Corporate Income Taxes and Investment: A Comparative Study

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Executive Summary

As economic activity becomes increasingly integrated, the taxation of corporate income has to be considered in an international context. This study considers developments in the USA, Japan, Germany, France, the UK, Denmark and the Netherlands. We consider the proposed reform of corporate taxation in Germany in this context, particularly with respect to its likely effects on business investment.

The most striking feature of corporate taxation over the last twenty years has been a general trend towards lower corporate income tax rates. This trend shows no sign of stopping. Japan, Germany, the UK and Denmark cut their corporate tax rates in 1999, and France reduced its surcharge on corporate profits.

This trend is broadly consistent with results from the economic analysis of corporate income taxes in open economies. Taxes on corporate income in small open economies are borne not by the owners of internationally mobile capital, but by relatively immobile workers - either in the form of lower wages or lower employment as a result of lower capital formation. Taxes on income from employment, which tax workers directly, are likely to be more efficient than taxes on corporate income, since they avoid this distortion to capital-labour ratios.

Whilst corporate tax rates have been falling, revenues from corporate income taxes have not - either as a share of GDP or of total tax revenues. This partly reflects corporate tax reforms which have broadened the tax base at the same time as they have cut tax rates, and partly reflects the recovery in underlying corporate profitability since the late 1970s.

These developments have produced a marked convergence in the impact of corporate taxes on the cost of capital over the period 1979-99. The cost of capital measures the minimum pre-tax rate of return required for an investment to be attractive to investors. Germany and Japan, whose corporate income taxes resulted in a high cost of capital at the start of this period, have experienced a decrease in their cost of capital – mainly as a result of lower corporate tax rates. The UK and the USA, whose corporate income taxes resulted in a low cost of capital at the start of this period, have experienced an increase in their cost of capital – partly as a result of big reductions in depreciation allowances in the mid-1980s.

Effective average tax rates, which measure the share of the value of profitable investment projects that is taken by corporate income tax, have shown a more general tendency to fall over this period. This reflects the trend towards lower corporate income tax rates.

At the beginning of 1999, the German corporate income tax was characterised by high tax rates; generous depreciation allowances, particularly for investment in plant and machinery; and generous tax reliefs for profits paid out as dividends. This left Germany with a high cost of capital by international standards, particularly for investment in buildings and for investment financed by retained profits; and with a high effective average tax rate on investment more generally.

The proposed corporate tax reform in Germany will reduce the headline rate of corporate income tax to 25%; reduce the generosity of depreciation allowances, particularly for plant and machinery; and reduce the value of tax reliefs for dividends. This reform is similar in nature to the rate cutting, base broadening corporate tax reforms that have been introduced in several other countries.

Taking into account local taxes and the solidarity surcharge, the typical corporate tax rate paid in Germany will fall to around 38%. This is similar to that in the USA and France, but still rather higher than that in the UK, Scandinavia and Ireland.

The proposed reform tends to reduce the cost of capital and effective average tax rate for those types of investment where these measures are currently particularly high in Germany – notably for investment financed by retained profits. However the proposed reform tends to increase the cost of capital and effective average tax rate for those types of investment where these measures are currently low or average in Germany – notably for investment financed by debt.

The proposed reform will therefore bring the costs of capital and effective average tax rates in Germany closer to the levels of these measures found in the other six countries we have considered.

Whether this will be favourable for investment in Germany depends on the weights given to different sources of finance, and to the cost of capital measures compared to the effective average tax rates. For domestic investment, we emphasise the importance of the cost of capital for investment financed by retained profits – which finances at least 70% of aggregate investment spending. For inward investment, we emphasise the importance of effective average tax rates – since investments by foreign multinational firms tend to be highly profitable. Both these measures tend to be reduced by the proposed reform.

Nevertheless the size of these reductions is quite modest, and has only a minor impact on Germany's relative position among the seven countries we have considered. The planned corporate income tax reform may make Germany a somewhat more attractive location for business investment, but it will not transform Germany into one of the low cost of capital or effective average tax rate countries among this group.

Chapter 1. Introduction

As we move into the twenty-first century, the taxation of corporate income has become a subject that has to be considered in an international context. Business activity is increasingly dominated by multinational corporations that have both operations and the ability to raise capital in several countries. National governments can no longer be indifferent to developments in corporate taxation that are occuring elsewhere.

In this study we consider developments in the USA and Japan, in three large European countries – Germany, France and the UK – and in two smaller European countries – the Netherlands and Denmark. We use this background information to describe how the German corporate income tax compared to those in the other six countries immediately prior to the currently proposed reform of corporate taxation in Germany, particularly with respect to its likely effects on business investment; and how this position would be changed by the proposed German reform.[1]

Chapter 2 describes the main developments in corporate taxation over the last twenty years. Estimates of the effects of these corporate income taxes on the cost of capital and the effective average tax rate for a range of domestic and international investments are presented. This analysis is summarised in section 8 of Chapter 2. Chapter 3 describes some results from the economic literature on corporate taxation in open economies, which are useful in interpreting these trends. Chapter 4 describes the planned reform of the federal corporate income tax in Germany, and assesses the impact of this reform on the cost of capital and the effective average tax rate on a range of domestic and international investments. The findings are summarised in section 3 of Chapter 4. Separate annexes provide more information on our measures of the cost of capital and the effective average tax rate, and on the corporate tax systems in these seven countries.

[1] In this report we only consider the effects of the planned German corporate tax reform on business investment. We do not discuss the possible effects of changes to the taxation of corporate capital gains on mergers and acquisitions.

Chapter 2. Trends in Corporate Taxation

This chapter describes the main developments in corporate income taxes over the past two decades. We begin by describing the basic trends in corporate income tax rates and corporate income tax revenues. For the seven countries that are the focus of this study, we then present our estimates of how their corporate income taxes affect the cost of capital and the effective average tax rate for different types of investment. For the five larger countries – USA, Japan, Germany, France and the UK – we present these measures for the period 1979-99, whilst for the two smaller countries – Denmark and the Netherlands – we present estimates for the period 1990-99.

1. Corporate income tax rates

The most striking development in corporate taxation over the last twenty years has been a widespread trend towards lower corporate income tax rates. Table 1 reports some figures for the seven countries we focus on in this report. We distinguish between the headline corporate tax rate, which excludes surcharges and local corporate income taxes, and refers to tax rates on retained profits; and the typical corporate tax rate paid, which includes surcharges and a typical local corporate tax charge where these apply, and which reports separate tax rates for retained profits and distributed profits where these are different.[2]

All seven countries have cut their headline corporate tax rates since 1979, in some cases quite substantially. Figure 1 presents annual figures for these headline corporate tax rates over the period 1979-99 for the five larger countries.[3] Figure 2 presents annual figures for the corporate tax rates typically paid on retained profits in these countries.

The UK reduced its tax rate from 52% to 35% between 1983 and 1986 as part of a major reform of corporate income tax, and has subsequently reduced its rate to 30%. The USA reduced its federal corporate income tax rate from 46% to 34% as part of its

[2] Annex B provides further information on surcharges and local corporate income tax rates.

[3] Denmark's corporate income tax rate was 50% in the late 1980s, falling to 40% in 1990, 38% in 1991, 34% in 1993 and 32% in 1999. The Netherlands' corporate income tax rate was 42% in the late 1980s, falling to 35% in 1989.

1986 Tax Reform Act, although this was increased to 35% in 1993. Many other countries have followed this pattern and reduced their corporate tax rates over this period. Japan reduced its national corporate income tax rate from 43.3% in 1987 to 30% in 1999, although it should be noted that Japan has rather high local taxes on corporate profits.[4] France reduced its corporate income tax rate from 50% to 33.3% between 1985 and 1993, although the effect of this reduction has been partially reversed by significant surcharges introduced in 1995 and 1997. Germany reduced its federal corporate income tax rate on retained profits from 56% to 50% in 1990, and from 50% to 45% in 1994. Germany also reduced its federal corporate income tax rate on distributed profits from 36% to 30% in 1994.[5] Germany has now reduced the federal tax rate on retained profits to 40%, as the first stage in a planned major reform of its federal corporate income tax, which we discuss further in Chapter 4.

These seven countries are not unusual in having reduced their corporate tax rates over this period. Some other notable examples include Ireland, which introduced a 10% rate of corporate income tax for manufacturing business in 1981; and the Scandinavian countries (Sweden, Norway and Finland), which have cut their corporate tax rates to 28% during the 1990s. Italy was one of the few large countries that had increased its national corporate tax rate significantly over this period. However the 1998 Italian corporate tax reform significantly reduced local tax rates on corporate profits, as well as introducing new tax reliefs for investment.

2. Integration of corporate and personal income taxes

Whilst corporate income tax rates have been falling in all seven countries, there continue to be important differences between these countries in the relationship between their corporate and personal income taxes.

The USA and the Netherlands both have a ‘classical’ system. Under a classical system, profits earned by companies are taxed under the corporate income tax. When profits are paid out to shareholders as dividends, this dividend income is taxed again

[4] In 1999, Japan’s ranking moves from equal lowest to second highest among these seven countries when we take the local enterprise tax and inhabitants tax into account.

[5] As in France, the effect of these rate reductions has been somewhat offset by the introduction of surcharges.

under the personal income tax, at the shareholder's normal marginal tax rate, with no tax relief given on account of corporate income tax paid previously on the underlying profits by the firm. In so far as shareholders' marginal income tax rates are greater than the effective tax rate they pay on capital gains,[6] this gives firms an incentive to finance investments using retained profits rather than new share issues, and to minimise dividend payments.

Japan and Denmark both have a modified form of the classical system, under which dividends are taxed under the personal income tax, but at a reduced rate compared to the shareholder's marginal tax rate on other forms of income. This system is sometimes called a 'shareholder relief' system.[7]

Germany, France and the UK operate an 'imputation' system. Under an imputation system, some or all of the corporate income tax paid on distributed profits is 'imputed' to have been paid by the shareholders. This is then treated as if it was a pre-payment of the shareholders' personal income tax liability on the underlying distributed profit. For example, if the corporate tax rate on distributed profits is 30%, the rate of imputation is also 30%, and the shareholder receives a dividend of 70, this is treated as the shareholder receiving distributed profits of 100, on which income tax of 30 has already been paid. If the shareholder's marginal income tax rate is 40%, the income tax liability on distributed profits of 100 is 40, and there is an additional income tax charge of 10 to be paid. If the shareholder is tax-exempt - for example, where shares are owned by a tax-exempt pension fund – or has a marginal income tax rate below the rate of imputation (30%), there may be a refund of some or all of the corporate income tax paid on the underlying distributed profit.

Where the rate of imputation equals the rate of corporate income tax, as in our previous example, the system is known as a full imputation system. Germany and France currently operate full imputation systems in relation to their standard rates of corporate income tax on distributed profits, although neither country extends the imputation system to surcharges that are currently levied on corporate income.

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[6] This is generally the case since capital gains are taxed only when assets are sold, and the present value of the eventual tax charge is reduced by discounting. Assets held for long periods may also be subject to preferential tax rates, as for example in the USA.

[7] See, for example, OECD (1991).

Germany is also proposing to replace its imputation system by a form of shareholder relief system, as we discuss further in Chapter 4.

Where the rate of imputation is less than the corporate income tax rate, the system is known as a partial imputation system. The UK currently operates a partial imputation system, with a corporate income tax rate of 30% and an imputation rate of 10%. In this case, when a shareholder receives a dividend of 70, this is treated as an underlying distributed profit of 77.77, on which income tax of 7.77 has previously been paid. Under a partial imputation system, only part of the firm's corporate income tax payment is treated as a pre-payment of the shareholder's income tax liability on the underlying distributed profit, and part is treated as an additional layer of taxation (as under a classical system). In fact, the current UK system also has elements of a shareholder relief system: taxpaying shareholders are subject to lower tax rates on dividends than on other forms of income, as well as being able to credit part of the firm's corporate income tax payment against their personal income tax liability; whilst tax-exempt institutional shareholders cannot claim any refund of corporate income tax paid on dividends they receive.[8] Prior to 1997, the UK operated a more conventional partial imputation system, with an imputation rate of 20%, and dividend tax credits that were refunded to tax-exempt shareholders.

Germany is currently unique among the seven countries consider here in also having a lower corporate income tax rate on distributed profits than on retained profits. Japan had a split-rate corporate income tax of this kind up to 1989. France had a split-rate corporate income tax between 1989 and 1991, but with a higher tax rate on distributed profits than on retained profits. Germany is proposing to abolish this split-rate system as part of the corporate tax reform we discuss in Chapter 4.

3. Corporate income tax revenues

When cutting corporate income tax rates, governments have often sought to cushion the impact of rate cuts on their corporate tax receipts by simultaneously reducing various deductions against taxable profits, particularly tax allowances for

[8] Indeed, for domestic shareholders, the current UK system operates effectively as a shareholder relief system, under which tax-exempt and basic rate taxpayers face a personal income tax rate of zero on dividend income, and higher rate taxpayers face a personal income tax rate of 25% on dividend income.

depreciation. Both the UK reform in 1984 and the US reform in 1986 sharply reduced accelerated depreciation allowances. More recently, increases in personal taxation of dividend income have been used to finance cuts in corporate tax rates. In 1997, the UK cut its corporate income tax rate from 33% to 31%, but at the same time made its imputation system considerably less generous for non-taxpaying institutional shareholders, as we discussed in the previous section. The proposed introduction of a uniform 12.5% corporate tax rate in Ireland is associated with a switch from an imputation system to a classical treatment of dividend income.

This movement towards broader corporate income tax bases helps to explain why government revenues from corporate income taxes have not fallen in line with the reduction in corporate tax rates. At the same time it should be recognised that corporate profits were depressed in many countries during the 1970s and early 1980s, as a result of the two oil crises in 1973 and 1979 and the worldwide recession at the start of the 1980s. Part of the strength of corporate tax revenues over this period is therefore accounted for by a recovery in underlying corporate profitability.

Table 2 reports OECD statistics for corporate income tax revenues, measured both as a share of gross domestic product (GDP) and as a share of total tax receipts. As well as the seven individual countries, we include here figures for the European Union (EU) as a whole, calculated as a weighted average of the figures for all available EU countries. Figure 3 presents annual figures for corporate tax revenues as a share of GDP over the period 1975-97 for the five larger countries, as well as a series for the weighted average of the European Union countries. Figure 4 presents annual figures for corporate tax revenues as a share of total tax receipts.

It should be noted that the levels of these measures for 'taxes on corporate income' are not directly comparable across countries. One reason is that incorporated firms, that pay corporate income tax, account for differing shares of total business activity in different countries. Another reason is that the OECD classification of tax revenues between corporate and personal income taxes is not entirely consistent across countries.[9]

[9] For example, revenues from the withholding tax on dividends paid to shareholders are classed as personal income tax revenues in the case of Germany. Revenues from a similar tax in the UK, which

The striking feature of these revenue figures is the absence of any trend decline in corporate tax receipts. Table 2 shows that corporate tax revenues have risen in the USA following the Tax Reform Act of 1986, both as a share of GDP and of total tax revenue. Figure 3 shows that in the EU as a whole, corporate tax revenues have been remarkably stable over this period. Japanese corporate tax revenues fell sharply between 1989 and 1993, but have been stable thereafter.

Different European countries have experienced quite different patterns in recent years. In Germany, corporate tax revenues declined quite steadily between the mid-1980s and the mid-1990s. In France, corporate tax revenues fell quite sharply in the early 1990s, but have recovered more recently. Corporate tax revenues have been very volatile in the UK, whilst they have been rising in recent years in Denmark and the Netherlands. If we look beyond these seven countries, it is striking that there has been strong growth in corporate tax revenues in Sweden, Finland and Ireland – three countries that have cut their corporate tax rates substantially.

4. Costs of capital: domestic investments

Measuring the effect of corporate income taxes on the cost of capital is a standard way of assessing the potential impact of corporate taxation on investment. This approach is used by, for example, King and Fullerton (1984), OECD (1991), Ruding Committee (1992) and Chennells and Griffith (1997).

The 'cost of capital' is simply the minimum pre-tax rate of return required for an investment project to be attractive to investors. For example, if investors require a minimum real post-tax return of 10% per annum in order to finance an investment, the effect of a corporate income tax may well be that only projects with a real pre-tax return of 15% per annum are able to satisfy this requirement. In this example, the effect of the corporate income tax would be to raise the cost of capital from 10% to 15%. If firms are able to undertake all investment projects that meet their investors' minimum required real post-tax rate of return, the effect of a corporate income tax that raises the cost of capital will be to reduce the level of investment spending. In our example, investment projects that have a real pre-tax rate of return between 10% and

happened to be called 'advance corporation tax' prior to its abolition in April 1999, are classed as corporate income tax.

15% will no longer appear attractive to investors in the presence of the corporate income tax. Similarly if we consider a different corporate tax system that raises the cost of capital even more, say to 20%, then a greater range of investment projects are likely to be discouraged.

We discuss the impact of corporate income taxes on the cost of capital for different types of investment project in Annex A. In general this will depend on the type of asset, since different types of assets may be subject to different depreciation allowances; and on the source of investment finance, since returns paid out as dividends, capital gains and interest may be taxed differently. In this section we present estimates for investment carried out by domestic corporations in both industrial buildings and plant and machinery, in each case financed by retained earnings, by issuing new shares, or by borrowing. Investments carried out by domestic subsidiaries of foreign parent corporations may be subject to additional withholding taxes and taxes on foreign-source income when profits are repatriated. We discuss costs of capital for international investments separately in section 6.

Before presenting our empirical estimates, we clarify some assumptions on which these are based. First, our main measures relate only to the effects of corporate income taxes paid by firms, and do not include any effects of personal taxes on dividends, interest and capital gains, or of dividend tax credits available under imputation systems. In most cases these can be interpreted as the cost of capital facing a tax-exempt shareholder, though this is not the case in Germany and France, and in the UK prior to 1997. In some countries, such as the USA and the UK, where a large proportion of company shares are owned by tax-exempt financial institutions such as pension funds, this may be a highly relevant case to consider. In other countries it may be less relevant. However, given the very different personal tax rates facing different taxpaying shareholders, opportunities for tax avoidance particularly on interest income and capital gains, and the growing importance of non-resident shareholders, it is not clear that any other simple assumption would be more

appropriate. [10] Thus we simply assume that shareholders require firms to pay a minimum real rate of return after corporate income tax of 10% per annum.[11]

Second, these measures require assumptions about depreciation rates and inflation rates. Concerning tax allowances for depreciation, where more than one schedule is allowed by the tax code for industrial buildings or plant and machinery, we assume that the firm adopts the most favourable treatment available. The effect of depreciation allowances on the cost of capital depends on whether the tax depreciation provisions are more or less generous than 'true economic depreciation', or the actual rate at which the value of the asset falls as it gets older.[12] For all countries we assume common rates of true economic depreciation of 3.61% for industrial buildings, and 12.25% for plant and machinery, as in OECD (1991). Inflation rates affect the cost of capital because depreciation allowances are generally unindexed, and because nominal interest payments can generally be deducted against taxable profits. For all countries we estimate the cost of capital on the assumption of a constant inflation rate of 3.5%. Assuming a constant inflation rate allows us to focus on changes in the cost of capital that result directly from differences in the corporate income taxes, rather than those which arise indirectly as a result of the interaction of different inflation rates with unindexed tax systems.

Finally we note how the figures for the cost of capital we present here relate to figures for the 'effective marginal tax rate'. Denoting the cost of capital by p and the minimum required real post-tax rate of return by r, the (tax-exclusive) effective marginal tax rate is defined as

$$EMTR = \frac{p - r}{r}.$$

[10] We consider the impact of different assumptions about personal taxes on dividend income in Germany in Chapter 4.

[11] In the terminology used by King and Fullerton (1984) and OECD (1991), we present estimates of the cost of capital (p) computed on a fixed-r basis, with r equal to 10%.

[12] Note that our measures of the cost of capital account for differences between tax depreciation allowances and true economic depreciation using the method proposed in Devereux and Griffith (1998b), rather than the method suggested by King and Fullerton (1984) and used in OECD (1991) and Chennells and Griffith (1997). See Devereux and Griffith (1998b) for further discussion of the differences and the rationale for their approach.

Since we assume a fixed minimum required real post-tax rate of return (r) of 10%, figures for the effective marginal tax rate can easily be inferred from the costs of capital (p) we present. For example, if the cost of capital is 15%, this corresponds to an effective marginal tax rate of 5/10 = 0.5 or 50%.[13]

Empirical estimates

Our main results for the costs of capital for domestic investments are presented in Tables 3 and 4. Figures 5-8 present annual figures for some of these measures over the period 1979-99 for the five larger countries.

Consider first the cost of capital for investment by a domestic firm in plant and machinery financed by retained earnings, presented in Table 4(i) and Figure 8. In 1979 the highest costs of capital were found in Germany and Japan. This principally reflected the high corporate tax rates on retained earnings in those countries (see Table 1(ii)), together in Japan's case with less generous depreciation allowances for plant and machinery than those in France and the USA, and much less generous depreciation allowances for plant and machinery than those that were available in the UK. Over this period the impact of corporate income taxes on the cost of capital has fallen considerably in Germany and Japan, reflecting the reductions in their corporate tax rates. However despite these falls, it is still the case in 1999 that Germany and Japan have a rather higher cost of capital for domestic investment in plant and machinery financed by retained earnings than any of the other five countries.

In 1979 the lowest cost of capital for this type of investment was found in the UK, although the UK had a higher corporate tax rate than either France or the USA. This resulted from the availability of 100% first year allowances or 'expensing' for investment in plant and machinery in the UK at the time. Indeed, as a result of expensing, the 1979 UK corporate income tax left the cost of capital unchanged at 10%, or had an effective marginal tax rate of zero. Expensing for plant and machinery was replaced by much less generous depreciation allowances between 1983 and 1986, with the result that the UK cost of capital for domestic investment in plant and machinery financed by retained earnings rose during this period, despite the reduction

[13] Since we consider only corporate income taxes, this is sometimes referred to as the 'effective marginal corporate tax rate'.

in the corporate tax rate from 52% to 35%. This contrasts with the US reform of 1986, where reductions in both depreciation allowances and the corporate tax rate had approximately offsetting effects on the cost of capital for this type of investment.

