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3.1 Introduction

Income tax was first introduced to Britain during the Napoleonic Wars, but it became a permanent feature of the tax system only in 1842. Although there has been an increase both in tax rates and in the number of taxpayers, much of the administrative structure of the system has remained unchanged. This superficial continuity, however, masks far-reaching changes in the economic effects of the tax system, especially since the Second World War. Many of these changes concern the taxation of income from capital.

A government with an overall parliamentary majority finds it easy to alter both the structure and the rates of tax. Most finance acts in recent years have contained significant innovations. Since the Second World War there have been four major reforms of corporation tax, the introduction and subsequent major overhaul of a capital gains tax, a reform of capital transfer taxation, and a rapid growth in tax-exempt saving via financial intermediaries (such as pension funds and life insurance companies). One of the principal motives for these changes was a desire to increase the incentives to save and invest, in an effort to raise the growth rate of industrial productivity. From a situation in which the tax system could be said to approximate a tax on economic income, Britain has moved over the past thirty years to a situation in which many types of investment attract 100 percent first-year allowances. There has been a gradual move from an income-based tax system to an expenditure-based tax system, albeit an uncoordinated change based on a series of ad hoc reforms.¹ Part of this shift resulted from attempts to adjust the tax system

1. There have been occasional hiccups, but these have usually proved temporary. The latest move away from an expenditure tax treatment is the change in stock relief (see section 3.2.3).

for the effects of inflation. In the decade 1970–79 the average annual rate of increase of the consumption goods deflator was 12.76 percent, and that for the investment goods deflator was 14.37 percent. The average of 13.57 percent was high in comparison with that of Britain's major competitors and led to concern about the effects of inflation on the taxation of corporate profits and investment income in general. At the corporate level, investment incentives were gradually extended, and a system of "stock relief" was introduced to remove the inflation-induced increase in inventory values from the tax base. The effects of inflation on personal investment income were ameliorated by an expansion of investment in tax-exempt forms, the introduction of government index-linked bonds, and (in 1982) the partial indexation of capital gains tax by an adjustment to the asset's acquisition cost.

Some of the other major changes in the postwar period include the introduction of value-added tax (replacing purchase tax) in 1973, the

Table 3.1 **Sources of Tax Revenue, United Kingdom, 1960–79**

Revenue Source	Share of Total Receipts (%)			Total Receipts (£ million)
	1960	1970	1979	1979
Taxes on personal incomes	27.8	31.1	31.3	20,169
Wages and salaries			25.2	16,251
Dividend, interest, trading income			3.9	2,535
Capital gains			0.6	413
Other			1.5	970
Taxes on corporate incomes	9.7	9.2	7.6	4,918
Social security contributions	12.6	13.9	17.3	11,169
By employers			10.4	6,666
By employees			6.6	4,237
By self-employed			0.4	266
Payroll taxes	0	4.4	4.4	2,853
Property taxes	15.2	12.5	12.2	7,849
Value-added tax ^a	7.3	6.5	10.3	6,617
Taxes on specific goods and services	25.6	19.9	14.9	9,601
Alcohol			3.7	2,638
Tobacco			3.8	2,474
Petroleum			4.3	2,777
Other			3.1	1,982
Miscellaneous taxes	1.9	2.5	1.9	1,214
Total receipts	100.0	100.0	100.0	64,390
Gross domestic product (£ million)	25,520	50,780	189,270	
Share of taxes in GDP (%)	28.15	35.85	34.02	

Source: *Revenue Statistics of OECD Member Countries, 1965–1980* (Paris, 1981), table 59; International Monetary Fund, *International Financial Statistics*.

^aFor 1960 and 1970, purchase tax.

reduction in the higher rates of personal tax in 1979 such that the top rate of tax on earned income is now 60 percent, and the gradual reduction in the deductibility of interest payments. With few exceptions, the only interest payments that are tax deductible in the United Kingdom are payments on loans for business purposes or for the purchase or improvement of a principal residence. There is, in fact, a limit on the latter in that (in 1982) only interest on loans up to £25,000 was tax deductible, and this nominal limit had remained constant for a number of years. If the nominal limit remains constant, then the effective deduction of interest payments for home purchase will be further reduced. There is no taxation of imputed rental income of owner-occupied housing (schedule A taxation of imputed rental income was abolished in 1963), and so housing is one of the assets most favorably treated for tax purposes. It is therefore not surprising that most net personal saving has in recent years been channeled into owner-occupied housing, pension funds, and savings through life insurance companies.

The relative importance of different taxes in the United Kingdom in 1979 is shown in table 3.1. The share of total tax revenue in gross domestic product is 34 percent, a figure similar to the average for the OECD countries. Only a small proportion of total revenue is derived from taxes on income from capital, and there has been an increasing reliance on receipts from value-added tax and social security contributions, which brings the United Kingdom more into line with its Common Market partners. These aggregated figures, however, give little indication of the effective marginal tax rates on income from capital, and it is to the calculation of such rates that we now turn.

3.2 The Tax System

3.2.1 The Personal Income Tax

The principal characteristics of personal taxation in the United Kingdom are, first, the relatively small number of allowances against taxable income; second, the high initial tax rate (currently 30 percent); and, third, the broad band of income that is taxed at the basic rate of income tax. All taxpayers receive a personal allowance that is the amount of income they can receive free of tax. In fiscal years 1980–81 and 1981–82 this allowance was £1,375 per annum for the single taxpayer. All income beyond this amount is subject to tax. The first band of taxable income is taxed at the basic rate, and the band is so broad that most taxpayers face a marginal tax rate equal to the basic rate. In 1980–81 the first £11,250 of taxable income was taxed at this basic rate of 30 percent.

The degree of progression in marginal rates is shown in table 3.2, which sets out the tax rates and the bands of taxable earned income to which

Table 3.2 Rates of Income Tax 1980-81 and 1981-82

	Slice of Taxable Income (£)	Rate of Tax, (%)
Basic rate	1-11,250	30
Higher rates	11,251-13,250	40
	13,251-16,750	45
	16,751-22,250	50
	22,251-27,750	55
	27,751 upward	60

Source: *Inland Revenue Statistics*, 1981, table A.2.

they applied in the period 1980-82. The maximum marginal tax rate on earned income is 60 percent. Fewer than 5 percent of taxpayers pay tax at a marginal rate greater than the basic rate (in 1980/81 the proportion was 3.4 percent), so that for the vast majority of taxpayers the United Kingdom income tax approximates a "linear" tax system.

In addition to income tax, social security (National Insurance) contributions are levied on earned income. In 1980-81 the combined rate on employer and employee was 13.45 percent of pretax income. Since the social security system is not an insurance system in any genuine sense, these rates are equivalent to additional marginal tax rates on earned income. The effective marginal tax rate on labor costs, for someone paying tax at the basic rate, is $(30 + 13.45)$ divided by labor costs. Since the employer's contribution of 9.2 percent is not taxable income to the employee, these total labor costs consist of pretax earnings of 100 and employer's contributions of 9.2. Thus the marginal rate is 39.8 percent. The contribution rates quoted are those for taxpayers contracted out of the State Earnings-Related Pension Scheme, who are in consequence in a private occupational pension scheme.

Investment income is subject to the same schedule of rates as earned income, although if investment income in total is greater than a certain value it is subject to additional rates of tax. In the period 1980-82, if net investment income exceeded £5,500, that excess was subject to an investment income surcharge at the rate of 15 percent. This means that the highest marginal tax rate on investment income was 75 percent. But this rate applied only to those persons with a total taxable income in excess of £27,750 and more than £5,500 of investment income.

Deductibility of interest payments is much more restrictive in the United Kingdom than is typically the case elsewhere (except for West Germany, as seen in chap. 5). There is therefore an asymmetry in the tax treatment of investment income in that receipts of interest and dividends

are taxed whereas, in general, payments of interest on loans taken out to purchase securities are not deductible.

Capital gains are taxed at a special tax rate. The tax is levied only upon net realized gains (that is, realized gains less realized losses), and in 1980–82 the first £3,000 of such gains was not liable for tax. The remainder was taxed at 30 percent. In 1980 no allowance was made for inflation, but in 1982 a major change in capital gains tax took place in the wake of the availability of index-linked government securities to all investors (domestic and foreign investors, taxed and tax exempt alike). Capital gains tax was indexed by allowing the acquisition cost of an asset to be adjusted by the increase in the retail price index that occurred after the asset had been held for one year (or after April 1982 for assets purchased before April 1981). Hence, apart from inflation during the first year of ownership, the indexation for inflation is complete.² In addition, the threshold was raised such that the first £5,000 of gains in any one year is free of tax. Since capital gains are now defined in real terms, the rationale for such a high threshold is unclear. It had previously been defended as a substitute for indexation.³ The revenues from capital gains tax are likely to become very small in the long run. More important, there is an unresolved issue as to how long the system will be able to function with one channel of rewards taxed on an indexed basis and other channels (such as interest income on debt) taxed on an unindexed basis.

The taxation of households has been subject to a good deal of debate, and the present system is unlikely to remain unchanged for long. The basic premise of the tax system is that a wife is a dependent of her husband. A wife's income is therefore added to her husband's to obtain their joint income, and the husband is liable for the resulting tax payment. In recognition of the husband's responsibility for his wife, he receives a married man's allowance (in 1981–82, £2,145 per annum), which has in the past been approximately 1.5 times the single person's allowance. In addition, if a wife receives earned income in her own right, then she receives a single person's allowance against that income. Consequently, a married couple receives a higher tax allowance than two single people living together. But if their joint income is high, the fact that the income is aggregated and may be subject to higher rates of tax means that the benefit of the additional allowance may be more than offset by the burden of the higher rates. To deal with this, the tax code permits a husband and wife to elect to be taxed separately on their earned income. In this case the earned income of each partner is taxed individually. The husband forgoes the married man's allowance and receives a single

2. The adjustment for inflation cannot, however, give rise to an allowable loss.

3. The present defense of the high threshold appears to be that it is a substitute for making indexation retrospective to 1965, when capital gains tax was introduced.

person's allowance instead. Investment income continues, however, to be taxed jointly, though not symmetrically, and a wife's investment income is added to the total income of her husband.

Debate about this system centers on two aspects. First, the married man's tax allowance affords generous tax treatment of two-earner couples. Second, the system is not symmetrical between husband and wife in the sense that the total tax liability of the household is a function of whether it is the husband or the wife who receives a particular amount of income.⁴ Debate on both these points has been lively.⁵ Although it is improbable that totally separate taxation of all income will be introduced, the likely outcome is the introduction of separate taxation of earned income with the phasing out of the married man's allowance, and a symmetrical treatment of aggregate investment income.

Since the introduction of child benefit (cash allowances for children), there have been no child tax allowances (apart from certain transitional arrangements and allowances for children living overseas). There is, however, a special allowance for the head of a one-parent family to ensure that such a person receives an allowance equal to that of a married man rather than that of a single person.

The degree of progression implied by the rate structure depends upon the pattern of average tax rates, whereas the disincentive to work is a function of the marginal tax rate.⁶ Both average and marginal rates at different levels of earnings are shown in table 3.3. Part A of the table shows the tax rates for a married man receiving tax allowances of £2,000 (for mortgage interest payments) in addition to the married man's allowance in the period 1978–82. Each row shows the marginal and average tax rate for a constant level of money income throughout the period. More realistic perhaps is the comparison of tax rates on constant real income levels, and in part B of table 3.3 we show the tax rates on constant levels of money income at 1982 prices (but holding nominal mortgage interest constant). The table shows clearly the reduction in tax rates made by the incoming Conservative government in 1979 when the basic rate of income tax fell from 33 to 30 percent, and the top rate on earned income was reduced from 83 to 60 percent. But part B of the table shows also that average tax rates were higher in 1982 than before the 1979 budget for almost all earners, except those at the very top of the distribution, earning more than £30,000 per annum. Moreover, these figures include neither National Insurance contributions nor value-added tax, both of

4. This is because investment income, of either partner, is always aggregated with the earned income of the husband and hence taxed at a rate determined by the size of the husband's earnings rather than by the earnings of either the household or the higher earner.

5. The government's view of alternative schemes has been set out in a green paper. "The Taxation of Husband and Wife" (Cmnd. 8093, London: HMSO, 1980).

6. Strictly speaking, it is the pattern of marginal tax rates over the range of earnings opportunities that is relevant.

Table 3.3 Income Tax Rates 1978-82
(%)

A. Constant Money Incomes						
Gross Income, All Earned (1982 £)	Marginal Tax Rate			Average Tax Rate		
	1978-79	1979-80	1980-82	1978-79	1979-80	1980-82
5,000	33	30	30	9.7	7.1	5.1
10,000	33	30	30	21.3	18.6	17.6
15,000	55	40	30	27.9	22.9	21.7
20,000	70	50	45	36.4	28.5	26.7
25,000	75	55	50	43.7	33.1	31.2
30,000	83	60	55	49.6	36.9	34.6
50,000	83	60	60	63.0	46.1	44.8
100,000	83	60	60	73.0	53.1	52.3

B. Constant Real Incomes								
Gross Income (1982 £)	Marginal Tax Rate			Average Tax Rate				
	1978-79	1979-80	1980-81	1981-82	1978-79	1979-80	1980-81	1981-82
5,000	0	25	30	30	0	0.002	2.3	5.1
10,000	33	30	30	30	14.6	14.7	16.2	17.6
15,000	33	30	30	30	20.7	19.8	20.8	21.7
20,000	45	40	45	45	25.0	23.4	24.7	26.7
25,000	60	50	50	50	30.8	27.8	29.1	31.2
30,000	70	50	55	55	36.4	31.5	32.7	34.9
50,000	83	60	60	60	52.9	42.1	43.1	44.8
100,000	83	60	60	60	67.9	51.0	51.5	52.3

Source: Own calculations based on *Inland Revenue Statistics*, 1981, tables A.1 and A.2; *Economic Trends*, March 1982, p. 42.

Note: Tax rates are those applying to a married man with allowances of £2,000 plus the married man's allowance. In panel B the income level at 1982 prices was converted to a money income for each year by the general index of retail prices for the third quarter of the year (midpoint of the fiscal year). The actual tax schedule was then applied to the computed money income level.

which have risen since 1979 and both of which contribute to the tax “wedge” between work and leisure. Marginal tax rates have, however, fallen for individuals in the top two percentiles of the earnings distribution.

