

TABLE 15-1
GOVERNMENT SPENDING AS A PERCENTAGE OF UK NATIONAL INCOME*

SPENDING ON	1956	1966	1976	1984
Goods and services	20.7	21.6	25.9	23.8
Transfer payments	13.2	16.5	21.0	22.7
Total spending	33.9	38.1	46.9	46.5

* Spending of central and local government as a percentage of gross domestic product at market prices.
Source: CSO, UK National Accounts.

decades. The last row of Table 15-1 shows that the increase in spending on transfer payments has offset the fall in spending on goods and services since 1976.

One reason for trying to reduce government spending is to make room for tax cuts. Table 15-2 picks out the most controversial aspect of the tax system, the *marginal rate of income tax*.

The *marginal rate of income tax* is the percentage taken by the government of the last pound that an individual earns. In contrast, the *average tax rate* is the percentage of total income that the government takes in income tax.

A *progressive tax structure* is one in which the average tax rate rises with an individual's income level. The government takes proportionately more from the rich than from the poor. A *regressive tax*

TABLE 15-2
MARGINAL INCOME TAX RATES IN THE UK
(Tax rates on an extra pound of income)

TAXABLE INCOME* (£ per annum, 1986 prices)	MARGINAL TAX RATE (%)	
	1978-79	1986-87
5 000	34	29
10 000	34	29
15 000	45	29
20 000	50	40
25 000	65	45
30 000	70	50
45 000	83	60

* Taxable income is income after deduction of allowances. In 1986/87 the single person's allowance was £2335.

Source: HMSO, Financial Statement and Budget Report, 1986-87.

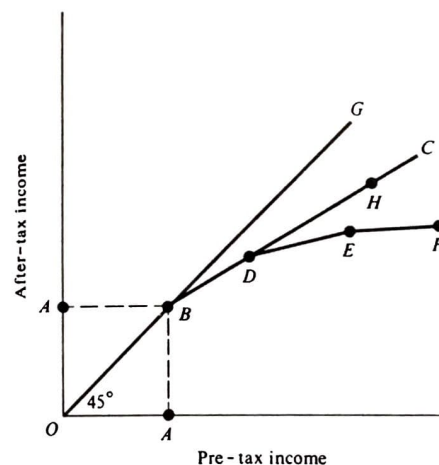
structure is one in which the average tax rate falls as income level rises. The government takes proportionately less from the rich.

Table 15-2 shows that, as in most countries, the UK has a progressive income tax structure. Figure 15-1 explains why. We plot pre-tax income on the horizontal axis and post-tax income on the vertical axis. The line OG with a slope of 45 degrees would correspond to no taxes. A pre-tax income OA on the horizontal axis corresponds to the same post-tax income OA on the vertical axis. Now suppose there is an income tax with a tax allowance OA. The first OA pounds of income are untaxed. If the marginal tax rate on taxable income is constant, individuals face a schedule such as OBC. The individual gets to keep only a constant fraction of each pound of pre-tax income above OA. The higher the marginal tax rate the flatter the portion BC of the schedule.

How do we calculate the average tax rate at a point such as D? We join up OD. The flatter the slope of this line the higher the average tax rate. Hence, even with a constant marginal tax rate and a constant slope of the portion BC of the tax schedule, the presence of an initial tax allowance makes the tax structure progressive. If we join up OH we get a line with a flatter slope than OD, which in turn has a flatter slope than OB. The higher an individual's gross income, the smaller is the tax allowance as a percentage of this gross income so the larger is the percentage of total income on which the individual is paying tax.

But Table 15-2 shows that *marginal tax rates also rise with income*. The tax schedule in the UK

FIGURE 15-1 A PROGRESSIVE INCOME TAX. The line OG with a slope of 45 degrees shows what would happen in the absence of any income tax. A pre-tax income measured on the horizontal axis would convert into the same amount of post-tax income measured on the vertical axis. An income tax plus an allowance OA implies that the first OA pounds of pre-tax income are still retained after-tax. If income above OA is taxed at a constant marginal rate, the individual is then on the schedule BC with a constant slope. The slope is less than 45 degrees because for each extra pound earned the individual is only allowed to keep a constant fraction of it. Higher pre-tax incomes move the individual up BC and imply that the government is taking a larger and larger fraction of total pre-tax income. The individual is falling further and further below the no-tax schedule OG. With a rising marginal tax rate, the schedule falls even further below OG. The complete schedule OBDEF approximates the income tax structure in the UK.



looks more like the schedule OBDEF. As individuals move into higher tax bands they pay higher marginal tax rates and move on to even flatter portions of the tax schedule. The average tax rate now rises sharply with income. The line joining OF has a much flatter slope than the line joining OD.

Table 15-2 shows that the first Thatcher government was able to reduce marginal tax rates substantially, especially for the very rich. A

millionaire paying an 83 per cent tax rate on all taxable income except the first £45 000 in 1978-79 was paying only 60 per cent in 1986-87.

Were the tax cuts designed to make the rich richer? Or was their purpose to revive hard work and enterprise? If so, will they work? These questions go to the heart of the current debate and form the background to much of the discussion of this chapter.

15-1 TAXATION AND GOVERNMENT SPENDING IN THE UK

Table 15-1 shows that government spending, and the taxation that finances it, are now running at over 40 per cent of national income. Table 15-3 shows the composition of government spending and revenue in 1985.

Table 15-3 shows that in 1985 £75.2 billion, almost half of total government spending, went on transfer payments such as unemployment benefit and debt interest. Of the remaining £81.2 billion spent directly on goods and services, the most important spending categories were the National Health Service, defence, and education.

Why is the government directly involved in providing defence, schools, and health services? How much of each should be provided? Would it make sense for these activities to be provided by the private sector in the same way as haircuts and cars? If refuse collection can be 'privatized', why not defence? To deal with these issues in democratic decision-making, we shall need a large dose of economics and a fair helping of political science.

Table 15-3 shows that most government spending is financed through taxation. The most important taxes are income tax and expenditure taxes such as value added tax (VAT). Since state provision of retirement pensions is included on the expenditure side under transfer payments, the pension contributions under the National Insurance Scheme must be included on the revenue side.

