

CAN INTERNATIONAL TAX COMPETITION EXPLAIN CORPORATE INCOME TAX REFORMS?

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Abstract

This paper analyses the development of taxes on corporate income in EU and G7 countries over the last two decades. We establish a number of stylised facts about their development. Tax-cutting and base-broadening reforms have had the effect that, on average across EU and G7 countries, effective tax rates on marginal investment have remained fairly stable, but those on more profitable investments have fallen. We discuss two possible explanations of these stylised facts arising from alternative forms of tax competition. First, governments may be responding to a fall in the cost of income shifting, which puts downward pressure on the statutory tax rate. Second, reforms are consistent with competition for more profitable projects, in particular those earned by multinational firms.

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1 Introduction

The last two decades have seen considerable reform to corporate income taxes in major industrialised countries. Statutory rates have fallen from an average of 48% in the early 1980s to 35% by the end of the 1990s. The main wave of reforms occurred in the mid to late 1980s but the pace has continued throughout the 1990s. In 1992, the EU-appointed Ruding Committee proposed a minimum statutory corporation tax rate of 30%. At that time, only Ireland had a lower rate than this – and then only for the manufacturing industry. Less than ten years later, one third of EU member states have tax rates at or below this level. In 2001 Germany reduced its tax rate to 25%,¹ and this may well lead to further reductions elsewhere.

On the face of it these reforms seem consistent with the predictions of economic theory. It has been argued that increasing capital mobility will lead to a “race to the bottom” as countries compete with each other to attract capital. Policy makers have been concerned that this downward pressure on corporate income taxes will lead to a loss of revenue, and thus provide a constraint on government activity. The European Commission (1997) has also expressed concern that this process is forcing governments to rely more heavily on taxes on labour, which they fear will in turn increase unemployment. The European Commission and the OECD have recently made attempts at international coordination to counter what they see as “harmful” tax competition.

This paper presents a detailed consideration of these issues. The first part of the paper analyses the development of taxes on corporate income over the last two decades. We analyse the tax regimes in 16 countries² over the 1980s and 1990s. The most common reform to corporate income taxes in these countries has been to lower tax rates and to broaden tax bases. Measuring the tax base in a simple way, by the

¹ Including local corporate income taxes brings this rate up to approximately 37%.

² In analysing measures based data on tax revenue, we expand this to 18 countries – the EU and G7.

rate of allowance available for investment in plant and machinery, seven countries – including France, Germany, the UK and the USA – reduced the tax rate and expanded the tax base. A further five, mainly smaller, countries reduced their tax rates, but left the tax base unchanged.

The rate-cutting, base-broadening reform has interesting effects on firms' investment incentives. Most empirical research on the impact of taxes on investment³ – and most theoretical work on tax competition⁴ - has focussed on the impact of taxes at the margin. Typically, corporate income taxes raise the cost of capital - the required rate of return on an investment - and therefore act as a disincentive to invest. The two aspects of these reforms have offsetting effects on this disincentive: the lower tax rate typically increases the incentive to invest, while the lower allowance decreases it. The combined effect depends on the details of each reform.

In Section 2, we describe the development of the tax rate, the tax base and the effective marginal tax rate, which measures the extent to which the tax raises the cost of capital. We develop a series of stylised facts describing the trends in tax reform. There have been marked changes in the effective marginal tax rate in individual countries over the period considered. However, there has been no clear movement in the average rate across countries. The average rate at the end of the 1990s was similar to that in the early 1980s.

The view that corporate income tax rates have fallen in response to increased mobility of capital, as countries compete to lower the cost of capital within their jurisdictions, is therefore not generally borne out by the data. An alternative possibility is that countries may instead compete for the activities of mobile multinational firms, which have access to valuable proprietary assets, rather than simply for mobile capital. This is consistent with our empirical findings. The

³ See Hines (1999) for a survey on the literature of the impact of tax on investment, and Devereux and Griffith (2002b) for a discussion of the impact of tax on firms' location decisions.

⁴ See Wilson (1999) for a recent survey.

literature on multinational firms emphasises that such firms make discrete investment choices: for example, whether to export to a new market or to produce locally, or where within a new location to site a new production facility. Devereux and Griffith (2002a) show that the impact of taxes on such discrete decisions is not captured by the effective marginal tax rate. Instead, it depends on the proportion of total profit taken in tax, measured by the effective average tax rate. This measure also depends on both the tax rate and the tax base, so that the effect of the rate-cutting, base-broadening reforms could be either to increase or decrease this effective rate. The evidence presented in Section 2 points to a fall in the effective average tax rate averaged across countries.

In section 3 we review possible explanations of this pattern of reforms in corporate income taxes over the last two decades. Broadly we argue that the canonical model from the theoretical tax competition literature does not explain the reforms, since it (implicitly) focuses on only one aspect of the tax schedule - the effective marginal tax rate.

The finding that there has been a decline in the effective average tax rate may indicate a process of competition to attract more profitable and mobile firms. A fall in the effective average tax rate benefits more profitable firms. If such firms are also more mobile – and if their mobility has increased over time – then governments may gain by shifting the shape of the tax schedule in order to attract them. This could be accomplished by rate-cutting and base-broadening. We explore this explanation in Section 4. We present evidence that capital has become more mobile, that more profitable firms are more mobile and that the degree of mobility of higher profitability firms has increased faster than that of lower profitability firms.

We also explore an alternative explanation for the observed reforms, based on a formal model of tax competition by Haufler and Schjelderup (2000). The idea is that, as well as competing for inward flows of capital, governments also compete for flows of taxable profit. That is, conditional on where they locate their real activities, firms may be able to shift their profit between countries in order to reduce their worldwide tax liabilities. After using up all allowances in each location, the relevant

marginal tax rate for shifting profit is the statutory tax rate – which has fallen in almost all countries over the last two decades. In this model, governments use two instruments - the tax rate and allowances – to compete over two mobile resources – capital and taxable income.

One other recent policy development is also relevant to this discussion. Over the last five years there have been significant advances in international cooperation. In the late 1990s, both the EU and the OECD introduced forms of cooperation, designed to counter what was seen as “harmful” tax competition. The exact aims of these policy initiatives are somewhat unclear. In practice, however, both initiatives appear to be concerned with combating profit shifting, which is consistent with both of the explanations of tax reforms outlined above. In Section 5 we present some brief conclusions.

2 What has happened to corporate taxes?

We begin with a description of the development of source-based capital income taxes over the last two decades.⁵ A number of other studies have presented a description of corporate income taxes across countries in a particular year.⁶ However, there has been very little description of how they have developed over time, across a wide range of countries.⁷ In this paper, we therefore begin by presenting a systematic account of how such taxes have developed over time. In order to understand the measures used below, it is necessary to explain how they are

⁵ The tax data used in this paper is available at <http://ifs.org.uk/corptax/internationaltaxdata.zip>.

⁶ See, for example, Jorgenson and Landau (1993), OECD (1991), European Commission (1992), Devereux and Pearson (1995), European Commission (2001b).

⁷ Chennells and Griffith (1997) is a precursor of this paper, in that they present similar measures to those in this paper for a smaller number of countries and years and discuss how the broad trends relate to predictions from the tax competition literature. Mendoza et al (1994) also present a time-series for taxes on “capital”; however, for reasons explained elsewhere, we do not believe that their measure adequately captures the incentives for investment created by corporate income taxes.

derived, and what they are intended to capture. We begin this section by summarising the measures to be used. We then apply the measures and describe a number of stylised facts about the development of corporate income taxes. We also comment on the recent moves towards international cooperation.

We use data on eighteen countries – the EU and the G7. Data on tax revenue are available from 1965, and we can therefore track the development of revenue over 35 years. However, data on the rules of tax systems are more difficult to collect. We present measures of effective tax rates based on sixteen of these countries (excluding Luxembourg and Denmark) from 1982 to 2001. In the next sub-section we discuss the measures in more detail.

2.1 Some measurement issues

The main focus of this paper is on competition between national governments to attract capital. The specific form of competition which we investigate is the way in which corporate income is taxed. The traditional method of measuring the impact of corporate income tax on the level of capital is through the cost of capital – defined as the pre-tax real required rate of return on an investment project.⁸

The basic idea is that a firm will invest up to the point at which the marginal product of capital is just equal to the cost of capital – so that, at the margin, the project just breaks even. As investment increases, the marginal product is assumed to decline, resulting in a unique profit-maximising level of investment. Most theoretical papers which model the impact of corporate income tax in an open economy are based on this approach. Typically, firms are assumed to be immobile, but can raise finance for capital on the world market. A higher effective marginal tax rate pushes up the cost of capital, and therefore reduces the inflow (or increases the outflow) of capital.

⁸ This approach dates back at least to Hall and Jorgensen (1967). It was further developed by King (1977) and King and Fullerton (1984), among others.