This pattern illustrates a general feature of our results for the costs of capital, namely that there has been considerable convergence between the five larger countries over this period (i.e. the differences between their costs of capital have become smaller). This is particularly clear for the case of finance from retained earnings (Figures 6 and 8). In part this simply reflects the general reduction in corporate income tax rates, since other aspects of corporate income taxes such as depreciation allowances tend to have a smaller impact on the cost of capital at lower tax rates. In part, it also reflects deliberate policy reforms that have been intended to produce a more uniform treatment of different types of investments (i.e. differences within countries between different types of investments have been reduced).

Considering the cost of capital for domestic investment in plant and machinery financed by issuing new shares, our main results presented in Table 4(ii) take into account corporate income taxes paid by firms, but do not account for dividend tax credits where these are refundable to tax-exempt shareholders in the three countries with imputation systems (Germany, France and the UK, before 1997). As we explain in Annex A, dividend taxes affect the cost of capital only for investments financed by new equity, and not for investments financed by retained profits or debt.[14] This is particularly important since in all these countries, only a very small proportion of aggregate investment is financed by issuing new shares, and as a consequence dividend taxes have only a limited impact on the overall cost of capital.

For the countries with imputation systems, the figures in Table 4(ii) can be interpreted as the cost of capital facing a shareholder whose income tax rate on dividend income is equal to the rate of imputation, and who faces a zero effective tax rate on capital gains. For comparison, in Table 5(ii) we report for these three countries

[14] Strictly we should say that any constant level of dividend taxation has no effect on the cost of capital for investment financed by retained profits. When firms finance investment using retained profits, shareholders give up dividends in the current period in exchange for higher dividends in the future. Provided taxes on dividends are expected to remain constant, they have no effect on the rate of return earned by shareholders on investments financed by retained profits. If taxes on dividends were expected to increase, this would reduce the rate of return earned by shareholders.

the costs of capital that do take into account the dividend tax credits available under their imputation systems. These figures can be interpreted as the cost of capital facing a tax-exempt shareholder. Prior to 1997 these are arguably more meaningful figures to consider for the UK, where tax-exempt institutional shareholders do own a large proportion of corporate equity.

Concerning our main results in Table 4(ii), these differ from the case of retained earnings only for those countries with split-rate corporate income taxes: Japan in 1979, France in 1990 and Germany throughout this period. The lower rate of corporate income tax on distributed profits in Germany has the effect of reducing the cost of capital for investment financed by new equity relative to that for the same investment financed by retained profits (Table 4). For tax-exempt shareholders, this effect is increased by the operation of the imputation system (Table 5). For the countries with classical or shareholder relief systems, we would find the opposite ranking if we were to consider the case of a taxpaying shareholder. However in general we do not attach much significance to these costs of capital for investments financed by new equity, since as noted above only a small proportion of aggregate investment is financed in this way.

Considering the costs of capital for domestic investment in plant and machinery financed by debt, presented in Table 4(iii), these are substantially lower than the costs of capital for investment financed by retained earnings. Indeed, in all seven countries these figures are lower than the assumed post-tax required rate of return of 10%. As we explain in Annex A, this reflects a combination of the deductibility of nominal interest payments on debt against the tax base for corporate income taxes, and the availability of tax depreciation allowances that are more generous than our assumed rates of economic depreciation. Also, these costs of capital for investments financed by borrowing have increased over this period. This reflects the trend towards lower corporate income tax rates over this period, which reduces the benefit of interest deductibility. We can also see the effect of big reductions in the generosity of tax depreciation allowances for plant and machinery investment in the US and the UK during the 1980s. Note that in 1999, Germany has the lowest cost of capital for investment in plant and machinery financed by debt, whilst the UK has the highest cost of capital for this type of investment - almost the opposite pattern to that found

for the same investment financed by retained earnings. This reflects the fact that Germany has the highest corporate income tax rate of the seven countries in 1999, combined with relatively generous depreciation provisions for investment in plant and machinery.

It is convenient to summarise these different costs of capital for domestic investment in plant and machinery by a weighted average over the three sources of finance. In Table 4(iv) we present a weighted average using the same weights as in OECD (1991): 55% for retained earnings, 10% for new equity and 35% for debt. Annual figures for this weighted average are presented in Figure 7. Again there is considerable convergence over this period in this weighted average measure of the cost of capital for domestic investment in plant and machinery. The countries with the lowest costs of capital in 1979, the UK and the USA, experience an increase over this period; whilst the countries with the highest costs of capital in 1979, Japan and Germany, experience a fall. However these reductions in the weighted average measure of the cost of capital for Japan and Germany are not as large as those for investment financed by retained earnings, since in each case the reduction in the cost of capital for investment financed by retained earnings is partly offset by an increase in the cost of capital for investment financed by debt. Focusing on the results for 1999, it is striking how similar are the weighted average costs of capital for domestic investment in plant and machinery across all seven of the countries considered.

One point worth noting is that the OECD (1991) weights may understate the importance of investment financed by retained earnings, and overstate the importance of finance from new equity and debt. Recent studies of how private sector investment spending is financed in developed countries suggest that at least 70% of total finance comes from retained earnings. For example, Corbett and Jenkinson (1997) report figures for the USA, UK, Japan and Germany over the period 1970-94. They find that firms finance 70-90% of investment from internally generated funds, 10-30% from debt, and little or no investment from new equity.[15] Of course these aggregate patterns are dominated by the behaviour of large corporations, and finance from new equity and debt may be more important for small firms and for particular sectors.

[15] Gross flows of finance raised by issuing new shares tend to be offset by share repurchases, and by the use of retained profits to fund acquisitions.

Nevertheless they suggest that the cost of capital for investment financed by retained earnings may have a more important role in aggregate than these conventional weighted average measures of the cost of capital would imply.

Considering the cost of capital figures for domestic investment in industrial buildings, we see generally similar patterns to those discussed for domestic investment in plant and machinery. For investment financed by retained earnings (Table 3(i) and Figure 6), the countries with the highest costs of capital at the start of the period are again Germany and Japan, and these countries experience a fall over the period, as does France. Costs of capital for investment financed by debt are again substantially lower, and increasing over the period (Table 3(iii)). Considering the weighted average measure of the cost of capital for domestic investment in industrial buildings (Table 3(iv) and Figure 5), there is again considerable convergence. The low cost of capital countries at the start of the period, the UK and the USA, experience an increase as a result of lowering their depreciation allowances for industrial buildings; whilst the high cost of capital countries at the start of the period, Germany and Japan, experience a decrease as a result of falling corporate income tax rates.

One difference between the two types of assets that is worth noting concerns the relative position of Germany at the end of the period. For domestic investment in plant and machinery, Germany has the highest cost of capital in 1999 for investment financed by retained profits, but this is only marginally higher than the figure for Japan. For the weighted average measure in 1999, Germany has a similar cost of capital to that in the USA, the UK and the Netherlands, and rather lower than that in Japan. However for domestic investment in industrial buildings, Germany has much the highest cost of capital among these seven countries in 1999, both for investment financed by retained earnings and on the weighted average measure. This difference indicates that whilst the impact of Germany's high corporate income tax rate on the cost of capital for domestic investment in plant and machinery is largely offset by relatively generous depreciation allowances compared to the other countries, this is not the case for domestic investment in industrial buildings.

5. Effective average tax rates: domestic investments

Whilst the cost of capital measures focus on the effects of corporate income taxes on investment projects that are 'marginal', or only just worth undertaking for investors, effective average tax rates measure the impact of corporate income taxes on relatively profitable investment opportunities. The effective average tax rate is a measure of the share of the pre-tax value of a profitable investment project to shareholders that is taken away by the corporate income tax.

The effective average tax rate is likely to be relevant in contexts where firms are choosing one investment from a set of mutually exclusive and otherwise similar profitable opportunities. One case where it has been suggested this is relevant concerns the decision by a multinational corporation over where it should locate a profitable European operation between different European countries. Devereux and Griffith (1998a) find the effective average tax rate to be an important explanatory variable in a model of location choices by US multinational firms.

To measure the effective average tax rate, we consider the difference between the net present value of a hypothetical investment project to the firm's shareholders, with and without the corporate income tax. This difference is scaled by a measure of the size of the project to produce the effective average tax rate. A higher effective average tax rate indicates that the corporate income tax takes away a higher share of the pre-tax value of the investment, and may indicate that the country will be a less attractive location for that type of investment.

It should be noted that these effective average tax rate measures are very different in nature from average corporate income tax rates that are sometimes estimated from company accounts data, by comparing the published tax charge to some measure of accounting profits. The effective average tax rates we present are forward-looking – they measure how prospective new investment projects are expected to be taxed under the current tax system – and they can be calculated separately for different types of investment. Average tax rates estimated from company accounts data are backward-looking – they reflect how the firm's existing profit-generating activities are taxed, they are heavily dependent on the firm's history of investment activities, and the single figure that can be calculated for a firm reflects its mix of different types of

investment. Indeed, for a UK firm that has invested heavily abroad, for example, they will reflect not only taxes paid in the UK but also taxes paid abroad.[16]

In this section we report effective average tax rates for investments carried out by domestic corporations. Again these differ by asset and by source of finance, and we report figures for industrial buildings and plant and machinery, financed by retained earnings, new equity and debt. These measures are calculated for the case of investments that earn a real rate of return of 30% per annum in the absence of tax. We compute effective average tax rates using the method proposed in Devereux and Griffith (1998b), making the same assumptions about depreciation rates and inflation rates as we did in our cost of capital calculations. Again we focus on the effects of the corporate income taxes paid by firms, and abstract from the effects of personal income taxes and imputation credits.[17] Annex A provides further discussion of the effects of various features of corporate income taxes on these effective average tax rate measures. International investments are considered separately in section 7.

Empirical estimates

Our measures of the effective average tax rates for domestic investments are presented in Tables 6 and 7. Figures 9-12 present annual figures for some of these measures over the period 1979-99 for the five larger countries.

These effective average tax rates show a more general tendency to decline over this period, rather than to converge, which reflects the fact that effective average tax rates are more influenced by the statutory corporate income tax rate (cf. Figure 2). Thus the effective average tax rates for domestic investments in the UK fall in line with the corporate income tax rate between 1983 and 1986, in contrast to the cost of capital figures presented in the previous section.

Looking first at the effective average tax rates for domestic investments financed by retained earnings in 1979 (Tables 6(i) and 7(i), Figures 10 and 12), one difference

[16] For a recent comparative study of average corporate tax rates estimated from company accounts data, see Buijink, Janssen and Schols (1999). These measures can only be calculated for small and possibly unrepresentative samples of large, publicly quoted companies; and rely on published tax charges whose relation to actual tax payments varies across companies and countries.

[17] We consider the impact of different assumptions about personal taxes on dividend income in Germany in Chapter 4.

from the corresponding cost of capital figures (Tables 3(i) and 4(i), Figures 6 and 8) concerns the relative position of Japan. Japan was found to have the second highest costs of capital for domestic investment financed by retained earnings in 1979, but had the second lowest effective average tax rates for this type of investment. This is partly because Japan had the lowest corporate income tax rate for distributed profits under its 1979 split-rate system (Table 1(ii)), and illustrates the fact that dividend taxation does affect the effective average tax rate figures for all types of investment finance.

Turning to the effective average tax rates for domestic investment financed by retained earnings at the end of the period, these are highest in Japan and Germany – in common with the pattern of costs of capital for this type of investment. This principally reflects the fact that Japan and Germany have the highest corporate income tax rates among these countries in 1999, even for distributed profits (Table 1(ii)). Japan's position also reflects its relatively low depreciation allowances, compared to say the USA and France, particularly for investment in plant and machinery. As with the cost of capital, Germany's effective average tax rate is again particularly high for investment in industrial buildings, reflecting the relative generosity of its current depreciation allowances for investments in plant and machinery. Conversely we find the lowest effective average tax rates for domestic investment financed by retained earnings in the UK and Denmark, the two countries with the lowest corporate income tax rates among these seven in 1999.

Our effective average tax rate measures for domestic investments financed by new equity (Tables 6(ii) and 7(ii)) differ from those for investments financed by retained earnings only for those countries with split-rate corporate income taxes: Japan in 1979, France in 1990 and Germany throughout this period. If we were to also take into account dividend tax credits available to tax-exempt shareholders under imputation systems, we would find substantially lower figures here for Germany and France, and for the UK prior to 1997. For example, on this basis for Germany in 1999 the effective average tax rates for domestic investments in buildings financed by retained earnings and new equity are respectively 30.8% and 11.2%, and the corresponding figures for France are 18.9% and 3.5%. However, these apparently low figures for tax-exempt shareholders may not be very relevant for these countries. We

would stress that the main impact is again on investments financed by new equity, which accounts for a very small proportion of aggregate investment spending.

As with the costs of capital, our effective average tax rates for domestic investments financed by debt (Tables 6(iii) and 7(iii)) are substantially lower than those for investments financed by retained earnings, reflecting the advantage of interest deductibility for investments financed by borrowing. In contrast to the costs of capital for the case of debt finance, there is no simple relation between a high corporate income tax rate and a low effective average tax rate for investment financed by debt. This reflects the fact that the taxation of profits over and above the minimum return paid out as interest also matters for these effective average tax rate figures. Thus in 1999, for example, Germany has the highest effective average tax rate for domestic investment in buildings financed by debt, but a fairly average figure for domestic investment in plant and machinery financed by debt, again reflecting the relative generosity of the tax allowances for depreciation.

Not surprisingly, the weighted averages of these effective average tax rate measures (Tables 6(iv) and 7(iv), Figures 9 and 11) show a similar pattern to the measures for investments financed by retained earnings. In 1999, the highest effective average tax rates are found in Germany and Japan, whilst the lowest effective average tax rates are found in the UK. Both the Netherlands and Denmark also have low effective average tax rates for domestic investments in 1999.

6. Costs of capital: international investments

We now present costs of capital for investments carried out by domestic subsidiaries of foreign multinational corporations. These are likely to be more relevant than domestic costs of capital for considering the impact of corporate income taxes on the relative attractiveness of different countries as locations for mobile international investments.

When a firm makes an investment in a foreign subsidiary, the cost of capital will additionally depend on withholding taxes and the taxation of foreign-source income. Withholding taxes may be levied by the country in which the subsidiary is located – often referred to as the ‘source country’ – on payments of dividends or interest from

the subsidiary to the parent firm. The country in which the parent firm is located – often referred to as the 'residence country' – may also levy corporate income tax on the parent firm's receipts of dividends and interest from its foreign subsidiary. Whether it does so will depend on whether the residence country operates an exemption system or a credit system for foreign-source income, and in the latter case on whether the taxes paid abroad on the underlying profits are already greater than would have been paid if these profits had been earned in the residence country. We explain these tax treatments of foreign-source income and their impact on the cost of capital for international investments further in Annex A.

To illustrate these costs of capital for cross-border investments, we consider inward investment by a US or a Japanese multinational company into each of the other six countries. We assume that the parent firm finances this investment from retained earnings (i.e. reducing dividends paid to its shareholders), but allow the investment by the wholly-owned subsidiary to be financed from retained earnings, new equity or debt. The case where the subsidiary also uses retained earnings (i.e. reduces dividends paid to the parent firm) is likely to be most relevant in the context of domestic investments by existing, established subsidiaries of foreign multinational companies. The case where the subsidiary uses new equity or debt (i.e. issues new equity or debt which is purchased by the parent firm) may be more relevant in the context of new inward investments where the parent firm has no existing subsidiary in the source country. It should be noted that many other patterns of international investment finance are possible – for example, the parent firm may finance its investment in the subsidiary by itself issuing new equity or debt, the subsidiary may issue shares or borrow locally in the source country, or the investment may be routed through some third country such as a Belgian coordination centre. We do not consider all these possibilities in the figures presented here.

Empirical estimates

Tables 8 and 9 present our international cost of capital figures for the case of inward investment from a US parent company, and Tables 12 and 13 present our international cost of capital figures for the case of inward investment from a Japanese parent company. The USA and Japan both operate credit systems for foreign-source dividends and interest, and current withholding tax rates on dividends and interest

paid to the USA and Japan are provided in Annex B. Since neither the USA nor Japan has an imputation system, the figures presented here for corporate income taxes can be interpreted as the cost of capital facing tax-exempt shareholders of parent firms in those residence countries.

Again we consider investments in buildings and in plant and machinery separately. We do not present weighted average figures in this case, since it is likely that very different weights would be relevant for different types of international investment (e.g. that by established subsidiaries compared to that by new subsidiaries), and it is not clear that equally-weighted averages of these figures would be very meaningful.

These cost of capital figures for international investments where both the parent firm and the subsidiary use finance from retained earnings (Tables 8(i), 9(i), 12(i) and 13(i)) coincide with the cost of capital figures for domestic investments financed by retained earnings (Tables 3(i) and 4(i)). In the domestic context, we noted that personal taxes on shareholders' dividend income do not affect the rate of return earned by shareholders on investments financed by retained earnings, which involve shareholders giving up current dividends in exchange for higher future dividends. This principle extends to taxes levied on cross-border payments of dividends from the subsidiary to the parent firm.[18] Thus to the extent that retained earnings is the main source of finance, costs of capital for established domestic subsidiaries of foreign multinational corporations may not be very different from costs of capital for established domestic firms in the source country. As we discussed in section 4, these costs of capital have converged over the period 1979-99. The highest costs of capital in 1999 are found for subsidiaries located in Germany and Japan, whilst the lowest costs of capital are found for subsidiaries located in the UK and Denmark.

The costs of capital for international investments where the subsidiary uses new equity finance (Tables 8(ii), 9(ii), 12(ii) and 13(ii)) are generally higher than those where the subsidiary uses retained earnings finance (Tables 8(i), 9(i), 12(i) and 13(i)). This reflects the effect of taxes on cross-border payments of dividends from the subsidiary to the parent. This effect is offset in cases where the source country has a

[18] Again we note that strictly these results apply only for constant levels of these taxes on dividends.

split-rate corporate income tax with a lower tax rate on distributed profits, as in Japan in 1979 and in Germany throughout this period. However it should be stressed that the dividend tax credits available under imputation systems to domestic shareholders in Germany and France are not relevant in considering these costs of capital for investments financed by foreign parent companies with shareholders resident in the USA or Japan. For international investment in buildings where the subsidiary uses finance from new equity, the highest costs of capital in 1999 are found for subsidiaries located in Germany, Japan and the USA. For the corresponding investments in plant and machinery, the highest costs of capital in 1999 are found for subsidiaries located in Japan, the USA and the UK. Germany's cost of capital is among the lowest in this case, reflecting a combination of the split-rate system and generous depreciation allowances for plant and machinery.

The costs of capital for international investments where the subsidiary uses debt finance (Tables 8(iii), 9(iii), 12(iii) and 13(iii)) are not systematically lower than those where the subsidiary uses retained earnings finance (Tables 8(i), 9(i), 12(i) and 13(i)) or new equity finance (Tables 8(ii), 9(ii), 12(ii) and 13(ii)). Whilst there can be an advantage to borrowing and claiming interest deductibility in cases where the source country has a higher corporate income tax rate than the residence country (for example, for subsidiaries of US firms in 1999, we see this comparing debt to new equity for subsidiaries located in Japan, Germany and France), the advantage of interest deductibility in the source country is offset by withholding taxes and taxation of foreign-source interest where the source country has a lower corporate income tax rate than the residence country, and the residence country operates a credit system as in the USA and Japan. For the case where the subsidiary uses debt finance, the highest costs of capital in 1999 are found for subsidiaries located in Japan, the UK and the USA (particularly for investment in buildings); whilst for the case of investment in plant and machinery, the lowest costs of capital in 1999 are again found for subsidiaries located in Germany.

7. Effective average tax rates: international investments

Finally we present our measures of effective average tax rates for profitable investments carried out by domestic subsidiaries of foreign multinational corporations. These again take into account the effects of withholding taxes and the

taxation of foreign-source income, as we explain in Annex A. Again we consider inward investments by US and Japanese parent firms into each of the other countries. It has been suggested that these effective average tax rates may be particularly relevant for the decision by multinational companies to locate a profitable operation in one of several competing tax jurisdictions.[19]

Empirical estimates

Tables 10 and 11 present our international effective average tax rates for the case of inward investment from a US parent company, and Tables 14 and 15 present our international effective average tax rates for the case of inward investment from a Japanese parent company.

Considering effective average tax rates, those for international investment where both the parent and the subsidiary use finance from retained earnings are generally higher than the corresponding figures for domestic investment financed from retained earnings. This reflects the impact of additional taxes on cross-border payments of dividends from the subsidiary to the parent firms. Just as we saw for dividend taxes in the domestic case, these cross-border dividend taxes are relevant when we consider the effective average tax rates for profitable investments.

In general these effective average tax rates are more strongly influenced by the corporate income tax rates in the source country than are the costs of capital for international investments. Thus we see a general decline in these effective average tax rates for international investments, for both buildings and plant and machinery, and for all the patterns of finance considered. In 1999 the highest effective average tax rates are found for subsidiaries located in Germany and Japan, the countries with the highest corporate income tax rates among these seven; whilst the lowest effective average tax rates are found for subsidiaries located in Denmark, the Netherlands, the UK, and, in some cases, France. These patterns may help to explain why countries with low corporate income tax rates have tended to attract higher shares of inward investment into Europe than have countries with higher corporate income tax rates.

[19] See Devereux and Griffith (1998a, 1998b).

