative of the marginal utility of ordinary consumption.

The foregoing analysis treated the levels of government spending and taxes as given. The two, however, are linked to each other through the requirement that the government in its various activities must be solvent. The government budget constraints specify that in each period government outlays be financed by taxes or by debt issue, and solvency requires that in the last period all debt be repaid without issuing new liabilities. In our two-period model these constraints are

$$G_0 = B_0^g + T_0 - (1 + r_{-1}^g)B_{-1}^g,$$
$$G_1 = T_1 - \frac{1}{\alpha_1^g} B_0^g, \tag{8.5}$$

where B^g denotes government debt, and thus $(1 + r_{-1}^g)B_{-1}^g$ is the government debt commitment on the historically given initial government debt position. The formulation in (8.5) embodies the possibility that the rate of interest applicable to the government may differ from the one applicable to the private sector. Hence the government budget constraint is specified in terms of the present-value factor applicable to the government, α_1^g, rather than in terms of α_1^p.

Analogously to the procedure applied previously to consolidate the private sector's periodic budget constraints into a single present-value budget constraint, we can also consolidate the government constraints into a single present-value constraint. Applying this procedure to the constraints in (8.5) yields

$$G = G_0 + \alpha_1^g G_1 = T_0 + \alpha_1^g T_1 - (1 + r_{-1}^g)B_{-1}^g, \tag{8.6}$$

where G denotes the discounted sum of government spending.

The fully informed forward-looking individuals are presumed to "see through" the government budget constraint and thereby to recognize the precise dependence between the levels of government spending and the implied tax liabilities. Hence they incorporate the implications of the government budget constraint into their own. Incorporating the government budget constraint (8.6) into the private-sector constraint (8.2) yields

$$C_0 + \alpha_1^p C_1 = (\bar{Y}_0 + \alpha_1^p \bar{Y}_1) - (G_0 + \alpha_1^p G_1) - (\alpha_1^g - \alpha_1^p)(G_1 - T_1) + (r_{-1}^p - r_{-1}^g)B_{-1}^g - (1 + r_{-1}^p)B_{-1}, \tag{8.7}$$

where B_{-1} denotes the historically given value of the economy's external debt position, which in turn equals the sum of the corresponding private-sector and government debts (i.e., $B_{-1} = B_{-1}^p + B_{-1}^g$). The right-hand side of equation (8.7) specifies the value of private-sector wealth which incorporates the government budget constraints as perceived (correctly) by the private sector. As may be seen, the value of wealth is composed of three items: the discounted sum of GDP net of government spending (discounted by the private sector's market interest rates), terms that are proportional to the discrepancy between private and government interest rates, and finally the historically given value of the economy's external debt commitment.

Equation (8.7) reveals that changes in taxes that satisfy the government budget constraint and that are not associated with changes in government spending alter private-sector wealth if the discount factors applicable to the private and to the public sectors differ from each other. Likewise, changes in the historical value of government

debt that are not associated with corresponding changes in the economy's external debt position or in government spending alter private-sector wealth if there is a discrepancy between the historical rates of interest applicable to the private and to the public sectors.

Consider, for example, the effect of a government budget deficit arising from a current tax cut. Obviously, as indicated by the government budget constraint (8.6), a deficit arising from a fall in T_0, as long as it is not accompanied by a change in government spending, must be accompanied by an equal future surplus (in present-value terms) arising from a rise in future taxes, T_1. Equation (8.7) shows that if for reasons such as finite life the discount factor applicable to the government exceeds the discount factor applicable to the private sector (i.e., $\alpha_1^g - \alpha_1^p > 0$), then the deficit raises private-sector wealth, and thereby influences behavior and alters the real equilibrium of the system. The opposite holds if $\alpha_1^g < \alpha_1^p$. These examples highlight the considerations underlying the famous *Ricardian equivalence* proposition, according to which the timing of taxes and the size of government debt do not influence private sector's behavior and the real equilibrium as long as government spending and the size of foreign debt remain unchanged. In our case the Ricardian proposition emerges if the private and the public rates of interest are equal to each other (i.e., if $\alpha_1^g = \alpha_1^p = \alpha_1$ and $r^g_{-1} = r^p_{-1} = r_{-1}$). With such equalities the private-sector budget constraint (8.7) becomes

$$C_0 + \alpha_1 C_1 = (\bar{Y}_0 - G_0) + \alpha_1(\bar{Y}_1 - G_1) - (1 + r_{-1})B_{-1}. \qquad (8.8)$$