Two other features of the revenue side of Table 15-3 deserve comment. First, the revenue raised in

TABLE 15-3
EXPENDITURE AND REVENUE OF CENTRAL AND LOCAL
GOVERNMENT 1985

EXPENDITURE	£b	REVENUE	£b
Health	17.8	Income tax	38.2
Defence	18.3	Corporation tax	9.6
Education	17.5	Petroleum revenue tax	7.4
Other current spending	21.0	Social security contributions	24.1
Capital investment	6.6	Taxes on capital	2.2
All goods and services	81.2	Taxes on goods	37.3
Social security	45.9	Taxes on property	13.6
Debt interest	17.5	Tax revenue	132.4
Other transfer payments	11.8	Rent, interest, dividends, and other receipts	14.3
All transfer payments	75.2	Borrowing	9.7
TOTAL EXPENDITURE	156.4	TOTAL REVENUE	156.4

Source: CSO, UK National Accounts, 1986.

the UK by taxing companies directly is very low by international comparison. Corporation tax provides only about 6 per cent of UK government revenue, two-thirds of the fraction raised from companies in the United States, not because the tax rate is low but because taxable profits of UK companies are low. Second, property taxes levied by local government form an important and controversial component of revenue collection. High-spending local authorities have to levy high rates of property tax, and in recent years there has been increasing resentment by (relatively rich) taxpayers at the amount being raised in this way.

Against this background, we begin by discussing the reasons for government spending. Then we ask how spending should be financed. Are there good and bad taxes? The answer depends on the criteria of efficiency and equity that we developed in the last chapter.

15-2 THE GOVERNMENT IN THE MARKET ECONOMY

In this section we consider the arguments that can be used to justify government spending in a market economy. We begin with public goods.

Public Goods

A *private* good is a good that, if consumed by one person, cannot be consumed by another person.

Ice cream is a private good. If you eat an ice cream it prevents anyone else from eating the same ice cream. For any given supply of ice cream, your consumption reduces the quantity available for others to consume. Most goods are private goods.

A *public* good is a good that, even if consumed by one person, can still be consumed by other people.

Clean air and defence are examples of public goods. If the air is pollution-free, your consumption of it does not interfere with our consumption of it. If the Royal Navy is patrolling Britain's coastal waters, your consumption of national defence does not affect our quantity of national defence. In fact, for a *pure public good* we must all necessarily consume the same quantity, namely, whatever quantity is supplied in the aggregate. We may of course get different amounts of utility if our tastes differ, but we all consume the same quantity.

The key aspects of public goods are (1) that it is technically possible for one person to consume without reducing the amount available for some-

one else, and (2) the impossibility of excluding anyone from consumption except at a prohibitive cost. A football match could be watched by a lot of people, especially if it is televised, without reducing the quantity consumed by any individual; but *exclusion* is possible – the ground holds only so many, and the club can refuse to allow the game to be televised. The interesting issues in economics arise when, as with national defence, exclusion of certain individuals from consumption is effectively impossible.

Free-Riders In the last chapter we introduced the *free-rider problem* when discussing why bribes and compensation for externalities might not occur. Public goods are likely to be especially vulnerable to the free-rider problem if they are supplied by the private sector. Since you get the same quantity of national defence as everyone else, *whether or not you pay for it*, it would never be in your interest to purchase national defence in a free private market. Everybody else would adopt similar reasoning, and no defence would be demanded even if we all wanted defence.

Public goods are like a very strong externality. If you buy defence everyone else gets the benefits. Since marginal private and social benefits diverge, private markets will not produce the socially efficient quantity. There is a case for government intervention to make sure marginal social cost and marginal social benefit are equated.

The Marginal Social Benefit Suppose the public good is the purity of the public water supply. The more infected the water, the more likely it is that everyone will be hit by an epidemic of cholera or some other disease. Figure 15-2 supposes there are two people. The first person's demand curve for water purity is D_1D_1 . Each point on the demand curve shows what the individual would pay for the last unit of purer water. It shows the marginal benefit to the individual. D_2D_2 shows the marginal benefit of purer water to the second individual.

The curve DD gives the marginal social benefit of purer water. At each output level for the public good, we *vertically* sum the marginal benefit of

each individual to get the social marginal benefit. Thus at the output Q the social marginal benefit is $P = P_1 + P_2$. We sum vertically at a *given quantity* because everyone consumes the same quantity of a public good by definition.

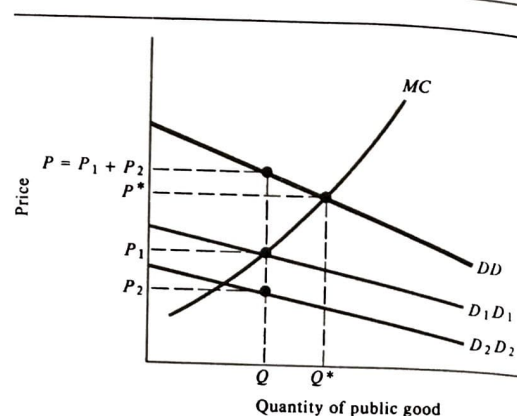
Figure 15-2 also shows the marginal cost of producing the public good. If there are no production externalities the marginal private cost and the marginal social cost of production will coincide. The socially efficient level of production of the public good is at Q^* , where the marginal social benefit equals the marginal social cost.

What would happen if the good were privately produced and marketed? Person 1 might pay a price P_1 to have a quantity Q produced by a competitive supplier pricing at marginal cost. At the output Q the price P_1 just equals the marginal private benefit which person 1 derives from the last unit of the public good. Would person 2 be prepared to pay to have the output of the public good increased beyond Q ? The answer is, 'No'. Because it is a public good, person 2 cannot be excluded from consuming the output Q which person 1 has commissioned. But at the output Q , person 2's marginal private benefit is only P_2 , which is less than the current price P_1 . Person 2 would certainly not pay the higher price necessary to induce a competitive supplier to expand production beyond the output Q . Person 2 is thus a free-rider enjoying person 1's purchase Q . And the total quantity privately produced and consumed in a competitive market lies below the socially efficient quantity Q^* .

Revelation of Preferences By constructing the marginal social benefit curve DD , the government can decide how much of the public good it is socially efficient to produce. But how does the government find out the individual demand curves that must be vertically added to get DD ? If people's payments for the good are related to their individual demand curves everyone has an incentive to lie because of the free-rider problem. People will understate how much they value the good in order to reduce their own payments, just as in a private market.

FIGURE 15-2 A PURE PUBLIC GOOD.

D_1D_1 and D_2D_2 are the separate demand curves of two individuals and show the marginal private benefit of the last unit of the public good to each individual. What is the social marginal benefit of the last unit to the group as a whole? Since both individuals consume whatever quantity of the good is produced, we must add up vertically the price each is prepared to pay for the last unit. At the output Q the marginal social benefit is thus $P_1 + P_2$. The curve DD shows the marginal social benefit and is obtained by vertically adding the demand curves of the two individuals. If MC is the private and social marginal cost of producing the public good the socially efficient output is Q^* at which social marginal cost and social marginal benefit are equal.



