in the early Conservative 'era' that the population was 'over'-taxed. The pros and cons of this are discussed elsewhere; the main purpose here is to offer an insight into how a whole complex tax system can be summarized by condensation into a 'tax credit' and a single 'marginal rate'.

10.3.8 Public debt

When government expenditure exceeds government revenue (e.g. from taxation) the government runs a budget deficit. One way to finance this deficit is to borrow from the public by selling bonds.[3] The government's deficit is the annual shortfall between spending and tax revenue. Public debt is the total of unpaid deficits (i.e. a total which includes the sum that the government owes from past years). For public choice economists the existence of deficit financing and the creation of public debt causes problems. First, it is argued that debt creates a burden for future generations, i.e. for those who will be faced with servicing and redeeming the public debt. Secondly, it is alleged that deficit financing makes the 'tax price' of goods and services provided in the public sector appear lower than the true 'tax price'. Borrowing reduces the amount that is paid for public sector goods and services and leads the community to commit an 'excessive' allocation of resources to the public sector.

By contrast, other economists argue that raising finance by borrowing is simply 'equivalent' to raising revenue by taxation and, therefore, there can be no additional burden from borrowing. The argument that borrowing is 'equivalent' to taxation stems from the writings of David Ricardo (1772–1832). With the 'enormous' deficit incurred by Great Britain during the Napoleonic Wars, Ricardo took an interest in public debt. He considered the proposition 'that if people take full account of the future tax burden that will have to be imposed in order to pay the interest on public debt then financing government purchases with current taxes is equivalent to financing it with debt and paying the interest on that debt in perpetuity' (Parkin and King 1992, p. 929). The implication being that, if a government were to borrow to cover the deficit that emerged between taxation and spending, rather than covering this by additional taxation, the impact would be equivalent as far as individuals were concerned. Whether Ricardo actually believed that tax finance and borrowing were equivalent is a matter of dispute (O'Driscoll 1977). Ever since, economists have devoted energy to identify conditions in which they would be equivalent. The basic argument is that taxation directly reduces the taxpayer's net worth (because he/she must pay the tax now) but an equivalent amount of government debt creates an equal reduction in the taxpayer's net worth (as the taxpayer will be faced with the liability to repay the tax in the future). When considering public debt, a taxpayer's net worth is equally reduced by the capitalization of future tax liabilities which are required to service and to redeem the debt.[4] The conclusion is then that both forms of finance are equivalent. This result is often referred to as the Ricardian Equivalence Theorem.

Here the objective is to examine the conditions under which Ricardian equivalence will hold and then to reconsider the public choice case against public debt.

10.3.8a Ricardian equivalence

The Ricardian Equivalence Theorem can be illustrated by an analysis of an individual's consumption and saving decision.[5] In Fig. 10.6 an individual is assumed to have an after-tax income of $Y_1 - T_1$ in period 1 and an after-tax income of $Y_2 - T_2$ in period 2. The individual may not wish to consume all after tax income in period 1; preferring to save some of the income for consumption in period 2. The budget line 12 illustrates the way in which consumption possibilities can be transferred between the two periods. The slope of the budget line is $(1 + r)$, where r is the rate of interest. Any income saved in period 1 will earn this rate of interest. So, for example, in a very extreme scenario, if the individual consumed nothing in period 1 then the sum available for consumption in period 2 would be equal to $[Y_2 - T_2 + (Y_1 - T_1)(1 + r)]$. This sum is represented by the distance $O2$ in Fig. 10.6. Conversely, if the individual could borrow against future income (ie. $Y_2 - T_2$) for consumption in period 1, the present value of $Y_2 - T_2$ would be $(Y_2 - T_2)/(1 + r)$ and together with $Y_1 - T_1$ this would be equal to the distance $O1$ in Fig. 10.6. In this way, both the slope and the position of the line 12 can be determined.

[3] Interest-yielding bonds are attractive to those individuals who chose to purchase them. The excess of spending over revenue could be financed by printing money rather than selling bonds to the public though the implications for inflation might deter choice of this option.

[4] Following Buchanan and Wagner (1978, p. 98): 'Suppose ... that the rate of interest is 10 per cent and that a tax of $100 on a person is replaced by an identical share of public debt issue with the debt obligation to be met with a payment of $110 in one year. This shift does not affect the taxpayer's net worth.'

[5] See, for example, Browning and Browning (1991) and Hoover (1994).