Equation (8.8) shows that if both the private and the public sector can lend and borrow freely in the world capital market (at the same terms) and if all taxes are nondistortionary, then private-sector's wealth consists of the discounted sum of GDP net of government spending and of the initial external debt commitment. This is the case in which the internalization of government activities by the private sector eliminates the influence of the details of public finance.

8.2 Government Spending in a Small Open Economy

The foregoing analysis examined the factors underlying the effects of public finance (with nondistortionary taxes) on private-sector wealth. We turn next to analyze the effects of changes in government spending, starting with the case of a small open economy facing a given world rate of interest. In this context we highlight the role of timing by distinguishing between changes in government spending that are temporary (current or future) and changes that are permanent.

As indicated earlier, government spending influences the private sector through two channels. First, government activities absorb resources that otherwise would have been available to the private sector, and second, government spending may influence the marginal evaluations of private goods. The first channel is reflected in the terms $(\bar{Y}_0 - G_0)$ and $(\bar{Y}_1 - G_1)$ on the right-hand side of the budget constraint (8.8). We refer to this channel as the *resource-withdrawal* channel. The second channel is reflected in equation (8.3) by the dependence of the marginal rate of substitution between consumption in two consecutive periods on the levels of government spending. We refer to this channel as the *consumption-tilting* channel.

In operating through the resource-withdrawal channel, the influence of government spending is similar to that of supply shocks: both alter the size of *net* GDP (GDP net of government spending). Therefore our previous analysis of temporary (current or future) and permanent positive supply shocks (in section 5.3) also applies to the effects of temporary (current or future) and permanent reductions in government spending, operating through the resource-withdrawal channel.

In analyzing the effects of government spending as they operate through the consumption-tilting channel, we note that the dependence of the marginal rate of substitution of consumption in two consecutive periods on the levels of government spending reflects the characteristics of the utility function. If private consumption and government spending are complements (i.e., if the marginal utility of

consumption rises with the level of government spending), then a temporary rise in current government spending raises the marginal rate of substitution in equation (8.3), whereas a temporary rise in future government spending lowers the marginal rate of substitution. In the former case the consumption expansion locus tilts toward current consumption, and in the latter case it tilts toward future consumption. The opposite holds if private consumption and government spending are substitutes. In the neutral case the marginal utility of private consumption (and therefore the marginal rate of substitution of consumption between consecutive periods) is independent of the level of government spending. In that case government spending does not induce consumption-tilting effects. Finally, we note that the effect of a permanent change in government spending on the marginal rate of substitution in consumption combines the effects of current and future changes in government spending. As was shown (except for the neutral case), the two effects tend to tilt the intertemporal consumption patterns in opposite directions. In fact, as is evident from equation (8.3), if the initial patterns of consumption and government spending are stationary, then the two effects exactly offset each other. It follows that in that case a permanent change in government spending does not induce a tilt in the intertemporal pattern of consumption. We conclude that the influence of the intertemporal pattern of government spending on the marginal rate of substitution of consumption are akin to the consumption-tilting effects analyzed in section 5.3.

In summary, the impact of government spending on the equilibrium of the system reflects the combination of the effects operating through the resource-withdrawal channel and through the consumption-tilting channel. In the neutral case, in which the marginal rate of substitution of consumption in two consecutive periods is independent of the level of government spending, the impact of government spending operates only through the resource-withdrawal channel. In that case our analysis of the effects of supply shocks (in section 5.2) is fully applicable to the analysis of the effects of government spending.