8. Summary

The main trend in corporate taxation over the last twenty years has been a general shift towards lower corporate income tax rates. This trend is showing no signs of coming to a halt. Of the seven countries considered in this report, five have reduced their corporate tax rates in 1999: Japan cut its national corporate tax rate from 34.5% to 30%, Germany cut its federal corporate tax rate on retained profits from 45% to 40%, the UK cut its corporate tax rate from 31% to 30%, Denmark cut its corporate tax rate from 34% to 32%, and France reduced the surcharge that it levies on corporate profits. Beyond this group of countries, local taxes on corporate profits were cut from 16.2% to 4.25% as part of the Italian corporate tax reform in 1998. Perhaps most controversially, Ireland has announced plans to replace its special 10% tax rate for manufacturing by a uniform 12.5% corporate income tax rate, which will come into effect in 2003.

Over the same period, several countries have broadened their corporate tax bases, notably by reducing the value of tax allowances for depreciation on capital assets. More recently, some countries have financed cuts in their corporate tax rates by increasing personal taxes on dividend income.

Partly as a result of this base broadening, and partly as a result of the recovery in company profitability, there has not been a collapse in corporate tax revenues over this period. Indeed corporate tax receipts as a share of either GDP or total tax receipts have shown a modest increase since the mid-1980s, both in the USA and in the European Union as a whole.

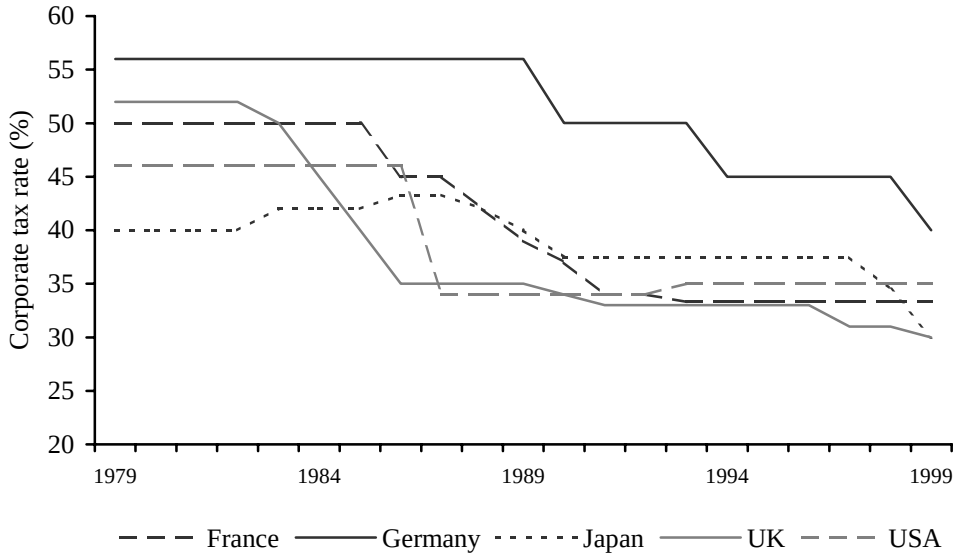
The main impact of these developments on the cost of capital has been to produce a marked convergence in the cost of capital measures between the five larger countries over the period 1979-99. Focusing on the weighted average measures of the cost of capital for domestic investments, the UK and the USA, whose corporate income taxes resulted in low costs of capital at the start of the period, have experienced increases in their costs of capital – partly as a result of big reductions in depreciation allowances in the mid-1980s. Germany and Japan, whose corporate income taxes resulted in high costs of capital at the start of the period, have

experienced decreases in their costs of capital – mainly as a result of reductions in their corporate tax rates.

There is also a tendency for these costs of capital to converge between the different sources of finance within individual countries. Costs of capital for investments financed by debt are generally lower than for investments financed by new equity or retained earnings, as a result of interest deductibility. This advantage has been reduced as corporate income tax rates have fallen. Costs of capital for investments financed by retained earnings – the most important source of finance for aggregate investment spending – have generally fallen over the period as a result of lower corporate tax rates.

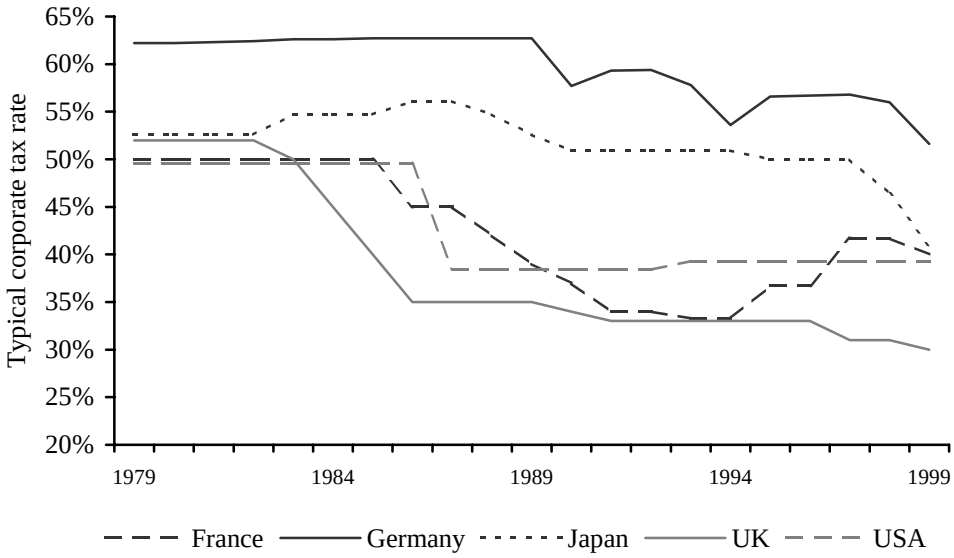
Effective average tax rates, which measure the share of the value of profitable investment projects that is taken by corporate income tax, have fallen more generally over this period. This is another result of the trend towards lower corporate income tax rates in these countries.

Figure 1 Headline corporate tax rates



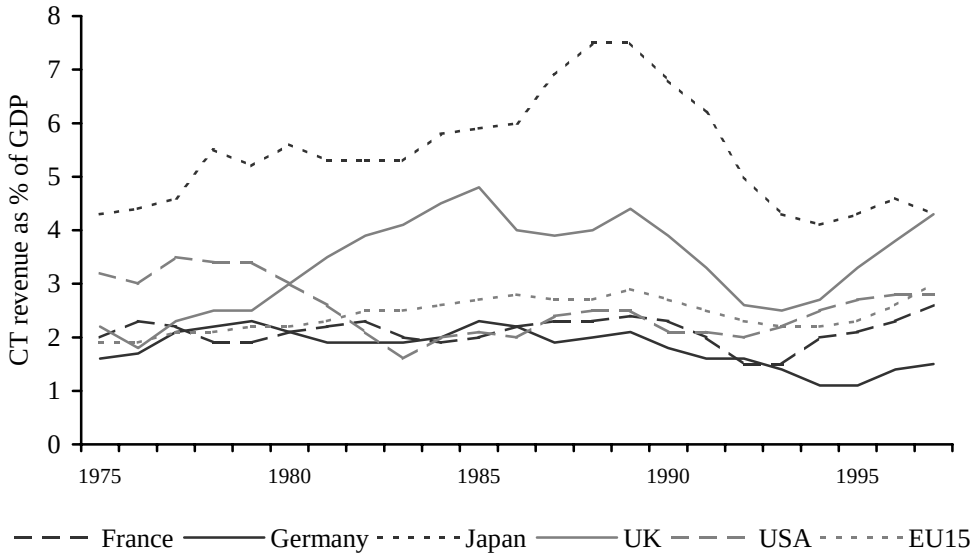
Note: The headline corporate tax rate is the national rate of corporate income tax on retained profits.

Figure 2 Typical corporate tax rates



Note: The typical corporate tax rate includes surcharges and typical local corporate income taxes, on retained profits.

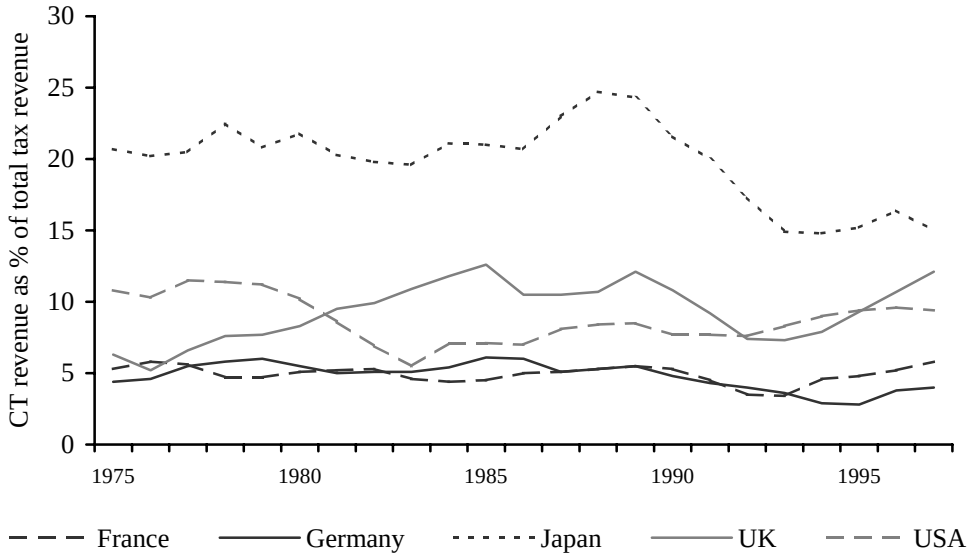
Figure 3 Corporate tax revenue as a share of GDP



Note: The EU15 is a weighted average for the 15 current member states, using GDP weights.

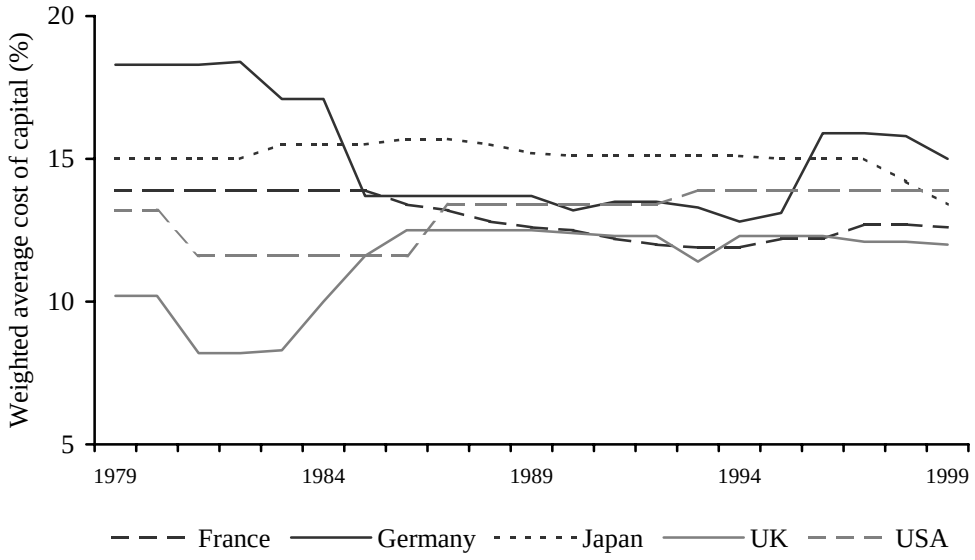
Source: Revenue Statistics 1965/1998, OECD (1999).

Figure 4 Corporate tax revenue as a share of total taxation



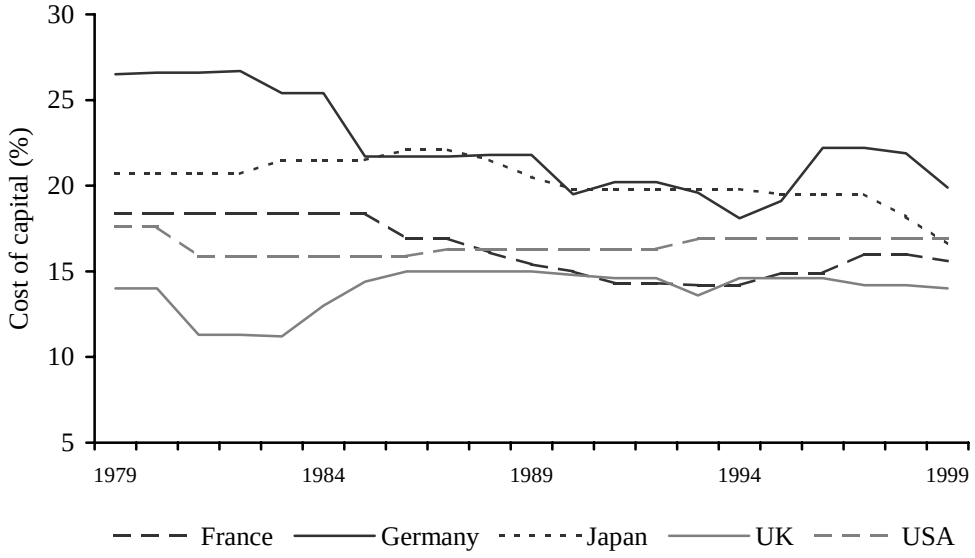
Source: Revenue Statistics 1965/1998, OECD (1999).

Figure 5 Domestic weighted average cost of capital – buildings



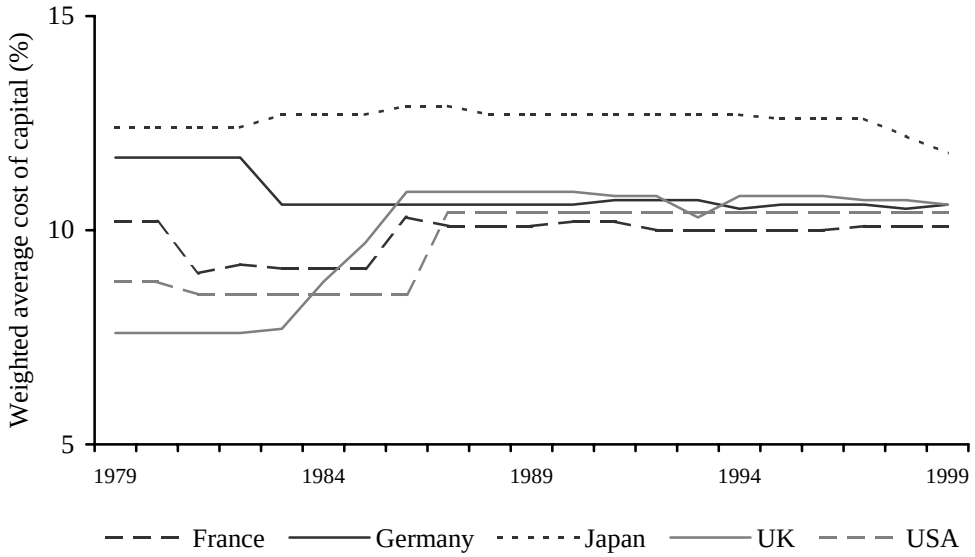
Note: The costs of capital are given the following weights by finance type: retained earnings 55%, new equity 10%, debt 35%, to calculate the weighted average. See OECD (1991). The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Figure 6 Domestic cost of capital using retained earnings – buildings



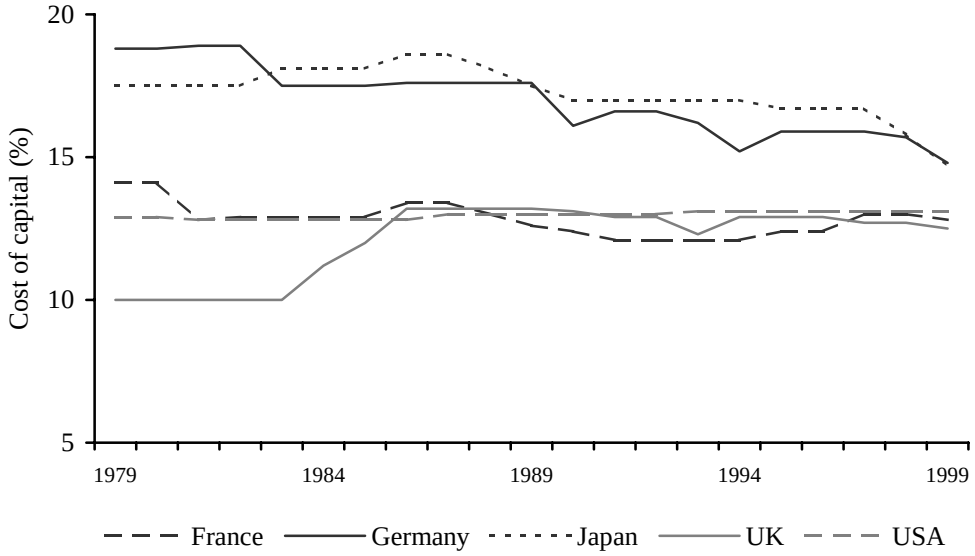
Note: The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Figure 7 Domestic weighted average cost of capital – plant and machinery



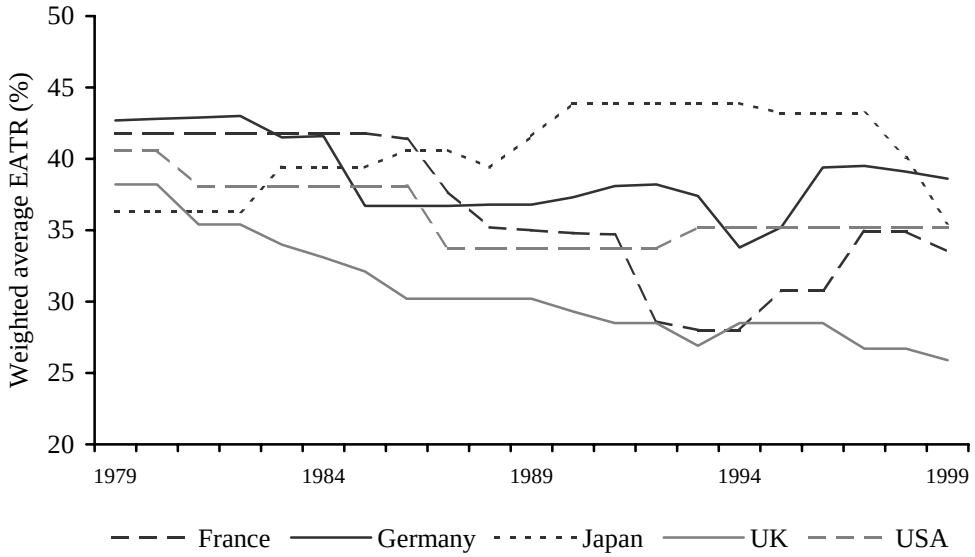
Note: The costs of capital are given the following weights by finance type: retained earnings 55%, new equity 10%, debt 35%, to calculate the weighted average. See OECD (1991). The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Figure 8 Domestic cost of capital using retained earnings – plant and machinery



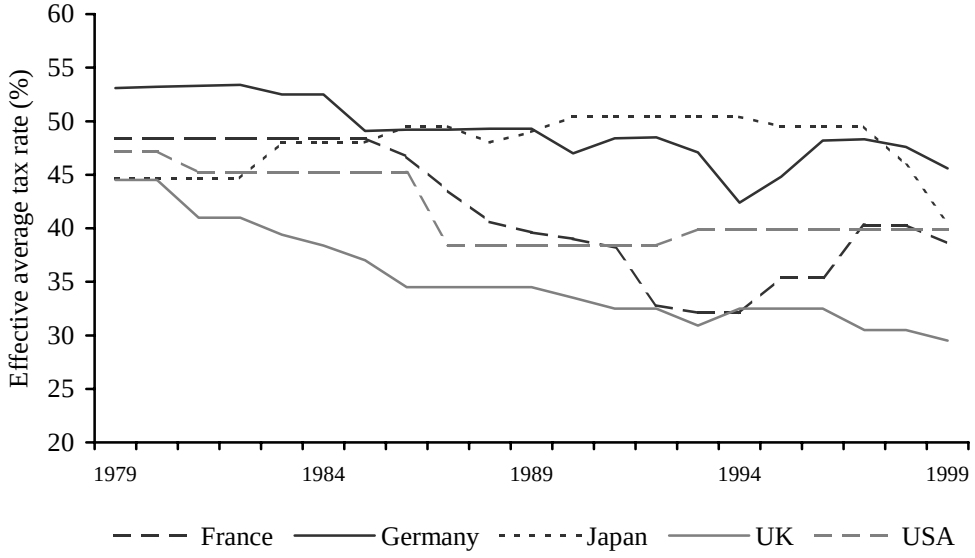
Note: The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Figure 9 Domestic weighted average EATR – buildings



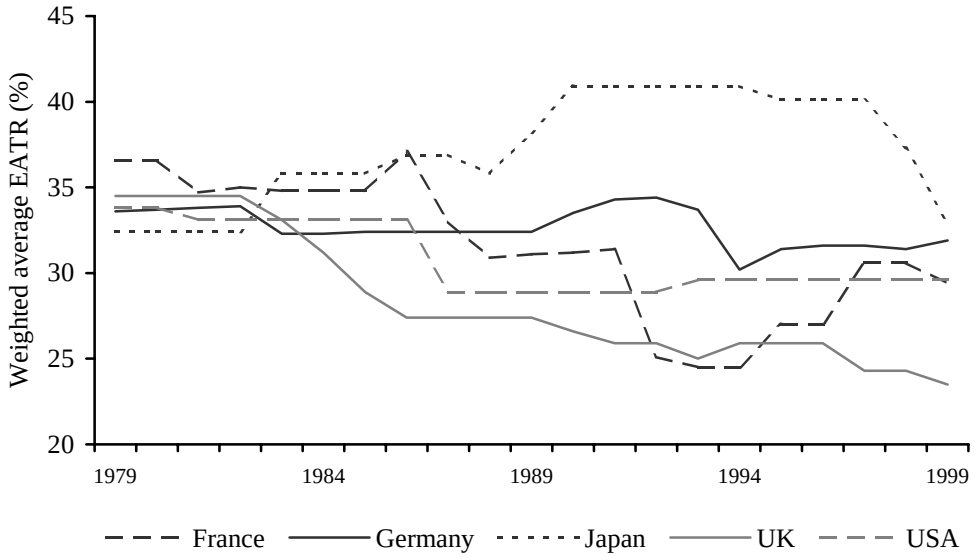
Note: The effective average tax rates are given the following weights by finance type: retained earnings 55%, new equity 10%, debt 35%, to calculate the weighted average. See OECD (1991). The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures assume the investment earns a 30% real rate of return in the absence of tax.