More recently, though, attention has focussed on the discrete investment choices made by such firms, based in part on the literature on multinational firms. One common approach to modelling the location choices of multinational firms analyses whether, and how, such firms access a foreign market.⁹ One choice facing the firm is whether to produce at home and export, or whether to produce abroad. Conditional on locating abroad the firm has a choice between alternative locations of production. For example, if an American firm wants to enter the European market, it could locate production in one of a number of different European countries. Conditional on deciding where to locate the firm must also decide the scale of investment.

The first two of these decisions are discrete. Suppose that the cost structure of the firm prohibits both exporting and producing abroad, and also prohibits producing in more than one location. Suppose also that the firm has some market power so that it expects to earn a positive economic rent. Then it can be assumed that the firm chooses that option which generates the highest post-tax rent. In this model – unlike in the traditional model - taxes on economic rent can affect firm’s investment decisions. Specifically, the impact of tax can be measured by the extent to which the pre-tax economic rent is reduced by taxation. Conditional on the discrete choice – for example, having chosen a location - the decision of the scale of the investment will be determined by the point at which the expected marginal product equals the cost of capital. For this third stage, then, it is again the impact of taxes at the margin – that is on the cost of capital - that are relevant.

The tax system affects returns to investments in a number of complex ways. Among other things, the tax paid will generally depend on the profitability of the investment, the legal status of the entity investing and the sources of finance. Data limitations, and the need to obtain interpretable measures, mean that significant simplifications are required in order to produce a description of the tax schedule facing firms. Which of these assumptions are appropriate will depend on the aims of

⁹ See, *inter alia*, the early literature of Dunning (1977), Caves (1974) and more recently Horstmann and Markusen (1992) and Devereux and Griffith (1998).

the research. In this paper we focus primarily on measures designed to capture the impact of tax on the incentives faced by firms to locate and use capital. We briefly explain why some proposed measures do not adequately measure such incentives. We also investigate trends in tax revenue.

Broadly, measures of corporate income taxes fall into two groups. The first group is based on an analysis of the tax legislation itself. Measures in this group are based on information on the statutory tax rate, depreciation allowances and so on. We describe these measures in the next subsection. The second group comprises measures based on tax revenues. These include measures that scale observed tax revenues by GDP, total tax revenue or some approximation of the tax base. These are discussed in subsection 2.3. One of the main differences between these two groups of measures is that the former is forward looking, and so captures the impact of tax on future expected earnings on a specific investment project, while the latter are backward looking, and so capture the impact of tax on the returns in any period of the whole past history of a firm's investment decisions.

2.2 Measures based on tax legislation

This group of measures includes statutory tax rates, the net present value of depreciation allowances and marginal and average effective tax rates. Corporate income tax liabilities are calculated by applying the statutory tax rate to the tax base, where the tax base can be defined with varying degrees of precision in tax legislation. Clearly, both the rate and base are relevant for exploring the incentives created by the tax regime. We begin by describing the development of both the tax rate and the tax base over time for the 16 countries analysed here. We then describe in more detail the measures of effective tax rates, and present estimates of these as well.

Some important simplifying assumptions are made in developing all of these measures. We consider the tax system as it applies to a mature manufacturing firm. In our main calculations we do not consider the treatment of losses or other forms of tax exhaustion, although we discuss below the impact that tax exhaustion would

have on our calculations. We analyse only source-based corporate income taxes – we do not include taxes levied in the country of residence of the parent company, for example. We generally exclude industry-specific measures and we do not allow for any forms of tax avoidance.

2.2.1 The statutory tax rate

The most basic measure of corporate income taxes is the statutory tax rate. This measure is widely used, although even defining this rate is less straightforward than might be expected. Corporate income taxes are often applied at more than one level of government. There may also be temporary or permanent supplementary taxes. Our definition includes local tax rates and any supplementary charges made.¹⁰

Figure 1 shows the tax rate for each country for which data are available in 1982 and 2001. Over this period, the statutory tax rate fell in most of these 16 countries. Only Italy and Spain increased their tax rate, each by around two percentage points. The Irish rate remained unchanged. Between 1982 and 2001, the unweighted mean statutory tax rate for this group of countries fell from around 48% to around 35%. Throughout the period Ireland had the minimum rate at 10% (Ireland reduced the tax rate on manufacturing activities from 45% to 10% in 1981).

In Figure 2 we present the time series of the mean (weighted by GDP, measured in US dollars) and the median. The fall in tax rates was fairly continuous, though most pronounced in the late 80s. The unweighted mean (not shown) reveals a similar pattern, though with a slightly steeper fall and lower tax rates in every single year. The median falls by more than the weighted mean.

Stylised fact 1: statutory tax rates fell over the 1980s and 1990s.

¹⁰ In cases where local tax rates differ across regions, we use averages weighted by production where data are available. Otherwise the rate of the region in which most production takes place is used. Where local taxes or surcharges can be set off against other taxes (e.g. against federal), this is taken into account. Where tax rates change within a year we use the rate valid at the end of the calendar year. See Chennells and Griffith (1997) and Devereux, Lockwood and Redoano (2001) for more detail on how the data was collected.

A high tax rate does not necessarily imply high tax payments, since payments depend also on the tax base. However, the tax rate may be important in its own right, since it is the marginal rate of tax applied to any additional income, given a level of allowances. It is therefore likely to be relevant in determining the incentive for firms to shift income between countries, conditional on where their real activity takes place. We return to this issue below.

2.2.2 The tax base

In all countries, the definition of the corporate tax base is extremely complex, involving a vast range of legislation covering everything from allowances for capital expenditure, to the deductibility of contributions to pension reserves, the valuation of assets, the extent to which expenses can be deducted, and so on. It is not feasible to present a measure which reflects all of these factors. We follow the empirical literature in focusing on depreciation allowances for capital expenditure.

If a firm invests £100 in capital, typically it cannot set the entire £100 cost against tax immediately. Instead, the cost can be spread over the expected life of the asset. For example, if the asset is expected to last for five years, then the allowance rate may be set at 20% of the initial cost per year for each of the 5 years. The rate allowed typically depends on the type of asset, and varies considerably both across countries and over time. A natural measure of the value of such allowances is their present discounted value (PDV). In Figures 3 and 4 we present estimates of the PDV of allowances for investment in plant and machinery, expressed as a percentage of the initial cost of the asset. The PDV would be zero if there were no allowances at all and it would be 100% with a cash-flow tax that permitted the cost to be deducted immediately.

In almost all countries, allowances are based on the original cost of an asset, and are not adjusted in line with inflation. To the extent that nominal interest rates move in line with inflation, a reduction in the inflation rate (expected over the lifetime of the asset) would increase the PDV of (expected) allowances. This raises the issue of what is the appropriate way of comparing the value of allowances between

countries and over time. Figure 3 shows the PDV for each country in 1982 and 2001, based on a single nominal discount rate for all countries and all years.¹¹ This Figure therefore reflects changes in the rates of allowance set by governments, and abstracts from changes in the inflation rate and the real interest rate. However, it is possible that governments have observed or expected changes in the inflation rate (which has generally fallen over the period analysed), and adjusted their allowance rates accordingly. To allow for this, in Figure 4, we present the two versions of the weighted average PDV of allowances. The first uses a constant nominal discount rate (as in Figure 3), while the second uses one based on the assumption that the nominal discount rate applied to all allowances associated with an asset purchased in period t is based on the inflation rate actually observed in that country in period t .¹²

Of the 16 countries analysed in Figure 3, 10 cut their allowance rates for investment in plant and machinery between 1982 and 2001 - that is, they have broadened their tax bases. Most notably, the UK and Ireland decreased their allowances substantially from 100% to 73% and 71% respectively. Five countries kept their allowances constant and only one country, Portugal, increased allowances.

Figure 4 presents the time series of the weighted mean with constant and actual inflation. Not surprisingly, given the evidence of Figure 3, when inflation is held constant, there has been a decline in the average PDV of allowances for plant and machinery; that is, the rates of allowance set by governments have become less generous. In fact, on this basis, the weighted mean fell nearly ten percentage points, from 83% to 74%. The largest part of this decline was in the late 1980s; cuts were less pronounced in the 1990s. An unweighted average (not shown) reveals the same pattern, as does the median.

¹¹ The nominal discount rate is 13.9%, based on inflation of around 3.5% and a real discount rate of 10%.

¹² Data for inflation are annual percentage changes in the consumer price index over the year. Source: IMF (2001).

Allowing for the effects of inflation on the nominal discount rate generates a slightly different pattern. The marked decline in the second half of the 1980s is even more pronounced. However, the stability of rates in the 1990s, combined with falling inflation, leads to some recovery of the average PDV. Overall, both measures indicate a decline over the period considered, but the impact of the decline in the rates has been offset by the lower discount rates implied by lower inflation.

Stylised fact 2: on average, tax bases were broadened between the early 1980s and the end of the 1990s; however, the impact of reduced rates of allowance was moderated by lower inflation.

Figures 3 and 4 show the PDV of allowances for an investment in plant and machinery. We have also calculated the PDV of allowances for investment in industrial buildings. These yield lower PDVs, corresponding to lower rates of allowances – which in turn reflects the lower economic depreciation rates of buildings. However, there was also a fall in the average PDV for buildings over the period considered.