Conversely, if payments are divorced from the question of how much people would like, people will overstate their private valuations. We are all for safer streets if we do not have to contribute to the cost. In practice, democracies try to resolve this problem through elections of governments. Different parties offer different quantities of public goods together with a statement of how the money will be raised through the tax system. By asking the question, 'How much would you like, given that everyone will be charged for the cost of providing public goods?' society can come closer to providing the efficient quantities of public goods. However, since there are only a few parties competing in the election and many different aspects of government on which they are offering a position, this can be only a very crude way to elicit people's views of how much of any particular public good should be provided.

Government Production The economist's definition of public goods relies solely on the fact that everyone consumes the same quantity. We have seen that the free-rider problem implies that private markets will not produce the socially efficient level and that there is a case for government intervention on efficiency grounds.

But this merely says that the government must determine how much is produced. It does not imply that the government must produce the goods itself. Public goods are not necessarily the goods the government happens to produce.

For example, in the UK, as in most countries, national defence is a public good and is also produced largely within the public or government sector. We have few private armies. On the other hand, street-sweeping, though a public good, can be subcontracted to private producers, even if local government determines its quantity and pays for it out of local tax revenue. Conversely, nationalized industries such as coal and steel involve public sector production of private goods. Our consumption of coal most certainly reduces the quantity available for consumption by others.

In the next chapter we examine why the public sector may wish to produce private goods. Whether public goods need be produced by the public sector depends not on their consumption characteristics, on which our definition of public goods relies, but on their production characteristics. There is nothing special about street-sweeping, and it can as easily be produced by the public or the private sector. In contrast, armies and navies rely on discipline and secrecy. Generals and

admirals may believe, and society may agree, that offences against these regulations should receive unusual penalties which would not be generally sanctioned in private firms. Few people believe that insubordination is an important offence for street-sweepers and should be punished by incarceration or even death. Hence it may make more sense for soldiers to be in the public sector than street-sweepers. Where such considerations do not arise, for example in the production of uniforms, it is more likely that the production of defence goods will take place in private firms.

Transfer Payments and Income Redistribution

The government spends money on public goods because there is a market failure when public goods are left entirely to private markets. Thus the motivation for this type of intervention is social efficiency. In contrast, government spending on transfer payments is primarily concerned with *equity* and *income redistribution*. By spending money on the unemployed, the old, and the poor (who in the UK are entitled to supplementary benefit if their total income from whatever source falls below a certain minimum level), the government seeks to ensure that the distribution of income and welfare that a totally free market economy would otherwise have produced is at least truncated: there is a minimum standard of living below which no citizen should fall. The specification of this standard is of course pure value judgement.

Where does the money come from to pay the poor and the disadvantaged? Primarily from those who can most afford to pay. Table 15-2 shows that the income tax system in the UK is *progressive*. Increasing marginal tax rates on income ensure that each individual's average tax rate, the proportion of total income paid in taxes, increases with income. Taken as a whole, the tax and transfer system takes money from the rich and gives to the poor. The poor receive not merely the direct financial transfer in the form of transfer payments

such as supplementary benefit, but also the consumption of public goods that have been paid for by income taxes raised from the rich.

As we pointed out in the last chapter, not only is the amount of redistribution to be undertaken by the government a pure value judgement on which different individuals and different political parties will disagree, but there is an inevitable trade-off between the competing objectives of efficiency and equity. To undertake more redistribution the government will have to increase tax rates, thereby driving a larger wedge between the price paid by the purchaser and the price received by the seller of the good or service. Since the price system achieves Pareto efficiency by inducing each individual to equate marginal cost or marginal benefit to the price received or paid, and hence to one another, taxes that imply that buyers and sellers face different prices ensure that the marginal cost to a seller no longer equals the marginal benefit to a buyer. Taxes are generally distortionary and tend to reduce efficiency.

In Table 15-2 we saw that the Thatcher government succeeded in reducing marginal tax rates, especially for the very rich. Opponents of the government argued that the objective as well as the consequence of the legislation was to increase the after-tax incomes of the rich at the expense of the poor. The government argued that reducing distortions in the labour market by cutting income tax would lead to efficiency gains that would far outweigh the valuation that society should put on a more equal income distribution. If society's resources could be used to make more output, even the poor might be better off in the long run.

Merit Goods and Bads

Merit goods (bads) are goods that society thinks everyone ought to have (ought not to have), regardless of whether they are wanted by each individual.

Examples of merit goods are education and health. Merit bads are products such as cigarettes. Since society places a different value on these goods

from the value placed on them by the individual, it follows that individual choice within a free market economy will lead to a different allocation from the allocation that society wishes to see.

There are two distinct reasons for designating merit goods. The first is a version of the externality argument we examined in the previous chapter. If more education raises the productivity not merely of an individual worker but of all other workers with whom this worker co-operates, there is a production externality that the individual does not take into account in choosing how much education to purchase. If individuals demand too little education, society should encourage the provision of education. Free schooling to ensure a minimum level of education, communication, and social interaction might be one way to achieve this.

Conversely, if people take account of the costs to themselves but not the burden on the National Health Service in deciding whether or not to smoke and damage their health, society may regard smoking as a merit bad that should be discouraged. We shall shortly see how the tax system, in this case a tax on cigarettes, may be used to offset externalities that individuals fail to take into account.

The second aspect of merit goods is where society believes that individuals are no longer acting in their own best interests. Addiction to drugs, tobacco, or gambling are obvious examples. Economists rarely subscribe to the value judgement of whole-scale paternalism. The function of government intervention is less to tell people what they ought to like than to allow them better to achieve what they already like. However, the government will sometimes have more information or be in a better position to take a decision. Much as some people hate going to school, they will frequently be glad afterwards that they were made to do so.

Thus the government may spend money on compulsory education or compulsory vaccination because it recognizes that, left to their own decisions, individuals will act in a way they will subsequently regret.

15-3 THE PRINCIPLES OF TAXATION

This section is in three parts. First we consider the different kinds of taxes through which the government can raise revenue. Then we consider again the equity implications of taxation. Finally, we examine the efficiency implications of taxation.

Variety of Taxes

Governments can raise tax revenue only if they can identify the activities on which the tax rates apply. Before sophisticated records of income or sales were ever kept, governments raised most of their revenue through customs duties and road tolls, the two places where transactions could be easily monitored. Income tax in peacetime was not introduced in the UK until the 1840s, and VAT – a general tax on goods and services (with a few specified exemptions such as food and children's clothing) – was not introduced until the 1970s. We briefly outline the main taxes shown in Table 15-3, grouped under three headings: *taxes on income, or direct taxes*; *taxes on expenditure, or indirect taxes*; and *taxes on assets, or wealth taxes*.

Direct Taxes Individuals pay income tax on earnings from labour, rents, dividends, and interest. In Chapter 13 we saw that the return on an asset is not just the dividend or interest payment but also the capital gain. Although many economists would argue that capital gains, as for example when ICI shares are purchased for £2 and subsequently sold for £3, are as much income as the dividend component of the return on an asset, in practice the Inland Revenue assesses and taxes capital gains separately. National insurance contributions by individuals are also a form of direct personal taxation.