The degree of progression in the 1980–82 rate structure is illustrated also in figure 3.1, which shows marginal and average tax rates for a married man. The figure shows the effect of the broad basic rate band on the average rate curve, the slope of which changes nonmonotonically as income rises.⁷ The effect of the rate structure may be illustrated also in terms of the net income elasticity curve, which shows the percentage increase in net income corresponding to a 1 percent increase in gross (pretax) income for a married man at different earnings levels.

3.2.2 The Corporate Tax System

The United Kingdom provides an excellent case study for examining the effects of different corporate taxes because of the frequent changes of system since the war. In this respect the United Kingdom experience is unique and may afford lessons for other countries.

The continuing debate on corporate taxation has been concerned with three main issues. First, the relative taxation of dividends and capital gains, and hence the incentives to use internal as opposed to external finance, has been a matter on which successive governments have felt sufficiently concerned to change the system of corporation tax. Since the war, four different tax systems have been used. Second, the tax has gradually been changed from one based on a measure of profits in the direction of one based on cash flow. Concern about low levels of investment, particularly in manufacturing, has led successive governments to increase tax allowances for capital investment in fixed assets. From a position after the war in which tax allowances approximated “economic depreciation,” the United Kingdom has now arrived at a point where a large proportion of investment qualifies for 100 percent first-year allowances. In addition, investment in particular “depressed” areas qualifies for cash grants. Depreciation allowances and investment grants are discussed further in sections 3.2.3 and 3.2.4, respectively. Third, the inflationary experience in the 1970s raised questions about the appropriate definition of the corporate tax base. By then the tax base had already moved far enough from any concept of economic profits that the issue of adjusting profits for inflation was confused with the desirability of moving to a cash flow basis of corporation tax. Inflation causes particular problems for the taxation of inventory profits, and a temporary system of

7. The nonmonotonicity would be even more apparent were national insurance contributions included. Because of the ceiling on the level of earnings on which contributions are paid, the marginal tax rate actually falls at a level of earnings below that on which the higher rates of tax are charged.

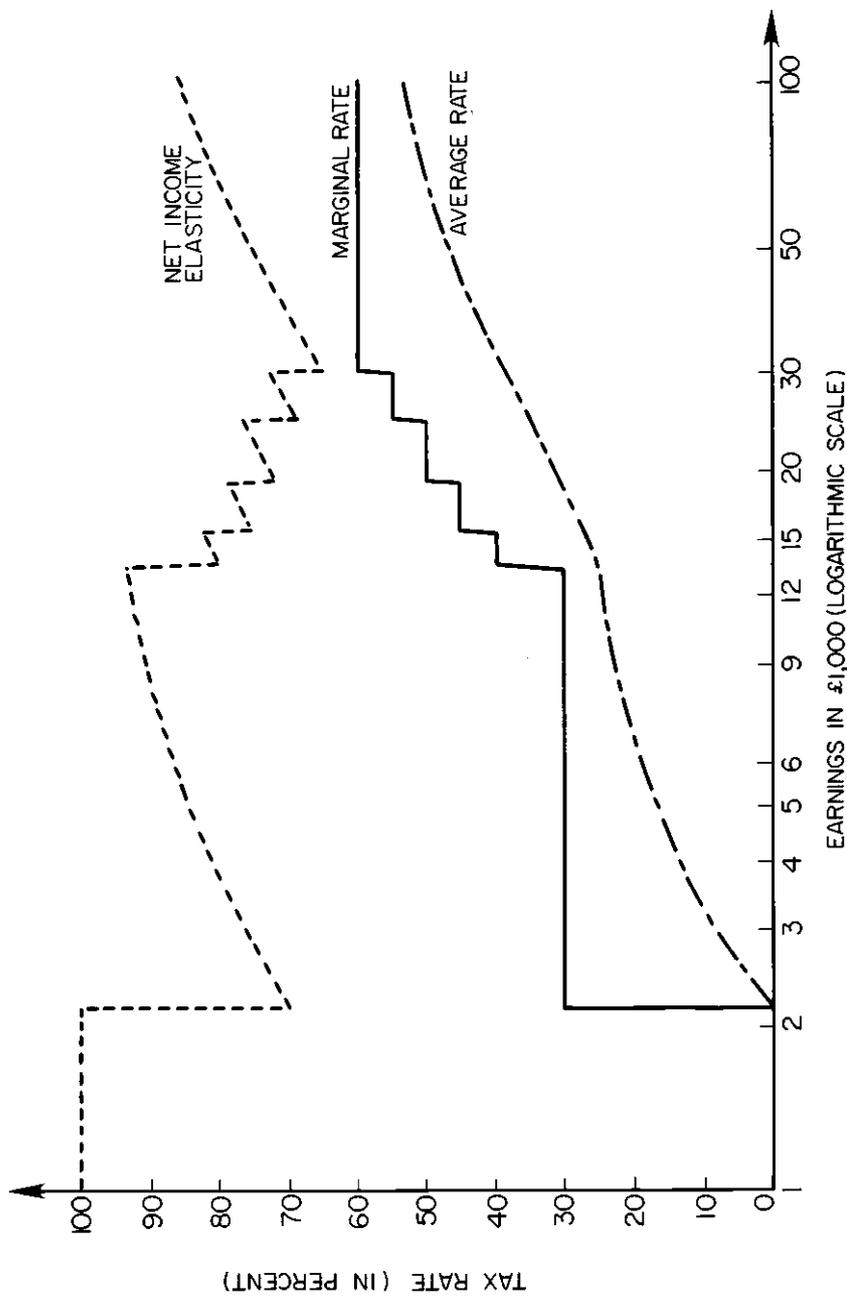


Fig. 3.1 Income tax structure in the United Kingdom, 1980-82: married man. From *Inland Revenue Statistics*, 1980, chart 1.5.

relief (stock relief) was introduced in 1974. Successive chancellors of the exchequer promised that a permanent reform was just around the corner and waited for the accounting profession to agree on a system for accounting in an inflationary period. But in the absence of a clear consensus, further changes were introduced in 1981, and the government implicitly acknowledged that the appropriate reform of corporation tax no longer depended upon the deliberations of the accounting profession.

The number of changes, and their size, mean that the United Kingdom has experimented with corporate taxation in so many ways that it is highly misleading to represent the effects of the corporate tax system by a single tax rate, namely the statutory rate of tax. We discuss below the economic consequences of some of the changes. Nor have the changes led to a stable system. In 1982 the government published a green paper on corporation tax (*Corporation tax 1982*), which set out a number of avenues for reform. The green paper drew attention to the problems with the present system, but it is clear that a further period of debate will precede any new legislation. It is likely that future reform will be undertaken by the party or parties to emerge victorious from the next election. The only safe prediction is that there will indeed be future legislation on corporation tax.

In the postwar period, four corporate tax systems have been tried. Between 1947 and 1958 a two-rate system was in force, in which undistributed profits were taxed at one rate of profits tax and distributed profits were taxed at a higher rate. The second system, in force between 1958 and 1965, abolished the differential element in profits taxation. Both distributed and undistributed profits were taxed at a single rate. In addition, shareholders were given credit for tax paid on dividends at the corporate level. In effect, this was an imputation system in which the rate of imputation was set equal to the basic rate of income tax. Although similar in principle to the two-rate system, the system in force between 1958 and 1965 had the effect of reducing the tax burden on dividends relative to that on retentions.

The advent of a Labour government in 1965 saw the introduction of a straightforward system of corporation tax. Under this system profits were taxed at a single rate of corporation tax, and the shareholders were charged income tax on dividends and capital gains tax (introduced at the same time) on realized capital gains. The change raised the tax burden on dividends relative to that on retentions. But in 1973 the Conservative government went back to an imputation system with a single rate of corporation tax and an imputation rate equal to the basic rate of personal income tax. This system is still in force, and since 1974 the rate of corporation tax has been constant at 52 percent. The rate of imputation is, in practice, kept equal to the basic rate of tax to reduce the number of

taxpayers from whom additional tax on dividends must be sought and to whom refunds must be paid. Shareholders whose marginal tax rates are greater than the basic rate thus pay additional personal taxes on dividends, and shareholders whose personal tax rates are less than the basic rate receive refunds. The only shareholders for whom the marginal tax rates are less than the rate of imputation are those with a zero tax rate, and the bulk of these consist of pension funds and the pension business of life insurance companies. Such bodies receive regular and substantial refunds from the Inland Revenue under the imputation system. The principle of the system is that part of the corporate tax bill is regarded as income tax at the basic rate on distributions of dividends.

To prevent tax avoidance, companies must pay income tax at the basic rate to the Inland Revenue when dividends are distributed. Such payments are made in advance of the date when corporation tax would normally be paid, and since they are also part of the corporate tax bill, they are termed advance corporation tax (ACT). Since part of the corporate tax bill is effectively income tax at the basic rate on distributed profits, it makes sense to regard this part of company taxes as really personal taxation. This element, which is equivalent to advance corporation tax, would be paid as income tax even if corporation tax were abolished. Hence the total of company taxes minus ACT is usually termed "mainstream" corporation tax, and it is this figure that is equivalent to the revenues from corporate income tax under a classical system.

The imputation system provides credit to the shareholders for tax paid on their behalf by the company. But when companies have no tax liability it is necessary for the prevention of tax avoidance that imputation relief be withdrawn. This is now a serious problem in the United Kingdom because, in any year, approximately half of all companies have no mainstream corporate tax liability. This arises from the generous first-year allowances and the deductibility of nominal interest payments. To prevent tax avoidance, the Inland Revenue must collect "advance corporation tax" on dividends that, for companies with zero mainstream tax liabilities, cannot then be credited against payments of corporation tax (although the unrelieved ACT can be carried forward). This unrelieved ACT has been the subject of great concern, but the concern has been largely misplaced. The principle of imputation is that relief can be granted only for tax paid by the company. To do otherwise would create further possibilities for tax avoidance (for a detailed analysis see King 1977, chap. 4). The problem of unrelieved tax liabilities has nothing to do with ACT as such but concerns the result of an asymmetric tax system that taxes positive profits but does not provide refunds on tax losses. Of course such losses may be carried forward, but in the United Kingdom there are many companies with substantial cumulative losses that have no

immediate prospect of seeing a positive taxable income. In the absence of full loss offset, unrelieved ACT will continue.⁸ Even for companies that do not pay dividends (and hence do not pay ACT), unrelieved losses will be a serious problem. This is one of the practical problems that are likely to stimulate the demand for reform in the future. An imputation system is difficult to reconcile with a tax base under which many companies have no positive taxable income.

For small companies there are special lower rates of corporation tax, and special rates apply also to cooperative and building societies and to insurance companies. The taxation of insurance companies is discussed below in section 3.2.10. In 1980, small companies whose total profits were less than £80,000 were taxed at the lower rate of 40 percent. Since the floor for the full rate is low and the difference in rates is small, we shall take the basic statutory rate of 52 percent as the marginal tax rate on the corporate sector in 1980.

To illustrate the effects of the frequent changes in the corporate tax system, we present two series of tax rates in table 3.4. The first is the marginal tax rate on retained earnings (defined as τ in chap. 2), and the second is the opportunity cost of retained earnings in terms of gross dividends forgone (defined as θ in chap. 2). This latter variable relates to the relative tax burden on dividends and retained earnings. The table shows the values of these two variables over the period 1947–80. There has clearly been substantial variation in both rates during this time. The figures shown in the final row for 1980 are those used in our comparative study. As discussed in chapter 2, the value of θ is unity divided by unity minus the rate of imputation. In the United Kingdom, the rate of imputation has been set equal to the basic rate of income tax, and at a rate of 30 percent this implies a value for θ of $1/(1 - 0.3) = 1.429$.

3.2.3 Tax Allowances for Depreciation and Inventories

The effective rate of corporate taxation on investment income depends critically upon the depreciation allowances granted both on fixed investment and on investment in inventories. The United Kingdom system is complicated by the multiplicity of ways depreciation is treated. For many years depreciation allowances have been becoming more and more generous, and now 100 percent of all investment in plant, machinery, ships, and aircraft can be written off in the first year of purchase (immediate expensing). Industrial buildings received a first-year allowance of 50 percent in 1980 (increased to 75 percent in 1981), and in addition special cash grants are available for investment in the assisted regions for both

8. Unrelieved ACT could continue also for companies with substantial overseas income on which they were entitled to a credit for foreign tax paid. For companies that are not "tax exhausted" but pay gross dividends in excess of taxable profits, there is a further restriction on the amount of ACT that can be recovered.

Table 3.4 Corporate Tax Rates, United Kingdom, 1947-80

Year	τ	θ	Year	τ	θ
1947	0.50500	1.581	1965	0.40000	1.527
1948	0.50500	1.581	1966	0.40000	1.000
1949	0.50500	1.570	1967	0.41875	1.000
1950	0.52750	1.550	1968	0.44375	1.000
1951	0.52750	1.361	1969	0.43125	1.000
1952	0.51000	1.356	1970	0.40625	1.000
1953	0.51500	1.333	1971	0.40000	1.000
1954	0.45000	1.311	1972	0.40000	1.257
1955	0.45000	1.277	1973	0.49000	1.460
1956	0.45375	1.190	1974	0.52000	1.515
1957	0.45500	1.183	1975	0.52000	1.538
1958	0.47000	1.521	1976	0.52000	1.527
1959	0.48750	1.633	1977	0.52000	1.504
1960	0.50625	1.633	1978	0.52000	1.460
1961	0.53125	1.633	1979	0.52000	1.429
1962	0.53750	1.633	1980	0.52000	1.429
1963	0.53750	1.633			
1964	0.56250	1.667			

Source: Own calculations as described in the text.

machinery and industrial buildings. No depreciation allowances, however, are given for land and commercial buildings (except for hotels and commercial buildings in enterprise zones), because such assets are assumed to retain their value. The effect is that most investment by industrial companies qualifies either for immediate expensing or for greatly accelerated depreciation. When combined with the fact that nominal interest payments are deductible, this means that the treatment of such investment where it is debt financed is exceedingly generous.