2.2.3 Effective tax rates

We use the term “effective tax rates”, whether marginal or average, only for measures based on tax legislation. This term has also been used to refer to tax rates estimated from data on tax revenues. We differentiate by referring to those as “implicit tax rates”.

Clearly both the tax rate and the tax base are relevant in determining incentives for investment. This is true of both the types of decision described above: the discrete choice of which type of investment to undertake (or where to undertake it), and the scale of investment conditional on that choice. Given an underlying model of investment, it is possible to combine information on the tax rate and tax base in ways which summarise these incentives.

The standard approach to combining the rate and base to summarise incentives is to look at the impact of tax on a hypothetical investment project that just earns the

minimum required rate of return (a marginal investment). In general, the incentives generated by the tax system depend on the form of the investment project, including the type of asset purchased and the way it is financed. However, in practice it is not possible to account for all the features and complexities of the tax system. The form of the investment modelled is therefore typically simple. Box 1 describes our approach.¹³ The basic approach is to find the impact of taxes on the cost of capital – the pre-tax required rate of return - given a post-tax required rate of return (equal to the discount rate). The proportionate difference between the pre-tax and post-tax required rates of return is known as the *effective marginal tax rate* (EMTR). The higher the EMTR, the greater the required pre-tax rate of return, and hence the lower is the incentive to invest.

The impact of taxes on discrete investment choices is not captured in this framework. Instead, it is necessary to consider two alternative forms of investment, each of them profitable. The impact of taxation on the choice between them depends on the proportion of total profit taken in tax. We denote this the *effective average tax rate* (EATR). If one option has a higher pre-tax profit than the other, but also a higher EATR, then the tax may lead the firm to choose the option with the lower pre-tax profit. The measure of the EATR used here is also defined in Box 1. As with the EMTR, it is defined for a particular project (the same project as for the EMTR, apart from the rate of profitability), and takes into account only the broad structure of the tax system.

Our base case for the effective tax rates is an investment in plant and machinery, financed by equity. We ignore any personal taxes paid by the marginal shareholder.¹⁴ These effective tax rates also depend on economic conditions associated with each investment, notably the real post-tax required rate of return, the economic depreciation rate of the asset and the inflation rate. Throughout, we hold

¹³ This is based on Devereux and Griffith (2002a), and is slightly different from the well-known approach of King and Fullerton (1984) (although the measures generated are very similar).

¹⁴ We do not incorporate any forms of personal taxation, so there is no distinction between investment financed by new equity or retained earnings.

fixed the real post-tax required rate of return (at 10%) and the economic depreciation rate for each asset (12.25% for plant and machinery and 3.61% for industrial buildings).

Figure 5 and 6 show the development of effective marginal tax rates (EMTR) over time, using the same format as in previous figures. In Figure 5 we follow the approach of Figure 3, in holding inflation constant across all years and countries. In Figure 6 we mirror the approach of Figure 4 in presenting the weighted average across countries both with inflation fixed, and using the inflation rate actually observed in the country and period in which the investment is assumed to take place. Note that these rates correspond to the EATR evaluated for a marginal investment, that is, when the pre-tax rate of profit is equal to the cost of capital ($p = \tilde{p}$).

The development of the EMTR over time does not replicate the pattern seen in the statutory tax rates. This is because investment projects at the margin are strongly affected by the value of allowances. Considering the rates under the constant inflation assumption (Figure 5) we see that in more than half of the countries the EMTR has decreased, although in many others it has increased. Figure 6 shows that, given fixed inflation, the weighted mean EMTR remained fairly stable over the period; it rose a little during the early and mid 1980s, but has since fallen back to its initial level. On the same basis, the unweighted mean fell by nearly 4 percentage points over the period, and the median by six percentage points; this is consistent with a greater fall in smaller countries, as reflected in Figure 5. There is also a slight fall between 1982 and 2001 in the weighted mean EMTR based on actual inflation rates in each country and year. Again, this measure rose slightly in the 1980s; however, its subsequent decline has been greater, leaving it around 3 percentage points lower than in 1982. This largely reflects the evidence shown in Figure 4; with lower inflation rates, a given allowance rate is more generous, leading to a lower EMTR.

BOX 1: EFFECTIVE MARGINAL AND AVERAGE TAX RATES

Consider a simple one period investment, in which a firm increases its capital stock for one period only. It does so by increasing its investment by 1 at the beginning of the period, and reducing it by $1 - \delta$ at the end of the period, where δ represent economic depreciation. The higher capital stock generates a return at the end of the period of $p + \delta$, where p is the financial return. The discount rate is r . Ignore inflation.

One unit of capital generates a tax allowance with a net present value (NPV) of A . So introducing tax reduces the cost of the asset to $1 - A$, while the saving from the subsequent reduction in investment becomes $(1 - \delta)(1 - A)$. The total return $p + \delta$ is taxed at the tax rate τ .

The NPV of the investment with tax is therefore:
$$R = \frac{(p + \delta)(1 - \tau) - (r + \delta)(1 - A)}{1 + r}$$
.

The cost of capital is the value of p , denoted \tilde{p} , for which the investment is marginal i.e. $R = 0$. The effective marginal tax rate (EMTR) is $(\tilde{p} - r) / \tilde{p}$.

We define the effective average tax rate (EATR) - for a given value of p - to be the NPV of tax payments expressed as a proportion of the NPV of total pre-tax capital income, $V^* = p / (1 + r)$. This is comparable to other commonly used measures of the average tax rate. For a marginal investment, EATR=EMTR. For a highly profitable investment, EATR approaches τ .

The cash flows are slightly different in the case of debt-financed investment, but the concepts of the EMTR and EATR are unchanged.

Figures 7 and 8 present evidence for the EATR, following the same approach as Figures 5 and 6. In each case, the investment project is assumed to have an expected rate of economic profit of 10% (i.e. $p - \tilde{p} = 0.10$). Figure 7 shows that, given the fixed inflation assumption, the EATR fell in all but three of the countries. The pattern of reduction reflects the pattern seen in the development of the statutory tax rate in Figures 1 and 2. The EATR for industrial buildings follows similar patterns.

Figure 8 shows that, on the basis of fixed inflation, the weighted mean EATR fell over the period from around 41% to around 34%. Based on actual inflation, the fall

in the EATR was similar, from 42% to 33%. These two series are closer in the case of the EATR than in the case of the EMTR, since the EATR depends rather more on the statutory tax rate and rather less on allowances. Nevertheless, the two approaches give a similar qualitative picture of the development of effective tax rates.

Figure 9 shows the weighted mean EATR at different rates of economic profit, for the fixed inflation case. The lowest line is the weighted mean EMTR (equivalent to the EATR evaluated at zero economic profit, a marginal investment). The three higher lines represent the EATR for investments with increasing rates of profitability. The highest is simply the statutory tax rate (to which the EATR converges as profitability rises). This Figure confirms the previous discussion; the reduction in the EATR is greater the higher is the profitability of the investment. At one extreme, it is equal to the statutory rate, which has fallen significantly. At the other, it has remained fairly constant.

The difference in the effective tax rate at very low and very high levels of economic profit has fallen over time. This is shown in Figure 10, again for the fixed inflation case. The top line shows the weighted average effective average tax rate in 1982 at different levels of profitability. It rises sharply as economic profits rises from 0% to 20% and then flattens out, converging to the statutory tax rate. The lower line shows the same relationship in 2001. At the margin, the weighted mean EATR is very similar for the two years. However, in 2001, while the effective average tax rate still rises with profitability, it does so more slowly, and never reaches the higher rates seen in 1982.

Stylised fact 3: the effective marginal tax rate has remained stable over the 1980s and 1990s; effective average tax rates for projects earning positive economic profits have fallen over the 1980s and 1990s, and they have fallen more at higher levels of profitability; allowing for lower inflation implies a small reduction in the effective marginal tax rate, and a greater fall in the effective average tax rate.

Despite the various forms of effective tax rate described already, there are other possibilities which have not yet been addressed. In particular, we discuss two issues: the impact of using debt, instead of equity, to finance the investment; and the impact of the asymmetry in most corporation taxes, which implies that taxable losses do not generate an immediate tax rebate, but must be carried forward to offset against future taxable profits (a form of tax exhaustion).

The main difference in effective tax rates for investment financed by debt, rather than equity, is that interest payments to lenders are deductible from taxable profit. This plays a very important role in determining effective marginal and average tax rates.