Figure 10 Domestic EATR using retained earnings – buildings



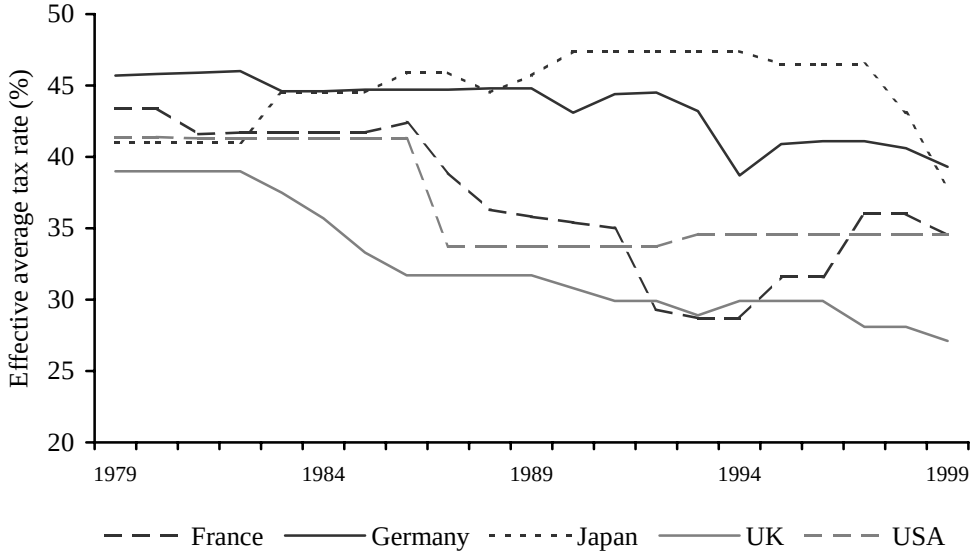
Note: The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures assume the investment earns a 30% real rate of return in the absence of tax.

Figure 11 Domestic weighted average EATR – plant and machinery



Note: The effective average tax rates are given the following weights by finance type: retained earnings 55%, new equity 10%, debt 35%, to calculate the weighted average. See OECD (1991). The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures assume the investment earns a 30% real rate of return in the absence of tax.

Figure 12 Domestic EATR using retained earnings – plant and machinery



Note: The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures assume the investment earns a 30% real rate of return in the absence of tax.

Table 1 Corporate tax rates

(i) Headline tax rates

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	46.0	40.0	56.0	50.0	52.0		
1990	34.0	37.5	50.0	37.0	34.0	40.0	35.0
1999	35.0	30.0	40.0	33.3	30.0	32.0	35.0

(ii) Typical tax rates paid

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	49.6	52.6/40.0	62.2/45.0	50.0	52.0		
1990	38.4	50.9	57.7/45.9	37.0/42.0	34.0	40.0	35.0
1999	39.3	40.9	51.6/42.8	40.0	30.0	32.0	35.0

Notes: The headline tax rate is the main rate of the national corporate income tax charged on retained profits. The typical tax rate paid includes surcharges and typical levels of local corporate income taxes. Where two figures are given, the first refers to tax rates on retained profits and the second refers to tax rates on distributed profits.

Source: PriceWaterhouseCoopers Corporate Taxes Worldwide Summaries and Doing Business In… Information Guides (various years); International Bureau for Fiscal Documentation Tax News Service (various issues); OECD (1991); Chennells and Griffith (1997).

Table 2 Taxes on corporate income

(i) As a share of GDP (%)

	USA	Japan	Germany	France	UK	Denmark	Netherlands	EU
1975	3.0	4.3	1.6	1.9	2.2	1.3	3.3	1.9
1985	2.0	5.8	2.3	2.0	4.6	2.4	3.1	2.7
1997	2.8	4.3	1.5	2.6	4.3	2.6	4.4	3.0

(ii) As a share of total tax revenue (%)

	USA	Japan	Germany	France	UK	Denmark	Netherlands	EU
1975	11.4	20.6	4.4	5.2	6.2	3.1	7.7	5.4
1985	7.5	21.0	6.1	4.5	12.3	4.9	7.0	6.8
1997	9.4	15.0	4.0	5.8	12.1	5.2	10.5	7.4

Note: EU figures are a weighted average for the 15 EU countries in 1996, and a weighted average for 14 EU countries in 1975 and 1985 (excluding Portugal for which corporate tax revenues are not available).

Source: Revenue Statistics 1965-97, OECD (1999).

Table 3 Domestic cost of capital – buildings

(i) Retained earnings

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	17.6	20.7	26.5	18.4	14.0		
1990	16.3	19.8	19.5	15.0	14.8	14.7	14.6
1999	16.9	16.6	19.9	15.6	14.0	14.0	14.6

(ii) New equity

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	17.6	14.9	15.7	18.4	14.0		
1990	16.3	19.8	13.0	16.8	14.8	14.7	14.6
1999	16.9	16.6	15.8	15.6	14.8	14.0	14.6

(iii) Debt

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	5.0	6.2	6.1	5.4	3.2		
1990	8.1	6.3	3.5	7.2	8.0	6.0	7.6
1999	8.4	7.5	7.2	6.9	8.3	7.8	7.6

(iv) Weighted average

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	13.2	15.0	18.3	13.9	10.2		
1990	13.4	15.1	13.2	12.5	12.4	11.7	12.1
1999	13.9	13.4	15.0	12.6	12.0	11.8	12.1

Note: The costs of capital are given the following weights by finance type to calculate the weighted average: retained earnings 55%, new equity 10%, debt 35%. See OECD (1991). The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Table 4 Domestic cost of capital – plant and machinery

(i) Retained earnings

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	12.9	17.5	18.8	14.1	10.0		
1990	13.0	17.0	16.1	12.4	13.1	12.6	13.0
1999	13.1	14.7	14.8	12.8	12.5	12.3	13.0

(ii) New equity

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	12.9	12.3	9.5	14.1	10.0		
1990	13.0	17.0	10.4	14.1	13.1	12.6	13.0
1999	13.1	14.7	11.2	12.8	12.5	12.3	13.0

(iii) Debt

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	1.3	4.4	1.2	2.9	3.0		
1990	5.6	4.7	2.0	5.5	6.8	4.7	6.3
1999	5.4	6.3	3.8	5.0	7.2	6.6	6.3

(iv) Weighted average

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	8.8	12.4	11.7	10.2	7.6		
1990	10.4	12.7	10.6	10.2	10.9	9.8	10.7
1999	10.4	11.8	10.6	10.1	10.6	10.3	10.7

Note: The costs of capital are given the following weights by finance type to calculate the weighted average: retained earnings 55%, new equity 10%, debt 35%. See OECD (1991). The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Table 5 Domestic cost of capital – imputation systems

(i) New equity, buildings

	France	Germany	UK
1979	9.7	7.2	7.8
1990	9.2	4.6	9.8
1999	8.3	8.9	14.0

(ii) New equity, plant and machinery

	France	Germany	UK
1979	6.6	2.1	6.0
1990	7.3	3.1	8.4
1999	6.3	5.3	12.5

Note: The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Table 6 Domestic effective average tax rate – buildings

(i) Retained earnings

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	47.2	44.7	53.1	48.4	44.5		
1990	38.4	50.4	47.0	39.0	33.5	37.4	33.9
1999	39.9	40.5	45.6	38.6	29.5	30.9	33.9

(ii) New equity

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	47.2	37.6	42.0	48.4	44.5		
1990	38.4	50.4	39.0	41.4	33.5	37.4	33.9
1999	39.9	40.5	40.6	38.6	29.5	30.9	33.9

(iii) Debt

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	28.2	22.7	26.6	29.4	26.6		
1990	25.1	31.9	21.6	26.4	21.6	22.3	21.5
1999	26.5	26.1	27.0	24.1	19.1	19.5	21.5

(iv) Weighted average

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	40.6	36.3	42.7	41.8	38.2		
1990	33.7	43.9	37.3	34.8	29.3	32.1	29.6
1999	35.2	35.5	38.6	33.5	25.9	26.9	29.6

Note: The effective average tax rates are given the following weights by finance type to calculate the weighted average: retained earnings 55%, new equity 10%, debt 35%. See OECD (1991). The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures assume the investment earns a 30% real rate of return in the absence of tax.

Table 7 Domestic effective average tax rate – plant and machinery

(i) Retained earnings

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	41.4	41.0	45.7	43.4	39.0		
1990	33.7	47.4	43.1	35.4	30.8	34.3	31.3
1999	34.6	37.9	39.3	34.5	27.1	28.2	31.3

(ii) New equity

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	41.4	33.7	32.8	43.4	39.0		
1990	33.7	47.4	35.1	37.8	30.8	34.3	31.3
1999	34.6	37.9	34.1	34.5	27.1	28.2	31.3

(iii) Debt

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	19.8	18.6	14.9	23.9	26.2		
1990	19.9	28.8	18.1	22.8	18.9	19.4	18.8
1999	20.4	23.5	19.7	19.9	16.8	17.0	18.8

(iv) Weighted average

	USA	Japan	Germany	France	UK	Denmark	Netherlands
1979	33.8	32.4	33.6	36.6	34.5		
1990	28.9	40.9	33.5	31.2	26.6	29.1	26.9
1999	29.6	32.9	31.9	29.4	23.5	24.3	26.9

Note: The effective average tax rates are given the following weights by finance type to calculate the weighted average: retained earnings 55%, new equity 10%, debt 35%. See OECD (1991). The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures assume the investment earns a 30% real rate of return in the absence of tax.

Table 8 US parent company, cost of capital – buildings

(i) Parent retained earnings, subsidiary retained earnings

	Japan	Germany	France	UK	Denmark	Netherlands
1979	20.7	26.5	18.4	14.0		
1990	19.8	19.5	15.0	14.8	14.7	14.6
1999	16.6	19.9	15.6	14.0	14.0	14.6

(ii) Parent retained earnings, subsidiary new equity

	Japan	Germany	France	UK	Denmark	Netherlands
1979	19.4	24.5	19.8	13.0		
1990	22.8	16.4	18.2	16.2	15.9	15.7
1999	19.0	17.4	16.8	16.9	16.3	16.1

(iii) Parent retained earnings, subsidiary debt

	Japan	Germany	France	UK	Denmark	Netherlands
1979	19.2	21.2	19.0	13.0		
1990	17.6	12.7	16.5	16.2	14.8	15.7
1999	17.2	15.7	15.9	16.9	16.3	16.1

Note: These measures assume an investment is made by a US parent company into a wholly-owned subsidiary in one of the above countries. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Table 9 US parent company, cost of capital – plant and machinery

(i) Parent retained earnings, subsidiary retained earnings

	Japan	Germany	France	UK	Denmark	Netherlands
1979	17.5	18.8	14.1	10.0		
1990	17.0	16.1	12.4	13.1	12.6	13.0
1999	14.7	14.8	12.8	12.5	12.3	13.0

(ii) Parent retained earnings, subsidiary new equity

	Japan	Germany	France	UK	Denmark	Netherlands
1979	16.3	17.1	15.3	9.4		
1990	19.7	13.4	15.4	14.4	13.6	14.0
1999	17.0	12.6	13.8	15.3	14.5	14.3

(iii) Parent retained earnings, subsidiary debt

	Japan	Germany	France	UK	Denmark	Netherlands
1979	16.1	14.2	14.6	9.4		
1990	15.0	10.1	13.8	14.4	12.7	14.0
1999	15.2	11.2	13.0	15.3	14.5	14.3

Note: These measures assume an investment is made by a US parent company into a wholly-owned subsidiary in one of the above countries. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Table 10 US parent company, effective average tax rate – buildings

(i) Parent retained earnings, subsidiary retained earnings

	Japan	Germany	France	UK	Denmark	Netherlands
1979	50.8	61.0	49.9	42.8		
1990	53.3	51.2	41.4	36.4	39.4	36.2
1999	44.3	47.8	40.6	35.9	35.8	36.8

(ii) Parent retained earnings, subsidiary new equity

	Japan	Germany	France	UK	Denmark	Netherlands
1979	49.5	59.5	51.3	41.5		
1990	56.0	47.8	45.4	38.3	40.9	37.7
1999	47.1	45.0	42.1	39.8	39.1	38.7

(iii) Parent retained earnings, subsidiary debt

	Japan	Germany	France	UK	Denmark	Netherlands
1979	49.3	56.9	50.5	41.5		
1990	51.2	43.3	43.4	38.3	39.5	37.7
1999	45.0	43.0	41.0	39.8	39.1	38.7

Note: These measures assume an investment is made by a US parent company into a wholly-owned subsidiary in one of the above countries. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures also assume the investment earns a 30% real rate of return in the absence of tax.

Table 11 US parent company, effective average tax rate – plant and machinery

(i) Parent retained earnings, subsidiary retained earnings

	Japan	Germany	France	UK	Denmark	Netherlands
1979	47.5	54.8	45.1	37.2		
1990	50.5	47.6	38.0	33.8	36.4	33.7
1999	41.9	41.9	36.6	33.7	33.3	34.3

(ii) Parent retained earnings, subsidiary new equity

	Japan	Germany	France	UK	Denmark	Netherlands
1979	46.1	53.1	46.5	36.1		
1990	53.2	44.2	42.0	35.8	37.9	35.2
1999	44.7	38.9	38.1	37.7	36.5	36.3

(iii) Parent retained earnings, subsidiary debt

	Japan	Germany	France	UK	Denmark	Netherlands
1979	45.9	50.1	45.7	36.1		
1990	48.3	39.7	39.9	35.8	36.5	35.2
1999	42.6	36.7	37.0	37.7	36.5	36.3

Note: These measures assume an investment is made by a US parent company into a wholly-owned subsidiary in one of the above countries. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures also assume the investment earns a 30% real rate of return in the absence of tax.

Table 12 Japanese parent company, cost of capital – buildings

(i) Parent retained earnings, subsidiary retained earnings

	USA	Germany	France	UK	Denmark	Netherlands
1979	17.6	26.5	18.4	14.0		
1990	16.3	19.5	15.0	14.8	14.7	14.6
1999	16.9	19.9	15.6	14.0	14.0	14.6

(ii) Parent retained earnings, subsidiary new equity

	USA	Germany	France	UK	Denmark	Netherlands
1979	20.4	24.5	23.0	14.2		
1990	21.8	17.6	21.5	21.7	19.6	21.1
1999	19.4	19.8	16.0	17.5	16.9	16.6

(iii) Parent retained earnings, subsidiary debt

	USA	Germany	France	UK	Denmark	Netherlands
1979	19.9	22.2	21.5	14.2		
1990	21.8	16.6	21.2	21.7	19.6	21.1
1999	18.3	17.0	16.0	17.5	16.9	16.6

Note: These measures assume an investment is made by a Japanese parent company into a wholly-owned subsidiary in one of the above countries. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Table 13 Japanese parent company, cost of capital – plant and machinery

(i) Parent retained earnings, subsidiary retained earnings

	USA	Germany	France	UK	Denmark	Netherlands
1979	12.9	18.8	14.1	10.0		
1990	13.0	16.1	12.4	13.1	12.6	13.0
1999	13.1	14.8	12.8	12.5	12.3	13.0

(ii) Parent retained earnings, subsidiary new equity

	USA	Germany	France	UK	Denmark	Netherlands
1979	15.4	17.1	18.1	10.2		
1990	17.9	14.5	18.4	19.5	17.0	19.1
1999	15.3	14.7	13.1	15.8	15.0	14.9

(iii) Parent retained earnings, subsidiary debt

	USA	Germany	France	UK	Denmark	Netherlands
1979	14.9	15.1	16.8	10.2		
1990	17.9	13.6	18.1	19.5	17.0	19.1
1999	14.3	12.3	13.1	15.8	15.0	14.9

Note: These measures assume an investment is made by a Japanese parent company into a wholly-owned subsidiary in one of the above countries. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Table 14 Japanese parent company, effective average tax rate – buildings

(i) Parent retained earnings, subsidiary retained earnings

	USA	Germany	France	UK	Denmark	Netherlands
1979	42.8	55.3	46.0	36.3		
1990	46.6	52.4	45.8	44.8	44.7	44.6
1999	43.8	50.7	39.2	37.0	36.9	37.9

(ii) Parent retained earnings, subsidiary new equity

	USA	Germany	France	UK	Denmark	Netherlands
1979	46.0	53.6	50.7	36.7		
1990	52.2	50.5	52.7	52.1	50.1	51.7
1999	46.5	50.6	39.7	41.6	40.9	40.5

(iii) Parent retained earnings, subsidiary debt

	USA	Germany	France	UK	Denmark	Netherlands
1979	45.4	51.6	49.3	36.7		
1990	52.2	49.4	52.4	52.1	50.1	51.7
1999	45.3	47.7	39.7	41.6	40.9	40.5

Note: These measures assume an investment is made by a Japanese parent company into a wholly-owned subsidiary in one of the above countries. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures also assume the investment earns a 30% real rate of return in the absence of tax.

Table 15 Japanese parent company, effective average tax rate – plant and machinery

(i) Parent retained earnings, subsidiary retained earnings

	USA	Germany	France	UK	Denmark	Netherlands
1979	36.5	48.2	40.8	30.0		
1990	42.5	48.9	42.6	42.6	41.9	42.4
1999	38.8	45.1	35.2	34.8	34.5	35.5

(ii) Parent retained earnings, subsidiary new equity

	USA	Germany	France	UK	Denmark	Netherlands
1979	40.1	46.3	45.7	30.3		
1990	48.4	47.0	49.6	50.0	47.3	49.6
1999	41.7	45.0	35.6	39.5	38.4	38.2

(iii) Parent retained earnings, subsidiary debt

	USA	Germany	France	UK	Denmark	Netherlands
1979	39.4	44.0	44.2	30.3		
1990	48.4	45.9	49.3	50.0	47.3	49.6
1999	40.5	41.8	35.6	39.5	38.4	38.2

Note: These measures assume an investment is made by a Japanese parent company into a wholly-owned subsidiary in one of the above countries. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures also assume the investment earns a 30% real rate of return in the absence of tax.

Chapter 3. Corporate Taxation in Open Economies

This chapter briefly describes some results from the economic analysis of corporate income taxes in open economies. The trend towards lower corporate income tax rates that we saw in the previous chapter is broadly consistent with a key result from this literature, namely that it is inefficient to tax corporate income in a small open economy.

1. The small open economy case

Corporate income taxes are an example of a source-based tax on income from capital. They are said to be levied on a source basis, since they are charged on all profits earned within the tax jurisdiction, whether these profits are earned by domestic firms or by foreign firms, and whether the ultimate recipients of these profits are residents or non-residents. This contrasts with a residence-based tax on income from capital, which is levied on the taxpayer's worldwide income from capital, so long as the taxpayer is classed as a resident for tax purposes. For example, a personal income tax on residents' income that taxes all dividend receipts in a uniform way, whether they are received from domestic or foreign firms, would be a residence-based tax on a form of capital income.

A country is said to be a small open economy if its actions do not influence either the rate of interest or other prices in international markets. Among other things, this requires that the country has no market power in financial markets and goods markets. The small open economy assumption is more likely to be a reasonable benchmark assumption in contexts where there are integrated, perfectly competitive world markets.

There are two key results in the economic literature on taxation in small open economies that may be helpful in understanding recent developments in corporate income taxation, as the world economy in general, and financial markets in particular, have become more integrated. The first states that source-based taxes on income from capital levied by a small open economy are not borne by the owners of capital, but are

fully shifted onto relatively immobile workers. The second states that it is ineffecient to impose source-based taxes on income from capital in small open economies.

Effective incidence

The effective incidence of a tax describes which people are made worse off as a result of the tax being imposed. Often these will not be the same people who pay the tax to the revenue authorities. For example, value-added taxes (VAT) are paid by retailers, but it is very unlikely that all of the effective incidence of VAT remains with retailers. Much of the effective incidence will be shifted onto consumers in the form of higher prices charged by retailers for goods sold. If the prices paid by consumers rise fully in line with the VAT imposed by the government, we would say that all the effective incidence of VAT is borne by consumers.

Similarly, in a small open economy, none of the effective incidence of source-based taxes on income from capital will be borne by the owners of capital, and all of the effective incidence will be shifted onto workers.

The basic reason is that, in a small open economy, owners of capital can always earn the going world rate of return by investing abroad. To attract capital to finance investment in a small open economy, firms must therefore pay the going world rate of return. This applies to both domestic firms and foreign firms. If the returns from their domestic investments are taxed, firms will require a higher pre-tax rate of return from domestic investment projects in order to pay the same post-tax rate of return to investors. The result will be lower investment, as fewer domestic investment projects meet the higher threshold pre-tax rate of return.[20] Lower investment will in turn depress labour productivity, which will be reflected in either lower wages or lower employment. One way or another, the effective incidence of the source-based tax on income from capital falls entirely on relatively immobile labour.

[20] Note that in this model firms do not respond by raising prices, since in a small open economy, firms have no market power and must accept the going world price for the goods they are producing.

Efficiency

Given this result, it is now a short step to see that source-based taxes on income from capital are inefficient in a small open economy.