In terms of the notation in chapter 2, for the asset machinery the value of f_2 equals unity and f_1 equals zero in all three industry groups. This is because machinery receives 100 percent first-year allowances and hence receives no annual depreciation allowances. In the case of buildings, as already noted, a distinction is made between industrial and commercial structures. Industrial buildings receive a first-year allowance at an accelerated rate, and the remaining amount is depreciated for tax purposes on a straight-line basis (currently 4 percent per annum). We assume, therefore, that for buildings in the manufacturing and other industrial sectors, the values for both f_1 and f_2 are 0.5. In the commercial sector we assume a value of zero for both parameters for all investments in buildings other than hotels. The latter receive an initial allowance of 20 percent, and 4 percent per annum write-down allowances on the remain-

der. Inland Revenue data suggest that 5 percent of new commercial buildings are new hotels. Hence we take f_1 to be 0.04 and f_2 to be 0.01 in commerce.

For most of the postwar period, inventories were taxed on a FIFO basis (first in, first out). Both accounting and tax systems were based on historical cost accounting principles. But the experience of rapid inflation in the late 1960s and throughout the 1970s led to increasing concern over the appropriate tax treatment of inventories. Over the decade 1970–79, as mentioned earlier, the average annual rate of increase of the consumption goods deflator was 12.8 percent, and that of the investment goods' deflator was 14.3 percent. This represents an inflation rate significantly higher than the rates for the other countries in our study. The government appointed an inflation accounting committee (the Sandilands Committee), which reported in 1975. This report led to a continuing debate in the accounting profession, and the government postponed permanent reform of the tax system in the hope that the accounting profession would come up with an agreed set of principles. Because the tax system is not based on profits anyway (one difference being accelerated depreciation for tax purposes), the relevance of a new accounting standard to the tax base is unclear. In 1974 some temporary relief for the tax burden on inventories was introduced. Significant changes to this temporary scheme were introduced in 1981, and these affected liabilities for the year 1980–81. Before 1980, companies were allowed to deduct for tax purposes the excess of the change in the book value of inventories over 15 percent of trading profits measured after depreciation allowances for tax purposes.⁹ The increase in the book value of inventories in any one year consists of the inventory valuation adjustment (termed stock appreciation in the United Kingdom) plus the value of the net physical investment in inventories. The initial idea was to take the former component out of the tax base but to leave in the latter. Since no simple method could be introduced quickly for distinguishing between the two components, the temporary scheme merely gave relief for the whole of the increase in the book value beyond a figure that was thought to be a rough average of the value of physical investment in inventories for the economy as a whole. This figure was taken to be 15 percent of net trading profits. At the margin, however, the scheme not only offered relief for the effect of inflation, but also granted immediate expensing on the purchase of inventories. In this period it is appropriate to assume that inventories were taxed according to LIFO principles (last in, first out) and that the value of f_2 was equal to unity. The other depreciation rate variables are set to zero.

9. When stock relief was first introduced in 1974, the allowable deduction was the change in the book value of inventories less 10 percent of trading profits measured before tax depreciation allowances.

The scheme was modified in 1980 because immediate expensing of marginal purchases of inventories means that, when inventories are run down, the relief is “clawed back.” The prospect of clawed-back relief threatened to reduce corporate cash flow when there was substantial disinvestment in inventories in 1980–81, and so the scheme was altered. Under the modified scheme no relief on physical increase in inventories was allowed as a tax deduction, and a method of restricting relief to the increase in book value resulting only from inflation was introduced. The rate of inflation used in these calculations is not an average rate of inflation but a rate relating to inventories themselves: companies must use an “all inventories index” the government has devised for the purpose. Relief is then calculated by multiplying the closing value of inventories at the end of the preceding year (less a small *de minimus* amount) by the proportionate increase in the index. As explained in chapter 2, our calculations assume a uniform inflation rate, and we ignore changes in relative prices. Given this assumption, the new scheme is equivalent to a system under which inventories are taxed on LIFO principles but in which the increase in the volume of inventories is no longer deductible. Hence the value of f_2 is zero. The tax treatment of inventories does not vary from one industry to another.

The above system of depreciation allowances for fixed assets and for inventories is supplemented by a system of cash grants for investment in particular regions. We discuss these schemes in section 3.2.5.

3.2.4 Estimates of Economic Depreciation

The extent to which the tax system acts as a deterrent or an incentive to investment depends to a large extent on the relation between tax allowances for depreciation and the true or “economic” rate of depreciation. The former were analyzed in section 3.2.3, and here we discuss the construction of estimates of economic depreciation for the different types of asset examined in this study.

In chapter 2 we assumed that assets depreciate at a constant exponential rate, denoted by δ , and showed that, if economic depreciation did in fact follow a different path, it could be approximated by an equivalent rate of exponential decay. For example, if economic depreciation is truly straight line (which means that an asset depreciates by a constant amount $1/L$ each year for L years), then the equivalent rate of exponential decay can be approximated by $2/L$ (see chap. 2). This result is useful because the United Kingdom national accounts assume straight-line depreciation when capital stock estimates are made. Given lifetimes for each asset, we can compute equivalent exponential rates of depreciation.

Since there exists the possibility of replacing parts of a machine and thereby modifying or improving its operation, the definition of the service life of an asset is not unambiguous. Nevertheless, assumed average

service lives have been estimated in the United Kingdom for the purposes of the national accounts, although the source of these estimates is not always clear. Before the Second World War, the Inland Revenue occasionally surveyed businessmen and engineers to determine average service lives of capital goods. These estimates were used to construct a schedule of declining balance rates at which fixed assets could be depreciated for tax purposes (these are given in Board of Inland Revenue 1953). In his pioneering study of capital stock in the United Kingdom, Redfern (1955) used the Inland Revenue data, together with figures used for accounting purposes in some publicly owned industries, to compute capital consumption and the net capital stock. The Redfern estimates have become the basis of national accounts statistics, in part because of the absence of other studies and in part because of the irrelevance of tax allowances that now bear no relation to economic depreciation.

In the mid-1960s the Central Statistical Office reviewed the assumptions about asset lives using a range of miscellaneous data such as surveys conducted by trade associations and information provided by engineers and accountants (see Griffin 1975, 1976). The surprising feature of this review was that there appeared to have been no significant reduction in asset lives over the previous thirty years. This is an important finding because the asset lives assumed in the United Kingdom are undoubtedly longer than those used in the construction of national accounts in some other countries (see for example King and Mairesse 1982). One explanation is that the rate of growth of real labor costs in manufacturing has been much lower in the United Kingdom than in most of her competitors, and so the age at which it is optimal to scrap a machine is higher in the United Kingdom. In addition, as Griffin (1976) points out, "the United Kingdom has a reputation for making its machinery last."

To compute asset lives for the different assets and industries in our classification, we used data on asset lives for a large number of assets both in manufacturing (Griffin 1976) and in nonmanufacturing (supplied by the Central Statistical Office). For almost all buildings in every industry, the average lifetime is assumed to be eighty years. This implies that the equivalent annual rate of exponential decay is equal to $(2/80) = 0.025$. In the case of machinery, however, there are wide variations in the composition of investment among industries. Machinery is not a homogeneous quantity, and asset lives vary across industries. The importance of vehicles, which typically have shorter lives than fixed plant, varies from industry to industry, and within the category "vehicles" there are differences between trucks, ships, and aircraft. Lack of data on the composition of investment in vehicles led us to assume that all such investment had a life of ten years. This is too short for aircraft and ships, but much investment of this kind is in the public sector and so is excluded from our study. The assumed equivalent annual rate of exponential decay for vehicles is therefore equal to 0.20.

Table 3.5 Assumed Lifetimes of Machinery Excluding Vehicles

Life Length (L)	Depreciation Rate (2/L)	Share of Fixed Plant	
		Manufacturing	Commercial
5	.400	.047	0
16	.125	.018	.060
19	.105	.058	0
25	.080	.181	.540
34	.059	.503	.280
50	.040	.193	.120
		1.000	1.000
<i>Weighted average depreciation rates</i>			
		Manufacturing .079	
		Commerce .072	

Source: Own calculations, based on unpublished Central Statistical Office data.

Investment in machinery excluding vehicles is classified into any one of several lifetime categories. The proportion of net capital stock in both the manufacturing and the commercial sectors corresponding to each lifetime is shown in table 3.5. Column 2 shows the equivalent depreciation rates for each lifetime, and the average depreciation rate was computed by weighting the individual depreciation rates by their share in net capital stock.¹⁰ The weighted averages are 0.079 for manufacturing and 0.072 for the commercial sector. Data were not available for "other industry," and we have assumed that the rate was the same as that for manufacturing. Finally, the rates for vehicles and for machinery excluding vehicles were averaged using their shares in net capital stock as weights. These are shown in the final column of table 3.6. The depreciation rate is much higher in the other industrial sector because of the relative importance of vehicles in this sector, particularly in construction.

The matrix of depreciation rates by asset and industry (see Appendix A) contains the estimates for machinery, our assumed values of 2.5 percent per annum for buildings, and an assumed rate of zero for inventories.

3.2.5 Investment Grants and Incentives

The experience with investment grants and incentives in postwar Britain has been one of continuous change and experimentation. Both the magnitude and the nature of incentives to investment have altered frequently, with use being made of cash grants as well as increasingly generous tax allowances. In particular, all investment in manufacturing, construction, and extractive industries qualified for investment grants

10. Note that it is the depreciation rates (2/L) that are averaged, not the asset lives.

Table 3.6 **Depreciation Rates for Machinery Including Vehicles**

Sector	Machinery		Vehicles		Total Average Depreciation Rate
	Share in Capital Stock	Depreci- ation Rate	Share in Capital Stock	Depreci- ation Rate	
Manufacturing	.976	.079	.024	.20	.0819
Other industry	.384	.079	.616	.20	.1535
Commerce	.913	.072	.087	.20	.0831

Source: Own calculations, based on unpublished Central Statistical Office data.

between 1966 and 1970, when grants ranging between 20 and 45 percent were available. In section 3.2.3 we described the current regime of tax allowances for investment, and here we focus on cash grants. At present most grants available in the United Kingdom arise from two types of help for industrial investment, regional assistance and national selective assistance. Grants are nontaxable receipts.

As its name implies, the purpose of regional assistance is to stimulate industrial investment in those areas suffering from high unemployment—the so-called depressed areas. Certain areas have been designated assisted areas (of which there are several categories), and regional assistance is provided only for fixed investment within the designated areas. The major form of this aid is given in the form of regional development grants, which amounted to £490.5 million in the financial year 1980–81. The designated assisted areas are classified into three categories: special development areas, development areas, and intermediate areas. In 1979 the incoming Conservative government announced a gradual reduction of the geographical size of these assisted areas (principally of the intermediate areas), although the scheme itself was maintained. In all assisted areas grants are made toward capital expenditure on new buildings that are used for “qualifying activities.” In terms of our industrial classification, qualifying activities fall principally within the manufacturing sector, with the exception of construction, which is in the “other industrial” sector. In addition, in the special development areas and development areas, grants are awarded for capital expenditure on new machinery employed on the premises and used for the same “qualifying activities.” Unlike other forms of assistance (regional or national), regional development grants are given at fixed statutory rates, the values of which are shown in table 3.7.

In addition to regional development grants, which are available automatically on qualifying expenditure, investment projects undertaken in assisted areas may be eligible for discretionary selective assistance under section 7 of the 1972 Industry Act. Similarly, on a national basis, invest-

Table 3.7 Rates of Regional Development Grants (%)

Asset	Area	Rate of Grant	
		Before 31 July 1980	From 1 August 1980
Machinery	Special development area	22	22
Machinery	Development area	20	15
Machinery	Intermediate area	0	0
Buildings	Special development area	22	22
Buildings	Development area	20	15
Buildings	Intermediate area	20	0

Source: Department of Trade and Industry.

ment, wherever undertaken, may qualify for discretionary support under section 8 of the 1972 Industry Act. These discretionary grants are usually awarded at a rate of between 5 and 15 percent of the initial investment. During the year 1980–81, new assistance under section 7 amounted to £105.5 million, and that under section 8 amounted to £7.5 million. This total of £113 million is only 21 percent of the amount provided for regional development grants. Many of the selective assistance schemes have been eliminated since 1979, and actual payments over recent years have been higher than the figure for section 8 assistance shown above, reflecting the gradual withdrawal of the scheme.

A new scheme of enterprise zones, as yet very limited in scope, was introduced in the 1980 budget. The aim of the scheme is to offer a range of tax concessions to encourage businesses (particularly small businesses) to generate activity in derelict areas of the urban conurbations. Within these enterprise zones, companies are exempt from rates (property taxes) and receive 100 percent tax allowances for investment in buildings in addition to the allowances on machinery to which all companies are entitled. They are also exempt from the need to comply with a range of administrative procedures on planning, industrial training, and certain other matters. Because the amount of investment in such zones is still negligible in relation to total investment, we shall ignore these incentives in our calculations. It is also plausible that, given the size of enterprise zones, the incentives are capitalized into land values and hence rents. But the idea of enterprise zones has attracted interest in the light of concern with inner-city problems, and the success of the scheme will be watched closely in coming years.

Grants and subsidized loans for particular investment projects are also available from a variety of other sources, including the EEC and government agencies such as the National Enterprise Board, the British Steel

Corporation (Industry), Ltd., and a range of Scottish, Welsh, and Northern Irish government bodies. The approach taken here is, however, to make a conservative assumption about the grants firms expect would be forthcoming on additional investment projects. We shall ignore *all* discretionary grants and analyze only grants paid at fixed statutory rates on well-defined activities. Only regional development grants satisfy these conditions. This means we shall be understating the magnitude of investment grants that would, in practice, be paid out and hence overstating the effective marginal tax rate on capital income. But regional development grants are far and away the most important and dependable form of assistance to investment provided through channels other than the tax system.

Using the notation of chapter 2, therefore, f_3 is equal to the proportion of investment made in the assisted areas, and g is equal to the average rate of regional development grant. For the commercial sector, the value of f_3 is zero for all three assets. None of the qualifying activity is contained in this sector. (Note that the value of g is irrelevant when f_3 equals zero.) No grants are paid on investment in inventories, which leaves industrial investment in both machinery and buildings.