We explore the impact of tax reforms on effective tax rates for debt-financed investment in Figure 11. Rather than use the “tax inclusive” measure defined above ($EMTR = (\tilde{p} - r) / \tilde{p}$) we use the “tax exclusive” measure ($EMTR^* = (\tilde{p} - r) / r$), where \tilde{p} is the minimum pre-tax rate of return and r is the associated post-tax rate of return. In the case of debt finance, \tilde{p} can take values very close to zero, implying huge values of the $EMTR$. In presenting evidence of the development of such tax rates in Figure 11, we therefore scale by r instead of \tilde{p} . Note that this measure is therefore not directly comparable to the measure presented for the case of equity-financed investment.¹⁵

Figure 11 presents, for the case of fixed inflation in all years and countries, the weighted mean effective average tax rate and effective marginal tax rate for investment financed solely by debt. The effective marginal tax rate for an investment financed completely by debt would be zero if allowances were set equal to our assumed economic depreciation rates. This is because interest is fully deductible. In fact, allowances are, on average, more generous than our assumed depreciation rates, so the effective marginal tax rate is negative. These measures

¹⁵ We prefer the tax inclusive measure because, for that measure, the EMTR is a special case of the EATR with economic profits set to zero.

present a somewhat different picture of the impact on incentives. The combination of the various reforms has generated a rise in the effective marginal tax rate over the period, while the effective average tax rate initially rose in the mid 1980s, before falling back again to below its original level.

Differences in Figure 11 compared to the earlier evidence for equity-financed investment are due to the impact of the reduction in the statutory rates. Such reductions can increase effective marginal rates for debt-financed investment because of the reduced value of interest deductibility. However, the value of interest deductibility is lower for more profitable investments; hence this effect is less marked for effective average tax rates.

The second assumption about the measures of effective tax rates used here that we note is that we have made the assumption that when an investment takes place, the investor assumes that current tax rates will hold indefinitely. That is, we do not allow for the possibility that tax rates may change over the life of an investment.¹⁶

A special case of this assumption relates to the possibility that, in a given period, a firm may have, or expect to have, a negative taxable profit – a position sometimes referred to as tax exhaustion. This was common in some countries in the 1980s – particularly in the UK, where allowances were very generous. In considering an incremental investment for a firm in this position, the tax consequences of that investment may be delayed. For example, extra allowances cannot reduce tax liabilities immediately, but only when the firm returns to a tax paying position; likewise, extra revenue is not taxed immediately, but only when the firm returns to a tax-paying position.

The effect of a period of tax exhaustion on effective tax rates depends crucially on the timing of the tax exhaustion relative to the timing of the investment. Suppose the firm pays tax in periods $t-1$ and $t+1$, but not in period t . Then allowances for an

¹⁶ This is consistent with most, but not all, tax reforms. In principle, if there is an announcement of a future tax reform, then current investment should be based on the expected change.

investment which takes place in period t will be delayed, and hence will be less valuable; in turn, effective tax rates will be higher. However, an investment in period $t-1$ will generate allowances in period $t-1$, but the return from the investment, arising in period t , will not be taxed until period $t+1$. This reduces effective tax rates. These effects can be quite large, but it is clear that they may shift effective tax rates in either direction. Allowing for such effects goes beyond the scope of the cross-country analysis in this paper.¹⁷

2.3 Measures based on tax revenue

We now turn to a consideration of the second group of measures. A number of studies have used data on tax revenues to measure the impact of corporate income tax on incentives for investment. Typically, a form of average tax rate is calculated, expressing the tax payment as a proportion of a measure of profit or the tax base. There are a number of reasons why these measures are not appropriate for our purposes here.

The first, and most general, concerns the definition of profit used in the denominator of such a tax rate. Clearly, if the measure of profit used were defined in the same way as the tax system, then the proportion of it taken in tax would be equal to the statutory rate. Differences in such average tax rates from the statutory rate therefore reflect differences in the definition of profit used in the measure from the definition of profit used in the tax system.

Where it is the case that differences in the two measures of profit reflect the fact that legislators sometimes deliberately set the tax base to be narrower, or broader, than a conventional (or economically meaningful) measure of profit, then the measure provides meaningful information. However, in many cases the difference between the tax base and some other measure of profit may simply reflect differences in measurement, which provide no clear guide to incentives.

¹⁷ For a detailed analysis of such effects in the UK, see Devereux (1987, 1989).

These differences in the true and measured tax base reflect several common features of tax systems. For example, the tax liabilities of a firm at any point in time reflects (i) the history of its investment up to that point (in determining what allowances it can claim in that period) (ii) tax liabilities in possibly several jurisdictions, (iii) the history of losses in the firm (that is, it may be carrying forward losses from some previous period), and (iv) the history of the tax system up to that point. As such these measures are largely backward looking and reflect the past history of investment. Each of these features may affect the tax base, but are likely to be ignored in most conventional measures of profit.

A particular example of such a tax rate, and one which has been widely used,¹⁸ was developed by Mendoza et al (1994) for use with aggregate data. Their basic approach is to divide all taxes into one of three groups - labour, consumption and capital. For the last group, a tax rate is found by dividing total revenue from this group by a measure of the operating surplus of the economy.¹⁹ Eurostat (1998) use this methodology with a few minor changes. They refer to the last group of taxes as “taxes on other factors of production” rather than capital, but their interpretation of the measure is similar.

Such an “implicit” tax rate has the merit of being simple to calculate across a wide range of countries, years and types of tax. But one fundamental problem with the measure in the context considered here is its very broad scope. It typically groups together a diverse range of taxes; for example, inheritance and estate taxes, property taxes, stamp duties and gift taxes. These all have different economic effects, and most are unrelated to taxes on corporate income and in particular are not necessarily applied to “mobile” tax bases. In this measure, the denominator of the implicit tax

¹⁸ E.g. Eurostat (1998), Eurostat (2000).

¹⁹ Defined by Mendoza et al (1994) as “gross output at producers' values less the sum of intermediate consumption, compensation of employees - which is wages and salaries plus employers' contributions to social security -, consumption of fixed capital, and indirect taxes reduced by subsidies. Note that this definition of pre-tax capital income implicitly assumes zero net profits and an aggregate CRS technology”.

rate depends on the treatment of different factors related to profits in national accounts which vary widely across countries and over time.²⁰

We do not, therefore, use revenue-based measures to infer economic incentives. However, the size of revenues raised from corporate income taxes is clearly important to governments who face revenue constraints. We do therefore present a description of the development of revenues from corporate income taxes.

Note that these may differ in scope from the measures considered above. For example, in constructing effective tax rates, we considered only source-based corporate income taxes. However, tax revenues in any country may include both source-based taxes and residence-based taxes – typically, revenue collected from profits earned abroad and repatriated.

2.3.1 Corporate income tax revenues as a proportion of GDP or total tax revenue

It is clearly not useful simply to compare corporate income tax revenues across countries. Two convenient ways of making such comparisons are to scale tax revenues in each country by GDP or by total tax revenues. These measures will vary for reasons other than the corporate tax system. For example, both depend on the size of the corporate sector (e.g. the degree to which business is transacted through corporate tax paying entities, average rates of profitability) and on the relative size of corporate income in GDP, which varies considerably over the economic cycle and potentially across countries.

Figure 12 presents the time series of tax revenues from corporate income as a proportion of GDP from 1965 to 1999. We use data from OECD Revenue Statistics on tax revenues from corporate income and capital gains paid by corporations.²¹ The

²⁰ See an earlier version of this paper, Devereux, Griffith and Klemm (2001), which included a detailed examination of such tax rates in the UK.

²¹ This is tax class 1200 in the OECD data.

weighted mean of the ratio of taxes on corporate income to GDP varies over the economic cycle, but does not appear to follow any long-term trend. In most years it is within the interval from 2.5% to 3.5% of GDP. The median remains fairly constant until the early 1990s when it rises slightly.

Stylised fact 4: tax revenues on corporate income have remained broadly stable as a proportion of GDP since 1965.

Despite this general observation, it should be noted that developments vary strongly across countries. The unweighted mean (not shown) increases during the period, rising from around 2.3% to 3.4%, which suggests that revenues from corporate income taxes have grown in smaller countries. Figure 13 shows corporate income tax revenue as a proportion of GDP for each country in 1965, 1982 and 1999.²² The variation across countries is considerable: some of the smaller countries raised less than 2% of GDP from corporate income taxes in 1965; by contrast, Luxembourg raised over 7% in 1999. Between 1965 and 1999 most countries experienced an increase in tax revenues as a proportion of GDP. There are five exceptions, but only the USA experienced a drop in excess of 1 percentage point. Between 1982 and 1999 this ratio decreased in only two of the eighteen countries, and only one of them, Japan, experienced a large reduction - of nearly 2 percentage points of GDP.

This pattern of tax revenues may seem inconsistent with the stylised facts presented above, which indicate a fall in statutory tax rates and the EATR. It can be partly explained by changes in profitability. In some countries it may be partly due to the tax system itself. For example, Ireland has had a 10% tax rate on manufacturing activity since the early 1980s. One consequence has been a dramatic increase in inward investment: this in turn has boosted corporate income tax receipts as a share of GDP, despite the continuing low tax rate.²³

²² The latter two dates were chosen to correspond to the dates available for measures based on tax rules. We also show the year 1965, because tax revenue data are available over a longer period.

²³ It seems likely that it has also benefited from inward shifting of corporate income.