Source-based taxes on income from capital are borne entirely by labour in the small open economy model. Taxes on labour income are also borne entirely by labour under these assumptions. Both source-based taxes on capital income and taxes on labour income will affect labour supply decisions. If there was only one kind of production technology in the economy, with the same capital-labour ratio used by all firms, it would be possible for a fall in the real wage paid to workers (as a result of imposing a source-based tax on income from capital) to have an equivalent effect to a tax imposed directly on labour income. In this special case, a tax on labour income and a source-based tax on capital income would be equivalent.

More generally, when different production technologies are used by different firms and different sectors of the economy, a fall in the real wage will have a bigger impact on labour intensive sectors than on capital intensive sectors. A source-based tax on income from capital will therefore distort production activities away from capital intensive sectors and towards labour intensive sectors. This distortion to the capital-labour ratio can be avoided by taxing labour income directly, rather than imposing a source-based tax on capital income. Thus source-based taxes on corporate income are inefficient in a small open economy.[21]

This analysis does not imply that residence-based taxes on income from capital are inefficient in a small open economy. A residence-based tax would apply only to income from capital earned by domestic residents. Foreign investors would not be subject to the tax and would therefore still be willing to finance all domestic investment projects that yield the going world rate of return on a pre-tax basis. However there are formidable obstacles to implementing a residence-based corporate income tax – for example, income accruing to foreign shareholders in domestic companies would need to be exempt from the tax, whilst income accruing to domestic shareholders in foreign firms would need to be subject to it.

[21] See Dixit (1985) or Gordon (1986) for a formal derivation of this result.

Existing source-based corporate income taxes therefore appear to be inefficient in small open economies. Nor can they be justified in this context by distributional arguments based on the 'ability to pay' principle. In a small open economy, the standard equity argument for wanting to tax wealthy individuals does not imply that we should have source-based corporate income taxes on firms owned by wealthy individuals. As we saw above, source-based corporate income taxes will effectively be paid by workers in a small open economy. Indeed, the puzzle for many public economists is not that corporate tax rates are falling, but why this trend has not proceeded further and faster.[22]

2. Discussion

There are various reasons why the full force of this argument may not apply. These include the possibility that international capital markets are not perfectly integrated, the possibility that some countries or regions are large enough to significantly influence the world rate of return even if capital markets are perfectly integrated, and the importance of corporate taxes in limiting opportunities for the avoidance of personal income tax. Nevertheless it is clear that there is a powerful force towards lower corporate tax rates applying in open economies that is not present in closed economies, and it is no surprise that corporate tax rates should have fallen as economies have become more open to trade and capital flows, and as capital markets have become more integrated.[23] There is a coherent argument that countries will do better by complying with these forces than by trying to resist them.

One response to these pressures facing national governments is to call for supranational coordination or harmonisation of corporate tax policies. There are two, perhaps related, reasons why we do not expect harmonisation at the EU level to have a significant impact on the trends and forces we have described, at least in the short term. First, and most pragmatically, it is far from clear that the necessary degree of

[22] See, for example, Gordon (2000).

[23] Low corporate tax rates may be more effective in attracting inward investment by multinational firms than standard arguments based on the cost of capital would suggest. This could be the case if multinational corporations have unique advantages (e.g. access to technologies) that allow them to earn profits over and above the minimum required rate of return (so-called 'economic rents'); or if multinationals can benefit from shifting income into low tax jurisdictions, for example by manipulating transfer prices on intra-group transactions. See Devereux and Griffith (1998a, 1998b) and Bond (2000) for further discussion.

political agreement exists on the desirability of significant coordination, let alone on the direction that a coordinated EU corporate tax policy should take. Previous attempts to introduce a greater degree of harmonisation among EU corporate income taxes have conspicuously failed to overcome these obstacles.[24] Secondly, and more contentiously, it is not clear that even the EU as a whole is large enough to overturn the logic favouring lower corporate income tax rates in highly open economies.[25]

[24] These initiatives include Neumark Committee (1963), Van den Tempel (1971), European Commission (1967, 1975, 1980, 1988) and Ruding Committee (1992). Despite these endeavours, one commentator has recently observed that 'currently domestic and cross-border investment decisions in the EU are distorted by a crazy quilt of widely diverging tax rates on capital income' (Cnossen, 2000).

[25] This is not to say that there are not other good reasons for greater coordination of corporate taxes within the EU, particularly as they apply to companies operating in several jurisdictions. Reduced administration and compliance costs alone could yield significant improvements in the efficiency with which business is conducted in Europe. Our point here is only that such coordination may not make much impression on the worldwide trend towards lower tax rates on corporate income.

Chapter 4. The German Corporate Tax Reform

This chapter describes the planned reform of the federal corporate income tax in Germany, and assesses the impact of this reform on the cost of capital and effective average tax rate for the range of domestic and international investments that we considered in Chapter 2. We begin by summarising how Germany's corporate income tax compared to those in the other six countries we have considered at the start of this reform process.

1. The current German corporate income tax in international context

We emphasise three distinctive features of the German corporate income tax system prior to the current tax reform. The German system was characterised by high corporate tax rates; generous depreciation allowances, which mitigated the impact of these high tax rates on the cost of capital, particularly for investment in plant and machinery; and generous reliefs for profits distributed to shareholders as dividends.

Despite reductions in German corporate income tax rates in 1990 and 1994, at the end of 1998 the German corporate income tax was still characterised by high tax rates in comparison to the other countries in this study. Headline tax rates of 45% on retained profits and 30% on distributed profits were augmented by a 5.5% 'solidarity surcharge' and additional local taxes on corporate profits (Gewerbesteuer) that ranged from around 13%-20%. Combining these taxes, the tax rate typically paid by a corporation on an additional unit of profits was about 56.0% if these profits were retained and about 42.8% if they were distributed to shareholders.[26] The reduction in the federal corporate tax rate on retained profits from 45% to 40% in 1999, the first phase of the planned German corporate tax reform, has reduced the tax rate typically paid on an additional unit of retained profits from 56.0% to about 51.6%.

As we saw in Chapter 2, these typical corporate income tax rates in Germany are higher than those in the other six countries covered in this report. Our estimates of the corporate tax rates typically paid in 1999 are about 39.3% in the USA and about

[26] These figures assume a typical local tax rate of about 16.2%.

40.9% in Japan,[27] 40.0% in France (including surcharges), 35% in the Netherlands, 32% in Denmark and 30% in the UK (see Table 1(ii)).

At the same time, tax allowances for depreciation on capital assets have remained quite generous in Germany by international standards. Depreciation deductions for plant and machinery are allowed on a declining balance basis at up to 30% per annum, switching to straight line depreciation at up to 10% per annum when this provides for a larger deduction. Depreciation deductions for buildings are given on a straight line basis at up to 4% per annum. These relatively generous provisions for depreciation partially offset the impact of high statutory tax rates on the cost of capital, or the minimum pre-tax rate of return required to be earned on investment projects, particularly in the case of plant and machinery.

Nevertheless we saw in Chapter 2 that the German corporate income tax in 1999 tends to increase the cost of capital for domestic investments financed by retained earnings by a greater amount than the corporate income taxes in any of the other six countries considered (see Table 3(i) and Table 4(i)). This is particularly the case for domestic investment in buildings; the German cost of capital for investment in plant and machinery is very similar to that found in Japan, although these are both rather higher than those found in the remaining five countries. These costs of capital for domestic investments financed by retained earnings are particularly important, since the vast majority of aggregate business investment spending is financed internally.[28]

We also saw in Chapter 2 that these domestic costs of capital for investments financed by retained profits are also relevant for investments by domestic subsidiaries of foreign multinational firms, in the case where both the subsidiary and the parent firm finance the investment without recourse to new equity or debt (see, for example, Table 8(i) and Table 9(i)). More generally we found that the German cost of capital for inward investment by US and Japanese multinational firms tends to be high, particularly for investments in buildings, and where the German subsidiary company does not finance the investment by borrowing.

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[27] These figures are also approximate, as the USA and Japan also have state or local taxes on corporate profits, in addition to their national corporate income taxes. See Annex B for further details.

[28] See, for example, Corbett and Jenkinson (1997) and Mayer (1990).

On the other hand, the German cost of capital for investments by domestic corporations financed by new equity or debt tends to be low by international comparison, particularly for investments in plant and machinery (see, for example, Table 4(ii) and Table 4(iii)). The former reflects the current split-rate corporate income tax in Germany, which results in a lower corporate income tax charge when profits are paid out as dividends than when they are retained.[29] The latter is a consequence of interest deductibility against a higher corporate tax rate than that found in the other countries.

Effective average tax rates, which measure the share of the value of profitable investment projects that is taken by the corporate income tax, also tend to be high by international standards in Germany. For domestic investments, this was found for investment in plant and machinery financed by retained earnings, and for investment in buildings for all sources of finance (see Tables 6 and 7). This reflects the more important influence of the corporate income tax rate on these measures of effective average tax rates. For international investments, this was again found quite generally, particularly in the case of inward investment from Japan (see Tables 14 and 15).

The third distinctive feature of the current German corporate tax system is the comparatively generous treatment of distributed profits. First, there is the split-rate corporate tax structure, with distributed profits being taxed at a lower rate than retained profits. Of the seven countries we consider here, only Japan had operated a similar split-rate system, which Japan abandoned in 1990.[30] In addition, Germany has a full imputation system integrating corporate and personal income taxes, so that only taxpayers with marginal income tax rates above 30% would pay any further personal income tax on dividend income from German corporations, and shareholders with marginal tax rates below 30% would receive rebates. Of the seven countries considered here, only France operates a full imputation system.[31] Although imputation systems are not uncommon in a wider European context, there are some indications

[29] Recall that the measures of the cost of capital and the effective average tax rate that we focus on in this report take into account only corporate income tax charges, and abstract from both imputation credits and the personal taxation of dividends.

[30] France operated a split-rate system between 1989-91, but with distributed profits taxed at a higher rate than retained profits.

[31] As noted in section 2 of Chapter 2, neither Germany nor France gives imputation credits in relation to surcharges on corporate profits.

that they are becoming less generous. The UK partial imputation system was effectively abolished for tax-exempt institutional shareholders in 1997, and Ireland is proposing to replace its partial imputation system by a classical system.

One important point to note is that neither of these tax reliefs for dividends reduce the cost of capital for investment financed by retained profits. Financing investment using retained profits requires shareholders to give up dividend income today in return for higher dividend income in the future – provided that the tax treatment of dividend income is expected to remain unchanged, dividend taxation simply nets out when considering the rate of return earned by shareholders on such investment.[32] As discussed above, retained profits are by far the most important source of finance for aggregate investment spending in all developed countries. Tax reliefs for dividends also have no effect on the cost of capital for investment financed by borrowing. They do tend to reduce the cost of capital for investment financed by new share issues, but new equity finances only a very small fraction of total investment in all developed countries.[33] Hence this generous treatment of distributed profits in Germany has little impact on the cost of capital, and no effect at all on the costs of capital for investments financed by retained profits or by debt.

2. The proposed German reform

The currently proposed reform of the German corporate income tax will address each of these characteristics, and bring the German system more into line with corporate taxes elsewhere. By 1 January 2001, the headline rate of corporate income tax will be reduced to 25%, and this will apply to both distributed and undistributed profits. Assuming that the 5.5% solidarity surcharge remains and that local tax rates remain at their current levels, this will reduce the tax rate typically paid by a corporation on an additional unit of profits to about 38.3%. This is roughly in line with the typical corporate income tax rates currently paid by firms in France and the USA, though still rather higher than the corporate income tax rates in the UK and Denmark (see Table 1(ii)).

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[32] However an expected increase in dividend taxes will temporarily increase the cost of capital for investment financed by retained profits. See Annex A for further discussion of this point.

[33] See, for example, Corbett and Jenkinson (1997) and Mayer (1990).

This rate cut will be financed partly by making depreciation allowances less generous, and partly by making the personal tax treatment of dividends less generous. The maximum rate of declining balance depreciation allowed for plant and machinery will be reduced to 20% per annum, and the maximum rate of straight line depreciation allowed for buildings will be reduced to 3% per annum.

The current full imputation system of integrating corporate and personal income taxes will be replaced by a shareholder relief system, in which dividends paid by corporations are subject to personal income tax (as under a classical tax system), but at only 50% of the shareholder's marginal personal tax rate[34] (unlike a pure classical tax system, where dividends are subject to the shareholder's full marginal personal tax rate). Whilst this increase in dividend taxation will reduce post-tax dividend income for many taxpayers, it will also reduce the cost to these shareholders of financing new corporate investment through retained profits (i.e. through foregone current post-tax dividends). As emphasised above, this change to dividend taxation will therefore have no long-run effect on the cost of capital for investment financed by retained profits, and little long-run effect on the overall cost of capital. However it should be noted that there will be a transitional effect which temporarily raises the cost of capital for investment financed by retained profits, as a result of the announced increases in dividend taxation.

Table 16 presents our estimates of the cost of capital for domestic investments, assuming that this reform is fully implemented by 2001, and compares these to the costs of capital we found under the 1998 and 1999 German corporate income taxes. The main effect of the reduction in the corporate income tax rate is to reduce the cost of capital for domestic investments financed by retained profits, although this effect is partly offset by the reduction in depreciation allowances in the case of investment in buildings, and substantially offset by the reduction in depreciation allowances in the case of investment in plant and machinery. These changes reduce the cost of capital for domestic investment in buildings financed by retained earnings to below the level currently found in the USA and Japan (see Table 3(i)), and they reduce the cost of capital for domestic investment in plant and machinery financed by retained earnings

[34] In practice this will be achieved by taxing only 50% of the dividends received at the shareholder's marginal personal tax rate.

to below the level currently found in Japan (see Table 4(i)). Nevertheless they leave these costs of capital considerably higher than those found in France, the Netherlands, the UK and Denmark, and even in this most favourable case of investment financed by retained profits, the effect of the proposed reform will not transform Germany into one of the low cost of capital countries.

As Table 16 shows, the proposed reform will also increase the cost of capital for domestic investments financed by new share issues or by borrowing, by a quite substantial amount in the case of investment in plant and machinery. The former reflects the abolition of the split-rate system, and the latter reflects the reduction in the corporate income tax rate against which interest payments can be deducted – combined in each case with the effect of lower depreciation allowances. Notice that the costs of capital are equal for retained earnings and new equity finance after the abolition of the split-rate system.

The increase in the costs of capital for investments financed by new equity shown in Table 16 are not robust to alternative assumptions about dividend taxation. Our main measures focus only on corporate income tax paid by the firm, and do not take into account imputation credits or personal taxes on the shareholder's dividend income.[35] The proposed reform will abolish Germany's imputation system, and reduce the top rate of income tax on dividends from 55.9% in 1999 to 25.6% in 2001, since only 50% of dividends received will be taxed.[36] If we consider a shareholder who currently pays the top rate of income tax on dividend income, the cost of capital for investment financed by new equity is considerably higher than the figures presented in Table 16: 29.2% for buildings and 22.8% for plant and machinery in 1999. For a shareholder who pays the top rate of income tax on dividend income in 2001, these costs of capital will fall to 23.8% for buildings and 20.9% for plant and machinery.[37]

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[35] See Annex A for a discussion of how dividend taxes affect the cost of capital for investments financed by new equity.

[36] The 25.6% figure is obtained by taking the formal top rate of 48.5%, multiplying by 1.055 to reflect the solidarity surcharge, and multiplying by 0.5.

[37] These figures only take into account personal taxes on dividend income, not those on capital gains or interest. That is, we continue to assume that the shareholder requires the firm to earn a real rate of return of 10% after corporate income tax.

Using the OECD (1991) weights of 55% for retained earnings, 10% for new equity and 35% for debt to construct weighted average measures of the domestic costs of capital for each type of asset, the proposed reform will reduce the weighted average measure for investment in industrial buildings, but will increase the weighted average measure for investment in plant and machinery. As we noted in Chapter 2, these weights probably underestimate the importance of finance from retained earnings, where the proposed reform will reduce the costs of capital. Nevertheless the impact of the proposed reform on the costs of capital for debt finance may be of concern to fast-growing small and medium-sized firms that are likely to be particularly reliant on borrowing to finance their expansion.

One feature of the proposed reform illustrated by Table 16 is that it tends to reduce those costs of capital where Germany is currently high by international standards – for example, investment in buildings financed by retained earnings – whilst increasing those costs of capital where Germany is currently low by international standards – for example, investment in plant and machinery financed by debt. Thus we can conclude fairly unambiguously that the effect of the reform will be to bring the costs of capital for investment by domestic corporations more in line with the costs of capital found in the other six countries we have considered. Whether the reform will increase or decrease the cost of capital for any particular investment programme will clearly depend on the mix of assets and sources of finance. However the fact that in aggregate upwards of 70% of investment spending tends to be financed from retained profits suggests that there may be a tendency for the reform to reduce the cost of capital for most investment programmes in most large companies.

Table 17 presents our estimates of the effective average tax rates for domestic investments. For investment in buildings, the proposed reform will result in a large reduction in the effective average tax rate for investment financed by retained earnings, and a small increase in the effective average tax rate for investment financed by debt. In this case it is clear that the weighted average effective average tax rate measure would be reduced using any reasonable weights. For investment in plant and machinery, there is a rather smaller reduction in the effective average tax rate for investment financed by retained earnings, and a rather larger increase in the effective average tax rate for investment financed by debt. Again this illustrates that the

proposed reductions in depreciation allowances have a greater impact on investments in plant and machinery than they have on investments in buildings.[38] In this case the OECD (1991) weights still suggest a small reduction in the weighted average effective average tax rate measure for investment in plant and machinery, but this is more sensitive to the weights used.

Again the tendency is to reduce those effective average tax rates for types of investment where the current figures are particularly high for Germany (e.g. investment in buildings financed by retained earnings; see Table 6(i)), whilst increasing those effective average tax rates for types of investments where the current figures for Germany are not so high compared with other countries (e.g. investment in plant and machinery financed by debt; see Table 7(iii)). For investment financed by retained earnings, the proposed reform will reduce the German effective average tax rate for buildings below the level currently found in Japan and the USA, and reduce the German effective average tax rate for plant and machinery below the level currently found in Japan. Again, even in this most favourable case, the proposed reform will leave the German effective average tax rates rather higher than those currently found in the UK, Denmark and the Netherlands. Similar comments apply to the weighted average measure of the effective average tax rate for domestic investment in buildings, whilst the proposed reform has no effect on Germany's ranking for the weighted average measure of the effective average tax rate for domestic investment in plant and machinery.

Tables 18 and 20 present our estimates of the costs of capital for investment by German subsidiaries of US and Japanese parent companies respectively. Broadly similar observations can be made to those for the costs of capital facing domestic corporations. Assuming that the parent company finances its investment from retained profits, these international costs of capital are reduced by the reform when the subsidiary finances the investment by cutting dividends paid to the parent, but they are increased by the reform when the subsidiary finances the investment by issuing

[38] Note our assumption that firms take advantage of the most generous depreciation provisions allowed by the tax system, so we assume that German firms are benefitting from 30% depreciation allowances for plant and machinery under the current system. The effects of reducing these allowances to 20% may be less than our estimates suggest for firms that are not currently benefitting from the 30% depreciation allowances.

new shares or debt purchased by the parent. The former is more likely to be relevant for investment by established domestic subsidiaries of foreign firms, whilst the latter are more likely to be relevant for new inward investments. The effects on the cost of capital for subsidiaries using retained earnings and debt finance both reflect the reduction in the German corporate income tax rate; the new equity case reflects the abolition of the split-rate system. Again the tendency of the proposed reform to reduce these costs of capital is stronger in the case of buildings, and weaker in the case of plant and machinery.

Tables 19 and 21 present our estimates of the effective average tax rates for investments by German subsidiaries of US and Japanese parent companies respectively. Again broadly similar observations can be made to those for the effective average tax rates facing domestic corporations. For investments in buildings, these effective average tax rate measures fall for each of the patterns of finance considered here; whilst for investments in plant and machinery there is a large reduction in the effective average tax rate where the subsidiary uses finance from retained earnings, and only a small increase in the effective average tax rate where the subsidiary uses debt finance. Again even in the most favourable cases (investments in buildings, US parent company), these reductions in the effective average tax rates for German subsidiaries only bring the German figures into line with those currently found for France, and leave the German effective average tax rates rather higher than those currently found for the UK, Denmark and the Netherlands (see Table 10). Considering inward investment from Japan, the proposed reform leaves the German effective average tax rates rather higher than those currently found for France, the UK, Denmark and the Netherlands (see Tables 14 and 15).

3. Summary

This planned reform of the federal corporate income tax in Germany is similar in nature to the type of tax rate cutting, tax base broadening reforms of corporate income taxes that have been introduced in a number of countries over the last fifteen years, following the major reforms of corporate income taxes that occurred in the UK in 1984 and the USA in 1986. Whilst the main effect is to cut the headline rate of corporate income tax from 45% (on retained profits) to 25%, the impact of this rate cut on tax revenues is cushioned by reductions in tax allowances for depreciation and

by an increase in the personal taxation of corporate dividends. Indeed even this cut in the corporate tax rate is less dramatic than it may at first appear. Taking into account local taxes and the solidarity surcharge, the typical corporate tax rate in Germany will fall to around 38%. This is similar to the prevailing rate in the USA and France, but still considerably higher than the corporate tax rates in the UK, Scandinavia and Ireland.

The impact of the proposed reform will be to reduce costs of capital for investments financed by retained profits, but to increase costs of capital for investments financed by new equity and debt. Effective average tax rates on more profitable investment projects will be reduced by the proposed reform somewhat more generally. The effects tend to be more favourable for investments in buildings than for investments in plant and machinery, since the proposed reduction in tax allowances for depreciation has a greater impact in the case of plant and machinery.

One general finding is that the proposed reform tends to reduce the cost of capital and effective average tax rate for those types of investment where these measures are currently particularly high in Germany compared to the other countries considered in this study, and to increase the cost of capital and effective average tax rate for those types of investment where these measures are currently low or average in Germany compared to the other countries. Thus we tend to find reductions in the measures for investment in buildings financed by retained profits, and increases in the measures for investment in plant and machinery financed by debt.