For manufacturing and other industrial companies, data are available on the amount of grant paid, classified according to qualifying activity, by area and by asset. This information, together with the rates of grant shown in table 3.7, allow us to make an estimate of the average rate of grant and the amount of investment within the assisted areas for each asset. These data were obtained from the annual reports of the Industry Act of 1972. For each asset in each industry, the grants paid were grossed up by the statutory rate of grant to obtain an estimate of total qualifying investment expenditure. The statutory rates were taken to be a simple average of the figures in the two columns of table 3.7, because the date when the rates changed was roughly halfway through the financial year 1980–81, to which the figures on grant payments refer. These statutory rates were then weighted by the investment shares in the different areas to obtain an average rate of grant for each asset. It was not possible to do this separately for manufacturing and for other industrial groups, and the distribution of qualifying investment by type of area was assumed to be the same for the two sectors. The resulting estimates of the effective rates of regional development grant are 19.46 percent for machinery and 14.76 percent for buildings. To obtain the proportions of investment expenditures that were eligible for the grant, we computed the ratio of total qualifying investment expenditure to the value of investment as a whole (from the national accounts) in each asset and industry. These calculations are shown in table 3.8. The values of f_3 and g used in later calculations are shown in table 3.9.

Table 3.8 Investment Eligible for Regional Development Grants, 1980
(£ million)

	Machinery	Buildings
Eligible investment		
Manufacturing	1,826.8	873.5
Other industry	12.00	8.5
Total investment		
Manufacturing	5,659.0	1,064.0
Other industry	3,385.0	1,157.0
Proportion eligible (f_3)		
Manufacturing	0.323	0.821
Other industry	0.004	0.007

Source: Own calculations based on "Annual Report of the Industry Act, 1972, for the year ended 31 March 1981," HMSO, July 1981 (appendix 2, table 1). *National Income and Expenditure*, 1981, tables 6.3 and 10.8.

Table 3.9 Investment Grant Parameters

Sector	Machinery	Buildings	Inventories
	<i>A. Rate of Grant</i>		
Manufacturing	.1946	.1476	0
Other industry	.1946	.1476	0
Commerce	0	0	0
	<i>B. Proportion of Investment Receiving Grant</i>		
Manufacturing	.323	.821	0
Other industry	.004	.007	0
Commerce	0	0	0

Source: Own calculations as described in the text.

3.2.6 Local Taxes

The only local tax in the United Kingdom is called "rates." Rates are levied by local authorities on "immovable property," which, apart from very small amounts of immovable plant, consists of buildings. They differ from conventional property taxes in that they are a tax on the benefit of occupation and can be avoided by leaving a building empty.¹¹ The reform of the rating system attracts perennial interest, and there have been frequent discussions about the implications of moving to alternative sources of revenue for local authorities, such as a local income tax.

11. The picture is a little more complicated in that local authorities have discretion to levy a rate on unoccupied property (after six months of nonoccupation for a new building and three months for a building previously occupied). About half of local authorities take advantage of this discretion.

The basis of rates is the “net annual value” of the property, which is intended to be the amount for which the property might be let if the tenant was responsible for all repairs. A single rate of tax is then set that applies to all property within a particular local authority. It is a strictly proportional tax, so that the marginal tax rate is equal to the average rate. There are two difficulties in estimating the average tax rate for the nation. First, the tax rate varies from one local authority to another, and there is almost no information on the distribution of capital stock by asset and industry among authorities. Second, the basis of the tax is not current market values, because the ratable value of a property is revised only periodically, and the last revaluation was in 1973.¹²

The method used to estimate the average marginal tax rate was to divide the yield of total nondomestic rates by the net stock of buildings valued at current replacement cost in the private industrial and commercial sectors. In 1980–81 commercial and industrial rates were £3,408.6 million (figure supplied by the Chartered Institute of Public Finance and Accountancy). The value of private net capital stock in buildings other than dwellings at the end of 1980 was £138.4 billion (table 11.11 of *National Income and Expenditure*, 1981). This gives an average corporate wealth tax rate on buildings of 2.46 percent. We shall assume that the tax rate was the same in the corporate as in the unincorporated sector, and that the buildings of all three of our industrial sectors were identically distributed among the various local authorities, so that the rate of tax may be assumed to be the same for each industry.

The economic effects of rates on a marginal investment project are assumed to be equal to that of a tax on corporate wealth held in the form of buildings. This makes no assumption about the incidence of the tax, but it does ignore any additional benefits the companies might receive by way of publicly provided services such as sewerage or new roads. The rates of corporate wealth tax assumed in our study are therefore equal to 2.46 percent for wealth in the form of buildings and zero for wealth in machinery and inventories.

3.2.7 Wealth Taxes

There are no personal wealth taxes in the United Kingdom, and the value of the wealth tax parameter, w_p , is therefore equal to zero for all three ownership groups. Furthermore, apart from local authority rates (discussed in the previous section), there are no corporate wealth taxes.

The distinction between taxes on income and taxes on capital is not clear-cut. Our study, however, does not require such a distinction provided all of the appropriate taxes are taken into account in our computa-

12. In contrast to the United States, though, revaluations have always been synchronized and made on a consistent basis.

tions. Since our formulas include taxes on capital gains, taxes on investment income (including the inflationary component), and taxes on wealth, this objective is attained. The only tax omitted is that on transfers of wealth, in the form of either taxes on inheritances or taxes on gifts.

The taxation of transfers was reformed in Britain in 1975 with the introduction of capital transfer tax. One important change was made at this time, namely the extension of the taxation of estates to cover *inter vivos* gifts. Before 1975 lifetime gifts were not taxed, but to prevent gifts made "in contemplation of death" from avoiding tax altogether it was necessary to include gifts made just before death in the taxable estate. Before it was replaced, estate duty included gifts made within seven years of death in the tax base, albeit on a sliding scale. Since then a number of concessions have been introduced, and lifetime gifts are now taxed at much lower rates than transfers on death. For most of the rate bands, lifetime transfers are taxed at one-half the rate applying to transfers on death, except at the highest levels, where the maximum rates are 50 percent for lifetime transfers and 75 percent for estates. But these high marginal rates are reached only on transfers of more than £2.5 million, and this takes no account of the substantial concessions that exist for particular types of asset. These concessions are largely for small businesses and agricultural property. The net effect of these changes in legislation since 1975 has been to render capital transfer tax as ineffective a tax as the estate duty it replaced. The revenue has been falling in real terms, and changes between 1979 and 1982 will lead to further reduction. For further discussion of capital transfer taxation in the United Kingdom, see Kay and King (1983) and Sutherland (1981).

3.2.8 Household Tax Rates

In this section we describe the calculations of marginal tax rates on both dividend and interest income and also on capital gains received by the personal sector. Investment income is liable to income tax at the basic and higher rates, and also to an investment income surcharge on income over a certain amount (see section 3.2.1). Capital gains are liable to capital gains tax.

To compute average marginal tax rates in the household sector, it was necessary to examine income tax and investment income surcharge separately. To calculate the average marginal income tax rate on investment income, we need a distribution of both dividend and interest income by taxable income. Then, given the tax schedule, we can compute the distribution of marginal tax rates. The available data, however, provide a distribution of dividend and interest income only by "total net income" rather than by taxable, or assessed, income. Total income is income less certain deductions for tax purposes but before allowable interest deductions, life insurance premium relief, and personal allowances. Hence we

require a correspondence between levels of total income and levels of assessed income.

To construct this correspondence, we assume that the ranking of individuals by total net income is the same as by assessed income. Observations on the two distributions may be obtained from *Inland Revenue Statistics*, which provides the distribution of taxpayers by assessed income and by total net income. The aim of the exercise is to find the level of total income that corresponds to each tax threshold level. In this way the distribution of investment income can be reclassified as a distribution by bands of taxable income. In each band there is a unique marginal tax rate, and the distribution provides weights from which we may calculate the average marginal tax rate.

To construct the correspondence between the two distributions, we need a continuous distribution, and we follow the assumption of Orhniel and Foldes (1975) and King (1977, Appendix A) that income is distributed according to a Pareto distribution. Thus, if the logarithm of income is plotted against the logarithm of total number of people with incomes in excess of each level of income, the result is approximately a straight line. We obtained two separate straight lines—one for the distribution of assessed income and the other for the distribution of total income. Together these lines enable us to read off the level of total net income that corresponds to any given level of assessed income. In turn, this enables us to express the tax thresholds for each band in terms of total net income, and we further assume that all persons who fell below the threshold for the higher rates of tax were liable to tax at the basic rate. It is unlikely that a substantial proportion of investment income accrued to people whose total taxable income was below the personal allowance, but to the extent that such income existed we have slightly overestimated the marginal tax rates applicable to personal sector receipts of dividend and interest income. The average marginal tax rates on dividend and interest income were calculated as the weighted average of the marginal tax rates, with weights given by the proportions of dividend and interest income, respectively, accruing to recipients in each tax bracket.

Data on the distributions were obtained from *Inland Revenue Statistics* for 1980 and the *Survey of Personal Incomes* for 1977/78. A distribution for dividend income is given, but the distribution for interest income we used was that for "investment income taxed at source other than dividend income and building society interest." This category of income includes not only interest income from corporate securities but also interest from government bonds. But there is no alternative source of data to enable us to obtain a distribution of interest income from the corporate sector alone. The latest year for which data on the relevant distributions were available was the tax year 1977-78.

Using the method above, the estimated average marginal tax rate on dividend income was 48.6 percent. To obtain the values for later years, we assumed that the real distribution of dividend and interest income remained unchanged. The distribution for 1977–78 was increased in money terms by the percentage increase in total dividend payments in each year, and, using the relevant tax schedules, we computed a new distribution of marginal tax rates for subsequent tax years. In the tax year 1980–81, we obtained estimates of 39.0 percent for the average marginal income tax rate on dividend income and 38.2 percent for that on interest income. These are clearly substantially below the values for 1977–78, and the reason is the reduction in the top income tax rate and the increase in thresholds for the higher rates of tax introduced in the 1979 Conservative budget.

The next step is the computation of effective rates of investment income surcharge. There are no reported distributions of dividend or interest income by range of investment income surcharge. We computed the effective marginal rates indirectly by calculating the average marginal rate of surcharge on total investment income and using this as the appropriate rate. Data are available on the distribution of total investment income, and also on the amount of investment income surcharge paid on it, by total net income. These may be converted into distributions by assessed income rather than total income using the method described above. In addition, *Inland Revenue Statistics* provides the number of taxpayers liable to each of the different rates of surcharge classified by assessed income. Using this information, along with knowledge of the rate schedule, it is possible to compute the average marginal rate of investment income surcharge for each of the assessed income brackets. From these rates an overall average marginal rate may be computed as follows. Let the investment income surcharge schedule be parameterized by the most general form used in practice:

<i>Range of Net Investment Income, Lower Limit £</i>	<i>Rate of Surcharge (%)</i>
0	t_1
R_1	t_2
R_3	t_3

Note that t_1 is typically zero, and let

n_1 = the number of income tax payers liable to a marginal rate of t_1

n_2 = the number of income tax payers liable to a marginal rate of t_2

n_3 = the number of income tax payers liable to a marginal rate of t_3

SC = total amount of surcharge paid

I_1 = the amount of total investment income received by persons taxed at a marginal rate of t_1

I_2 = the amount of total investment income received by persons taxed at a marginal rate of t_2

I_3 = the amount of total investment income received by persons taxed at a marginal rate of t_3 ,
with $I = I_1 + I_2 + I_3$.

Now the average marginal rate of surcharge, m_a , is:

$$m_a = \frac{I_1 t_1 + I_2 t_2 + I_3 t_3}{I}.$$

Also:

$$SC = I_1 t_1 + R_1 n_2 t_1 + (I_2 - R_1 n_2) t_2 + R_1 n_3 t_1 \\ + (R_2 - R_1) n_3 t_2 + (I_3 - R_2 n_3) t_3.$$

Therefore, in terms of observable variables,

$$m_a = \{SC - [R_1 n_2 + R_1 n_3] t_1 - [(R_2 - R_1) n_3 - R_1 n_2] t_2 \\ + R_2 n_3 t_3\} / I.$$

The final calculation is to allow for the fact that the distribution of dividend (or interest) income by assessed income will not, in general, be the same as that for total investment income. We have made some adjustment for this by computing the average marginal rate of surcharge for dividend and interest income as a weighted average of the average marginal rates of surcharge on total investment income for each of the assessed income brackets. The weights used in this calculation were those for the distributions of dividend and interest income by assessed income, respectively, described above. Applying this method to the 1977–78 observations, the average marginal rate of investment income surcharge on dividend income was calculated as 9.29 percent and that on interest income as 8.74 percent.

Since this method of calculation is specific to the particular investment income surcharge schedule, it does not lend itself conveniently to extrapolation of effective marginal surcharge rates for the subsequent years in which the schedule was different. This makes it difficult to estimate the 1980–81 marginal tax rates with any great accuracy. The major change was that the 1979–80 schedule was different from those in previous years. The changes between 1977–78 and 1978–79 and again between 1979–80 and 1980–81 were small in real terms. Given the reduction in the number of investment income surcharge payers (*Inland Revenue Statistics*, 1980), we estimated the effective average marginal rates of surcharge in 1980 as 6.0 percent on dividend income and 5.5 percent on interest income.

The total average marginal rate of income tax applicable to dividends is

the average marginal income tax rate of 39.0 percent plus the average marginal rate of investment income surcharge of 6.0 percent. Together these give a total marginal tax rate of 45.0 percent. The average marginal tax rate on debt interest income is equal to 38.2 percent plus 5.5 percent, which equals 43.7 percent. These figures are, in total, about twelve percentage points below their respective values for 1977–78, before the reductions in the 1979 budget. This estimate for the absolute reduction in the effective tax rate on investment income is marked, and it contributes substantially to the change in effective marginal tax rates on capital income between the early 1970s and the early 1980s.

The Inland Revenue kindly performed for us some calculations with their tax model and obtained a similar result, with a fall of twelve percentage points in the marginal income tax rates on dividends between 1977–78 and 1979–80. The figures from the Inland Revenue tax model were some five or six percentage points higher in each year than our estimates. Part of this difference may arise from a different treatment of the investment income surcharge, and so in section 3.4 we examine the sensitivity of our results to the difference in estimated marginal tax rates. In any event, it is comforting that the results concerning the fall in the marginal tax rate in recent years are similar. In the results of section 3.4 we shall use the figures 45.0 percent and 43.7 percent as the standard values for the effective marginal tax rates of the household sector on dividend and interest income, respectively. Part of the interest income of households is received from banks, and the appropriate tax treatment of this income is discussed in section 3.3.5 below.