Part of the explanation for the maintenance of the ratio of revenue to GDP is an increase in the size of government generally. To see this, we consider, in Figure 14, equivalent measures to Figure 12, but based on the ratio of taxes on corporate income to total tax revenue. This paints a rather different picture. Corporate income taxes have fallen on average as a share of total tax revenue. The weighted mean of the ratio of corporate income tax revenues to total tax revenues declined steadily until the mid 1980s. It then recovered in the late 1980s before falling back to the lower level. Combined with Figure 12, this suggests that taxes from sources other than corporate income have risen rather faster than GDP, and that – relative to other taxes - governments are relying rather less on corporate income taxes.

Stylised fact 5: tax revenues on corporate income have declined as a proportion of total tax revenue since 1965.

2.4 International Co-operation

The discussion so far has focussed on the unilateral setting of taxes on corporate income by governments in different countries. Within that framework, we have been able to identify the broad directions of reform of such taxes in EU and G7 countries. In addition, there have been three recent international attempts to introduce some form of coordination of corporation taxes across countries. Two of these originated with the European Commission (1997 and 2001a),²⁴ and one with the OECD (1998). The first European Commission initiative and the OECD initiative have much in common and they are rather different from the more recent approach of the European Commission.

2.4.1 The EU code of conduct

The 1997 initiative – agreed by the EU Council of Ministers in December 1997 - introduced a “Code of Conduct” in business taxation, as part of a ‘package to tackle

²⁴ There is a long history of proposals from the European Union, dating back to the Neumark report in 1962.

harmful tax competition’.²⁵ The Code of Conduct was apparently designed to curb ‘those business tax measures which affect, or may affect, in a significant way the location of business activity within the Community’ (European Commission, 1998). Crucially, the Code specifies that only those tax measures that allow a significantly lower effective level of taxation (including paying no tax at all) than those levels that generally apply in the Member State should be regarded as harmful. In other words, the Code is not aimed at the overall rate or level of corporate taxation in individual Member States. It is aimed at specific, targeted measures that reduce the level of tax paid below the “usual” level. For example, the criteria used to determine whether a particular measure is “harmful” include whether the lower tax level applies only to non-residents, whether the tax advantages are ‘ring-fenced’ from the domestic market, and whether advantages are granted without any associated real economic activity taking place.

A working group examined a list of over 200 potentially harmful regimes within the EU against the agreed criteria to see if they should be classified as harmful. The group concluded that 66 of the measures were in fact harmful, although not all decisions were unanimous. Most of the measures declared harmful affect financial services, offshore companies and services provided within multinational groups. That is, they concentrate on those tax measures that affect the location of financial functions, but which are less likely to affect the location of real economic activity. This suggests - despite claims to the contrary – that the main concern of the working group has been to prevent revenue erosion through shifting of profits, rather than to prevent the distortion of real economic activity.²⁶

²⁵ The other elements included measures on the taxation of savings income and cross-border interest, and the taxation of royalty payments between companies. The package was seen as necessary to achieve certain objectives, such as reducing continuing distortions in the single market, preventing excessive loss of tax revenue and encouraging tax structures to develop in a way that is thought to be more favourable for employment.

²⁶ One example – out of many – of a regime which is classified as “harmful” is that for Belgian “Co-ordination Centres”. There are a number of criteria for eligibility for a firm to be classified as a co-ordination centre: for example, they must form part of an international group, in which at least 20%

Under the Code, countries commit not to introduce new harmful measures (under a 'standstill' provision) and to examine their existing laws with a view to eliminating any harmful measures (the 'rollback' provision). Member States are committed to removing any harmful measures by 1 January 2003. However, the Code is not legally binding — Member States have instead made only a voluntary commitment to abide by it.

2.4.2 The OECD initiative against harmful tax competition

At the same time as the EU Code of Conduct group was developing its recommendations, the OECD was pursuing a similar project. In 1998, the OECD published a report (OECD, 1998) which contained 19 recommendations to counter what it saw as the "harmful" tax competition of capital income. Subsequently, it created the Forum on Harmful Tax Practices to oversee the implementation of the recommendations. The first main output of this work was published in June 2000, (OECD, 2000). The OECD distinguished two forms of "harmful" tax practice, essentially split between OECD members and non-members.

The first form is concerned with "harmful preferential regimes in member countries", which were defined in a broadly similar way to that used by the Code of Conduct, although lack of transparency and exchange of information were also cited as important factors.²⁷ The 2000 Report listed 47 preferential regimes which were

of the equity is held outside of the country in which the parent is established and which operates subsidiaries in at least four countries. Approved activities include financial co-ordination activities and preparatory or auxiliary activities for other companies in the group. Tax payments are significantly reduced because the tax rate is applied to notional income rather than real profits, where notional income is defined as a fixed percentage of expenditure (usually 8%), excluding salaries and financing expenses. Co-ordination Centres are also exempt from a number of other taxes and administrative requirements, most importantly from withholding taxes on dividends and interest. Firms that set up such a co-ordination centre face strong incentives to shift as much of their profits to such a centre as possible.

²⁷ The report and the recommendations were approved by the OECD Council with abstentions from Luxembourg and Switzerland.

“potentially harmful”.²⁸ The Forum aims to verify by June 2003 whether member countries have eliminated “harmful” regimes, although the deadline for removing them is December 2005. However, there is no legally binding agreement between countries. The 2000 report does not outline any action to be taken against countries which have not complied with eliminating such regimes, it merely states that “other countries may wish to take defensive measures”.

The second form of "harmful" tax practice identified by the 1998 report concerned jurisdictions outside the OECD identified as "tax havens". Here the focus was on jurisdictions, rather than on specific features of their tax regimes. The criteria for identifying tax havens were again broadly similar to that for identifying harmful regimes operated by OECD members: lack of transparency and exchange of information were again important. Again, the OECD emphasised that low taxation itself was not sufficient to identify a jurisdiction as a tax haven.

The 2000 report published a list of 34 "tax havens" meeting its criteria.²⁹ Any jurisdiction deemed to be “uncooperative” – essentially by not agreeing to abandon the “harmful” aspects of their regimes by 2005 – were threatened with "defensive measures" outlined by the OECD in its 2000 report. These measures relate partly to the enforcement of existing tax regimes.³⁰ However, the measures go beyond this, effectively introducing a penalty for dealing with such jurisdictions. They include proposals to impose withholding taxes on payments to their residents, deny the availability of tax credits associated with income received from them, and generally to disallow deductions, exemptions, credits or other allowances related to transactions with them. Governments are also invited to reconsider whether to direct

²⁸ These include regimes such as the Belgian Coordination Centres, and the Irish International Financial Services Centres.

²⁹ Just prior to the publication of the report, 6 further jurisdictions made a public political commitment to eliminate their "harmful" tax practices and to comply with the principles of the 1998 report. As a result, they were not named in the 2000 report.

³⁰ For example, they include the enhancement of auditing and enforcement activities, a requirement for comprehensive information reporting rules, and a recommendation to adopt controlled foreign corporation (CFC) rules, all with respect to uncooperative tax havens.

non-essential economic assistance to "uncooperative tax havens". In the event, the OECD announced in April 2002 that the vast majority of "tax havens" named in the 2000 report have committed to abandoning their "harmful" practices, and committing to "principles of transparency and the effective exchange of information". The current list of "tax havens" contains just 7 states.³¹

Both the OECD initiative and the EU Code of Conduct appear not to be directed at affecting the broad nature of tax competition for capital, as they focus on the existence of specific regimes. Both initiatives claim specifically that tax regimes which have low general rates of capital income tax – but without special regimes - are outside their scope. Instead, they seem directed towards preventing tax avoidance by shifting taxable profits between jurisdictions. Special low-tax-rate special regimes may be vehicles into which companies can shift their profits on other activities; reducing the scope for firms to do this is likely to reduce – although not eliminate- such tax avoidance.

2.4.3 The European Commission proposals

A more recent initiative from the European Commission (2001a) is quite different to the previous policy initiatives. It is more broadly aimed at eliminating tax obstacles within the internal market. Under a two-track strategy, it encompasses smaller measures to address the most urgent problems, e.g. by extending the existing Merger and the Parent-Subsidiary Directives to cover a wider range of companies and transactions. It also covers the promotion of a more comprehensive approach to tax reform, by suggesting the introduction of an EU-wide consolidated tax base, and the use of formula apportionment. The current requirement to identify the profit earned in each separate country would be abandoned. Under the proposed system companies would need to compute profits only once for the whole of the EU, using just one set of rules. The obtained taxable profit would then be apportioned to

³¹ Andorra, Liechtenstein, Liberia, Monaco, Marshall Islands, Nauru and Vanuatu.

member states, according to a pre-agreed formula, which could be based on factors such as capital, payroll or sales or a combination thereof.³²

The tax rate at which these apportioned profits would be taxed, would remain under the sovereignty of each member state and would not be harmonised. Apart from addressing the compliance costs of computing taxable profits in every European jurisdiction, this proposal would also eliminate the possibilities firms have to manipulate transfer prices to shift profits within the EU. The initiative does not deal however with profit shifting in and out of the EU. Nor would it eliminate tax competition: tax rates would not be harmonised, and firms may be able to relocate factors used in the allocation formula.