We can conclude fairly unambiguously that the proposed reform will bring the costs of capital and effective average tax rates in Germany closer to the levels of these measures found in the other six countries we have considered.

Whether the reform will be favourable for investment in Germany depends on the weights given to different sources of finance, and to the cost of capital measures compared to the effective average tax rates. Regarding investment by domestic companies, we tend to attach considerable importance to the costs of capital for investments financed by retained earnings, which finances upwards of 70% of aggregate investment spending. These costs of capital will be reduced by the proposed reform. Regarding inward investment by subsidiaries of foreign multinational

corporations, we tend to attach considerable importance to the effective average tax rate measures, since these inward investments tend to be highly profitable. Again these effective average tax rates show some tendency to be reduced by the proposed reform, as they are more influenced by the reduction in the corporate income tax rate.

Nevertheless, even considering those measures where the proposed reform brings about the largest reductions, the scale of these reductions is fairly modest, and has only a minor impact on Germany's relative position among the seven countries we have considered in this study. Costs of capital for investments financed by retained earnings, and effective average tax rates, remain rather higher in Germany after the proposed reform than those currently found in the Netherlands, Denmark and the UK. The planned reform may make Germany a somewhat more attractive location for business investment, but it will not transform Germany into one of the low cost of capital or effective average tax rate countries among this group.

Table 16 Domestic costs of capital

Asset	Finance	1998	1999	2001
Buildings	Retained earnings	21.9	19.9	16.4
	New equity	15.0	15.8	16.4
	Debt	6.5	7.2	9.5
	Weighted average	15.8	15.0	14.0
Plant and machinery	Retained earnings	15.7	14.8	14.0
	New equity	9.9	11.2	14.0
	Debt	2.6	3.8	7.5
	Weighted average	10.5	10.6	11.7

Note: The costs of capital are given the following weights by finance type to calculate the weighted average: retained earnings 55%, new equity 10%, debt 35%. See OECD (1991). The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Table 17 Domestic effective average tax rates

Asset	Finance	1998	1999	2001
Buildings	Retained earnings	47.6	45.6	38.6
	New equity	39.6	40.6	38.6
	Debt	25.5	27.0	27.8
	Weighted average	39.1	38.6	34.8
Plant and machinery	Retained earnings	40.6	39.3	35.2
	New equity	31.9	34.1	35.2
	Debt	16.7	19.7	24.0
	Weighted average	31.4	31.9	31.3

Note: The effective average tax rates are given the following weights by finance type to calculate the weighted average: retained earnings 55%, new equity 10%, debt 35%. See OECD (1991). The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures assume the investment earns a real rate of return of 30% in the absence of tax.

Table 18 Costs of capital: US parent company

Asset	Subsidiary Finance	1998	1999	2001
Buildings	Retained earnings	21.9	19.9	16.4
	New equity	17.3	17.4	17.5
	Debt	15.3	15.7	17.0
Plant and machinery	Retained earnings	15.7	14.8	14.0
	New equity	11.8	12.6	15.1
	Debt	10.1	11.2	14.6

Note: These measures assume an investment is made by a US parent company into a wholly-owned subsidiary in Germany. In each case the parent company uses finance from retained earnings. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Table 19 Effective average tax rates: US parent company

Asset	Subsidiary Finance	1998	1999	2001
Buildings	Retained earnings	50.6	47.8	40.6
	New equity	45.9	45.0	42.0
	Debt	43.5	43.0	41.3
Plant and machinery	Retained earnings	44.0	41.9	37.3
	New equity	38.8	38.9	38.8
	Debt	36.2	36.7	38.1

Note: These measures assume an investment is made by a US parent company into a wholly-owned subsidiary in Germany. In each case the parent company uses finance from retained earnings. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures also assume the investment earns a real rate of return of 30% in the absence of tax.

Table 20 Costs of capital: Japanese parent company

Asset	Subsidiary Finance	1998	1999	2001
Buildings	Retained earnings	21.9	19.9	16.4
	New equity	19.6	19.8	20.2
	Debt	18.1	17.0	18.3
Plant and machinery	Retained earnings	15.7	14.8	14.0
	New equity	13.8	14.7	17.5
	Debt	12.5	12.3	15.8

Note: These measures assume an investment is made by a Japanese parent company into a wholly-owned subsidiary in Germany. In each case the parent company uses finance from retained earnings. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery.

Table 21 Effective average tax rates: Japanese parent company

Asset	Subsidiary Finance	1998	1999	2001
Buildings	Retained earnings	53.2	50.7	44.6
	New equity	51.1	50.6	48.7
	Debt	49.5	47.7	46.7
Plant and machinery	Retained earnings	46.9	45.1	41.5
	New equity	44.6	45.0	45.9
	Debt	42.9	41.8	43.8

Note: These measures assume an investment is made by a Japanese parent company into a wholly-owned subsidiary in Germany. In each case the parent company uses finance from retained earnings. The real interest rate used is 10%, inflation is 3.5%. Economic depreciation rates used are 3.61% for buildings, 12.25% for plant and machinery. These measures also assume the investment earns a real rate of return of 30% in the absence of tax.

References

Bond, S.R. (1999) 'Levelling up or levelling down? Some reflections on the ACE and CBIT proposals and the future of the corporate income tax base', in S. Cnossen (ed.), *Taxing Capital Income in the European Union*, Oxford: Oxford University Press.

Buijink, W., Janssen, B. and Schols, Y. (1999), *Corporate Effective Tax Rates in the European Union*, Maastricht Accounting and Auditing Research and Education Center, Universiteit Maastricht.

Chennells, L. and Griffith, R. (1997), *Taxing Profits in a Changing World*, London: The Institute for Fiscal Studies.

European Commission (1967), *Programme for the Harmonisation of Direct Taxes*, Brussels: European Commission.

European Commission (1975), 'Draft directive concerning the harmonisation of systems of company taxation and of withholding tax on dividends', *Official Journal of the European Communities*, C253. COM(75) 392 final.

European Commission (1980), 'Report on the scope for convergence of tax systems in the Community', *Bulletin of the European Communities*, Supplement 1/80.

European Commission (1988), 'Preliminary draft proposal for a directive on the harmonisation of rules concerning the taxable profits of undertakings', XV/27/88.

Corbett, J. and Jenkinson, T.J. (1997), 'How is investment financed? A study of Germany, Japan, UK and UK', *Manchester School*, 15, 69-93.

Cnossen, S. (1999), 'Taxing capital income in the European Union: the case for adopting the dual income tax', in S. Cnossen (ed.), *Taxing Capital Income in the European Union*, Oxford: Oxford University Press.

Devereux, M.P. and Griffith, R. (1998a), 'Taxes and the location of production: evidence from a panel of US multinationals', *Journal of Public Economics*, 68 (3), 335-367.

Devereux, M.P. and Griffith, R. (1999b), 'The taxation of discrete investment choices', Institute for Fiscal Studies Working Paper no. W98/16 (http://www.ifs.org.uk).

Dixit, A.K. (1985), 'Tax policy in open economies', in M.S. Feldstein and A.J. Auerbach (eds.), *Handbook of Public Economics*, Amsterdam: North Holland.

Gordon, R.H. (1986), 'Taxation of investment and savings in a world economy', *American Economic Review*, 76, 1086-1102.

Gordon, R.H. (1999), 'Taxation of capital Vs. labor income: an overview', in S. Cnossen (ed.), *Taxing Capital Income in the European Union*, Oxford: Oxford University Press.

King, M.A. and Fullerton, D. (1984), *The Taxation of Income from Capital*, Chicago: University of Chicago Press.

Mayer, C.P. (1990), 'Financial systems, corporate finance and economic development', in R.G. Hubbard (ed.), *Asymmetric Information, Corporate Finance and Investment*, Chicago: University of Chicago Press.

Neumark Committee (1963), 'Report of the fiscal and financial committee', in *Tax Harmonisation in the Common Market*, Chicago: Commerce Clearing House.

OECD (1991), *Taxing Profits in a Global Economy*, Paris: Organisation for Economic Cooperation and Development.

Ruding Committee (1992), *Report of the Committee of Independent Experts on Company Taxation*, Brussels: European Commission.

Van den Tempel, A.J. (1971), *Corporation Tax and Individual Income Tax in the European Communities*, Brussels: European Commission.

Annex A: Corporate income taxes, the cost of capital and effective average tax rates

We assess the possible impact of corporate income tax systems on firms' investment decisions by calculating the effect of corporate income taxes on the cost of capital and on the effective average tax rate, for a variety of hypothetical investment projects. The cost of capital is essentially the minimum pre-tax rate of return required for an investment project to remain attractive to investors. In contexts where firms undertake all profitable investment opportunities, a higher cost of capital will be associated with a lower level of investment spending. A tax system which raises the cost of capital is therefore likely to reduce the level of investment.

The effective average tax rate measures the total corporate income tax charge on profitable investment projects, which earn rates of return in excess of the cost of capital. This will be relevant in contexts where firms are choosing between alternative profitable investment opportunities, for example when a US multinational corporation is choosing where to locate its profitable European subsidiary between one of several European countries. Locations with low effective average tax rates will tend to be more attractive locations for profitable inward investments.

Both costs of capital and effective average tax rates can be calculated for investment conducted by a purely domestic firm, or for investment conducted by a foreign subsidiary of a parent corporation. In the latter case, it is necessary to take into account both withholding taxes and the tax treatment of foreign-source dividends and interest. Section 1 of this Annex discusses the effects of corporate income taxes on the cost of capital in the domestic case. Section 2 discusses the measurement of effective average tax rates in the domestic case. Section 3 explains how these measures extend to the case of cross-border investments.

1. The cost of capital: domestic investments

To illustrate the effects of corporate income taxes on the cost of capital, we consider the following very simple investment project. Suppose a firm increases investment in a particular type of capital by one unit this period, and reduces investment in the same asset by one unit in the following period. For simplicity,

suppose that this type of capital does not depreciate, so that the firm's stock of capital is left unchanged in all subsequent time periods. Again for simplicity, suppose that owning one additional unit of this type of capital generates some additional profits for the firm in the following period, but that profits are unchanged in all subsequent periods.

Investment financed by retained earnings

Suppose first that this investment is financed by cutting dividends paid to shareholders in the current period (i.e. by retained profits); that the reduction in investment in the next period implies a corresponding increase in dividends paid to shareholders next period (i.e. that investment would otherwise also have been financed by retained profits); and that all the additional profits generated in the following period are also paid out to shareholders in the form of higher dividends in that period. Again this ensures that there are no subsequent changes to the stream of dividends paid from the firm to its shareholders that we need to take into account in analysing our simple investment project.

Now suppose that the shareholders discount income received next period at a rate of 10% (i.e. they are indifferent between receiving $1.00 in the current period and $1.10 in the following period); and that the firm's investment project earns a 10% rate of return (i.e. by investing $1.00 in the current period, the firm generates additional profits of 10 cents in the following period). Then if there are no taxes to be paid, the shareholders will be indifferent between the firm undertaking this investment project or not. The shareholders will give up one unit of dividend income in the current period to finance the investment, but they will receive 1.1 units of additional dividend income in the following period – 1 unit reflecting the reduction in investment financed by retained profits next period, and 0.1 units reflecting the 10% return earned by the firm on its investment of one unit of capital in the current period. By assumption, shareholders are indifferent between $1.00 this period and $1.10 next period, so they will not care whether this investment proceeds or not.

If the firm could earn a rate of return on the same investment project higher than 10%, shareholders would strictly prefer to receive more than 1.1 units of income next period in exchange for 1 unit of income today – so if the firm is investing to maximise

shareholder value it would want to undertake investment projects with a rate of return higher than 10%. Conversely if the firm earned a rate of return below 10%, shareholders would strictly prefer the investment project not to go ahead. In this case, 10% is referred to as the minimum required rate of return, or the 'cost of capital' for this type of investment project.

Now suppose that there is a corporate income tax at a rate of 50%. In this case, shareholders who discount future income at 10% will no longer be indifferent between the firm undertaking and not undertaking investment projects which have a pre-tax rate of return of 10% - they will strictly prefer such investment projects not to go ahead. With tax on the additional profits resulting from the investment charged at 50%, a project that earns additional profits of 10 cents before tax will only earn additional profits of 5 cents after corporate income tax. In this case the shareholders will give up 1 unit of dividend income in this period in return for only 1.05 units of additional dividend income in the following period, so if the firm is investing to maximise shareholder value it will not want to undertake investment projects that earn only a 10% rate of return before tax. With a corporate income tax at 50%, the minimum required rate of return before tax rises to 20%, in order to pay a post-tax rate of return of 10% on the investment made by shareholders. More generally, if the shareholders' discount rate is denoted by ρ and the corporate income tax rate is denoted by τ, the cost of capital for this type of investment, financed by retained profits, rises to $\rho/(1-\tau)$.[39]

Table A1 sets out this simple cost of capital calculation. In period 1 the firm invests 1 unit, financed by retained earnings. Denoting the rate of return by R and the corporate income tax rate by τ, this allows the firm to pay out a higher dividend of $1+(1-\tau)R$ units in period 2. The net present value of this investment project to a shareholder with discount rate ρ is given by

$$NPV = -1 + \frac{1+(1-\tau)R}{1+\rho}.$$

[39] In our example, we have ρ=0.1 or 10% and τ=0.5 or 50%, giving a cost of capital of 0.1/0.5=0.2 or 20%.

The cost of capital is simply the rate of return which sets this net present value equal to zero, which here requires

$$1+(1-\tau)R=1+\rho$$

or $R = \rho/(1-\tau)$.

Table A1. Domestic investment financed by retained earnings

	Period 1		Period 2	
	Shareholder	Firm	Firm	Shareholder
Lower dividend	-1	+1		
Higher investment		-1		
Return			+R	
Corporate tax			-τR	
Lower investment			+1	
Higher dividend			-[1+(1-τ)R]	+[1+(1-τ)R]
Net cash flow	-1	0	0	+[1+(1-τ)R]

This simple example has ignored both depreciation and personal taxes on dividend income. Most types of capital used by firms depreciate, in the sense that their real value falls over time as they become older and more used. Corporate tax systems generally recognise this cost by giving firms allowances for some cost of depreciation, that can be deducted from revenues in calculating the firm's 'taxable profits', i.e. the tax base on which corporate income tax is charged. If the depreciation allowances used by the tax system accurately reflect the true decline in the value of assets over time (known as 'true economic depreciation'), this would leave the cost of capital for investment financed by retained profits unchanged at $\rho/(1-\tau)$. If the depreciation allowances allowed by the tax system are lower than true economic depreciation, this will further increase the cost of capital. Conversely if the depreciation allowances allowed by the tax system are higher than true economic depreciation, this will reduce the cost of capital. In the estimates presented in this report, we account for the effect of tax depreciation provisions on the cost of capital

using the method proposed by Devereux and Griffith (1998b). We assume rates of true economic depreciation for buildings of 3.61% per annum and for plant and machinery of 12.25% per annum.

Subject to one qualification, the personal tax treatment of dividend income has no effect on the cost of capital for investments financed by retained profits. Suppose we have a corporate income tax rate of 50%. Consider an investment project, of the type we discussed above, that earns a pre-tax rate of return of 20%. We saw that with a corporate income tax rate of 50% and no further taxes on dividend income, shareholders with a discount rate of 10% would be indifferent between the firm undertaking this investment project or not – they give up 1 unit of current dividends in return for 1.1 units of additional dividends next period.

Now suppose there is also a personal income tax on dividend income at the rate of 25%, and a classical relationship between the personal and corporate income taxes.[40] In order to finance an investment project costing $1.00, the firm still reduces its dividend payments in the current period by $1.00 – but this reduces the shareholders' post-tax dividend income by only 75 cents in the current period, since the shareholders avoid paying 25 cents in personal income tax to the government. True, each $1.10 of additional dividend income paid out by the firm in the following period will also be worth only 82.5 cents after income tax to the shareholders, with 27.5 cents paid in income tax to the government. But these two effects of dividend income taxes, on both the cost and the return of the investment project to the shareholders, are exactly offsetting – the shareholders give up 0.75 units of current post-tax dividend income in return for 0.825 units of additional post-tax dividend income next period, and continue to earn a 10% rate of return on their investment. Shareholders with a discount rate of 10% will continue to be indifferent as to whether the firm undertakes this investment project or not, and the cost of capital for this type of investment financed by retained profits remains at 20%, or more generally at $\rho/(1-\tau)$, whatever the personal tax treatment of dividend income.

More generally, suppose that 1 unit of dividends paid out by the firm is worth $(1-m)\theta$ to the shareholder after personal income tax on dividend income. Here m is the

[40] See section 2 of Chapter 2 for a discussion of classical and imputation systems.

shareholder's marginal personal tax rate on dividend income, and the parameter $\theta \geq 1$ allows for tax credits that may be available to the shareholder under imputation systems.[41] In this case the cost to the shareholder in period 1 of the simple investment project set out in Table A1 becomes $-(1-m)\theta$, whilst the return to the shareholder in period 2 becomes $(1-m)\theta[1+(1-\tau)R]$. The net present value of the project to the shareholder becomes

$$NPV = (1-m)\theta\left\{-1+\frac{1+(1-\tau)R}{1+\rho}\right\}$$

and it is straightforward to see that the cost of capital which sets this net present value equal to zero is again given by $R = \rho/(1-\tau)$.

The one qualification to this analysis is that we have assumed a constant personal tax treatment of dividend income between the two periods. The accurate statement is that any constant level of dividend taxation has no effect on the cost of capital for investment financed by retained profits. However if it is known that personal taxes on dividend income will increase between the two periods, this will raise the cost of capital – the effect of higher taxes on next period's dividends will not be fully offset by the effect of current dividend income taxes on the cost of the investment project to the shareholders.[42] Thus an announcement that dividend income taxes will be higher at some point in the future will raise the cost of capital for investment financed by retained profits during the transitional period, but will have no effect on the cost of capital for investment financed by retained profits in the long run.

Whilst we have introduced these effects of dividend taxation in the context of personal taxes on dividend income, the effects of an additional corporate tax charge or rebate levied on dividends is essentially the same. Thus the current split-rate corporate tax system in Germany, with a tax rate of 40% on retained profits and 30% on

[41] In a standard imputation system, $\theta=1/(1-c)$, where c is the rate of imputation. Thus for a shareholder whose income tax rate equals the rate of imputation, we find $(1-m)\theta=1$. For a classical system we have $\theta=1$ and $(1-m)\theta=(1-m)$.

[42] For example, if dividend income tax is 25% in the current period but it is known that this will rise to 30% next period, each $1.10 of additional dividends paid next period will be worth only 77 cents to shareholders after dividend income tax, giving them a return of only 2.66% on each 75 cents of post-tax dividend income given up this period.

distributed profits, is equivalent to a tax charge of 40% on all profits with a rebate of 14.3% paid on dividends.[43] Again this tax treatment of dividends has no effect on the cost of capital for investment financed by retained profits, although the announcement of its abolition will temporarily increase the cost of capital for investment financed by retained profits.

Investment financed by new equity

We now consider the effects of corporate income taxes on the cost of capital for investment financed by new share issues. We return to the simple type of investment project analysed above, but now suppose that the additional unit of investment in the current period is financed by issuing new shares, and that the one unit reduction in investment in the following period would also have been financed by issuing new shares. We continue to assume that any additional profits earned by having one unit of additional capital in the current period are paid out as dividends to shareholders in the next period. Again the effect of these assumptions is to keep both the firm's capital stock and the value of its outstanding shares unchanged in all subsequent periods. For simplicity, we assume that all new shares issued are purchased by the firm's existing shareholders.

In the absence of any taxes, shareholders with a 10% discount rate will again require a 10% rate of return from this investment project. Here shareholders give up one unit of cash to purchase the new shares issued by the firm in the first period. In return they receive one unit of cash when the firm issues fewer shares in the following period, and they receive the return on the firm's investment in the form of a higher dividend. Thus if the firm's investment earns a 10% rate of return, they will receive additional dividends of 0.1 units, and additional income in the next period of 1.1 units altogether. With no taxes, the cost of capital or minimum required rate of return is again 10%.

If we now introduce a corporate income tax at 50%, the firm will pay tax at 50% on the additional profits from this investment project, and will only be able to pay

[43] Since distributed profits are taxed at 30%, distributed profits are 1/(1-0.3) = 1.43 times the dividend paid. Each 1 DM of profits distributed is taxed at 30% instead of 40%, so the tax saving is (0.4-0.3)x1.43 = 0.143 times the dividend paid.

additional dividends of 0.05 units to its shareholders. Again the shareholders will strictly prefer the firm not to undertake investment projects with a pre-tax return of 10%, and the minimum required pre-tax rate of return will again rise to 20%. More generally, the cost of capital will again rise to $\rho/(1-\tau)$ for this type of investment project financed by new share issues.

Table A2 sets out the cost of capital calculation in this case. In the absence of personal taxes, it is clear that the net present value of the investment project to the shareholder and the cost of capital are the same as for the retained earnings case.

Table A2. Domestic investment financed by new equity

	Period 1		Period 2	
	Shareholder	Firm	Firm	Shareholder
Higher share issue	-1	+1		
Higher investment		-1		
Return			+R	
Corporate tax			$-\tau R$	
Lower investment			+1	
Lower share issue			-1	+1
Higher dividend			$-(1-\tau)R$	$+(1-\tau)R$
Net cash flow	-1	0	0	$+[1+(1-\tau)R]$

The effects of taxes on dividend income on the cost of capital are however different for investment financed by new equity. Suppose as before that there is also a tax of 25% on the shareholders' dividend income, and a classical system. In this case, even an investment project that earns 20% before corporate income tax will appear unattractive to the firm's shareholders if the investment is financed by issuing new shares. Although this project allows the firm to pay an additional 0.1 units of dividends to the shareholders in the next period, this gives the shareholders only an additional 0.075 units of post-tax dividend income, after the income tax on dividend income has been paid. In order for shareholders to earn their required rate of return of

10%, the investment project must now earn a pre-tax rate of return of 26.66%.[44] More generally, the cost of capital for this type of investment project financed by new share issues becomes $\rho/[(1-m)\theta(1-\tau)]$, where m is the personal tax rate on dividend income and θ is the imputation parameter.