The final task in this section is to compute the average marginal rate of capital gains tax for the tax year 1980–81. We first calculate the nominal tax rate, then convert it to an effective rate of tax on accrued capital gains. Computation of the nominal rate was made using a distribution of realized gains on corporate securities by a range of total net realized gains (as given in *Inland Revenue Statistics*, 1980).

Using this distribution, we may compute the average marginal capital gains tax rate by knowledge of the rate schedule. Again, however, the latest data are for the tax year 1977–78, and we assume that the real distribution of gains remained unchanged between 1977 and 1980. The money values of total net realized gains were adjusted by the change in the “all share index” (*Financial Statistics*). This produced an average rate of capital gains tax of 28.32 percent, very close to the maximum rate of 30 percent.

The second step is to convert this nominal rate into an effective accrued tax rate (EAT rate). We employ the simple model of investor behavior described in chapter 2, which is used in our model to calculate endogenously the ratio of the effective to the statutory rate. The model makes the assumption that a constant proportion of accrued gains will be real-

ized in each year and that the expected nominal rate of capital gains tax is stationary. We use a value of 0.1 for the proportion of accrued gains realized in each year (see King 1977 for an empirical justification of this assumption). To illustrate the calculations, suppose that the discount rate is equal to the observed 13.68 percent gross redemption yield on long-dated government securities during the tax year 1980–81. Then, using the formula for the EAT rate of chapter 2, we obtain an effective accrued tax rate of 13.6 percent. In the results presented in section 3.4, the interest rate used to compute the effective accrued rate is endogenous and depends upon the particular combination being analyzed.

3.2.9 Tax-Exempt Institutions

One of the most significant developments in the taxation of capital income since the Second World War has been the extraordinarily rapid growth of the asset holdings of tax-exempt institutions. In large part this represents the growth of pension funds and the pension business of life insurance companies. From relatively small beginnings in the postwar period, these funds now account for a substantial proportion of total corporate securities, and this change is documented in detail in section 3.3.4. In addition to pension funds, the tax-exempt group of institutions includes charities and nonprofit bodies. The size of such bodies has remained fairly stable and hence has been declining as a proportion of the tax-exempt group.

The comparative advantage of investment via the medium of tax-exempt institutions depends upon the extent to which households are allowed to channel their private savings into such forms and upon the tax burden imposed on the income accruing to directly invested personal savings. The Inland Revenue has tried to limit tax concessions for private savings to schemes associated with contractual savings through either pensions or life insurance policies. But a great deal of complex anti-avoidance legislation has proved necessary to deal with “bogus” life insurance policies involving only a very tenuous connection with insurance against loss of life. Changes in the personal tax system have altered the relative advantage of tax-exempt institutions, and just as important has been the change in the effective tax rate on capital income levied on the personal sector by an unindexed tax system. The consequences of this will be seen clearly in the results of section 3.4.

One of the main aims of this comparative exercise is to estimate the effective marginal tax rates on capital income. Although the tax-exempt ownership group might appear by definition to pay a zero tax rate, we shall see that this is far from true. The effective tax rate on capital income depends upon taxes collected at all stages, and the interaction between the corporate and the personal tax systems means that, although the tax-exempt group may pay no tax at one particular stage, the overall

effective tax rate may be either positive or negative. In particular, high personal tax rates in times of inflation have raised the pretax rate of return to levels such that tax-exempt owners received, in practice, a substantial subsidy on capital income.

3.2.10 Insurance Companies

The third category of owner analyzed in our study is insurance companies. Insurance business is divided into three categories for tax purposes: nonlife "ordinary" insurance business, life insurance business, and pension business. Nonlife insurance business income is taxed as ordinary corporate income. Pension business is, as we have seen, tax exempt. Life insurance business is taxed in a special way that distinguishes it both from pension business and also from direct personal ownership by households. In sections 3.3.4 and 3.3.5 we attempt to separate the pension and life insurance components of insurance company holdings.

When a life insurance company purchases shares or other securities of unit value for its policyholders, the effective acquisition cost to the policyholder is only $1 - \epsilon$, because tax relief is granted to the individual on premiums paid to life insurance companies at rate ϵ . The value of ϵ has varied from year to year and has usually borne a stable relation to the basic rate of income tax. In recent years it has been 50 percent of the basic income tax rate. The 1981-82 figure was $\epsilon = 0.15$. Although relief is granted on policyholders' premiums only provided the premiums do not exceed a certain proportion of income, we shall ignore this restriction. It is unlikely to be binding on many investors, because of the additional possibilities of tax-exempt contributions to pension funds.

When the income on the initial investment accrues to the insurance fund it is taxed at a special rate, which for some time has remained at 37.5 percent. But on dividend income no corporate tax is paid, and the effective tax rate is simply the basic rate of income tax deducted at source by the company paying the dividend. We shall denote this special rate of tax on life business by τ_l . Hence, if the fund earns a posttax return of $1 - \tau_l$ on its initial investment, this is equivalent to a posttax return of $(1 - \epsilon)(1 - \tau_e)$ on the policyholder's investment, where τ_e is the *effective* tax rate on the capital income accruing to the policyholder. This implies that

$$(1 - \epsilon)(1 - \tau_e) = 1 - \tau_l.$$

Therefore,

$$\tau_e = \frac{\tau_l - \epsilon}{1 - \epsilon}.$$

The equation above defines the effective tax rate on capital income obtained through the medium of a life insurance policy in terms of the

statutory corporate tax rate on insurance companies and the rate at which premiums may be deducted against tax by policyholders. Given the relevant values for τ_I of 37.5 percent on interest income and 30 percent on dividends, and given the value of 0.15 for ϵ , the effective tax rates for ownership by life insurance companies are 26.47 percent on interest and 17.65 percent on dividend income. We shall use these values for the tax rates of the ownership group “insurance companies.”

The effective capital gains tax rate is derived in exactly the same way, with the one difference that capital gains are taxed at the rate of 30 percent rather than the special corporate tax rate applicable to insurance companies. Hence the effective nominal tax rate on the capital gains obtained through life insurance companies is given by the formula above with τ_I set equal to 0.3. This gives a nominal tax rate of 17.65 percent, which is the same as that applying to dividends.

3.3 The Structure of the Capital Stock and Its Ownership

3.3.1 Data Limitations

The data described in the previous section may be used to compute the effective tax rates on income from capital for any given combination of asset, industry, source of finance, and category of owner. These give eighty-one different tax rates. Although the distribution of tax rates is interesting in itself and will be described in detail in section 3.4, we shall also compute weighted average marginal tax rates. To do this we need weights for the relative importance of the different combinations. We shall now describe the construction of the weights.

In the ideal outcome it would be possible to estimate individual weights for all eighty-one combinations. Unfortunately, however, the cross-tabulations required for this are not available. In section 3.3.2 we describe the construction of a matrix of proportions of capital stock tabulated by asset and industry for the nonfinancial corporate sector. Although we can obtain a classification of capital stock by asset and industry, it is not possible to allocate these across sources of finance and categories of owner. The data on sources of finance (see section 3.3.3) refer to the whole nonfinancial corporate sector, and we have not tried to impute a particular source of finance to a particular type of investment. Similarly, although we can produce a cross-tabulation by category of owner and source of finance (distinguishing between the ownership of debt and equity), we are unable to obtain a classification of ownership by industry or asset. Nevertheless, the weights constructed below provide a broadly accurate picture of the relative importance of the different combinations in terms of the proportions of the capital stock for which they account.

3.3.2 Capital Stock Weights

In calculating weights for each of the routes by which savings may be channeled into investment, the first step is to compute weights for the net capital stock in different assets and industries. The aim is to produce a cross-tabulation of net capital stock by industry and asset.

Estimates of the capital stock are made by the Central Statistical Office using the perpetual inventory method (for a fuller description see Griffin 1975). Depreciation is assumed to occur on a straight-line basis, and, as discussed in section 3.2.4, the assumed asset lives have changed very little since Redfern's (1955) study. For all manufacturing industries, for example, buildings are assumed to have a life of eighty years, and most types of machinery are assumed to have a lifetime of twenty-five years or more. In table 3.10 we show the breakdown of net capital stock valued at current replacement cost by four asset types (buildings, equipment, vehicles, and inventories) classified by three industrial groups (manufacturing, other industry, and distributive trades and other services, which here includes financial institutions). Figures for the financial sector are shown separately because these are used below to make an adjustment for leased assets.

Several difficulties arise in using the basic data in a way compatible with the aims of our study. The most important concerns the treatment of leased assets. These assets are typically purchased by financial institutions but used by manufacturing and other industrial firms. The principal motive for leasing is to enable the lessor to claim tax allowances on purchased assets (which, as we have seen, are generous in the United Kingdom) that manufacturing companies might not have been able to claim because of an insufficient level of taxable profits. Figures given in *National Income and Expenditure*, 1981 (p. 131), show that the total volume of investment leased in 1980 was £2.8 billion. Unfortunately these data cover leasing of buildings by property companies and do not provide

Table 3.10 Corporate Capital Stock in United Kingdom, End 1980
(£ billion)

Sector	Buildings	Machinery	Vehicles, Ships, and Aircraft	Book Value of Inventories
Manufacturing	45.1	73.3	2.9	35.5
Other industry	5.7	5.6	18.1	1.3
Distributive trades and other services	52.4	23.2	7.2	15.9
Financial institutions	15.7	7.0	2.2	0.001

Source: Unpublished data provided by the Central Statistical Office; *National Income and Expenditure*, 1981, table 12.4.

sufficient information to enable us to make an accurate reallocation of leased assets from sector of ownership to sector of use. We have therefore used the following approximation in order to allocate investment to the sector in which it is used.

From table 3.10 we see that about 30 percent of the net capital stock of the sector "distributive trades and other services" is owned by the financial sector. Some of these assets are leased to nonfinancial companies, and others are used as inputs to the production of financial services (machinery and buildings of banks and financial institutions). The discussion in *National Income and Expenditure*, 1981, which covers leasing activity in connection with the purchase of machinery and vehicles, suggests that in total 2 percent of the net capital stock of these assets in the manufacturing sector is leased from other sectors. The original capital stock figures were then adjusted by adding 2 percentage points to the net capital stock of the manufacturing sector as a whole and allocating this addition only to the category machinery. The capital stock of our commercial sector was assumed to be 70 percent of the assets of the "distributive trades and other services" sector, except for inventories where a figure of 100 percent was imputed to the commercial sector because the holdings of inventories by financial institutions are negligible. Table 3.11 shows the adjusted figures for the net capital stocks and the corresponding weights for the share of each asset in each sector.

Of the nonfinancial corporate sector capital stock, slightly less than half is invested in machinery, one-third in buildings, and one-fifth in inventories. The relative magnitudes for different assets vary according to industry, with machinery being more important for the manufacturing sector

Table 3.11 Net Capital Stock at Current Replacement Cost, United Kingdom, End 1980

Sector	Asset			Total
	Machinery	Buildings	Inventories	
	<i>A. Levels (£ billion)</i>			
Manufacturing	78.6	45.1	35.5	159.2
Other industry	23.7	5.7	1.3	30.7
Commerce	21.2	36.7	15.9	73.8
Total	123.5	87.5	52.7	263.7
	<i>B. Percentage Shares</i>			
Manufacturing	29.8	17.1	13.5	60.4
Other industry	9.0	2.2	0.5	11.7
Commerce	8.0	13.9	6.0	27.9
Total	46.8	33.2	20.0	100.0

Source: Own calculations based on table 3.1 and unpublished data provided by the Central Statistical Office.

and buildings for the commercial sector. The figures above refer to the corporate sector, and in table 3.12 we show the division of the national capital stock among the corporate, personal, and public sectors. In total, the corporate sector accounts for only just over one-third of the capital stock, with the remainder accounted for by dwellings (both privately and publicly owned), nationalized industries, public administration and services, and the unincorporated business sector. But the corporate sector accounts for most of the "business" assets, such as machinery and inventories, as shown in part B of table 3.12.

3.3.3 Sources of Financial Capital

For British corporations there are three important sources of funds by which savings may be channeled from the household to the corporate sectors: retained earnings, new share issues, and borrowing. Other sources of finance do exist (principally import and other credit and overseas capital issues), but 89 percent of corporate finance is raised from these three major sources. In what follows, we shall focus on these three sources.

Our aim is to estimate weights for the marginal contribution of the three sources to the financing of new investment projects. By its nature, all we can observe are historical average weights for sources of finance. If it were true that firms attempted to maintain some long-run debt-to-equity ratio in their capital structure, then we could estimate it from data

Table 3.12 National Capital Stock, United Kingdom, End 1980
(£ billion)

<i>A. Net Fixed Assets at Current Replacement Cost</i>			
By Sector		By Asset	
Personal	174.7	Vehicles, ships, and aircraft	39.2
Corporate	252.7	Machinery	168.1
Nationalized industries	127.9	Dwellings	232.3
Central and local government	189.6	Other buildings	305.3
Total	744.9	Total	744.9
<i>B. Cross-Tabulations</i>			
Machinery		Inventories at Book Value	
Personal	8.3	Personal	7.8
Corporate	105.7	Corporate	54.7
Nationalized industries	48.5	Nationalized industries	4.7
Central and local government	5.6	Government	1.7
Total	168.1	Total	68.9

Source: *National Income and Expenditure*, 1981, tables 11.11 and 12.4.

on the market values of debt and equity outstanding. We shall assume that the marginal investment projects relevant to our study would be financed in the same proportions as the average capital structure of the corporate sector. The market value of debt, defined as the market value of debentures and loan stock plus net short-term borrowing (bank advances less liquid assets), is shown in columns 1–3 of table 3.13. The table reports also the market value of common and preferred equity outstanding, and the implied debt/equity ratio. At the end of 1980 the debt/equity ratio for industrial and commercial companies was 0.263, and the implied share of debt in the total capital structure was 0.208.

Equity finance may be obtained from retained earnings or by the issue of new shares to equity holders. Table 3.14 shows the relative importance of retentions and new share issues over the period 1975–80. During this period, new share issues accounted for 5.43 percent of total equity finance. This is consistent with the broad historical trends documented in King (1977). By combining the information on the corporate sector debt/equity ratio and the split of equity finance between internal and external sources, the shares of the different sources of finance may be computed. These are shown in table 3.15. They are average figures for the period 1975–80 and show that the weights are 0.193 for debt, 0.763 for retentions, and 0.044 for new share issues.