3 Can theory explain the stylised facts?

The previous section established a number of stylised facts about the development of corporation taxes over the last two decades. Over roughly the same period of time, there has been a great deal of theoretical work on tax competition. In this section, we ask whether this explosion of theory can explain the stylised facts.

The central results of the tax competition literature were established by Wilson (1986) and Zodrow and Mieszkowski (1986). In the context of perfectly mobile capital between many jurisdictions, the post-tax rate of return earned on capital must be equated between jurisdictions. As a result, any tax on capital levied within a jurisdiction will raise the required pre-tax rate of return and, in doing so, drive part of the capital stock elsewhere. This spillover effect between jurisdictions creates an additional cost to levying a source-based tax on capital. As a result, the optimal tax rate is lower than it otherwise would be, and if this is the only source of revenue,

³² For a discussion of the economic issues of formula apportionment, see, inter alia, Gammie et al. (2001), European Commission (2001b), Gordon and Wilson (1986), Goolsbee and Maydew (2000).

this leads to an underprovision of public goods. This canonical model is at the heart of concerns about capital tax competition within the EU.

In a closely related paper, Gordon (1986) also considers other tax-raising opportunities. He compares source-based and residence-based capital income taxes in a two period model of a small open economy. The source-based tax has the same effects as in the canonical model, driving up the pre-tax required rate of return and driving away capital. However, the residence-based tax does not have these effects. Hence in this model, the source-based tax should not be used; instead revenue should be raised from a residence-based tax. This type of analysis³³ has led to fears of a “race to the bottom”, in which source-based capital income taxes disappear altogether.³⁴

Of course, there are considerable practical problems in levying a residence-based tax on capital income, especially if the tax is to apply to income earned but not repatriated. As a result, as the survey by Wilson (1999) suggests, the theoretical literature has generally investigated models where residence-based taxes are either limited or not available.

At first glance it seems that these models are a good starting place for understanding at least part of the stylised facts described in the previous section. Beginning with some degree of imperfect capital mobility, and allowing an exogenous increase in mobility over time, would result in the optimal tax rate on capital falling over time (as seen in the stylised facts).

However, the models in these papers – as with most others in the literature – do not specifically allow for the two broad instruments which governments have available for taxing capital income: the tax rate and the tax base. Instead the tax base is

³³ See also Razin and Sadka (1991).

³⁴ Gordon and Mackie-Mason (1995) consider two tax instruments: corporation tax and personal income tax. They contrast the corporate income shifting between countries with income shifting between the personal and corporate sectors.

generally assumed to be equal to capital income net of true economic depreciation, but before any costs of financing investment. An advantage of this formulation is that it is tractable, since it becomes possible to write the required post-tax rate of return (r) as a simple function of the tax rate (t) and the pre-tax marginal product of capital (F_K): $F_K(1-t) = r$. But, clearly from this expression, t is an effective marginal tax rate (EMTR): it reflects the difference between the required return on capital in the presence and absence of tax. Yet t is typically assumed to be the statutory rate. In general, then, these models do not permit governments to choose separately the tax rate and tax base. But there are many combinations of the rate and base which can generate a given EMTR. A tax base equal to net capital income is a special case.

In fact, it is straightforward to show that the key results of the canonical model do not survive if governments can choose the two instruments separately. As long as the revenue requirement is not too high, governments can use a cash flow tax, in which all capital expenditure is deductible in the period in which it is incurred. It is well known that such a tax generates an EMTR of zero. Revenue is generated from the infra-marginal returns, assumed in the canonical model to accrue to immobile domestic residents. In this case, an optimal tax rate can be set which generates the appropriate level of public good provision, without distorting capital flows. This is shown by Haufler and Schjelderup (2000).

However, this extension of the canonical model is clearly not sufficient to explain the pattern of existing corporate income taxes, since in fact, as shown above, the EMTR is typically not zero. One possible explanation of this is that the revenue requirement – determined by the preference for public goods - exceeds the immobile infra-marginal returns (which is certainly plausible if generally capital earns only a normal return). In this case, it may be necessary to raise revenue from a tax on capital as well – i.e. to have an EMTR greater than zero.

But whether this is the case depends also on the other tax instruments available to governments. One issue here is whether a labour income tax is more or less distorting than a tax on capital flows. In the canonical model, labour is typically assumed to be immobile. In this case, any taxes on capital are effectively borne by labour, so it is generally better to tax labour directly, than to distort the availability of capital by taxing capital. But the European Commission (1997) has argued that switching tax bases from capital to labour – as a result of increasing tax competition - has had serious implications for unemployment in Europe. Daveri and Tabellini (2000) present evidence that taxes on labour have impacted on unemployment rates. However, there have been no studies which investigate the impact of corporate income tax on unemployment that use detailed measures of taxes on corporate income that reflect both the rate and the base.

Another extension of the canonical model would consider the possibility that inframarginal returns are mobile. In this case, imposing a tax on economic rent would also distort the location of capital; this is at the heart of the model discussed above, in which multinational firms make discrete location choices. In this case, the EMTR is not the only measure of taxation which affects location decisions; the EATR also matters.

This raises the question of the extent to which governments can rely on taxes on economic rent to raise revenue. There may be location-specific rents in a particular country – that is, economic rent over and above that which could be earned elsewhere. In principle, such location-specific rents could be taxed without distorting the location of firms and capital.³⁵ But it is likely that such location-specific rents vary – across industries, firms and time. It is simply not possible to capture location-specific rents with a general tax system which applies to all investment projects, while avoiding tax on rents which are not location-specific.

³⁵ For example, in the 1980s the UK government raised substantial amounts of revenue from a tax on North Sea oil production in the form of the Petroleum Revenue Tax.

But if all economic rents cannot be fully taxed, it will generally be optimal to tax different kinds of internationally mobile capital differently. All else equal, source-based tax rates should be lower, in terms of the pursuit of national welfare, on more mobile forms of capital. At one extreme, location-specific rents can still be taxed at 100%. At the other extreme, if the same rent is available in another country, then such rents cannot be taxed at a higher rate than in the other country without causing the capital to locate there. If some location-specific rents, which accrue to foreigners, cannot be fully taxed, then it is generally optimal for a small open economy to levy a distorting source-based capital income tax as a rent-shifting device. That is, setting a tax system to capture at least some of the location-specific rent will involve having a positive EMTR. We discuss these issues further below.

The theoretical literature has explored cases in which optimal tax rates may vary according to economic circumstances. For example, Bucovetsky (1991) and Wilson (1991) present models in which large countries maintain higher tax rates than small countries. The tax rate levied in large countries will have a greater effect on the equilibrium post-tax rate of return, and hence a smaller impact on the pre-tax required rate of return. Hence larger countries can maintain a higher source-based capital income tax rate. This could be interpreted in terms of a location-specific rent associated with large countries.

Baldwin and Krugman (2000) present a model in which an agglomeration in one country creates a location-specific economic rent. Given the presence of an agglomeration, small changes in the source-based capital income tax rate may have little effect. However, larger changes may end up collapsing the agglomeration, which could have large welfare effects.

Our discussion in this paper so far has implicitly assumed a benevolent welfare-maximising government. That is, we have been attempting to understand observed patterns of tax setting behaviour by identifying whether they are consistent with the

optimisation of social welfare. But what if governments are not benevolent?³⁶

Suppose, for example, that a Leviathan government puts greater weight on public goods than private goods, since the government itself gains some private benefit from the public provision. In a static model, that might lead the Leviathan government to set taxes on capital higher than a benevolent government; consequently there would be lower capital in the economy; and the lower welfare associated with the lower private consumption would exceed the greater welfare arising from higher public goods provision.

Suppose we start from such a situation and observe an increase in capital mobility. This changes the relative cost of public good provision - it becomes more expensive to provide public goods in terms of the amount of private consumption that must be given up. As long as the Leviathan government attaches some positive value to private goods for its citizens, then the higher “price” of public goods would lead to lower tax rates and public goods, just as with the benevolent government.

The relevant question here is not whether different types of government would set different tax rates, but how their chosen tax rates would respond to increases in mobility. We are not aware of any model which predicts that tax rates would increase as a result of increased mobility because the government is not welfare-maximising.³⁷

³⁶ Two papers which explore alternatives in this vein are Edwards and Keen (1996) and Wilson and Gordon (2001).

³⁷ There is at least one model in which greater mobility leads to higher tax rates, but in a setting of a benevolent government. Janeba (1998) begins from a trade model in which two firms, resident in different countries, compete in an imperfectly competitive market in a third country. In this model, if the firms are immobile, each government has an incentive to subsidise its own firm in order to give it a competitive advantage. However, introducing capital mobility restricts this inefficient activity, since a high subsidy would attract the foreign firm, and would be captured by its non-resident owners. In this case, tax competition for mobile capital enhances efficiency, and reduces subsidies.