Companies pay corporation tax calculated on their taxable profits after allowance for interest payments and depreciation. They also make a national insurance contribution on behalf of their employees.

Indirect Taxes Indirect taxes are taxes levied on expenditure on goods and services. The most important source of indirect tax revenue is value added tax (VAT), which is effectively a retail sales tax. Whereas a sales tax is collected only at the point of final sale to the consumer, VAT is collected at different stages of the production process.

Suppose a firm mines iron ore and converts it into £200 worth of high-grade steel, which is then sold to a car producer. The car producer converts the steel into a car costing £3200. A simple sales tax levied at 15 per cent would raise the cost to the consumer to £3200 + £480 (15 per cent of £3200) or £3680. In contrast, VAT works as follows. The steel firm has a value added or net output of £200 on which it pays 15 per cent or £30 in tax. Passing the tax on to the car producer, the steel is sold for £230. The car producer has a value added or net output of £3000 and pays 15 per cent or £450 in tax. Since the car firm paid £230 for the steel, the final price to the consumer is £230 + £3000 + £450 = £3680. As far as the consumer is concerned this is just the same as a 15 per cent sales tax.

This example makes it seem that the consumer price is raised by the full amount of the tax. But a higher consumer price will reduce the quantity demanded. In turn this will move producers back down their marginal cost curves and alter the net-of-tax price producers require. Later in this section

we show how to analyse these induced effects to determine how the burden of the tax is ultimately divided between producers and consumers.

Revenue from VAT is supplemented by other indirect taxes including special duties on tobacco and alcohol, licence fees for motor cars and televisions, and customs duties on imports.

Wealth Taxes In the UK there are two taxes that tax wealth *per se* rather than the income that is derived from wealth. The first is the tax on property values, which forms the main source of revenue for local government. The second is capital transfer tax, which applies to transfers of wealth between individuals, whether as gifts during life or as inheritances after death.

How does the UK tax structure compare with that in other countries? Table 15-4 shows data for several advanced countries in 1983. The most notable feature of the UK tax system appears to be its low reliance on social security taxes for state pension and unemployment provisions. Table 15-4, which applies to the period after the rate of VAT in the UK was raised from 8 to 15 per cent in 1979, also suggests that the UK relies quite heavily on indirect taxes rather than direct taxes.

Tax revenue is necessary to pay for government expenditure. We now assess the UK tax system against our two welfare criteria, equity and efficiency.

TABLE 15-4
SOURCES OF TAX REVENUE IN 1983
(Percentage of total taxes*)

COUNTRY	TAXES ON INCOME	INDIRECT TAXES	SOCIAL SECURITY TAXES	TAXES ON PROFITS AND CAPITAL
UK	28.7	41.9	18.0	11.3
Italy	30.6	28.4	34.4	5.8
Sweden	39.2	30.5	26.5	3.7
Japan	25.2	27.1	29.6	18.0
USA	38.4	29.7	23.8	8.1

* Percentages for a country may not add to 100 because of miscellaneous taxes and rounding errors.
Source: CSO, *Economic Trends*, May 1986.

How To Tax Fairly

In the last chapter we introduced two notions of equity: *horizontal equity*, or the equal treatment of equals, and *vertical equity*, the redistribution from the 'haves' to the 'have-nots'.

In Table 15-2 we showed that income tax is progressive. In taking proportionately more from the rich than from the less well off, income tax reflects the principle of *ability to pay*. There are two reasons society might think it fair that the rich should pay more. First, society may wish to take from the rich in order to give to the poor. Second, if money has to be raised to pay for public goods, society may wish to avoid taxing those whose incomes are already low. The principle of ability to pay thus reflects a concern about vertical equity.

A second principle is sometimes applied in discussing the extent to which unequal people should be treated unequally. *The benefits principle* argues that people who receive more than their share of public spending should pay more than their share of tax revenues. Car users should pay more towards public roads than people without a car should pay. And to some extent they do. Car users pay heavy duties on petrol and must pay licence fees for running a car.

However, the benefits principle often conflicts directly with the principle of ability to pay. If people who are most vulnerable to unemployment must pay the highest contributions to the government unemployment insurance scheme, it becomes very difficult to achieve a significant redistribution of income, wealth, or welfare. If the main objective is vertical equity, the ability to pay principle must usually take precedence.

Although Table 15-2 shows that the income tax system in the UK is progressive, it is the entire structure of taxes, transfers, and public spending that we must examine before we can judge how much the government is effectively redistributing from the rich to the poor.

We have already mentioned two factors that make the entire structure more progressive than an examination of income tax alone would

suggest. First, transfer payments actually give money out to the poor. The old get pensions, the unemployed get unemployment benefit, and, as a final safety net, anyone whose income from whatever source falls below a certain minimum is entitled to *supplementary benefit*. Second, the state provides public goods that can be consumed by the poor, even if they have not paid any taxes to finance these goods. In addition to pure public goods, such as defence, the state also makes free provision of certain goods, such as parks and swimming pools, which have part of the characteristics of a pure public good. Although the whole population cannot squeeze into Hyde Park, quite a few people can enjoy its amenities without spoiling the enjoyment of others. And since the rich tend to sit in their own gardens, public parks help redistribute enjoyment towards the poor.

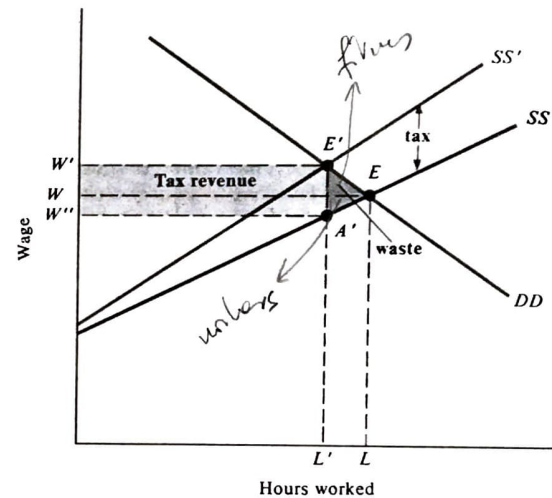
As against these progressive elements of the tax, transfer, and spending structure, it should be noted that there are some important *regressive* elements that take proportionately more from the poor. Beer and tobacco taxes are huge revenue-earners for the government. Yet the poor spend a much higher proportion of their income – in some cases even a larger absolute amount – on these goods than do the rich. Such taxes reduce the effectiveness of the tax, transfer and spending structure in redistributing from the rich to the poor.