The assumption that the average and marginal debt/equity ratios are equal may be examined in the light of tables 3.13 and 3.14. The share of debt issues and borrowing in the total sources of funds of nonfinancial companies averaged 26.8 percent during the period 1975–80. This figure is only slightly higher than the figure for the average debt/equity ratio shown in the capital structure of the nonfinancial corporate sector in table 3.13.

The one significant trend, which is shown clearly in table 3.14, is that there has been a marked shift from long-term debt finance to short- and medium-run bank borrowing during the 1970s. In fact, between 1973 and 1980 bond redemptions exceeded new issues in five of the eight years, and in the remaining three years only very small net amounts were raised. The collapse of the corporate bond market was partly the result of uncertainty about future inflation, and hence interest rates, which made companies reluctant to enter into long-term fixed-interest contracts, and partly the result of the authorities' discouragement of attempts to issue index-linked securities. Now that the public sector is itself issuing index-linked securities, and given that capital gains tax has been indexed, it is possible that new forms of corporate borrowing will appear. But in the recent past, variable interest rate borrowing from banks has seemed attractive. This shift has had important consequences for the ownership of corporate debt and, in particular, for the effective taxation of capital income, as we shall see in section 3.3.5.

Table 3.13 Capital Structure of Nonfinancial Companies, 1975-80
(£ million)

Year	Market Value of Debenture and Loan Stock (1)	Net Bank Borrowing (2)	Net Debt (3) = (1) + (2)	Market Value of Equity		Debt/ Equity Ratio (7) = (3)/(6)
				Ordinary (4)	Preference (5)	
1975	5,113	7,196	12,309	43,709	451	0.279
1976	5,280	8,705	13,985	41,708	547	0.331
1977	6,927	8,213	15,140	66,511	767	0.225
1978	6,562	8,722	15,284	87,539	736	0.173
1979	6,273	12,260	18,533	109,626	781	0.168
1980	6,324	14,538	20,862	78,576	815	0.263

Source: Unpublished data provided by the Bank of England.

Note: The average debt/equity ratio in 1975-80 was 0.240.

Table 3.14 Sources of Funds of Nonfinancial Companies, 1975-80
(£ million)

Year	Undis-tributed Profits (1)	New Equity Issues (2)	Debt (3)	Loans and Bank Borrowing (4)	Total (5)
1975	9,057	1,003	202	3,211	13,473
1976	12,563	785	42	4,872	18,262
1977	15,064	730	-67	4,958	20,685
1978	16,777	829	-71	4,747	22,282
1979	20,406	906	-22	6,859	28,149
1980	15,781	897	423	9,549	26,650

Source: *Financial Statistics*, October 1981, table 9.2.

Table 3.15 Sources of Corporate Finance
(%)

Debt	19.3
Retentions	76.3
New share issues	4.4
Total	100.0

Source: Tables 3.4 and 3.5.

3.3.4 The Ownership of Equity

Given data on the distribution of tax rates by category of owner and on the relative shares of the different sources of finance, the final set of information we require is the distribution of source of finance by category of owner. In this section we examine the ownership of equity, and in section 3.3.5 we examine the ownership of debt. In neither case was it possible to obtain information on ownership separately for each industry group, and so we assumed that the ownership of debt and equity by type of owner was the same for each of our three industry groups.

Statistics on ownership of corporate equity have been collected in various surveys of company registers for the years 1957, 1963, 1969, and 1975 (see *Economic Trends*, September 1977, for a discussion of these surveys). The major problem encountered in examining shareownership is the need to distinguish between registered nominee and beneficial ownership. There are institutions such as banks and nominee companies that hold securities purely as intermediaries. The surveys attempted as far as possible to trace back all nominee holdings to their ultimate beneficial owners, and it is for this reason that the results of such surveys are unique. Other sources of information on United Kingdom ownership suffer from the problem of nonallocation of nominee holdings. The size of nominee

Table 3.16 Beneficial Share Ownership, United Kingdom, 1957-75
(%)

Category of Owner	1957	1963	1969	1975
Persons	79.44	71.09	65.95	54.02
Tax-exempt institutions	5.89	9.64	12.64	21.63
Insurance companies	9.78	11.34	13.90	18.01
Overseas	4.89	7.94	7.52	6.34
Total	100.00	100.00	100.00	100.00

Source: Own calculations based on *Economic Trends*, September 1977, p. 100.

Note: Columns may not sum to total shown because of rounding errors. Tax-exempt institutions comprise mainly pension funds but also include charities and nonprofit bodies. Persons include unit and investment trusts. The proportions owned by "other" groups (banks, corporations, and the public sector), about 10 percent of the total, were ignored in calculating the figures in this table. The surveys refer to ownership on 31 December each year except for 1957, when the date is 1 July.

holdings is by no means negligible. In 1975 individuals owned 32 percent of total registered equity holdings, but their beneficial ownership was 38 percent (*Economic Trends*, September 1977). There has been no study imputing nominee holdings to their beneficial owners since 1975. Table 3.16 summarizes the existing information on shareownership in the United Kingdom based on the four postwar surveys. It reveals marked trends in shareownership. There has been a sharp decline in the fraction of equity owned by the household sector, with a corresponding increase in holdings by tax-exempt institutions and life insurance companies. The proportion of equity held by pension funds has increased dramatically—it rose by more than 150 percent between 1963 and 1975.

To construct beneficial shareownership weights for 1980, we extrapolated from 1975. The first assumption was that the fraction of equity held by overseas investors remained constant at 6.5 percent.¹³ For two of our three ownership categories—life insurance companies and pension funds—information on the total market value of ordinary shareholdings is available for the period 1975-80. These figures are shown in table 3.17 together with the total market value of outstanding equity of industrial and commercial companies. From this table we see that the total market value of equity rose by 123 percent during 1975-80, while that of pension funds increased by no less than 265 percent and that of life insurance companies by 138 percent. These figures imply that the ownership share of pension funds in total equity rose by 63.6 percent between 1975 and 1980, and that the ownership share of life insurance companies rose by 6.6 percent. Because the total funds of life insurance companies comprise two components, life insurance and pension business, that are taxed in

13. At the time of writing, no data on foreign ownership of United Kingdom equity after 1975 was available. A stock exchange survey was due to be completed in early 1983.

Table 3.17 **Market Value of Equity Holdings**
(£ million)

Year	Total Market Value of Nonfinancial Corporate Equity	Value of Equity Held by Pension Funds	Value of Equity Held by Life Insurance Companies		
			Total	Life Insurance	Pension Business
1975	51.912	6.515	5.962	4.550	1.412
1976	49.594	7.455	5.740	4.382	1.358
1977	77.429	11.310	8.930	6.815	2.115
1978	105.469	15.622	9.835	7.506	2.329
1979	142.557	17.436	10.593	8.084	2.509
1980	115.894	23.800	14.206	10.841	3.365

Source: Unpublished data provided by the Bank of England, with reallocation for share of life insurance holdings (9/38) attributable to pension business.

different ways, it is important to distinguish between them. Although such a division is necessary for the tax liability of an insurance company to be computed, no statistics are published on the relative sizes of life insurance and pension business of insurance companies. This failing was criticized by the Wilson Committee (1980), which produced its own estimates of the division (pp. 532 and 579) and suggested that pension business accounted for £9 billion of the total assets of life insurance companies out of £38 billion at the end of 1978. We use this figure to reallocate a proportion of insurance company assets from our ownership group "insurance companies" to the group "tax-exempt institutions." The two components of life insurance company equity holdings are shown in table 3.17.

The figures above enable us to compute new values for the shareownership weights at the end of 1980, and these are reported in table 3.18. Adjusting for the assumed constant share of overseas owners yields the share of the personal sector as a residual. Because we are interested in the shares of total equity owned by domestic investors, we recompute the shares excluding holdings by overseas investors, and the final set of shareownership weights used in our study is shown in the last column of table 3.18.

3.3.5 The Ownership of Debt

In analyzing the ownership of debt, we must take into account the two distinct ways companies may obtain debt finance—issues of debentures and net bank borrowing. It is important to distinguish between these components because of the different assumptions we make about the taxation of income deriving from the two sources. Income from debenture loan stock is taxed at ordinary personal tax rates, whereas income

Table 3.18 Shareownership Weights

Category of Owner	1975 Weight	Growth Factor, 1975-80	1980 Weight	Weight after Business Allocation	1980 Weight in Domestic Ownership	
					Without Reallocation	With Reallocation
Households	0.540	0.755	0.408	0.408	0.435	0.435
Tax-exempt institutions	0.216		0.337	0.382	0.360	0.407
Pension funds	0.190	1.636	0.311	0.356	0.332	0.380
Other	0.026	1.000	0.026	0.026	0.028	0.028
Insurance companies	0.180	1.066	0.192	0.147	0.205	0.157
Overseas investors	0.063	1.000	0.063	0.063	—	—
Total ^a	1.000		1.000	1.000	1.000	1.000

Source: Own calculations based on tables 3.7 and 3.8.

^aColumns may not sum to total shown because of rounding errors.

obtained from savings channeled to the corporate sector via banks is taxed in a more complicated way. We must therefore distinguish between the way debt finance is made up, on the one hand, of debentures and borrowing from banks and, on the other hand, of the two types of bank deposits. As discussed in chapter 2, we shall assume that income accruing to sight deposits (checking accounts) is in the form of bank services provided free of charge and untaxed. Interest income on time deposits will, in contrast, be assumed to be taxed at ordinary rates.

The composition of debt finance is illustrated in figure 3.2, which shows

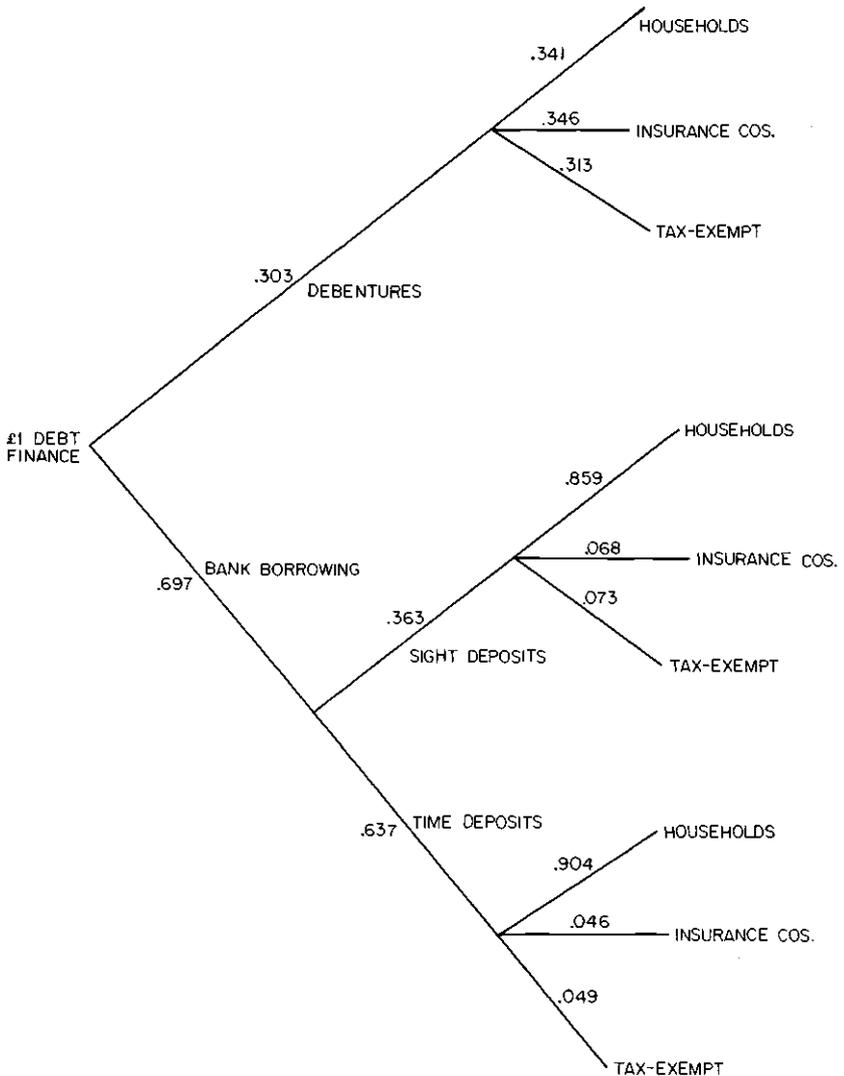


Fig. 3.2 The structure of debt finance.

the way the three ultimate categories of owner may contribute to a unit increase in total debt finance. The proportion of an increase in debt finance coming from each category of owner along the different routes may be calculated by multiplying the numbers shown along each route. For example, at the end of 1980 debenture finance accounted for 30.3 percent of nonfinancial corporate sector debt finance (table 3.13). This figure is shown in the diagram along the path corresponding to debenture finance. We shall show below that the proportion of debentures owned by the personal sector was 34.1 percent, which also is shown on the appropriate path in the diagram. Hence the proportion of an increase in debt finance accounted for by personal sector ownership of debentures was $0.303 \times 0.341 = 0.103$.

We examine first the ownership of the debenture stock. Table 3.19 shows the ownership of debentures and loan stock for several types of owners, principally the personal sector and a number of financial institutions that include building societies, trustee savings banks, finance houses, pension funds, and life insurance companies. Figures are shown separately for unit trusts and investment trusts because we include these in our definition of the household sector, whereas in the official statistics they are included in a category of financial institutions. Hence the final two rows of table 3.19 show the holdings for the "adjusted" household sector, which includes unit and investment trusts, and the "adjusted" other financial institutions, which excludes these two types of owners.

At the end of 1980 the proportion of debenture and loan stock owned by the household sector was 34.1 percent. The division of the remaining 65.9 percent among different financial institutions was possible using data provided by the Bank of England. These are shown in table 3.20 and indicate the holdings of debt by life insurance companies and by pension funds at the end of 1980. Holdings by the category "other financial institutions" seem to be extremely small, and these have been neglected. We show figures also for a reallocation of insurance company holdings to pension business using the proportion described in section 3.3.4. That the

Table 3.19 Debenture Holdings by Sector 1976-80
(£ million)

Sector	1976	1977	1978	1979	1980
Household sector	1,686	2,364	2,158	1,585	1,379
Unit trusts	18	22	18	8	15
Investment trusts	84	95	71	42	30
"Adjusted" household sector	1,788	2,481	2,247	1,635	1,424
Other financial institutions	2,750	3,208	2,930	2,657	2,762

Source: *Economic Trends*, July 1981; *Financial Statistics*, October 1981, tables 8.11 and 8.12.