4 Possible explanations of the stylised facts

The discussion above suggests that the canonical tax competition literature is not able to explain the observed behaviour of governments over the last two decades of cutting tax rates on corporate income as well as broadening the associated tax bases. In this section we discuss two possible explanations based on the notion of tax competition. Of course, there could be reasons, unconnected to tax competition, why governments have followed rate-cutting, base-broadening tax reforms. For example, they could simply be learning from each other about the construction of (more) optimal tax structures. The first major rate-cutting, base-broadening corporation tax reform was in the UK in 1984. The rationale for the reform given at the time was to reduce distortions to the investment and financial policy for UK firms, by reducing the dispersion in effective marginal tax rates across different forms of investment and sources of finance. A similar rationale was at least partly behind the corporation tax reforms included in the US Tax Reform Act of 1986.³⁸ It is possible that other countries could have simply followed suit in an attempt to reduce distortions in the domestic economy. Indeed, anecdotally, there is some evidence of this occurring in the 1980s wave of reform. However, this seems less persuasive as an explanation of the continuing rate-cutting, base-broadening reforms, up to the German tax reform of 2001.

An alternative, but related explanation, has been offered by Sinn (1988, 1989). This explanation begins by noting that, given three conditions, the cost of capital is equal to the real interest rate. These conditions are: (i) that the personal tax rate of the marginal shareholder is equal to the corporate tax rate; (ii) that the marginal shareholder does not pay capital gains tax; and (iii) that capital allowances are set equal to the true economic depreciation rate. Compared to this, Sinn argues that, in the past, corporation taxes subsidised investment by being more generous in setting

³⁸ An extensive literature has analysed this reform. See, for example, Slemrod (1990), and Auerbach and Slemrod (1997).

allowances. A tax cutting reform which cut personal and corporate tax rates equally would have only a small impact on the cost of capital. However, combining this with a reduction in allowances would reduce the subsidy to investment. A similar argument holds if the two tax rates are not exactly equal, but are both simultaneously cut.

However, a problem with this explanation is that it relies on the tax reform reducing both the corporate tax rate and the personal tax rate. While many countries did indeed institute such reforms, these taxes have rather different properties. The corporate tax is generally levied on a source basis – where activity takes place. The personal tax is generally levied on a residence basis – where the recipient of the income resides. If, in the context of an international capital market, the marginal shareholder of the firm resides in a different country, then the source country has no control over that shareholder's personal tax rate. For the corporate and personal tax rate to be simultaneously cut requires either the marginal shareholder to be a domestic resident (which seems unlikely in the case of a capital-exporting country), or the two countries to co-ordinate on the rate cut. This does not seem a persuasive explanation of the stylised facts described above.

We consider two possible explanations of the stylised facts presented in Section 2. Both are based on forms of tax competition and both focus on the impact of taxes on economic profits on firms' investment behaviour. They differ, however, in that each considers some form of mobility other than capital. The first considers taxable profit to be mobile, independently of the location of capital. The second considers the mobility of firms (multinationals) with access to valuable proprietary assets (be these technologically knowledge, management skills or brand name).

4.1 Income shifting

One possibility is that income shifting between jurisdictions is driving these reforms. Such income shifting can take simple forms: the manipulation of transfer prices on intermediate goods traded between members of the same group, for example, or lending from low tax countries to subsidiaries in high tax rate countries. Or it can

take rather more complex forms, which may or may not use “special regimes” available in some countries, allowing taxpayers to reduce their overall tax liabilities. There is empirical evidence of income shifting behaviour by firms,³⁹ and as we have seen the EU and OECD measures have to a large extent been targeted at regimes that exploit such activity by firms.

One response governments can make to income shifting is to attempt to impose greater constraints on such activities. For example, one approach is to tighten and more rigorously enforce taxes on Controlled Foreign Companies (CFCs). This may drive firms to use more sophisticated, and more costly, techniques of income shifting, which in turn reduce the net benefit. This would imply less income shifting, although it may also be costly to governments in the form of administrative and compliance costs.

Income shifting itself might be seen as giving rise to competition between jurisdictions. Shifting income between jurisdictions creates spillovers just as shifting capital does; in the case of movement of income, it is the tax base – and hence tax revenues – which move, as opposed to capital. But there is nothing to rule out countries also competing over such tax revenue. One theoretical paper, Haufler and Schjelderup (2000), has addressed the optimal choice of source-based capital income tax parameters in a model with profit shifting. This paper starts from what is essentially the canonical model described above, although in a two country setting. The paper begins by demonstrating the result referred to above: that if the government has two instruments at its disposal – the tax base and the tax rate – then it will define the tax base to be cash flow, ensuring an EMTR of zero.

Haufler and Schjelderup go on to consider the case in which firms can shift their profits between jurisdictions with some convex costs. They can do so by overpricing an input purchased from the other country. The higher the price given to this input, the lower the tax base in the home country and the higher the tax base in the

³⁹ See Hines (1999) for a survey.

foreign country. The amount of income shifted out of a jurisdiction depends on its tax rate relative to those in some lower taxed jurisdiction. Conditional on the foreign tax rate, the higher the home country tax rate, the greater the benefit of shifting income out of the home country. The firm will therefore increase the price of the input, in the process raising the marginal cost of doing so, until the marginal cost is equal to the difference in the tax rates.

This additional factor constrains the tax-setting of the home country government. The tax rate cannot be raised without a cost in terms of a smaller tax base due to greater income shifting. With a fixed revenue requirement, the government is forced to reduce allowances in order to recoup the tax revenue lost from being obliged to have a lower tax rate. In effect, the optimal policy is then to accept some distortion to capital flows in the form of lower allowances in order to reduce the incentives to shift capital out of the country.

Note that in this simple formulation, the amount of income shifted does not depend on the generosity of tax allowances; lower allowances have no direct effect on the degree of income shifting. The optimal tax rate depends on the degree of convexity of the cost of overpricing the input. It also depends, in conjunction with the rate of allowances, on the sensitivity of the capital stock to the EMTR.

Suppose now, in the context of this model, that there is an exogenous reduction in the cost of profit shifting. In particular, suppose that, for any given difference between the two tax rates, there is greater profit shifting. Other things being equal, this would change the trade-off in the welfare costs of income shifting compared to the distortion to capital. Since income shifting has become cheaper, we would expect the tax rate to fall and allowances to fall as well.

This is a possible explanation of the rate-cutting, base-broadening reforms in the 1980s and 1990s. As Haufler (2001) points out, in the absence of income shifting, the optimal policy is to have a cash flow tax. Introducing profit shifting implies lower allowances and hence raises the EMTR from zero to some positive number. Beginning with no income shifting this model therefore predicts a rise in the EMTR.

However, this is not necessarily the case for all combinations of the tax rate and tax base. Beginning from some positive value of the EMTR, a revenue-neutral fall in allowances and fall in the tax rate may raise or lower the EMTR.

This is therefore a possible explanation for the rate-cutting, base-broadening reforms of the 1980s and 1990s. The explanation also fits well with the interpretation of the EU Code of Conduct and OECD measures as being designed to make income shifting more difficult. If governments can increase the cost of income shifting, then they at least partially relax the constraints on their tax-setting behaviour. The fact that the Code cannot eliminate income shifting is irrelevant to this argument. Any increase in the cost of income shifting would ease constraints faced by governments.

4.2 Multinational firms

Another possible explanation for these reforms is that governments are particularly interested in attracting certain types of investment project – those carried out by multinational firms. The theory of the multinational firm suggests that they have access to proprietary assets, and that their projects will, on average, be more profitable. These assets may, for example, be technological knowledge, management skills or brand name. These investment projects may be thought to be more desirable if they bring greater social benefits through positive externalities. As shown in Section 2, the effect of rate-cutting, base-broadening reforms has generally been to reduce the tax rate on profitable investments by more than on less profitable investments.

In particular, while a revenue-neutral rate-cutting and base-broadening reform may leave the EATR on the *average* project unchanged, it will tend to lower the EATR on projects of above-average profitability and raise the EATR of those of below average profitability. Figure 10 illustrates the impact that reforms over the past two decades have had on projects of varying levels of profitability. It indicates that there has been a greater fall in the EATR at higher rates of profitability.

Given this non-linear pattern of the EATR, there are two plausible related reasons for the observed tax reforms. One possibility is simply that more profitable activities are thought to have greater benefits to the domestic economy. Hence, even if all activities were equally mobile, governments would want to attract more profitable activity. The second is that, irrespective of any such benefits, more profitable firms may also be more mobile.

It has been argued that multinational firms may increase productivity and generate positive externalities through technological spillovers or increases in competition. The introduction of new technologies benefits consumers (to the extent that the goods were not previously traded), workers (to the extent that they benefit from training, or capture some of the economic rent) and possibly also domestic firms (to the extent that they are able to copy the technically superior multinational to improve their own efficiency).⁴⁰ Thus, to the extent to which multinational firms do generate positive externalities, it may be optimal to tax them at a lower rate. An alternative explanation would be that large multinationals might have more resources to lobby for lower taxes than less profitable local firms.

These factors may help explain the stylised facts of Section 2, if the cost of shifting profitable investment projects between countries has decreased over time. That is, if governments have undertaken tax reforms in order to attract higher profit firms, then the fact that they have done so suggests that the degree of competition has increased, which in turn is consistent with greater mobility. An alternative explanation is that the mobility of such firms has increased more sharply than that for lower profit firms. In this case, governments may have responded by reducing effective tax rates more quickly for such firms, even if all firms generated the same benefit to the domestic economy. What evidence is there to support these assertions?