Tax Incidence

The *incidence* of a tax measures the final tax burden on different people once we have allowed for the indirect as well as the direct effects of the tax. The ultimate effect of a tax can be very different from its apparent effect. Thus to get a really good idea of the extent to which taxes (or subsidies) alter people's spending power and welfare, we need to examine the issue of tax incidence in more detail.

Figure 15-3 shows the market for labour. *DD* is the market demand curve for labour and *SS* is the supply curve for labour, which we assume slopes upwards. Thus a higher wage rate increases the

FIGURE 15-3 A TAX ON WAGES. In the absence of a tax, free market equilibrium is at *E* and the wage is *W*. A wage tax makes the gross wage paid by firms higher than the net wage received by workers. Measuring gross wages on the vertical axis, the demand curve *DD* is unaltered by the imposition of the tax. Firms still choose the quantity of labour demanded to equate the gross wage to the marginal value product of labour. *SS* continues to show labour supply, but as a function of the *net* wage. To get labour supply in terms of the gross wage we must draw the new supply curve *SS'*. At each quantity of hours, *SS'* lies vertically above *SS* by a distance reflecting the tax on earnings from the last hour worked. The new equilibrium is at *E'*. The gross wage paid by firms is *W'* but the net wage received by workers is *W''*. The vertical distance *A'E'* shows the amount of the tax. Whether the government collects the tax revenue entirely from firms or entirely from workers, the *incidence* of the tax is the same. It falls partly on firms, who must pay a higher gross wage *W'*, and partly on workers, who receive the lower net wage *W''*. The area of pure waste *A'E'E* will shortly be discussed in the text.



supply of hours of work, but reduces the demand for hours of work. In the absence of an income tax (a tax on wages), the labour market will be in equilibrium at point *E*.

Now suppose the government imposes an income tax. If we measure the gross wage on the vertical axis, the demand curve *DD* is unaltered since it is the comparison of the gross wage with the marginal value product of labour that deter-

mines the quantity of labour demanded by firms. Workers' preferences or attitudes are also unchanged, but it is the wage net of tax that workers compare with the marginal value of their leisure in deciding how much labour to supply. Thus, although *SS* continues to show the labour supply curve in terms of the after-tax wage, we must draw in the higher schedule *SS'* to show the supply of labour in terms of the gross or pre-tax wage. The

vertical distance between SS' and SS measures the amount of tax being paid on earnings from the last hour's work.

Since DD and SS' now show the behaviour of firms and workers at any gross wage, the new equilibrium will be at the point E' . The new equilibrium gross wage is W' at which firms demand a quantity of hours L' . The vertical distance between A' and E' measures the tax being paid on earnings from the last hour of work. Thus the after-tax wage is W'' at which workers are happy to supply a quantity of hours L' .

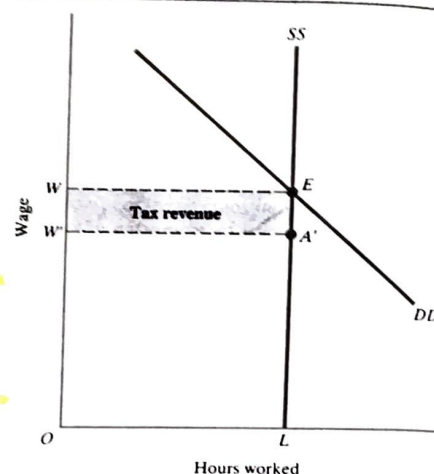
Relative to the original equilibrium wage W , the imposition of the tax on wages has raised the pre-tax wage to W' , but lowered the after-tax wage to W'' . It has raised the wage that firms must pay but lowered the take-home wage for workers. The incidence of the tax has fallen on both firms and workers even though, as a matter of administrative convenience, the tax may be collected by the government directly from workers.

The lesson from Figure 15-3 is an important one: the incidence or burden of a tax cannot be established by looking at who actually hands over the money to the government. Taxes usually alter equilibrium prices and quantities and these induced effects must also be taken into account. However, we can draw one very general conclusion. The more inelastic the supply curve and the more elastic the demand curve, the more the final incidence will fall on the seller rather than the purchaser.

Figure 15-4 depicts the extreme case in which the supply curve is completely inelastic. In the absence of a tax, equilibrium is at E and the wage is W . Since the vertical supply curve SS implies that a fixed quantity of hours L will be supplied whatever the after-tax wage, the imposition of a tax on wages leads to a new equilibrium at A' . Only if the pre-tax wage is unchanged will firms demand the quantity L that is supplied. Hence after-tax wages fall by the full amount of the tax. The entire incidence falls on the workers.

To check you have grasped the idea of incidence, try drawing for yourself a market with a relatively elastic supply curve and a relatively inelastic

FIGURE 15-4 TAXING A FACTOR IN INELASTIC SUPPLY. If the supply curve SS is vertical, a tax $A'E$ per unit leaves the quantity L unaffected. Since the demand curve DD is unaltered, the tax has no effect on the pre-tax wage rate. The full incidence of the tax falls on workers whose after-tax wage is reduced by the full amount of the tax.



demand curve. Show that the incidence of a tax will now fall mainly on the purchaser.¹

Taxation, Efficiency, and Waste

So far, we have been considering the equity implications of a tax. But we must also think about the efficiency implications of a tax. We can use Figure 15-3 again.

Before the tax is imposed, labour market equilibrium is at E . The wage W measures both

¹ By now you may be wondering whether we always show the effect of a tax as a shift in the supply curve. We do, provided we wish to measure the pre-tax price of the good or service on the vertical axis. If we want to measure the after-tax price on the vertical axis, the effect of the tax will be to shift not the supply curve but the demand curve. If you look again at Figures 15-3 and 15-4, you can see that in terms of the after-tax wage, the demand curve must shift down until it passes through the point A' . The distance between A' and E still measures the tax and we get exactly the same conclusions as before.

the marginal social benefit of the last hour of work and its marginal social cost. The demand curve DD tells us the marginal value product of labour, the extra benefit society could have from extra goods produced. The supply curve SS tells us the marginal value of the leisure being sacrificed in order to work another hour, the marginal social cost of extra work. Before the tax is imposed, the labour market is in equilibrium at E . Since marginal social cost and benefit are equal, this initial position is socially efficient.

When the tax is imposed, the new equilibrium is at E' . We have already discussed the incidence of the tax on firms and workers. The tax $A'E'$ increases the wage to firms to W' but reduces the after-tax wage for workers to W'' . But there is an additional tax burden or deadweight loss that is pure waste. It is the triangle $A'E'E$. By reducing the quantity of hours from L to L' , the tax causes society to stop using hours on which the marginal social benefit, the height of the demand curve DD , exceeds the marginal social cost, the height of the supply curve SS . By driving a wedge between the wage firms pay and the wage workers receive, the tax induces a distortion which destroys the efficiency of free market equilibrium.