Note: The "adjusted" household sector includes unit and investment trusts; "other financial institutions" excludes them.

Table 3.20 Debenture Holdings by Insurance Companies and Pension Funds, End 1980

	Amount (£ million)		Share	
	Before Pension Reallocation	After Pension Reallocation	Before Pension Reallocation	After Pension Reallocation
	Life insurance companies	2,023	1,544	0.688
Pension funds	918	1,397	0.312	0.475
Total	2,941	2,941	1.000	1.000

Source: Unpublished data provided by the Bank of England, and own calculations.

total holdings of insurance companies and pension funds shown in table 3.20 sum to more than the total shown in table 3.19 appears to be the result of the inclusion of a small amount of foreign debt instruments, and we have assumed that such securities were owned in equal proportions by pension funds and insurance companies. Hence, of the 65.9 percent of debentures owned outside the personal sector, 52.5 percent (34.6 percent of the total) were attributed to life insurance companies and the remaining 47.5 percent (31.3 percent of the total) to the tax-exempt group, which consists primarily of pension funds and the pension business of insurance companies. These numbers are shown in the top half of figure 3.2.

To determine the weights applicable to bank finance, we assume that an increase in bank borrowing by the corporate sector is financed by an equiproportionate increase in both time and sight deposits. We shall therefore focus on the two types of bank deposits held by our three ownership groups. Table 3.21 shows the total value of both sight and time

Table 3.21 The Ownership of Bank Deposits, End 1980 (£ million)

Group	Sight Deposits		Time Deposits	
	Value	Share	Value	Share
Households	9,745.4	.859	17,984.4	.904
Insurance companies	768.3	.068	919.1	.046
Pension funds ^a	824.8	.073	987.0	.049
Total	11,338.5	.363	19,890.5	.637

Source: Own calculations based on *Financial Statistics*, January 1982, tables 8.11 and 8.12, and unpublished data provided by the Bank of England. For pension funds the ratio of sight to time deposits was assumed to be the same as that for insurance companies; a separate breakdown was unavailable.

^aIncludes pension business of insurance companies.

deposits for the three groups. Again, part of insurance company holdings were reallocated to tax-exempt institutions as described above. It is clear that the household sector holds the bulk of time deposits and almost as high a proportion of sight deposits. Of bank deposits held by our three groups in total, 36 percent were in the form of sight deposits. The proportionate shares of the different sources of bank finance given by table 3.21 are shown also in figure 3.2.

Using figure 3.2, we may now compute effective tax rates for debt finance applicable to each ownership group. The tax rate applied to interest income from debt finance for each ownership group is a weighted average of the group's marginal tax rate (as estimated in section 3.2.8) and zero, where the respective weights are the share of the group's ownership of debenture finance and time deposits and its share of total sight deposits. As explained in chapter 2, income received via sight deposits is deemed to be taxed at a zero rate. For both time deposits and debenture interest, we use the appropriate marginal tax rate. The proportions of total debt finance attributable to the three groups in both taxable and nontaxable form are shown in table 3.22. The final row of the table shows the weights we use for each ownership group for debt finance. The marginal tax rates applicable to debt finance for each ownership group are equal to the product of the marginal tax rates derived in sections 2.8–2.10 above and the fraction of the group's total debt ownership that is in taxable form (given by the ratio of its entry in row 1 in table 3.22 to the sum of rows 1 and 2). The estimated effective tax rates on debt income are as follows: 30.55 percent for the household sector, 23.28 percent for insurance companies, and zero for pension funds.

That the household tax rate on debt interest is lower than that on dividends compensates for the smaller fraction of debt held by the tax-exempt institutions and insurance companies. The result is that the weighted average marginal tax rate on dividend income over all ownership groups is 22.4 percent, and that on interest income is 25.3 percent.

Table 3.22 Debt Ownership Proportions
(%)

	Households	Insurance Companies	Pension Funds	Total ^a
Debentures and time deposits	50.01	12.77	11.87	76.69
Sight deposits	21.79	1.72	1.85	25.31
Total ^a	71.80	14.49	13.72	100.00

Source: Own calculations based on figure 3.1.

^aRows and columns may not sum to totals shown because of rounding errors.

3.4 Estimates of Effective Marginal Tax Rates

This section describes the results for the United Kingdom. Summary results for the base-case parameter values for 1980 are presented in section 3.4.1. The effect of recent changes in legislation is discussed in section 3.4.2, and estimates for two earlier years, 1960 and 1970, are presented in section 3.4.3. In section 3.4.4 we compare our estimates of marginal tax rates with a calculation of the average tax rate on capital income in the nonfinancial corporate sector. This shows the relation between our "forward-looking" measure of the tax rate on new investment and a "backward-looking" measure of the tax revenues collected on past investment. Further discussion of the results is postponed until chapter 7, where comparisons are made with the other countries in our study.

3.4.1 Principal Results

Using the values of the tax parameters described in section 3.2, the marginal tax rates on capital income may be computed for each of the eighty-one combinations. These values may be aggregated using the capital stock weights described in section 3.3. In table 3.23 we show the marginal tax rates for the fixed- p case, in which each hypothetical

Table 3.23 **Effective Marginal Tax Rates,**
United Kingdom, 1980, Fixed- p Case
(%)

	Inflation Rate		
	Zero	10%	Actual (13.6%)
Asset			
Machinery	-24.2	-33.3	-36.8
Buildings	41.5	41.0	39.3
Inventories	50.5	42.7	39.5
Industry			
Manufacturing	-1.7	-6.9	-9.6
Other industry	4.6	-2.3	-5.4
Commerce	46.8	39.5	36.6
Source of finance			
Debt	-29.6	-81.7	-100.8
New share issues	7.6	-0.9	-4.2
Retained earnings	23.5	29.3	30.6
Owner			
Households	26.6	38.3	42.0
Tax-exempt institutions	-5.1	-33.5	-44.6
Insurance companies	8.7	-2.1	-6.7
Overall	12.6	6.6	3.7

investment project is assumed to earn a pretax real rate of return of 10 percent per annum. Each column of the table corresponds to an assumed rate of inflation, and we consider three particular values: zero, 10 percent, and the actual annual average in the period 1970–79. Comparison of the first two columns illustrates the effect of an increase in the inflation rate on the effective marginal tax rate. This effect may be compared across countries (see chap. 7). Comparing the first and third columns reveals the effect of the actual inflation rate over the 1970s. Each row of table 3.23 corresponds to a particular subset of the full set of eighty-one combinations. For example, the row for machinery gives the weighted average marginal tax rate over the combinations containing machinery (twenty-seven in all).

A striking feature of table 3.23 is the contrast between the effective subsidy given to investment in machinery and the high tax rates levied on investment in buildings and inventories. This is reflected in the relatively low tax rates in manufacturing and other industry (in the former there is a small subsidy on average) compared with the high tax rate in commerce. Given the relative decline of United Kingdom manufacturing, these figures are all the more surprising.

There are also marked differences in the tax rates on the different sources of finance, with debt finance receiving a substantial subsidy, new share issues being taxed at a rate close to zero, and positive tax rates existing only for retained earnings. The imputation system of corporation tax lowers the cost of new share issues below that of retained earnings for all investors other than those with very high personal tax rates and so produces the ranking of source of finance by marginal tax rate shown in table 3.23. As expected, the differences among the categories of owner are significant. For investment financed by savings channeled directly from households to companies, the tax system produces an effective marginal tax rate on capital income only a little below household marginal tax rates. At the actual inflation rate, the difference is small. But for investment financed by savings channeled indirectly through tax-exempt institutions and insurance companies, the position is very different. For insurance companies the tax rate is close to zero, and tax-exempt institutions receive a substantial subsidy, particularly at high rates of inflation. An increase in inflation increases the dispersion of tax rates among different types of owner because it increases the advantage of a tax-exempt institution over a household that pays tax on nominal interest income.

The overall average marginal tax rate is only 12.6 percent at zero inflation, 6.6 percent at a 10 percent rate of inflation, and 3.7 percent at the actual inflation rate. In practice, therefore, the United Kingdom tax system approximates an expenditure tax as far as the corporate sector as a whole is concerned. The average marginal tax rate on capital income is

close to zero. But this average conceals a very wide dispersion of marginal tax rates, which would not be a feature of a true expenditure tax. Interestingly, the overall tax rate declines with inflation. The generous depreciation allowances for investment and the deductibility of nominal interest payments at the corporate level more than offset the failure to index the personal tax system.

Table 3.24 shows the pattern of marginal tax rates in the fixed- r case, with a common rate of return to investors (before personal tax) of 5 percent per annum on all projects. As explained in chapter 2, this calculation gives much greater weight to projects subject to high tax rates, and this is particularly marked for the United Kingdom. Projects that are subsidized receive a low weight because the required pretax return on the project is much lower, and this is responsible for the figure of about 30 percent for the overall average marginal tax rate. The relative magnitudes of the tax rates are the same as in the fixed- p case, and the overall marginal tax rate is again a decreasing function of the inflation rate. In the case of debt finance for the two positive rates of inflation, the tax rate is not shown because the value of the real rate of return on an investment project required to produce a 5 percent return to investors is actually negative. The incentives to invest and the tax advantages of debt

Table 3.24 **Effective Marginal Tax Rates,
United Kingdom, 1980, Fixed- r Case
(%)**

	Inflation Rate		
	Zero	10%	Actual (13.6%)
Asset			
Machinery	-32.0	-47.4	-57.5
Buildings	56.1	57.0	56.4
Inventories	53.0	48.7	45.9
Industry			
Manufacturing	15.3	13.7	10.7
Other industry	17.9	15.0	12.0
Commerce	59.1	56.5	55.0
Source of finance			
Debt	3.8	—	—
New share issues	27.3	8.3	-1.8
Retained earnings	40.0	47.0	48.2
Owner			
Households	48.1	87.5	104.6
Tax-exempt institutions	19.6	-19.4	-34.5
Insurance companies	31.7	20.4	14.5
Overall	34.9	32.4	30.0

finance are so great that the revenue generated by the project need not cover even depreciation costs to produce the stipulated rate of return. Very low, even negative, real rates of return (net of depreciation) may be consistent with equilibrium in the capital market, with investors earning positive real returns on their savings.

Tables 3.23 and 3.24 summarize the principal results for the United Kingdom using our standard values for the parameters. We shall investigate the sensitivity of our results to two particular assumptions. The first is that all tax allowances may be claimed by the company. In practice, United Kingdom companies have found it increasingly difficult to use all their tax allowances—the problem of “tax exhaustion.” By 1982 about half of all companies had no mainstream corporation tax liability in any given year. Of course unused tax losses may be carried forward (and backward), but for many companies it is possible that the marginal incentives were different from those illustrated in table 3.23. We show in table 3.25, again for the fixed- p case, the estimated marginal tax rates under the assumption that the company does not claim tax allowances and never pays mainstream corporation tax ($\tau = 0$). Under this assumption, imputation relief is withdrawn (that is, θ becomes unity) because no mainstream tax is collected. ACT would continue to be collected and

Table 3.25 **Effective Marginal Tax Rates, United Kingdom, 1980:**
The Case of Tax Exhaustion
(%)

	Inflation Rate		
	Zero	10%	Actual (13.6%)
Asset			
Machinery	4.8	12.9	15.5
Buildings	27.7	36.2	38.9
Inventories	11.9	20.1	22.7
Industry			
Manufacturing	9.2	17.3	20.0
Other industry	16.0	24.2	26.8
Commerce	23.0	31.4	34.1
Source of finance			
Debt	26.9	52.2	61.3
New share issues	24.0	46.4	54.4
Retained earnings	1.0	13.0	13.7
Owner			
Households	35.4	67.1	78.2
Tax-exempt institutions	-13.7	-35.5	-43.7
Insurance companies	8.9	11.7	12.4
Overall	13.9	22.1	24.7

would become income tax on dividends deducted at source. Unrelieved ACT was about £30–35 billion in 1982, and table 3.25 shows the incentives to invest under these conditions. The most interesting feature of the table is that the tax rate is now an *increasing* function of inflation. At zero inflation the overall marginal tax rate remains almost unchanged at 13.8 percent, but at 10 percent inflation it reaches 22 percent. It is the interaction between inflation and tax exhaustion that raises tax rates rather than the phenomenon of tax exhaustion as such. This is reflected in the sharp increase in the tax rate on projects financed by debt, which are no longer able to benefit from the deductibility of nominal interest payments. In turn, the burden of the increased tax rate falls on projects financed by households and life insurance companies, leaving tax-exempt institutions no more heavily taxed than in table 3.23.

The second sensitivity test we shall carry out relates to household marginal tax rates. In section 3.2.8 we estimated the marginal tax rate on dividend income as 45.0 percent and that on interest income as 30.5 percent. These estimates are somewhat lower than those implied by the Inland Revenue tax model, which, under our assumptions, would give a tax rate on dividends of 51.0 percent and on interest of 34.7 percent. In turn, these imply overall effective marginal tax rates in the fixed-*p* case of

Table 3.26 **Effective Marginal Tax Rates, United Kingdom,
before 1980 Change in Stock Relief, Fixed-*p* Case
(%)**

	Inflation Rate		
	Zero	10%	Actual (13.6%)
Asset			
Machinery	-24.2	-33.3	-36.8
Buildings	41.5	41.0	39.3
Inventories	-5.2	-14.1	-17.6
Industry			
Manufacturing	-14.2	-19.6	-22.3
Other industry	2.2	-4.7	-7.8
Commerce	34.9	27.2	24.0
Source of finance			
Debt	-45.8	-97.9	-117.0
New share issues	-3.9	-12.4	-15.8
Retained earnings	13.7	19.2	20.4
Owner			
Households	17.3	28.9	32.5
Tax-exempt institutions	-18.6	-47.3	-58.5
Insurance companies	-2.9	-13.9	-18.6
Overall	1.4	-4.8	-7.7

13.4, 8.6, and 6.1 percent for zero, 10 percent, and actual inflation rates, respectively. In the fixed- r case, the overall effective tax rates rise very slightly to 35.4, 33.6, and 31.5 percent for the three rates of inflation.