With each unit of dividends paid out by the firm worth $(1-m)\theta$ to the shareholder after dividend taxation, the cost of the project funded by new equity to the shareholder in period 1 is unaffected, but the return to the shareholder in period 2 becomes $1 + (1-m)\theta(1-\tau)R$. The net present value of the project to the shareholder becomes

$$NPV = -1 + \frac{1 + (1-m)\theta(1-\tau)R}{1+\rho}$$

and the rate of return which sets this net present value equal to zero satisfies

$$1 + (1-m)\theta(1-\tau)R = 1 + \rho$$

or $R=\rho/[(1-m)\theta(1-\tau)]$.

This shows that for shareholders with $(1-m)\theta < 1$, who have income tax to pay on dividend receipts (in excess of any credits available to them under imputation systems), the cost of capital for investment financed by new equity will be higher than the cost of capital for investment financed by retained earnings. Conversely for shareholders with $(1-m)\theta > 1$, the cost of capital for investment financed by new equity will be lower than the cost of capital for investment financed by retained earnings. The latter situation cannot arise under a classical system, but can occur for shareholders with low or zero marginal income tax rates under an imputation system.

Similarly the effect of dividend tax rebates at the corporate level is to reduce the cost of capital for investment financed by new equity relative to the cost of capital for investment financed by retained earnings. Thus the current split-rate system in Germany reduces the cost of capital for investment funded by new share issues, but not for investment funded by retained profits.

[44] After corporate income tax this allows the firm to pay out 0.133 units of dividends, which gives an additional 0.1 units of post-tax dividend income to shareholders.

Finally notice that these effects of dividend taxes on the cost of capital for investment financed by new share issues depends only on the taxation of dividend income in the period when the return on the investment is paid out to shareholders. Thus a permanent increase in dividend taxation will permanently raise the cost of capital for investment financed by new share issues.

Investment financed by debt

We now consider the effects of corporate income taxes on the cost of capital for investment financed by borrowing. Again we return to the simple type of investment project analysed above. We now suppose that the additional unit of investment in the current period is financed by borrowing, and that the one unit reduction in investment in the following period would also have been financed by debt. Borrowing in the current period obliges the firm to pay interest to the lenders in the following period, and we assume that any profits left over after this interest charge are paid out to shareholders as dividends. Again the effect of these assumptions is to keep the firm's capital stock and level of outstanding debt unchanged in all subsequent periods.

Suppose that the rate of interest charged by lenders is also 10%. In the absence of any taxes, the cost of capital or minimum required rate of return on the investment project is again 10%. In this case the investment project costs the shareholders nothing in the current period, since the expenditure is entirely financed by borrowing. If the project earns any return over and above the interest charge, this is a pure profit to the shareholders, and they will strictly prefer such projects to go ahead. If the project earns less than the interest charge, this imposes a loss on the shareholders, and they will strictly prefer such projects not to go ahead. Only if the debt-financed project has a rate of return equal to the cost of borrowing will shareholders be indifferent between the firm proceeding or not proceeding with the investment.

Now suppose there is a corporate income tax at a rate of 50%, and that interest payments can be deducted from profits in computing the corporate tax base. This deductibility of interest payments from taxable profits is a feature of corporate income taxes in all OECD countries, and is a key difference from the corporate tax treatment of the costs of using equity finance (retained profits or new issues). In our example,

the effect of interest deductibility is to leave the cost of capital unchanged at 10%, despite the presence of the corporate income tax.

To see this, consider what happens to a debt-financed project that earns a rate of return of 10%. For each $1 invested, this project earns additional profits before interest of 10 cents in the following period, which just covers the interest charge of 10 cents on each additional $1 of borrowing. Since the interest payment is deductible, this implies no change in the firm's tax base, and there will be no tax liability on this project. If the project earned a higher rate of return, say 15%, there would then be a tax charge on the difference between the additional profits (15 cents) and the interest payment (10 cents), but at a tax rate of 50% this would still leave shareholders with a pure profit of 2.5 cents for each $1 invested. If the project earned a lower rate of return, say 5%, the project would result in a reduction in the firm's tax base of 5 cents. How this is treated would depend on the firm's overall tax position, but even in the most favourable case, where the firm can immediately offset this loss against profits from other activities, the project considered here would still leave shareholders with an after-tax loss of 2.5 cents per $1 invested. Thus with interest deductibility, the corporate income tax leaves the cost of capital for debt-financed investments unchanged at i, where i is the rate of interest.

Table A3 sets out this cost of capital calculation more generally. The shareholder receives a dividend in period 2 of $(1-\tau)(R-i)$, having financed no part of the investment in period 1. The net present value to the shareholder of this investment project is therefore

$$NPV = \frac{(1-\tau)(R-i)}{1+\rho}$$

and the rate of return which sets this net present value to zero is R = i.

Two points should be noted at this point, since this exact result is quite special to features of our example. First, recall that we are considering investments in a type of asset that does not depreciate, and for which the tax system (correctly) gives no depreciation allowances. The result derived above depends on the assumption that tax allowances for depreciation correctly reflect the true cost of economic depreciation. If we were to consider an asset for which tax depreciation allowances are lower than

true economic depreciation, we would find that this raises the cost of capital for debt-financed investments above the interest rate. Conversely if we were to consider an asset for which tax depreciation allowances are higher than true economic depreciation, we would find that this lowers the cost of capital for debt-financed investments below the interest rate – so that the cost of capital is actually reduced by the presence of the corporate income tax in this case. Note that this latter case is empirically relevant for most of the countries we consider in this report, particularly for investments in plant and machinery.

Table A3. Domestic investment financed by debt

	Period 1		Period 2	
	Shareholder	Firm	Firm	Shareholder
Higher borrowing		+1		
Higher investment		-1		
Return			+R	
Interest			-i	
Corporate tax			$-\tau(R-i)$	
Lower borrowing			-1	
Lower investment			+1	
Higher dividend			$-(1-\tau)(R-i)$	$+(1-\tau)(R-i)$
Net cash flow	0	0	0	$+(1-\tau)(R-i)$

Second, our example has implicitly assumed a zero rate of inflation, or alternatively that *i* is the real rate of interest between periods 1 and 2, and the tax system only permits a deduction for the real interest cost. In fact, nominal interest rates are higher than real interest rates when there is positive inflation,[45] and corporate income taxes almost invariably permit nominal interest payments to be deducted against taxable profits. This deductibility of nominal rather than real interest payments also tends to reduce the cost of capital for debt-financed investments below the real

[45] If I require a real rate of return of 10% from lending you $1, this will be achieved by an interest payment of 10 cents plus repayment of the principal of $1 if there is zero inflation. This will not be so if there is positive inflation, and the real value of the repayment of the principal is eroded by inflation. If there is an inflation rate of 5% between the two periods, the real rate of return on this unindexed loan would be (1.1/1.05) – 1 = 4.76%. To obtain an unchanged real rate of return of 10% would require a nominal interest rate of (1.1x1.05) – 1 = 15.5%.

interest rate at positive rates of inflation. Again this effect is empirically relevant, although not very significant at the inflation rate (3.5%) assumed in our cost of capital computations.[46] For both these reasons, we typically find costs of capital for debt-financed investments below the assumed real interest rate.

The result also illustrates a more general point. A corporate income tax which gives full deductions for the real cost of finance and for true economic depreciation has no impact on the cost of capital, or minimum required pre-tax rate of return. A so-called marginal investment, which just earns the minimum required rate of return in the absence of tax, pays no tax in this case. Nevertheless the corporate income tax would probably raise substantial amounts of revenue by taxing so-called intra-marginal investments, which have rates of return strictly above the cost of capital. Actual corporate income taxes operate approximately in this way in the case of investments financed by borrowing, provided inflation is low and tax depreciation allowances are not very different from true economic depreciation. Actual corporate income taxes do not operate in this way for equity-financed investments, since there is no tax deduction for the costs of using equity finance corresponding to interest deductibility. As we have seen, in the case of investments financed by retained profits, the result is a systematic tendency for corporate income taxes to increase the cost of capital. For classical tax systems, this is also the case for investments financed by new equity, although this may be offset by imputation credits or split-rate corporate income taxes. It would be quite possible to introduce a tax allowance for the cost of using equity finance, and treat debt and equity financed investments in a more neutral way. This is the essence of the 'Allowance for Corporate Equity' tax proposal suggested in IFS Capital Taxes Group (1991), a limited form of which has been introduced recently in Italy.

Finally in this section, we note that personal taxes on dividend income also have no impact on the cost of capital for investment financed by borrowing. With each unit of dividends paid out by the firm worth $(1-m)\theta$ to the shareholder after dividend

[46] For investment financed by retained earnings or new equity, the only impact of inflation is to reduce the real value of unindexed depreciation allowances that can be claimed in the future. Higher rates of inflation therefore tend to increase the differences between costs of capital for equity-financed and debt-financed investments.

taxation, the net present value to the shareholder of our debt-financed investment project becomes

$$NPV = \frac{(1-m)\theta(1-\tau)(R-i)}{1+\rho}$$

and setting this net present value to zero to obtain the cost of capital again requires R = *i*. The same applies for additional tax charges or rebates at the corporate level associated with dividend payments, arising as a result of split-rate corporate income taxes.

2. Effective average tax rates: domestic investments

We now illustrate more briefly the computation of the effective average tax rates presented in this report. The idea of these effective average tax rates is to measure how much of the pre-tax net present value of an investment project to shareholders is taken in the form of corporate income taxes, or in corporate and personal income taxes combined. Given a choice between paying a small proportion of the pre-tax net present value or a large proportion of the pre-tax net present value in taxes, shareholders will naturally prefer to pay a smaller proportion. Thus in situations where firms are choosing one project from a set of mutually exclusive and otherwise similar alternatives, the effective average tax rate is likely to be a more relevant measure of the impact of taxes than the effect of taxes on the cost of capital. One context where this may well be relevant concerns the choice by a multinational corporation concerning where to locate its European operations between alternative European countries.

Returning to the simple investment projects that we analysed in the previous section, we have already seen that the net present value to the shareholder of the project financed by retained earnings in the presence of the corporate income tax at rate τ is

$$NPV(\tau) = -1 + \frac{1+(1-\tau)R}{1+\rho}.$$

The pre-tax net present value of this project is obtained by setting the tax rate τ to zero, and is thus given by

$$NPV(0) = -1 + \frac{1+R}{1+\rho}.$$

The difference between the two is a measure of how much of the pre-tax net present value is taken by the corporate income tax. In this case we have

$$NPV(0) - NPV(\tau) = \frac{\tau R}{1+\rho}.$$

In order to potentially compare investment projects of different sizes or offering different pre-tax returns, this measure of the net present value of the corporate income tax payments is then scaled by a measure of the size of the project. Whilst several alternatives are possible, Devereux and Griffith (1998b) suggest scaling by the present value of the pre-tax return on the project, which in our case is $R/(1+\rho)$. This gives the effective average tax rate as

$$EATR = \frac{NPV(0) - NPV(\tau)}{\left(\frac{R}{1+\rho}\right)}$$

which, for our example, gives the effective average tax rate for investment financed by retained earnings, considering only corporate income tax, equal to the statutory corporate income tax rate τ. This result is quite special, again reflecting the fact that tax depreciation allowances and true economic depreciation are assumed to be equal in our illustration. As for the cost of capital, more generous tax depreciation allowances would result in a lower effective average tax rate, and less generous tax depreciation allowances would result in a higher effective average tax rate. In our empirical estimates, we again account for the effect of tax depreciation provisions on the effective average tax rate, following the method of Devereux and Griffith (1998b).

If we consider marginal investment projects for which $NPV(\tau)$ is zero by construction, the effective average tax rate is informationally equivalent to

considering the impact of the tax on the cost of capital.[47] The main motivation for considering these effective average tax rates is in contexts where firms are choosing between alternative infra-marginal investment projects. In principle, we can calculate a schedule of effective average tax rates corresponding to different pre-tax rates of return (R). In the measures we present in this report, we focus on effective average tax rates computed assuming a pre-tax real rate of return of 30%.

One feature of the effective average tax rate is that the personal tax treatment of dividend income will generally matter, even when we consider investments financed by retained profits or debt. In the case of retained profits, with personal taxes on dividend income, the net present value of the project to shareholders becomes

$$NPV(\tau, m, \theta) = (1-m)\theta\left\{-1+\frac{1+(1-\tau)R}{1+\rho}\right\}$$

which will be lower than NPV(τ) for shareholders with (1-m)θ < 1, and higher than NPV(τ) for shareholders with (1-m)θ > 1. The effective average tax rate calculation is again based on the difference between NPV(τ,m,θ) and NPV(0) as defined above. Thus for classical tax systems with θ = 1 and m > 0, the effective average tax rate for investment financed by retained profits will be higher if we consider corporate income tax and personal income tax on dividends combined, than if we consider corporate income tax alone. However the opposite may be true in the case of imputation systems, for shareholders with low or zero income tax rates on dividend income; and this can also arise with split-rate corporate income taxes, where dividend payments effectively qualify for a tax rebate at the corporate level.

To conclude this section, we briefly note that in the case of investment financed by new equity, the corresponding expression for the net present value of the investment project to shareholders for the corporate income tax alone is

$$NPV(\tau) = -1+\frac{1+(1-\tau)R}{1+\rho}$$

[47] See Devereux and Griffith (1998b) for details.

and that for the corporate income tax and personal tax on dividend income combined is

$$NPV(\tau, m, \theta) = -1 + \frac{1 + (1 - m)\theta(1 - \tau)R}{1 + \rho}.$$

Notice that for (1-m)θ < 1, the effective average tax rate for investment financed by new equity will be greater than the effective average tax rate for investment financed by retained earnings, when we take both corporate and dividend income taxes into account; and for (1-m)θ > 1, the effective average tax rate for new equity finance will be lower than the effective average tax rate for retained earnings. This mirrors the results for the cost of capital when we take both corporate and dividend income taxes into account.

In the case of investment financed by debt, the corresponding net present values are

$$NPV(\tau) = \frac{(1 - \tau)(R - i)}{1 + \rho}$$

and

$$NPV(\tau, m, \theta) = \frac{(1 - m)\theta(1 - \tau)(R - i)}{1 + \rho}.$$

We can note that, considering corporate income tax alone, the effective average tax rate for investment financed by debt will be lower than the effective average tax rate for investment financed by retained earnings, again reflecting the advantage of interest deductibility. When we consider dividend taxes as well as the corporate income tax, the impact again depends on whether each dollar of dividends paid out by the firm is worth more than one dollar to the shareholder ((1-m)θ > 1) or less than one dollar to the shareholder ((1-m)θ < 1).

3. The cost of capital and effective average tax rates: international investments

The same basic principles can be used to compute costs of capital and effective average tax rates for cross-border investment projects, carried out by a subsidiary located in a different tax jurisdiction from the parent company. In these cases, payments of dividends and interest from the subsidiary to the parent may be subject to withholding taxes levied by the country in which the subsidiary is located – often referred to as the source country; and receipts of dividends and interest from foreign subsidiaries may be subject to further taxation in the country where the parent is located – often referred to as the residence country. We first discuss how these taxes operate and introduce some notation, before illustrating how these taxes affect the cost of capital for international investments.

When a subsidiary pays one unit of dividends to its parent, we assume that the dividend is subject to a withholding tax at rate c_S, so that the parent receives the amount $(1-c_S)$. When the parent company receives this dividend, it may be subject to additional taxation. This will depend on the resident country's treatment of foreign-source dividends from the country where the subsidiary is located, which may depend on the bilateral tax treaty between the two countries.

Three systems are commonly used. Under the exemption system, foreign-source dividends are exempt from tax in the residence country, and so subject to no additional taxation. Under the deduction system, foreign taxes (including the withholding tax) can be deducted when computing the tax base in the residence country; thus foreign-source dividends net of any withholding tax are subject to corporate income tax in the residence country. Under the credit system, foreign taxes paid (including the withholding tax) can be credited against the corporate income tax liability in the residence country, and further tax will only be due to the extent that the taxes paid abroad are less than the corporate income tax that would have been due if the underlying profits had been earned in the residence country.

To illustrate how this works, consider a source country with a corporate income tax rate (τ_S) of 30% and a withholding tax on dividends (c_S) of 10%, and a residence country with a corporate income tax rate (τ_R) of 40%. When the subsidiary earns

underlying profits of $100, it pays corporate income tax of $30, leaving $70 to distribute to its parent company. If all this is distributed, there is a withholding tax charge of $7, and the dividend received by the parent is the remaining $63. If the residence country operates an exemption system, that is the end of the story. If the residence country operates a deduction system, the dividend received by the parent company ($63) is then subject to corporate income tax at 40%, giving an additional tax charge of $25.2. In effect, the $37 paid in foreign taxes is deducted in computing the tax liability on the underlying $100 of profit. If the residence country operates a credit system, the additional tax charge is only $3. In this case the foreign taxes of $37 are credited against the residence country corporate tax liability of $40 on the underlying $100 of profit. Note that the credit system tends to be more generous to the company than the deduction system. Indeed if the residence country corporate income tax rate was 37% or lower in this example, there would be no additional tax charge in the residence country.

More generally, if we let D_S denote the dividend paid by the subsidiary to the parent, *including* any withholding tax payment,[48] the additional tax charge on dividends received from the foreign subsidiary can be expressed as $\kappa_R D_S$, where the tax rate κ_R has the form:

Exemption system	$\kappa_R = 0$
Deduction system	$\kappa_R = \tau_R(1-c_S)$
Credit system	$\kappa_R = \max\left\{\frac{\tau_R - \tau_S}{1-\tau_S} - c_S, 0\right\}.$

When a subsidiary pays one unit of interest to its parent, we assume that the interest is subject to a withholding tax at rate w_S, so that the parent receives the amount $(1-w_S)$. When the parent company receives this interest, it may also be subject to additional taxation. Again this will depend on the resident country's treatment of

[48] That is, in the example of the previous paragraph, D_S = $70.

foreign-source interest from the country where the subsidiary is located, and again three systems are commonly used.

As in the case of dividends, an exemption system implies that no additional tax is charged by the residence country on foreign-source interest. Under the deduction system, any withholding tax paid can be deducted from the interest received in computing the residence country's corporate tax base. Under the credit system, any withholding tax paid can be credited against corporate income tax in the residence country. Thus if a subsidiary located in a source country with a corporate income tax rate (τ_S) of 30% and a withholding tax on interest (w_S) of 10%, pays \$100 in interest to a parent company located in a residence country with a corporate income tax rate (τ_R) of 40%, there is a withholding tax charge of \$10, and only \$90 is received by the parent company. With a deduction system, the interest received by the parent company (\$90) is then subject to corporate income tax at 40%, giving an additional tax charge of \$36. In effect, the \$10 paid in withholding tax is deducted in computing the tax liability on the underlying \$100 of interest. With a credit system, the withholding tax payment of \$10 is credited against the corporate income tax liability of \$40 on the underlying \$100 of interest, and the additional corporate income tax charged by the residence country is only \$30.

More generally, if we let i_S denote the interest paid by the subsidiary to the parent, again *including* any withholding tax payment,[49] the additional tax charge on interest received from the foreign subsidiary can be expressed as $\lambda_R i_S$, where the tax rate λ_R has the form:

Exemption system	$\lambda_R = 0$
Deduction system	$\lambda_R = \tau_R(1-w_S)$
Credit system	$\lambda_R = \max\{\tau_R - w_S, 0\}$.

[49] That is, in the example of the previous paragraph, i_S = \$100.

Using this description of the tax charges on cross-border flows of dividends and interest, we can now consider the effects of these taxes on the cost of capital for international investment projects. We focus on the case where the parent company's investment is financed from retained earnings, but allow the investment in the subsidiary company to be financed by either retained earnings, new equity or debt. The basic method can be extended to cases where the parent company also uses new equity or debt finance. Interested readers are referred to Devereux and Griffith (1998b) for details of the cost of capital calculations in these cases.

Parent financed by retained earnings; subsidiary financed by retained earnings

In this case, the investment conducted by the subsidiary company is financed by a reduction in dividends paid to the parent, which is passed on by the parent company as a reduction in dividends paid to its shareholders. Given the withholding tax levied on repatriation of dividends from the source country at rate c_S and the additional corporate income tax levied in the residence country at rate κ_R, the reduction in the post-tax value of dividends to the shareholders of the parent company, when the subsidiary retains sufficient profits to finance one unit of investment, is $(1 - c_S - \kappa_R)$. Here we abstract from personal taxes on dividends in the residence country, although this could be included as a simple extension.

In the following period, the investment by the subsidiary earns a return R which is subject to corporate income tax at the rate τ_S. As in the example we considered in the domestic case, the subsidiary is assumed to reduce its investment in the same (non-depreciating) asset by one unit, holding its capital stock constant in all other periods. We assume this investment would otherwise have also been financed by retained earnings in the same way. The increase in the subsidiary's revenue of $(1 + (1-\tau_S)R)$ units is paid out to the parent company as a dividend, which in turn pays out the after-tax value $(1 - c_S - \kappa_R)(1 + (1-\tau_S)R)$ to its shareholders as a dividend.