Must Taxes Be Distortionary?

Governments need tax revenue to pay for public goods and to make transfer payments to the poor. Must taxes create distortions and lead to the waste or inefficiency which Figure 15-3 suggests?

Figure 15-4 showed what happens when a wage tax is levied but the supply of labour is completely inelastic. Although the tax reduces the take-home pay of workers, there is no change in the gross wage or the equilibrium quantity of hours. Since the quantity is unchanged, there is no distortionary triangle or deadweight burden. The equilibrium quantity remains the socially efficient quantity.

We can make this into a general principle.² When either the supply or the demand curve for a good or service is very inelastic, the imposition of

² This insight is more than 50 years old. See Frank Ramsey, 'The Optimal Structure of Commodity Taxation', *Economic Journal*, 1927.

a tax will lead only to a small change in quantity. Hence the deadweight burden triangle must be small. Given that the government must raise some tax revenue, the smallest amount of total waste will be achieved when the goods that are most inelastic in supply or demand are taxed most heavily.

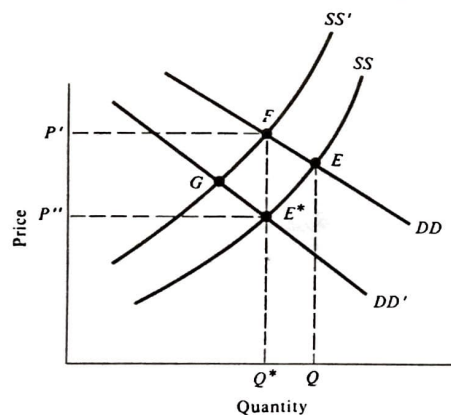
This principle finds practical expression in the UK tax system. The three most heavily taxed commodities are alcohol, tobacco, and the oil being extracted from the North Sea. For these commodities tax rates range from 50 to 90 per cent. Alcohol and tobacco are generally assumed to be products with a very inelastic demand. North Sea oil is inelastic supply. Having spent large amounts of money on exploration and drilling, oil companies are quite keen to recoup their investment, even if the government is taking a big slice off the top.³

So far, we have discussed the taxes that would do least harm to the allocative efficiency of the economy. Sometimes the government has the opportunity to levy taxes which will actually improve efficiency and reduce waste. The most important example is when externalities exist.

Cigarette smokers pollute the air for other people but take no account of this in deciding how much to smoke. They give rise to a harmful consumption externality. Figure 15-5 shows the supply curve SS of cigarette producers. Since there are no production externalities, this marginal private cost curve is also the marginal social cost curve. DD is the private demand curve showing the marginal benefit of cigarettes to smokers. Because there is a harmful consumption externality, the marginal social benefit DD' of cigarette consumption is lower than DD .

³ Why are tax rates not even higher? Recall from Chapter 4 that, if a demand curve is close to a straight line, the price elasticity of demand becomes more elastic as we move up the demand curve. The tax-inclusive price of alcohol and tobacco is now reaching a point where demand becomes elastic so that the government would actually lose revenue if duties were raised much further. Similarly, although the short-run supply of North Sea oil may be quite inelastic, the long-run supply may be much more elastic. If the tax rate becomes too high oil companies will stop searching for new oil.

FIGURE 15-5 TAXES TO OFFSET EXTERNALITIES. Given private demand DD and supply SS free market equilibrium is at E with a quantity Q . With a negative consumption externality, the social marginal benefit is DD' lying below DD . E^* is the socially efficient point at which output is Q^* . At this output the marginal externality is E^*F . By levying a tax of exactly E^*F per unit, the government can shift the private supply curve from SS to SS' leading to a new equilibrium at F at which the socially efficient quantity Q^* is produced and the deadweight burden of the externality E^*FE is eliminated.



In the absence of a tax, free market equilibrium is at E , but there is over-consumption of cigarettes. The socially efficient quantity is Q^* since marginal social cost and marginal social benefit are equated at E^* . Suppose the government levies a tax, equal to the vertical distance E^*F , on each packet of cigarettes. With the tax-inclusive price on the vertical axis, the demand curve DD is unaffected, but the supply curve shifts up to SS' . Each point on SS' then allows producers to receive the corresponding net-of-tax price on SS .

After the tax is introduced, equilibrium is at the point F . The socially efficient quantity Q^* is produced and consumed. Consumers pay the price P' and producers receive the price P'' after tax has been paid at the rate E^*F per unit.

Only the particular tax rate E^*F per unit will

guide the free market to the socially efficient allocation. A lower tax rate (including a zero tax rate) leads to too much consumption and production of cigarettes. A higher tax rate than E^*F will move consumers further up their demand curve and lead to under-consumption and under-production.

Why must the tax rate be exactly E^*F if the efficient quantity is to be achieved? Because this is exactly the amount of the externality on the last unit when the efficient quantity Q^* is produced. By levying a tax at precisely this rate, the government raises the price to the consumer above the price to the producer by the amount of the externality. Consumers are induced to behave as if they took account of the externality, though in fact they take account only of the after-tax price.

Whenever consumption or production externalities induce distortions in the free market equilibrium allocation, the government can improve efficiency and reduce waste by levying taxes. The fact that alcohol and tobacco have harmful externalities provides another reason for taxing them heavily.

15-4 TAXATION AND SUPPLY-SIDE ECONOMICS

We began the chapter by noting that many Western countries have become disenchanted with the extent of government involvement in the economy. In part, it was felt that governments were spending too much. Resources used to produce goods and services for the government cannot be used to make goods in the private sector. We shall have more to say about this in the next chapter. However, the major objection to high levels of government expenditure seems to have been associated with the need for correspondingly high levels of revenue collection. Table 15-3 reminds us that some government expenditure is financed by borrowing. In the UK this is known as the public sector borrowing requirement (PSBR). In Part 4 we shall examine the argument that a high PSBR leads to high inflation, high interest rates, or both. For the moment we ignore government

borrowing and consider the argument that high taxation to pay for high levels of public spending necessarily strangles the economy.

We have already seen that in order to pay for public goods and redistribution the government must raise tax revenues, which typically introduces allocative distortions and leads to a dead-weight burden. Suppose the government adopts a less ambitious spending programme and is therefore able to reduce income tax rates. What will be the consequences?

First, by spending less on goods and services, the government will free some resources which can now be used by the private sector. If it were true that the private sector uses resources more productively than the public sector, the transfer of resources might directly produce more output. The total supply of goods and services would rise. Whether or not the private sector does use resources more productively on average than the government remains a contentious issue.