3.4.2 Recent Changes in Tax Legislation

In this section we shall illustrate the effect of a number of recent changes to the tax treatment of capital income in the United Kingdom. One of the most important, though unheralded, changes was the reform of stock relief in 1980 that withdrew immediate expensing on marginal investment in inventories (see section 3.2.3). At the time, attention was focused on the average corporate tax burden, but the effect on the marginal tax rate is shown clearly in table 3.26. A comparison with table 3.23 reveals that the reform had the effect of converting a small subsidy into a positive tax rate of about 40–50 percent. As a result, the overall marginal tax rate on capital income rose by about ten percentage points. This was a marked change, though it went virtually unnoticed at the time.

Several other changes to the taxation of capital income were made after the election of the Conservative government of Mrs. Thatcher in 1979. In tables 3.27 and 3.28 we show the pre- and post-Thatcher effective marginal tax rates. After the 1979 election, reductions in income tax

Table 3.27 **Effective Marginal Tax Rates, United Kingdom,
Pre-Thatcher, Fixed- p Case**
(%)

	Inflation Rate		
	Zero	10%	Actual (13.6%)
Asset			
Machinery	-23.5	-30.4	-33.0
Buildings	36.1	38.0	37.2
Inventories	-3.2	-9.8	-12.4
Industry			
Manufacturing	-16.2	-19.3	-21.1
Other industry	3.4	-1.3	-3.6
Commerce	35.0	29.5	27.0
Source of finance			
Debt	-37.2	-76.1	-90.4
New share issues	-4.2	-9.7	-12.0
Retained earnings	10.2	15.2	16.3
Owner			
Households	27.6	52.7	61.3
Tax-exempt institutions	-31.5	-69.4	-83.9
Insurance companies	-12.8	-30.5	-37.6
Overall	0.4	-3.6	-5.6

produced a significant fall in the personal tax rates on dividends and interest. Using the methods explained in section 3.2.8, we estimate that the pre-Thatcher tax rates on dividends and interest were 57.9 and 39.5 percent, respectively, for households. In addition, the value of θ was 1.5 (reflecting the higher basic rate of income tax), the wealth tax rate on corporate investment in buildings was 2.0 percent, and the rates of investment grant in manufacturing and other industry were 21 percent for machinery and 18 percent for buildings. As discussed above, immediate expensing was available on investment in inventories. For the post-Thatcher comparison we use the standard parameter values with two adjustments. First, in 1981 the first-year allowance for investment in industrial buildings was raised to 75 percent. Second, major changes were made to capital gains tax. The tax base was indexed to the retail price index, and the threshold below which gains were tax exempt was raised to £5,000 per annum (see section 3.2.1). To a large extent these changes eliminated liability to capital gains tax for many investors, and we assume that the effective accrued tax rate on capital gains was zero for the post-Thatcher calculations.

From tables 3.27 and 3.28 it is clear that the differences between pre- and post-Thatcher tax rates are small. For low rates of inflation, the

Table 3.28 **Effective Marginal Tax Rates, United Kingdom,
Post-Thatcher, Fixed- p Case
(%)**

	Inflation Rate		
	Zero	10%	Actual (13.6%)
Asset			
Machinery	-29.9	-41.2	-45.3
Buildings	27.7	20.8	17.8
Inventories	47.2	36.2	32.2
Industry			
Manufacturing	-12.1	-21.3	-24.8
Other industry	-2.2	-12.5	-16.4
Commerce	43.7	32.9	28.9
Source of finance			
Debt	-34.4	-88.1	-107.4
New share issues	4.2	-5.4	-8.9
Retained earnings	14.5	15.9	16.2
Owner			
Households	20.9	30.1	33.2
Tax-exempt institutions	-16.0	-49.6	-61.9
Insurance companies	0.3	-14.5	-20.0
Overall	4.6	-5.1	-8.8

post-Thatcher rates are higher than the pre-1979 tax rates. The relative advantage of investment financed from tax-exempt institutions and insurance companies has been reduced, and the tax rate on households is lower than in 1979. But, although there are changes in the effective tax rates on different assets (a higher tax on inventories and lower tax on buildings, for example), the overall weighted average marginal tax rate has changed little.

3.4.3 Comparison with 1960 and 1970

To illustrate the trend in effective tax rates over time, we show in tables 3.29 and 3.30 marginal tax rates for both 1960 and 1970. These may be compared with the 1980 rates shown in table 3.23. For comparison, we have used the 1980 capital stock weights in the construction of the 1960 and 1970 effective tax rates so that any trends that may be apparent from the tables are the result of changes in the tax system rather than changes in the pattern of investment. Similarly, we have evaluated the effective tax rates at the same three inflation rates as before—zero, 10 percent, and 13.6 percent. The values of the tax parameters used in the 1960 and 1970 calculations are shown in tables 3.31 and 3.32.

The changes over time are striking. The overall marginal tax rate has

Table 3.29 **Effective Marginal Tax Rates, United Kingdom,
1960, Fixed- p Case**
(%)

	Inflation Rate		
	Zero	10%	Actual (13.6%)
Asset			
Machinery	12.5	26.6	28.7
Buildings	61.0	58.6	56.1
Inventories	46.2	92.4	8.9
Industry			
Manufacturing	30.8	47.9	51.9
Other industry	24.6	43.0	46.2
Commerce	49.7	58.8	61.3
Source of finance			
Debt	16.7	7.3	1.5
New share issues	30.8	39.8	40.9
Retained earnings	40.3	61.9	67.8
Owner			
Households	52.5	90.0	1.9
Tax-exempt institutions	13.1	-1.1	-8.8
Insurance companies	32.2	43.2	45.1
Overall	35.3	50.4	53.8

declined sharply, particularly at the higher inflation rate. At a 10 percent rate of inflation the overall marginal tax rate fell from 50.4 percent in 1960 to 27.7 percent in 1970 and 6.6 percent in 1980. The other notable change is that in 1980 the overall tax rate was a declining function of the inflation rate, whereas in 1960 and 1970 the tax rate increased sharply with inflation. The move to immediate expensing and the change in the tax treatment of inventories are mainly responsible for this reversal of the relation between tax rates and inflation. The most significant change between 1960 and 1980 was the introduction of more and more generous investment incentives in the form of higher tax allowances and cash grants. Although investment in machinery was especially favored, all assets received higher allowances of some sort. The one major exception to the general rule that tax rates have declined uniformly over time is the treatment of the different sources of finance. The introduction of a classical corporate tax system in 1965 meant that between 1960 and 1970 the tax rate on investment financed from new share issues rose relative to that financed from retained earnings (tables 3.29 and 3.30). This was reversed when the imputation system of corporation tax was introduced in 1973 (tables 3.23 and 3.30).

Table 3.30 **Effective Marginal Tax Rates, United Kingdom,**
1970, Fixed-*p* Case
 (%)

	Inflation Rate		
	Zero	10%	Actual (13.6%)
Asset			
Machinery	-40.4	-19.2	-13.5
Buildings	53.0	59.2	60.2
Inventories	43.5	85.0	99.6
Industry			
Manufacturing	3.6	23.4	29.1
Other industry	-19.5	-0.9	3.9
Commerce	26.9	48.9	55.7
Source of finance			
Debt	-10.4	-3.0	-1.6
New share issues	32.3	75.5	90.1
Retained earnings	10.5	32.7	39.2
Owner			
Households	34.7	78.9	93.8
Tax-exempt institutions	-27.6	-38.0	-43.6
Insurance companies	1.3	16.3	20.2
Overall	7.4	27.7	33.6

3.4.4 Comparison with Average Tax Rates

The calculations presented to date have considered the effective tax rates on a hypothetical project that might be undertaken by a United Kingdom corporation. These estimated marginal tax rates may, however, be substantially different from the average tax rate actually paid on corporate income. To provide some means of comparing our estimates with published data on tax collections, in this section we examine the average tax burden on corporate profits.

To calculate the average tax rate on corporate source income requires data on both total tax receipts and the real profits of industrial and commercial companies (ICCs). We define the real operating profits of the ICCs as gross trading profits less capital consumption and stock appreciation, *plus* payments of rates. The correction for capital consumption removes the real depreciation cost of physical capital from reported profits, and the adjustment for stock appreciation removes from profits nominal gains on inventories and work in progress. Our correction for rates is necessary because the national income accounts reflect rates as a

Table 3.31 Tax Rates in 1960, United Kingdom
($\tau = 0.50625$; $\theta = 1.633$; $\nu = 1.0$)

	<i>m</i>	<i>z</i>				
Households						
Debt	0.3812	—				
Equity	0.5610	0				
Insurance companies						
Debt	0.2296	—				
Equity	0.2604	0				
<i>Investment Incentives</i>						
Asset	Industry	f_1	f_2	f_3	<i>a</i>	<i>g</i>
Machinery	Manufacturing	0.9	0.3	0	0.153	0
	Other industry	0.9	0.3	0	0.153	0
	Commerce	0.9	0.3	0	0.153	0
Buildings	Manufacturing	0.95	0.15	0	0.02 ^a	0
	Other industry	0.95	0.15	0	0.02 ^a	0
	Commerce	0	0	0	0	0
Inventories	Manufacturing	0	0	0	0	0
	Other industry	0	0	0	0	0
	Commerce	0	0	0	0	0

Source: King (1977), Appendix A.

Note: All other parameter values as in standard case.

^aStraight-line basis.

current item expenditure. We treat rates as a tax liability, to be deducted from real profits, and as a payment out of the factors income accruing to capital.

Our calculation of the tax liability proceeds in three stages. First, we define the flow of corporate tax payments as corporation tax accruals, plus rates, less the value of investment and regional development grants to ICCs. This defines the net tax liability of corporations. Dividend payments and interest charges of the ICCs are reported in the national income accounts, and we use this information to define real retained earnings as the residual after dividends and interest have been subtracted from real operating profits. The calculation of real retained earnings for 1978-80 is shown in table 3.33. We assume that the value of shareholders' equity rises by the amount of real retained earnings.

The second step in our tax liability calculation was to assess tax liabilities on dividends and interest payments. Using the estimated marginal tax rates calculated in section 3.2, and assuming that all income flows are subject to tax at these marginal rates, we computed the tax liabilities shown in table 3.34. This assumes that dividends and interest receipts are regarded as marginal sources of income. The estimated capital gains tax

Table 3.32 **Tax Rates in 1970, United Kingdom**
($\tau = .40625$; $\theta = 1.0$; $\nu = 1.0$)

	<i>m</i>	<i>z</i>				
Households						
Debt	.3941	—				
Equity	.5800	.268				
Insurance companies						
Debt	.2257	—				
Equity	.2560	.1667				
<i>Investment Incentives</i>						
Asset	Industry	f_1	f_2	f_3	<i>a</i>	<i>g</i>
Machinery	Manufacturing	.8	.2	.93	.2	.261
	Other industry	.8	.2	.84	.2	.261
	Commerce	.8	.2	.69	.2	.261
Buildings	Manufacturing	.7	.3	0	.04 ^a	0
	Other industry	.7	.3	0	.04 ^a	0
	Commerce	.7	.3	0	0	0
Inventories	Manufacturing	0	0	0	0	0
	Other industry	0	0	0	0	0
	Commerce	0	0	0	0	0

Source: King (1977), Appendix A; "Investment Grants Annual Report," HMSO (1971).

Note: All other parameter values as in standard case.

^aStraight-line basis.

Table 3.33 Corporate Profits and Their Appropriation, United Kingdom, 1978-80
(£ million in current prices)

	1978-80 Average
Real operating profits	15,669
Corporate taxes	5,740
Interest payments	6,054
Dividend payments	4,981
Real retained earnings	-1,106

Definitions

Real operating profits: Gross trading profits *less* capital consumption *less* stock appreciation *plus* rates (property taxes).

Corporate taxes: Corporation tax (accruals) *less* ACT *less* regional development and investment grants *plus* rates.

Interest payments: Debenture and loan and other interest.

Dividend payments: Dividends on ordinary and preference shares including ACT.

Real retained earnings: Real operating profits *less* corporate taxes *less* interest payments *less* real retained earnings.

Source: *National Income and Expenditure*, 1981, tables 5.2, 5.4, 8.1, and 11.9.

Note: A figure of £100 million for preference dividends was assumed (see King 1977, Appendix B). The figure for rates was computed by applying the increase in total rates to the figure for industrial and commercial companies given in section 3.2.6.

Table 3.34 Average Tax Rate on Real Corporate Profits
(£ million in current prices)

	1978-80 (Average)	Percentage (of Profits)
Total taxes	8,308	53.02
Corporate taxes	5,740	36.63
Taxes on		
Interest payments	1,532	9.78
Dividend payments	1,116	7.12
Real retained earnings	-80	-0.51
Personal wealth	0	
Real operating profits	15,669	
Average tax rate (%)	53.02	
Average profit rate (%)		
Gross of tax	7.03	
Net of tax	3.30	

Source: Table 3.33 and *National Income and Expenditure*, 1979, 1980, and 1981.

Note: The profit rate is the ratio of real operating profits to the average value of the end-78 and end-79 capital stock, which is defined to be the net capital stock at current replacement cost *plus* the book value of inventories.

liability is found by multiplying the calculated EAT rate by real retained earnings to capture the change in share values. Since these earnings were negative, we assume full loss offset and deduct the tax rebate shareholders would receive from total tax collected. Since the EAT rate is low, the estimates are not sensitive to this. As shown in table 3.34, these calculations yield a total tax burden of £8,308 million or 53.02 percent of corporate earnings. This must be compared with the 30.0 percent estimate of the overall marginal tax rate from our calculations in the fixed-*r* case (table 3.24). The increases in investment incentives mean that the forward-looking marginal tax rate is significantly below the backward-looking average rate.

One by-product of our calculations is an estimate of the pretax rate of return on corporate capital. This is defined as the ratio of real operating profits to the ICCs' net capital stock. For 1978–80 this rate of return was 7.03 percent per annum. After deducting the total tax payments we attribute to corporate source income, posttax earnings averaged 3.30 percent of the net capital stock over 1978–80.