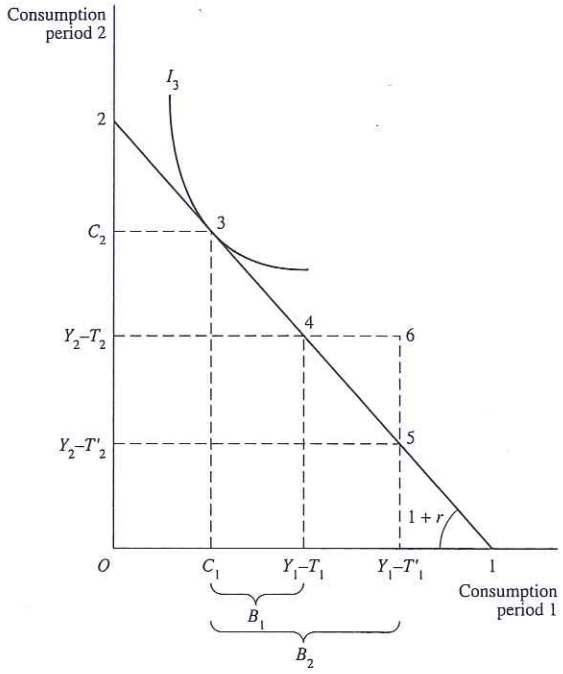

Figure 10.6 Ricardian equivalence.
Source: adapted from Hoover (1994).

The indifference curve I_3 in Fig. 10.6 shows the rate at which the individual would be prepared to forego consumption in one period for additional consumption in the other period. At any point on the indifference curve, the slope of the indifference curve reveals the individual's marginal rate of time preference (the rate at which the individual would substitute present consumption for future consumption). Of course, the individual will maximize welfare by attaining the highest possible indifference curve. This means allocating consumption between the two periods so as to attain a tangency position between the indifference curve and the budget line 12. In Fig. 10.6, the individual maximizes welfare at point 3 on indifference curve I_3. At this point the decision is to consume OC_1 in period 1 and OC_2 in period 2. This means saving in period 1 an amount equal to $(Y_1 - T_1) - C_1 (= B_1)$ for future consumption in period 2.

The government now decides to finance some existing expenditure programmes by borrowing in period 1 and is able to reduce taxes accordingly. The tax cut increases the consumer's after-tax income in period 1 to $Y_1 - T'_1$. If this were all, the individual might assume an income effect (or net worth effect), i.e. it would seem as if the budget line moved out to the right and that the relevant position was not point 4 on budget line 12 but point 6 on a budget line (not drawn) further to the right. However, the individual is assumed to be fiscally aware. The government will have to pay off the debt-financed tax cut in the future. As long as this is fully anticipated, in period 2 it will follow that taxation will increase from T_2 to T'_2 (where $T'_2 - T_2$ is equal to the future value of the tax cut $T_1 - T'_1$). The increase in taxes in period 2 reduces after-tax income to $Y_2 - T'_2$; the tax increase will be equal to the tax reduction received in period 1 plus the interest payable for one period. Therefore, in Fig. 10.6 the tax increase in period 2 will be equal to $T_2 - T'_2$ and the combined effect is to move the individual's endowment point from 4 to point 5 on the initial budget line (i.e. there is no income or 'net worth' effect).

As the interest rate remains the same, the individual remains in equilibrium at point 3, i.e. the point chosen when financing in period 1 was more heavily reliant on taxation. Saving will increase from B_1 to B_2 in period 1. Note that the increase in saving equals the amount of the tax reduction in year 1. It has increased to allow for the additional tax liability in period 2. The solution to the individual's maximization problem remains unchanged (at point 3) and the individual remains on budget line 12. Taxation and government borrowing are equivalent and it follows that no additional burden can be created by borrowing. However, the result is fragile. While the following list is not exhaustive, it is illustrative of the assumptions required to maintain equivalence.

(*a*) *Infinite lifetime*: In this example the individual expects to be alive to pay the tax when the debt is redeemed. If the individual were to die before the debt was redeemed then, during the individual's lifetime, it would appear that an income effect had been experienced and the equivalence theorem would not apply.

While some rely on the artifact of infinitely long-life people to present the case for Ricardian equivalence, there is an alternative. Barro (1976) has demonstrated that, when individuals' own time horizons are finite, Ricardian equivalence may still hold if individuals in the present generation are concerned about the welfare of their children. An individual in the present generation may acquire utility both from the consumption of goods and services and also from safeguarding his/her children's welfare. The children of the present generation are similarly concerned about their children. The implication is that an individual in the present generation makes decisions in

the same way as a single individual (or dynasty) facing an infinite time horizon.