What about the effects of lower income tax rates? Figure 15-3 suggests that income taxes introduce a distortion that leads to a level of work that is socially inefficient. With lower taxes and a smaller distortion there would be a lower dead-weight burden. Since the distortion leads to a level of work that is lower than the socially efficient amount, cutting income taxes would also increase the amount of work done in the economy.

How large could this effect be? It all depends on the elasticity of labour supply. The more inelastic the labour supply, the lower is the distortion introduced by any particular income tax rate. When labour supply is completely inelastic as in Figure 15-4, income tax does not induce any distortion at all and there will be no allocative gain in reducing income tax rates.

In Chapter 10 we showed that an increase in the after-tax wage (as for example when income tax rates are cut) will have a substitution effect, tending to make people work longer hours, but an income effect, tending to make them work fewer hours. With higher after-tax wages it takes fewer hours to earn any given target income. Hence we argued that, for people already in work,

changes in after-tax wage rates have only a small effect on hours of work supplied. Then we showed that increasing the after-tax wage *would* encourage labour force participation by those not currently in the labour force. Hence, taking hours and participation together, the supply curve of labour input (hours times people) will not be completely vertical. Cutting income tax *will* increase the supply of labour input, chiefly by attracting new workers into the labour force. But the total effect on labour supply might not be as large as some proponents of tax cuts believe.

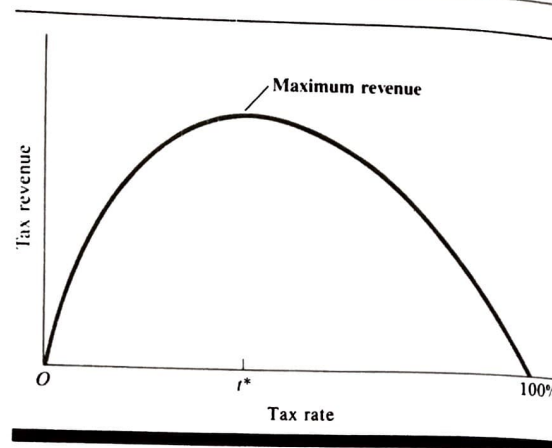
In contrast, the tax cut enthusiasts believe that income tax is a major distortion and labour supply is very elastic. The socially efficient quantity of labour input would then be much larger than the equilibrium level under current tax rates. One illustration of this view is the famous Laffer curve, named after Professor Arthur Laffer, one of President Reagan's most influential economic advisers.

Suppose, for example, that all government tax revenue was raised through income tax. Figure 15-6 shows that with a zero tax rate the government would raise zero revenue. At the opposite extreme, with a 100 per cent income tax rate, there would be no point working and again tax revenue would be zero. Beginning from a zero rate, a small increase in the tax rate will yield some tax revenue. Initially revenue rises with the tax rate, but beyond the tax rate t^* higher taxes have major disincentive effects on work effort and revenue starts to fall.

Professor Laffer's idea was that many 'big government-big tax' countries are now at tax rates above t^* . If so, tax cuts would be the miracle cure. Everybody likes a tax cut but the government would actually raise *more* revenue by cutting taxes. By reducing the tax distortion and increasing the amount of work *a lot*, lower taxes would be more than compensated by the extra work and incomes to which the tax rates were applied.

It is not the shape of the Laffer curve that is in dispute. Rather, what many professional economists in the UK, the United States, and other Western countries have disputed is that these

FIGURE 15-6 THE LAFFER CURVE. The Laffer curve shows the relationship between tax rates and tax revenue. Moderate tax rates raise some revenue. Beyond t^* , higher tax rates reduce revenue because disincentive effects greatly reduce the supply of the quantity being taxed. At 100 per cent tax rate, supply and revenue will be zero again.



economies do *in fact* have tax rates above t^* . Most economists' reading of the empirical evidence is that our economies lie to the left of t^* . Figure 15-3 implies that cutting income tax rates may eliminate some of the deadweight burden of distortionary taxation, but governments should probably expect their tax revenue to decline if such policies are put into effect. Hence, if governments do wish to reduce tax rates without adding to government borrowing it is essential that they reduce their spending.

15-5 PUBLIC CHOICE

Thus far we have studied how governments *should* behave. We also need a theory of how they actually behave. The theory of public choice tries to understand how the political process works. How will resources be allocated by governments in the real world?

The private citizens who make up society influence the process of public decision making in two ways. First, they elect representatives during elections held at regular intervals. Second, pressure groups or organized collections of interested citizens lobby their elected representatives between elections, perhaps by threatening to take

concerted action at the next election unless their lobbying is heeded.

The executive or government is the set of people that proposes laws and makes decisions subject to the general approval of the elected representatives. Civil servants and other bureaucrats are then instructed to implement the decisions made by the government.

The most serious question is whether the final result has much to do with the preferences of the voters. To examine how things might go wrong, we consider in turn the voting procedure for making decisions, the objectives of legislators, and the objectives of bureaucrats.

Voting

If everyone were identical and of one mind, public decision-making would be easy. The most important problem society solves through the political process is how to reconcile different views and different interests. In this section we discuss two features of majority voting. The first is the *paradox of voting*, which concerns cases where majority voting will lead to inconsistent decision-making. The second is the *median voter result*, which shows how public choice will tend to avoid extreme outcomes.

The Paradox of Voting Table 15-5 shows how voters 1, 2, and 3 rank three possible outcomes A, B, and C. For example, voter 1 likes A best, then B, then C. Let the group choose by *majority vote* between outcomes A and B. Voters 1 and 3 prefer A to B so the group will prefer A to B by two votes to one. Similarly, the group will vote two to one for outcome B rather than C. Since A is preferred

TABLE 15-5
THE PARADOX OF VOTING

VOTER	EACH VOTER'S RANKING OF OUTCOMES A, B, AND C		
	A	B	C
1	1	2	3
2	3	1	2
3	2	3	1

to B, and B preferred to C, you might expect the group to prefer A to C. But the first and third columns of Table 15-5 imply that the group would choose C rather than A by two votes to one. When individual preferences are as depicted in Table 15-5 majority voting will choose A over B, B over C, and C over A. *Consistent* decision-making will not be possible under majority voting.

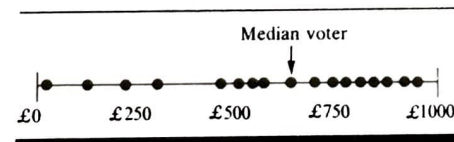
This is a serious problem. Society cannot necessarily rely on majority voting to lead to consistent decision-making.⁴ It also means that the decisions taken by society may well depend on the order in which it votes on them.

The Median Voter Majority voting does not always lead to inconsistent public choice. Figure 15-7 shows for 17 voters how much between £0 and £1000 each would like to spend on the police. Each dot represents an individual voter's preferred amount.