⁴⁰ Empirical research is unclear on the sign, size or importance of these externalities. The early literature suggested that there were large positive spillovers or externalities from multinationals to other firms see, inter alia, Blomstrom (1989), Borensztein et al (1998), Caves (1974) and Globerman (1979). The more recent literature finds a much smaller impact, see Aitken and Harrison (1999), Griffith, Simpson and Redding (2001) and Criscuolo and Martin (2002).

There have been a number of policy reforms which can be expected to have led to an increase in the mobility of capital. These include the relaxation of capital controls and trade liberalisation across a broad range of countries. It is very difficult to document the increase in capital mobility or the mobility of certain types of firm or investment project over time. We cite several types of evidence here to give an indicative picture of the increase in cross-border corporate activity over the past few decades.

One indicator is the upward trend in foreign direct investment (FDI) across OECD countries. Figure 15 shows that in 1981 FDI was around 0.5% of GDP (weighted average across OECD countries) and that this increased to around 3% by 1999. FDI statistics capture flows of financial capital across borders.

Another indicator looks at the real activity of firms. Griffith and Simpson (2001) show that the proportion of investment in physical assets in the UK production sector that was accounted for by foreign-owned firms rose from 20.9% in 1980 to 39.3% in 1996. Lipsey (2001) shows that the value of foreign non-official assets in the United States has risen from \$188 bn in 1976 (current value) to \$6,102 bn in 1999.

To provide further information, we use firm level data from Thomson Financial Datastream between 1975 and 1999 on 811 firms listed on the London Stock Exchange. We investigate the share of employees of these firms that were located abroad.⁴¹ This is clearly not a direct measure of mobility. Rather a measure of mobility would be more properly based on the elasticity of activity abroad with respect to, say, post-tax profitability. However, it seems plausible to suppose that more mobile firms would have a greater share of their employees located abroad, and that increased mobility is likely to be associated with a higher share of employees being located abroad.

⁴¹ This is measured as $1 - ds216/ds219$, where $ds216$ is the number of domestic employees and $ds219$ is the total number of employees (and where the number refers to Datastream account items).

In fact, the average share of employees located abroad rose from around 6% in the mid 1970s to around 15% by the late 1990s. In a regression of the share of workers located abroad on a time trend, allowing for individual firm constants, the time trend is positive and significant. The same data reveal a positive correlation between profitability⁴² and the share of employees located abroad. Splitting firms into those above and those below median profitability, less profitable firms have an average share of workers abroad of around 9%, while amongst more profitable firms it is around 13%. In a regression of the share on a time trend and profitability, allowing for individual effects, the coefficient on profitability is positive and significant.⁴³ These facts suggest that activity abroad has increased and that there is a correlation between higher profitability and activity abroad.

The increase in mobility has been faster for more profitable firms. In the late 1970s lower profitability firms had on average around 6% of employees located abroad while higher profitability firms had on average around 6.5%. By the late 1990s the average for lower profitability firms had increased to 10% while for higher profitability firms it had increased to 17%. Separate regressions of the share of employees located abroad on a time trend for low and high profitability firms (split by the median) reveal a positive and significant coefficient in both cases, but it is significantly larger for more profitable firms.⁴⁴

Using different data Bloom and Griffith (2001) show that UK firms are increasingly conducting R&D abroad and that the share of R&D conducted by foreign-owned firms in the UK has increased over time.

While these figures reflect the experience only for the UK, they are consistent with the proposition that the mobility of projects of above-average profitability has risen relative to other projects. This is also consistent with the literature on the activities –

⁴² We measure profitability by earned for ordinary – full tax (ds182) over total sales (ds104).

⁴³ The coefficient is 0.045 with a standard error of 0.025.

⁴⁴ The coefficient (standard error) is 0.049 (0.004) for lower profitability firms and 0.117 (0.005) for more profitable firms.

and indeed existence – of multinational firms, which suggests that they are more profitable than purely domestic firms. Theory suggests that multinationals should have some superiority over domestic firms, based on the presumption that, because there are costs to setting up production in a foreign country, a multinational must have some other advantages⁴⁵ to compete with local firms (which do not face such costs). Such advantages may take a number of forms. They may reflect lower production costs or a higher quality product, made possible, for example, by research and development undertaken in the multinational's home country or elsewhere. They may reflect a better organised and managed structure. However, the advantage may also reflect market power, due perhaps to advertising and branding.

There is one important caveat to the notion that multinational firms are more mobile. That is that the capital owned by immobile firms may nevertheless be mobile. In the canonical model described above, firms are immobile, but raise finance on the world market. A higher domestic tax rate will reduce the demand for finance for capital by domestic firms; the available capital will instead be used elsewhere. Such immobile firms may be relatively unprofitable; indeed they may make only a normal return. If so, then the relevant measure of taxation for the movement of capital is the EMTR.

Nevertheless, one interpretation of recent corporation tax reforms may be that governments have aimed to attract investment by multinationals, by shifting the distribution of effective tax rates across levels of profitability, because they believe it brings access to valuable proprietary assets. The evidence in Section 2 indicates that effective tax rates have fallen furthest at higher rates of profitability.

This might appear to be inconsistent with international cooperation in the form of the Code of Conduct. The Commission has effectively argued that, beginning from a position of relatively high taxes on capital, the creation in some jurisdictions of “special” low-tax regimes for some types of capital induces not only a reduction in revenue, but also greater distortions to the location of capital. Setting up such regimes would certainly be consistent with governments attempting to attract

⁴⁵ This is known as the OLI approach of Dunning (1977).

specific forms of activity. In this context, “special” regimes could be seen as a further attempt to reduce taxes on specific, targeted, forms of mobile capital, as has been suggested by Keen (2002).

But as Keen points out, if special regimes are eliminated, then the opportunity which governments have had to differentiate between different forms of capital investment (e.g. foreign-owned versus domestic-owned) through special regimes will be lost. To continue to compete for such activities will put additional downwards pressure on general levels of corporation tax (although more profitable activities can still be targeted by an appropriate movement in the distribution of the EATR). But, if this is the effect of the Code of Conduct, then the Code itself is inconsistent with this interpretation of two decades of corporation tax reform.

However, an alternative reading of the Code of Conduct, as was given above, is that it is primarily aimed at profit shifting activities. Certainly, the measures which the Code of Conduct Group has identified as being “harmful” include very few which are likely to affect the location of real activity. If the Code of Conduct is not targeted towards removing regimes specifically set up to attract real capital, then it does not contradict the second explanation of tax reforms put forward here.

5 Summary and concluding remarks

In this paper we have analysed the development of taxes on corporate income in EU and G7 countries over the 1980s and 1990s. We have developed a number of stylised facts about the development of such taxes over this period:

- statutory tax rates fell over the 1980s and 1990s;
- tax bases were broadened between the early 1980s and the end of the 1990s;
- the effective marginal tax rate has remained stable over the 1980s and 1990s;

- effective average tax rates for projects earning positive economic profits have fallen over the 1980s and 1990s, and they have fallen more at higher levels of profitability;
- tax revenues on corporate income have remained broadly stable as a proportion of GDP since 1965; and
- tax revenues on corporate income have declined as a proportion of total tax revenue since 1965.

We have argued that the standard or canonical theoretical economic models of tax competition are not sufficient to explain these developments. The main reason is that such models typically do not model the tax rate and the tax base separately. Instead, they make assumptions about the tax base which imply that the tax rate is equal to the effective marginal tax rate. We have seen that such an assumption does not generally hold. And in any case, it is not possible to model the observed developments in corporate income tax if the tax base is assumed not to change. We have discussed two possible explanations of the past two decades of reform.

The first draws on a paper by Haufler and Schjelderup (2001), which considers the impact of income shifting by firms, and focuses on competition for capital and tax revenue. The two broad instruments available to governments – the rate and base – can be combined in an optimal combination to pursue both forms of competition. As income shifting becomes less costly, a likely response by governments is to reduce the rate and expand the base.

The second possible explanation begins by noting that the observed tax reforms have had different effects on projects of different profitability. Specifically, they have tended to reduce the effective average tax rate by more for more profitable projects. Governments may compete more intensely over such projects, either because they generate more social benefits, or because they are more mobile. We provided evidence that capital and firms have become more mobile and that more profitable firms have become more mobile relative to less profitable firms.

While the share of GDP attributed to corporate tax revenues has remained fairly stable, the proportion of total tax revenues raised from corporate income taxes has fallen over time. Combined with theoretical predictions of a “race to the bottom” from some theoretical models, this has led policy makers to be concerned about the revenue stream likely to be available from corporate income taxes in the longer run. In turn, this has helped to generate new forms of international co-ordination in taxes on corporate income. These new forms of coordination are targeted primarily towards combating tax avoidance and evasion in the form of shifting income between countries, irrespective of the location of real activities.

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