In Fig. 10.6 assume that consumption in period 1 is by a member of the present generation and consumption in period 2 is by this individual's children. The indifference curve signifies the extent of altruism, i.e. the extent to which the individual will trade-off present-day consumption for her children's future consumption. In this situation, instead of B representing saving by the individual for personal consumption in the next period, now B_1 is the bequest that the individual wishes to make for her children. Individuals in the present generation recognize that the future redemption of borrowing will impose a tax liability on their successors. Therefore, to compensate the children, the individual increases the bequest of assets by sufficient to service and redeem the debt (i.e. from B_1 to B_2). Once again, an addition to public debt causes an equal increase in saving.

That parent's leave bequests for their children is evident. However, that such bequests are motivated only by concern for the welfare of children is questionable. Bequests may arise, in part, because of the uncertainty associated with determining the time of death. They may arise for strategic reasons, to ensure care and consideration from siblings (e.g. see the survey article by Seater 1992). Barro's model can be questioned in many different ways (e.g. Feldstein, 1976). Together with the original idea of Ricardian equivalence it is also sensitive to the arguments that follow.

(b) *Perfect capital markets where individuals can borrow and lend at the same rate as the government*: There are two examples to note. First, if the government was able to borrow at an interest rate lower than that available to individuals the present value of the government debt issue would be less than the value of the current tax reduction (leading to an increase in net wealth). The impact of this is easy to see. In Fig. 10.7 the lower costs of borrowing mean that the amount to repay is lower in period 2. Therefore, instead of increasing taxes from T_2 to T_2' in the second period, taxes are increased only from T_2 to T_2''. The effect of this is to allow individuals to experience an income (or 'net worth') effect. Comparing point 5 on the original budget line 12 with point 7 (the new combination of consumption in both periods that is now available), it is as if the budget line has moved to the right to 89. Individuals are better off having been able to borrow at the lower government borrowing rate.

Secondly, if there were a difference in the capital market between the rate of interest at which individuals could lend and the interest rate at which they

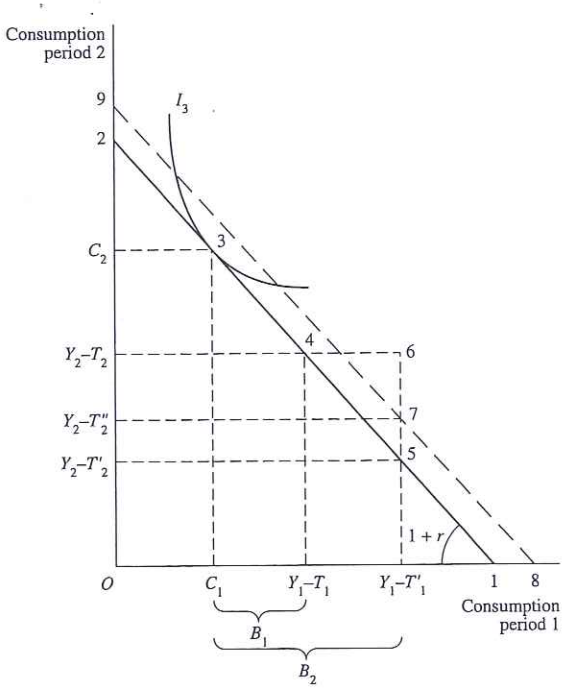

Figure 10.7 Costs of borrowing.
Source: adapted from Hoover (1994).

could borrow this distortion would be sufficient to offset the equivalence between tax and debt finance. In Fig. 10.8 the individual can lend at r_l (which is assumed equal to the government borrowing rate) but the rate at which individuals can borrow is the higher rate r_b. Some individuals may find themselves at equilibria at the kink that now exists in the relevant budget line 243. An individual at point 4 saves nothing (or leaves no bequest) for the next period. After a switch to deficit financing and a reduction in taxes the kink of the budget constraint shifts to point 5. If (as is possible) the new optimum is at the new kink (point 5) then there is no increase in saving (or bequest) to meet the future tax costs.

(c) *Lump-sum taxation*: Brennan and Buchanan (1987) demonstrate that, if future taxes are not lump sum, individuals are affected by the decision to finance by debt rather than by taxation. For example, suppose in the future the tax were to be a proportional tax on consumption. Individuals will be likely to switch more consumption into the current period and, therefore, save less than would be predicted by Ricardian equivalence (i.e. when there was lump-sum taxation). Consider Fig. 10.9. An individual faces a budget constraint 12 but debt has been raised (D) and