We also assume that each voter will vote for a spending level close to his or her own preferred

⁴ Professor Kenneth Arrow of Stanford University won the Nobel Prize in economics in part for his work on this problem. Since each individual acting alone would make consistent choices, Arrow showed that to guarantee consistent decisions in public choice it would be necessary to allow one person alone (a dictator!) to make decisions. The proof is based on the paradox of voting.

FIGURE 15-7 THE MEDIAN VOTER. Each dot represents the preferred expenditure of each of 17 voters. The outcome under majority voting will be the level preferred by the median voter. Everybody to the left will prefer the median voter's position to any higher spending level. Everybody to the right will prefer it to any lower spending level. The median voter's position is the only position that cannot be outvoted against some alternative. Hence it will be chosen.



amount rather than for one that is further away. A voter who wants to spend £250 will prefer £300 to £400 and will prefer £200 to £100. Each person has *single-peaked* preferences, being happier with an outcome the closer it is to the peak or preferred level as judged by that individual.

Now suppose there is a vote on how much to spend on the police. A proposal to spend £0 would be defeated by 16 votes to 1. Only the voter represented by the left-hand dot in Figure 15-7 would vote for £0 rather than £100. As we move to the right we get more people voting for any particular proposal. Figure 15-7 emphasizes the special position of the median voter. With 17 voters, the median voter is the person who wants to spend the ninth-highest amount on the police. There are 8 voters wanting to spend more and 8 wanting to spend less. The median voter is the person in the middle on this particular issue.

What is special about the median voter? Suppose the vote is between the amount the median voter wants to spend and some higher amount. The 8 people wanting less than either will vote for the median voter's proposal, and so will the median voter. There will be a majority against higher expenditure. By an identical argument there will be a 9-8 majority against lower expenditure when the alternative is the amount wanted by the median voter. Hence the median voter's preferred outcome will be the one that is chosen by majority voting.

Thus, majority voting works when each individual has single-peaked preferences. The paradox of voting arises in Table 15-5 precisely because preferences are not single-peaked. Suppose outcome A is low expenditure, B is moderate expenditure, and C is high expenditure on the police. Voter 1 prefers low to moderate and moderate to high. Voter 1 has single-peaked preferences. So does voter 2, whose peak is at moderate expenditure. But voter 3 prefers high to low and low to moderate expenditure, even though moderate expenditure is closer than low expenditure to the best outcome of high expenditure. Voter 3 does not have single-peaked preferences.

This is why majority voting is likely to get into trouble when individual preferences are not single-peaked. In contrast, with single-peaked preferences the outcome is likely to be that most preferred by the median voter. Consistent public choice under majority voting on particular issues is more likely the more each voter feels that the next best thing is an outcome close to that voter's preferred outcome. On issues where voters feel they must make an all-or-nothing choice between very different alternatives, intermediate positions are a complete waste of time. The failure of preferences to be single-peaked may result in inconsistent public choices.

Legislators

When preferences are single-peaked the median voter model helps us to understand how society makes decisions on particular issues, especially if there is a referendum on the issue. But the process of making decisions through legislative compromises is much more complicated. Decisions are not made issue by issue. There may be a trading of votes between different issues so that an individual gets a package that is preferred. *Logrolling* is one example.

Table 15-6 shows two issues, A and B, and three legislators, 1, 2, and 3. The value in pounds of each outcome to each individual is shown. These values are merely illustrative measures of how much each individual stands to gain or lose under

TABLE 15-6
LOGROLLING

PERSON	A	B
1	-4	-1
2	-3	4
3	6	-1

each outcome. Suppose each person votes for a proposal only if the outcome is positive. Person 1 votes against A and B, person 2 against A but for B, and person 3 for A but against B. Both issues would be defeated on a majority vote.

Now suppose persons 2 and 3 do a deal and vote together. Suppose they decide to vote for A, which person 3 wants, and for B, which person 2 wants. Person 2 will make a net gain of +£1, gaining £4 since B passes, and losing only £3 when A passes. Person 3 gains a total of £5, gaining £6 since A passes and only losing £1 when B passes. By forming a coalition they do better than they would have done under independent majority voting, when neither A nor B would have passed.

This kind of model helps us understand some behaviour by politicians, but they are subject to many other forces. They want to do good, to be powerful, to be popular, and above all to be re-elected. Even if society as a whole has consistent goals, it does not follow that politicians will act so as to reflect those goals as faithfully as possible.

Civil Servants

Civil servants influence public decision-making and its execution in two ways. They offer advice and expertise, which influence the government in deciding how laws and policies should be framed. They are also responsible for carrying out the enacted laws and stated policies and may have some discretion in how far and how fast to put into practice the directives with which they have been issued.

Civil servants also have vested interests. Those at the defence ministry are likely to try to persuade the government to expand defence activities. Those in education will press for higher spending

on education. Although the final responsibility must be taken by elected politicians, governments sometimes argue that civil servants are quite skilled in obstructing policies that the civil servants do not like.

The main point of this section is that the process through which governments make spending and taxing decisions does not magically and automatically translate society's wishes into the appropriate

action. Indeed, as the paradox of voting shows, it may be impossible for society always to express consistent aims. The simple view that the government acts to maximize the public good is a convenient one on which we frequently fall back. But a complete understanding of how public choices are made, and could possibly be made, requires an extension of the ideas we have briefly examined in this section.

SUMMARY

1 In industrialized economies, government revenues come mainly from direct taxes on personal incomes and company profits, indirect taxes on purchases of goods and services, and contributions to state-run social security schemes. Government spending comprises spending on goods and services and transfer payments.

2 Government intervention in a market economy should be assessed against the criteria of distributional equity and allocative efficiency. A progressive tax and transfer system takes most from the rich and give most to the poor. The UK tax and transfer system is mildly progressive. The less well off do receive transfer payments and the rich face the highest rates of income tax. Although some necessities, notably food, are exempt from VAT, other goods intensively consumed by the poor, notably cigarettes and alcohol, are heavily taxed.

3 Externalities and public goods are classic cases of market failure where intervention may improve allocative efficiency. By taxing or subsidizing goods that involve externalities, the government can induce the private sector to behave as if it takes account of the externality, thus eliminating the deadweight burden arising from the misallocation induced by the externality distortion.

4 A pure public good is a good for which one person's consumption does not reduce the quantity available for consumption by others. Together with the impossibility of effectively excluding people from consuming it, this implies that all individuals consume the same quantity, although they may attach different utility to this consumption if their tastes differ.

5 A free market will undersupply a public good because of the free-rider problem. Individuals need not offer to pay for a good that they can consume if others pay for it. The socially efficient quantity of a public good equates the marginal social cost of production to the *sum* of the marginal private benefits over all people at this output level. Diagrammatically, this implies that individual demand curves are vertically added to get the social demand or marginal benefit curve.