The details of this cost of capital computation are set out in Table A4. The net present value of this international investment project to the shareholders of the parent company is

$$NPV(\tau_S, c_S, \kappa_R) = (1 - c_S - \kappa_R)\left\{-1 + \frac{1 + (1-\tau_S)R}{1+\rho}\right\}.$$

The cost of capital is again found as the minimum pre-tax rate of return which leaves the shareholders just indifferent between proceeding or not proceeding with the investment, or which sets this net present value to zero. In this case the cost of capital is given by $R = \rho/(1-\tau_S)$. This is essentially the same as the cost of capital for investment financed by retained earnings in the purely domestic case, except the relevant corporate income tax rate is that paid by the subsidiary firm in the source country. Thus for investments that are fully funded by retained earnings, firms in high tax countries will face a lower cost of capital for foreign investments in lower tax jurisdictions than they do for domestic investments; whilst firms in low tax countries will face a higher cost of capital for foreign investments in higher tax jurisdictions than they do for domestic investments.

Table A4. Parent retained earnings; subsidiary retained earnings

	Period 1		
	Shareholder	Parent	Subsidiary
Lower dividend (parent) Corporate tax (parent) Lower dividend (subsid) Withholding tax Higher investment	$-(1-c_S-\kappa_R)$	$+(1-c_S-\kappa_R)$ $+\kappa_R$ $-(1-c_S)$	 $+(1-c_S)$ $+c_S$ -1
Net cash flow	$-(1-c_S-\kappa_R)$	0	0
	Period 2		
	Subsidiary	Parent	Shareholder
Return Corporate tax (subsid) Lower investment Higher dividend (subsid) Withholding tax Corporate tax (parent) Higher dividend (parent)	$+R$ $-\tau_S R$ +1 $-(1+(1-\tau_S)R)(1-c_S)$ $-(1+(1-\tau_S)R)c_S$	 $+(1+(1-\tau_S)R)(1-c_S)$ $-\kappa_R\,(1+(1-\tau_S)R)$ $-[(1+(1-\tau_S)R).(1-c_S-\kappa_R)]$	 $+[(1+(1-\tau_S)R).(1-c_S-\kappa_R)]$
Net cash flow	0	0	$+[(1+(1-\tau_S)R).(1-c_S-\kappa_R)]$

In this case, the taxes on cross-border dividend payments operate in essentially the same way as did personal taxes on dividend payments. Not surprisingly, if we were also to consider personal taxes on dividends, we would find that these have no effect on the cost of capital for an international investment where both the parent firm and the subsidiary use finance from retained earnings. Note however that these results again only apply when dividend taxes are constant. If either cross-border dividend taxes or personal dividend taxes were expected to increase between the two periods, this would temporarily increase the cost of capital for this type of investment.

The effective average tax rate for this international investment again measures the share of the pre-tax net present value of the investment project to the shareholders that is taken by the various tax charges. The definition is essentially the same as in the domestic case, giving

$$EATR = \frac{NPV(0) - NPV(\tau_S, c_S, \kappa_R)}{\left(\frac{R}{1+\rho}\right)}$$

where the pre-tax net present value NPV(0) is again obtained by setting all the relevant tax rates to zero.

These expressions for both the cost of capital and the effective average tax rate have been obtained for the case where tax depreciation allowances in the source country coincide with true economic depreciation (both zero in our illustration). The empirical measures we present in this report again account for actual tax depreciation provisions, using the method proposed by Devereux and Griffith (1998b).

Parent financed by retained earnings; subsidiary financed by new equity

In this case, the investment conducted by the subsidiary company is financed by issuing shares purchased by the parent company, and the parent company finances this investment by reducing dividends paid to its shareholders. Since there is no change in the flow of dividends from the subsidiary to the parent associated with this initial investment, there is no change in the withholding tax or corporate tax on foreign-source dividends paid, and a reduction in dividends paid to the shareholders of one unit is required to finance an investment of one unit by the subsidiary.

In the following period, the investment by the subsidiary earns a return R subject to corporate income tax at the rate τ_S, and the subsidiary reduces its investment by one unit, which we assume would otherwise have been financed in the same way. The remaining income is paid out as a dividend from the subsidiary to the parent, subject to the taxes on cross-border dividend flows. The parent company thus enjoys additional revenue in the second period, both as a result of reducing its purchase of shares in the subsidiary, and as a result of this dividend. This additional revenue is all passed on to its shareholders as a higher dividend in the second period, reflecting our assumption here that the parent firm's activities are funded by retained earnings.

Table A5. Parent retained earnings; subsidiary new equity

	Period 1		
	Shareholder	Parent	Subsidiary
Lower dividend (parent)	-1	+1	
Higher share issue		-1	+1
Higher investment			-1
Net cash flow	-1	0	0
	Period 2		
	Subsidiary	Parent	Shareholder
Return	+R		
Corporate tax (subsid)	$-\tau_S R$		
Lower investment	+1		
Lower share issue	-1	+1	
Higher dividend (subsid)	$-(1-\tau_S)R(1-c_S)$	$+(1-\tau_S)R(1-c_S)$	
Withholding tax	$-(1-\tau_S)Rc_S$		
Corporate tax (parent)		$-\kappa_R\ (1-\tau_S)R$	
Higher dividend (parent)		$-[(1-\tau_S)R(1-c_S-\kappa_R)$ +1]	$-[(1-\tau_S)R(1-c_S-\kappa_R)$ +1]
Net cash flow	0	0	$-[(1-\tau_S)R(1-c_S-\kappa_R)$ +1]

Table A5 sets out the cost of capital calculation in this case. The net present value of this project to the shareholders in the parent company is

$$NPV(\tau_S, c_S, \kappa_R) = -1 + \frac{1 + (1 - c_S - \kappa_R)(1 - \tau_S)R}{1 + \rho}$$

and the cost of capital for this pattern of finance is given by $R = \rho/[(1-c_S-\kappa_R)(1-\tau_S)]$.

In this case the additional taxes on cross-border payments of dividends from the subsidiary to the parent work in the same way as did personal taxes on dividend income in the case of domestic investment financed by new equity. If these dividend taxes are positive, they will raise the cost of capital for investment where the subsidiary uses new equity finance relative to the case where the subsidiary uses retained earnings finance. Note that personal taxes on dividend income in the residence country would again have no effect on the cost of capital for this pattern of finance, so long as they are constant, since the shareholders in the parent company are ultimately financing the investment by exchanging lower dividends in the current period for higher dividends in the future. This reflects the assumption that the parent firm is financed by retained earnings. Dividend taxes in the residence country would be relevant in cases where the parent firm finances its investment by issuing new shares.

The effective average tax rate for this form of international investment is then calculated in the same way, using this expression for $NPV(\tau_S,c_S,\kappa_R)$. When taxes on payments of dividends from the subsidiary to the parent are positive, the effective average tax rate will also tend to be higher when the subsidiary uses new equity finance than when the subsidiary uses retained earnings finance. Our empirical estimates again account for differences between tax depreciation allowances and the assumed rates of true economic depreciation, following Devereux and Griffith (1998b).

Parent financed by retained earnings; subsidiary financed by new equity

Finally we consider the case where the parent finances the investment by reducing dividends paid to its shareholders, but uses this finance to lend to the subsidiary. Again there is no change in the initial flow of dividends from the subsidiary to the parent, and to finance an investment of one unit made by the subsidiary requires a reduction of one unit in the dividends paid by the parent company to its shareholders.

In the following period the subsidiary pays interest to the parent on this additional borrowing, which can be deducted against corporate income tax in the source country. However the flow of interest from the subsidiary to the parent may also be subject to a withholding tax at rate w_S, and to corporate taxation in the residence country at rate λ_R, as discussed earlier. As usual we assume that there is a corresponding reduction in investment in the following period, so that the subsidiary's capital stock and level of outstanding debt is unchanged in all subsequent periods. All remaining profit after interest and corporate income tax is paid out to the parent company as a dividend. All additional revenue received by the parent company in the second period is paid out as a dividend to its shareholders.

Table A6. Parent retained earnings; subsidiary debt

	Period 1		
	Shareholder	Parent	Subsidiary
Lower dividend (parent)	-1	+1	
Higher borrowing		-1	+1
Higher investment			-1
Net cash flow	-1	0	0
	Period 2		
	Subsidiary	Parent	Shareholder
Return	+R		
Interest	$-i(1-w_S)$	$+i(1-w_S)$	
Withholding tax (int)	$-iw_S$		
Corporate tax (subsid)	$-\tau_S(R-i)$		
Lower investment	+1		
Lower borrowing	-1	+1	
Higher dividend (subsid)	$-(R-i)(1-\tau_S)(1-c_S)$	$+(R-i)(1-\tau_S)(1-c_S)$	
Withholding tax (div)	$-(R-i)(1-\tau_S)c_S$		
Corporate tax (parent)		$-\kappa_R(R-i)(1-\tau_S)$	
		$-\lambda_R i$	
Higher dividend (parent)		$-(R-i)(1-\tau_S)(1-c_S-\kappa_R)$	$+(R-i)(1-\tau_S)(1-c_S-\kappa_R)$
		$-i(1-w_S-\lambda_R)$ -1	$+i(1-w_S-\lambda_R)$ +1
Net cash flow	0	0	$+(R-i)(1-\tau_S)(1-c_S-\kappa_R)$
			$+i(1-w_S-\lambda_R)$ +1

Table A6 sets out the cost of capital calculation for this pattern of finance. The net present value of this investment project to the shareholders is

$$NPV(\tau_S, c_S, \kappa_R, w_S, \lambda_R) = -1 + \frac{1 + (R-i)(1-\tau_S)(1-c_S-\kappa_R) + i(1-w_S-\lambda_R)}{1+\rho}.$$

The cost of capital, or rate of return which sets this net present value to zero, is in this case given by

$$R = \frac{\rho}{(1-\tau_S)(1-c_S-\kappa_R)} - i\left[\frac{(1-w_S-\lambda_R)}{(1-\tau_S)(1-c_S-\kappa_R)} - 1\right].$$

Compared to the case in which the subsidiary is financed by issuing new shares, the benefit of using debt is that the interest payment can be deducted against corporate income tax in the source country, which is reflected in a higher dividend payment to the parent firm. However this benefit may be offset by taxes on the cross-border flow of interest. The term $(1-w_S-\lambda_R)$ reflects the post-tax value of an underlying unit of profit made by the subsidiary and paid to the parent as interest, whilst the term $(1-\tau_S)(1-c_S-\kappa_R)$ reflects the post-tax value of an underlying unit of profit made by the subsidiary and paid to the parent as a dividend. Thus where there is a tax advantage to repatriating profits in the form of interest, the cost of capital is lower when the subsidiary uses debt finance than when the subsidiary uses new equity finance. For example, in a simple case with no withholding taxes ($w_S = c_S = 0$), a higher tax rate in the source country than in the residence country ($\tau_S > \tau_R$), a deduction system or a credit system for foreign-source interest ($\lambda_R = \tau_R$) and a credit system for foreign-source dividends ($\kappa_R = 0$), we find $(1-w_S-\lambda_R) = (1-\tau_R)$ and $(1-\tau_S)(1-c_S-\kappa_R) = (1-\tau_S)$. In this case the cost of capital is lower when the subsidiary uses debt finance, reflecting the fact that interest is deductible against a high tax rate in the source country but taxed at a low tax rate in the residence country.

The effective average tax rate for this form of international investment is then calculated in the same way, using this expression for $NPV(\tau_S,c_S,\kappa_R,w_S,\lambda_R)$. When repatriation of profits as interest is tax-favoured compared to repatriation of profits as dividends, the effective average tax rate will also tend to be lower when the subsidiary uses debt finance than when the subsidiary uses new equity finance. Our empirical

estimates again account for differences between tax depreciation allowances and the assumed rates of true economic depreciation, following Devereux and Griffith (1998b). Finally we note that we have only consider cases in which the parent company finances the investment from retained earnings. The same principles can be applied to cases where the parent company also uses new equity or debt finance, and interested readers are referred to Devereux and Griffith (1998b) for details of the cost of capital calculations in these cases.

Annex B: Individual corporate tax systems

This annex explains which tax rates are used in the study, what assumptions have been made for the depreciation allowances available to companies, and other aspects of the tax structure which affect the calculation of the costs of capital and the effective average tax rates reported here.[50]

Statutory tax rates

The tax rates reported in the study include the headline tax rate, which is the national corporate income tax rate on retained profits. This rate does not include any surcharges or local profit taxes. The tax rates used in the calculations of the costs of capital and the effective average tax rates are the typical tax rates paid. These include surcharges and other special taxes levied on corporate income at the national level. They also include an estimate of corporate income tax levied at the local level, but do not include local taxes on property. Where the local corporate income tax is deductible from the national corporate income tax, this is taken into account.

The tax rates used are based on the rates in force at 31 December each year.

Depreciation allowances

Where there are several alternative types of depreciation allowance available, the most generous form of allowance is assumed to be used. Where a switch from declining balance to straight line depreciation is allowed, it is assumed that this occurs at the optimum point. Where the depreciation rate is based simply on the useful life of an asset, it is assumed that plant and machinery assets last for 8 years and buildings for 25 years.

Structure of tax systems

There are some elements of tax systems which remain relatively unchanged over time, including the method of integrating corporate and personal taxation for the

[50] This annex draws heavily on the country appendices in Chennells and Griffith (1997) and Devereux and Griffith (1998b).

treatment of dividend income, and the treatment of foreign-source income (i.e. payments of dividends and interest received from abroad).

Income from corporate profits can be the subject of taxation at two levels, the corporate level and the personal income tax level. Under a classical system, there is no attempt to alleviate this double taxation: dividend income is subject to corporate income tax and taxed again as personal income at the usual personal income tax rates. There are a variety of approaches that countries have adopted to alleviate this double taxation, through integrating their personal and corporate income tax systems.

These approaches can be classified into one of three categories: split rate systems, imputation systems, and shareholder relief systems. Under a split rate system there are two different statutory corporate tax rates, one applying to retained earnings, the other to distributed earnings. A lower tax rate on distributed profits acts to compensate, usually only partially, for the personal income tax subsequently levied on the dividend income. An imputation system is one in which some or all of the corporate income tax paid on distributed profits can be offset against the individual personal income tax liability on dividend income. Under some systems this comes in the form of a credit which can be refunded if, for example, the individual shareholder is tax-exempt. Under a shareholder relief system, the individual receives some form of relief from the personal income tax that would otherwise be owed on dividend income. This may take the form of a credit, or a lower tax rate on dividend income than the shareholder's usual marginal income tax rate.

The treatment of repatriated income from foreign sources, in the form of dividend or interest income, will affect the tax rates on international investments. The most common methods of dealing with foreign income are the credit method and the exemption method. The former grants a credit for foreign taxes paid by the subsidiary against the tax which would have been owed on that income by the parent had the investment been wholly domestic. The credit method has several variations, for example according to whether foreign-source income is considered on a country-by-country basis or a world-wide basis. Since we only consider investments into a single foreign country, this distinction has no impact in our measures for cross-border investments. The exemption method exempts foreign income in the hands of the parent company, so that the corporate tax paid in the country which is the source of

the profits, the withholding tax paid when the subsidiary transfers the income to the parent, and personal taxes owed by investors in the parent company are the only taxes levied. One other alternative modelled here is a deduction system, which allows the tax paid on foreign-source income to be deducted from the tax base, when calculating the payment owed in the residence country.

Payments of dividends and interest to a foreign parent company can also be liable to withholding taxes. These will also affect the costs of capital and effective average tax rates for international investments, and so are discussed here for the particular countries in this study.

Denmark

The Danish corporate tax rate has fallen from 50% in 1989, to 40% in 1990, and is now 32%. There are no local corporate income taxes.

Denmark operates a form of shareholder relief for the treatment of dividend taxation, where individuals can opt to pay a final withholding tax of 40% on their dividend income (or 25% for small amounts of income) rather than paying at their marginal income tax rate.

Until 1992, Denmark indexed depreciation allowances for inflation.

Foreign-source dividend income is exempt if taxed abroad under a system relatively similar to the Danish system. Foreign-source interest income is taxed on a credit-by-source basis. Dividend withholding taxes have fallen to zero within the EU since 1992, and are 5% and 10% for the USA and Japan respectively. No withholding taxes are levied on interest paid.

France

The statutory rate has fallen over the period from 50% in 1979, to 33.33% in 1999. Although the statutory tax rate on corporate income is 33.33%, surcharges at varying rates have applied since 1995. From 1989 to 1991, France levied a higher rate of tax on distributed profits than on retained profits. There are no local corporate income taxes.

France operates an imputation system, granting a dividend credit (*avoir fiscal*) of 50% of the net dividend. Both the dividend and the credit are included in taxable income; the credit is refundable to individuals but not corporations.

Foreign-source dividend income is exempt from tax; foreign-source interest income is taxed on a credit-by-source basis. Dividend withholding taxes have fallen to zero within the EU since 1992, and are 5% and zero for the USA and Japan respectively. No withholding taxes are now levied on interest paid (on corporate bonds issued since 1987).

Germany

Germany has a split rate system throughout the period, with a lower rate of tax on distributed profits (36% in 1979, 30% in 1999) than that on retained profits (56% in 1979, 40% in 1999). A local business profits tax (*Gewerbesteuer*) applies, which varies both by area and over time and is deductible from the national tax.[51] An annual weighted average of the local tax is used in the calculations up to 1996; the 1996 average of 16.2% is used thereafter. Various surcharges have been imposed over time, including the current solidarity surcharge of 5.5% for 1999.

In conjunction with the split rate system, Germany also operates an imputation system, granting a dividend tax credit against personal income tax liability, and refundable for individuals with lower tax liability. The credit was originally 36% of the gross dividend (the net dividend plus the tax credit), falling to 30% in 1994 with the rate of tax on distributed profits. Credit is not given for the solidarity surcharge.

Foreign-source dividend income is exempt from tax; foreign-source interest income is taxed on a credit-by-source basis. Dividend withholding taxes have fallen to 5% within EU in 1992, and to zero from 1996; and are 5% and 15% for the USA and Japan respectively. No withholding taxes are levied on interest paid.

[51] The tax base for the local corporate income tax is similar to that for the national tax, except that only 50% of interest payments on long-term loans are deductible under the local tax.

Japan

Japan had a split rate tax system between 1979 and 1989, charging a higher rate of tax on retained profits than that on distributed profits. The headline rate of tax on retained profits has fallen from 40% to 30% over the period, but the typical tax rate paid on retained profits has fallen from 52.6% to 40.9%. This is because there are two local taxes: an enterprise tax and an inhabitants tax. The enterprise tax is deductible (from the income base that it is calculated on), while the inhabitants tax is not. The enterprise tax applies to corporate income and depends upon the size of the firm, and the standard rate in the highest income range is used here (12%). The inhabitants tax applies to the firm's corporate income tax liability, and ranges from 5% to 20.7% (the lowest rate for Tokyo – 17.3% – is used in these calculations).

Japan operates a form of shareholder relief for the taxation of dividend income received by shareholders, where individuals can either choose a final withholding tax (at 35%) or have dividend income taxed at their marginal rate after deduction of a 10% credit.

Foreign-source dividend and interest income are taxed on a world-wide credit basis. Dividend withholding taxes are usually levied at 5% or 10%; interest withholding taxes are usually levied at 10%.

Netherlands

The national rate of corporate income tax has been 35% since 1989. No local corporate income taxes are levied.

The Netherlands operates a classical system, with individuals taxed at their marginal income tax rates on dividend income.

Foreign-source dividend income is exempt from tax; foreign-source interest income is taxed on a credit-by-source basis. Dividend withholding taxes fell to zero within the EU in 1992, and are 5% for the USA and Japan. No withholding taxes are levied on interest paid.

UK

The corporate income tax rate has fallen in the UK from 52% in 1979 to 30% in 1999. No local corporate income taxes are levied.

The UK operated a partial imputation system prior to 1997, with part of the corporate tax payment (Advance Corporation Tax) imputed to the individual as a dividend tax credit – the rate of which varied over time – to set against the individual's dividend income tax liability. The credit was fully refundable to non-taxpayers. Since 1997 the tax credit has become non-refundable, and the rate of the credit was lowered, with an offsetting reduction in the personal tax rates on dividend income.

Prior to 1984, 100% first-year depreciation allowances were granted to plant and machinery, with 75% first-year allowances for industrial buildings. During a major reform of the corporate tax system between 1984 and 1986, these allowances were reduced significantly (to 25% writing down allowances for plant and 4% straight-line allowances for buildings). The corporate tax rate was reduced from 52% in 1982 to 35% in 1986.

Both foreign-source dividend and interest income are taxed on a credit-by-source basis. Dividend withholding taxes have fallen to zero within the EU in 1992, and are 5% for the USA and Japan. Where countries have negotiated payment of the UK dividend tax credit, such as Denmark, the Netherlands and the US, the effective withholding tax on dividends could be negative prior to 1997. Withholding taxes on interest are commonly zero, although the rate is 10% for Japan.

US

The federal corporate income tax rate has fallen from 46% in 1979 to 35% in 1999 in the US. Individual states also levy corporate income taxes, of 6.6% on average, which are deductible from the federal corporate tax.

The US system is a classical one, with individuals taxed on their dividend income at their marginal income tax rates.

The US has had two major tax reforms during the period, the Economic Recovery Tax Act of 1981 and the Tax Reform Act of 1986. The 1981 Act introduced a new system of depreciation allowances, although it did not affect the generosity of allowances on plant and machinery. The reform of 1986 reduced the generosity of depreciation allowances for both buildings and plant and machinery, abolished an investment tax credit on plant and machinery of 10%, and lowered the corporate tax rate from 46 to 34%. Depreciation allowances for buildings were further reduced in 1993.

The US operates a world-wide credit system for foreign-source income.[52] Withholding taxes on dividends are usually 5% for the countries considered here, although the rate for Japan is 10%. Withholding taxes on interest are usually zero, although again the rate for Japan is 10%.

[52] The US pools foreign-source income rather than assessing it country-by-country, but since we only consider investments from one country at a time, this is effectively the same as the other systems modelled here. The US also attempts to redefine the base on which foreign taxes have been levied, in order to approximate the US tax base more closely. This has not been modelled here.