Chapter 1

Introduction and Outline

The economic analysis of corporate taxation has traditionally been something of a 'poor relation' of taxation analysis, although interest in this topic has been expanding in more recent years.¹ To a large extent the expanding body of modern research on corporate income taxes reflects a growing recognition that understanding those corporate tax issues which were of traditional interest in the context of closed economies – such as corporate tax incidence or the response of company investment to taxation – are increasingly important as globalisation means that open economy aspects must be analysed explicitly. Nevertheless, revenue aspects of corporate income taxes have remained relatively under-explored. In particular, though the tax revenue growth properties of income taxes have been extensively studied, there has been little analysis undertaken of the revenue growth properties of corporate income taxes. This book begins

¹For example, in the *Handbook of Public Economics* series, published by Elsevier, neither of the first two volumes (1985 and 1987) includes a chapter on corporate taxation, and the term does not appear in the Index. Volumes 3 and 4, published in 2002, acknowledge the increasing interest in, and analysis of, the topic by including a chapter by Auerbach (2002) on 'Taxation and Corporate Financial Policy', and by examining the role of tax policy in business investment decisions, and international taxation, much of which relates to multinational corporations.

to address this deficiency. It provides in many ways a companion volume to Creedy and Gemmell (2006) which examined the revenue growth properties of income and consumption taxes.

This chapter begins, in section 1.1, by outlining some of the reasons why an examination of the revenue properties of corporate income taxes is important. Section 1.2 then discusses the concepts of tax buoyancy and fiscal drag – or ‘built-in flexibility’ – as applied to corporate taxation, examining revenue and profit movements in the UK. The emphasis of the book is on the characteristics and determinants of the corporation tax ‘revenue elasticity’ – the proportional change in corporate tax revenues in association with a proportional change in the tax base (profits) holding other factors constant. It will be seen that the special nature of corporate profits, compared with individual incomes, and the associated tax structure, present substantial modelling challenges compared with the personal income tax system. After introducing the buoyancy and elasticity concepts, section 1.3 provides a brief outline of future chapters.

1.1 Corporate Tax Revenue

The rationale for a corporate income tax, as distinct from income taxes on individuals has been extensively debated in the tax literature and is not examined in this book. But, given the widespread use of corporate income taxes across OECD and other countries, it is clearly important to understand those influences on revenue-raising and other properties of the tax. As with any tax, a key consideration for corporate income taxes is how to raise a given amount of revenue at minimum efficiency cost. Modelling corporate tax revenue in particular is important

for a number of reasons.

First, any analysis of the social welfare impacts of a tax needs first to identify the economic, as distinct from legal, incidence of that tax. With corporation tax the incidence on individuals' and households' welfare is indirect, being mediated through impacts of profit taxation on output prices and wages. For this reason corporate tax incidence is especially difficult to identify empirically. The quantitative significance of these incidence problems become greater, the larger the amount of revenue governments seek to raise from corporate taxation. Similarly, revenue and incidence are influenced by the nature of the corporate tax regime, such as the extent of profit distribution to company shareholders, the use of imputation systems, and the extent and type of exemptions from the corporate tax regime (such as interest deductions and the rate structure).

Second, behaviour responses to corporate taxes – both by corporations themselves and by those shareholders and workers on whom the tax is incident – determine how much revenue a given corporate tax structure raises. These responses are examined in more detail in subsequent chapters. The recent literature has recognised that they can take a number of forms. These include: changes in corporate structure; investment choices, both locational and marginal; financial arrangements; transfer pricing and the location of declared corporate profits, deductions, and corporate headquarters. A suitable model of corporate income tax revenue needs to recognise and measure these responses as accurately as possible.

Third, the modelling of corporate tax revenue is important for tax revenue forecasting especially, as is shown in subsequent chapters, because corporate tax revenue appear to be highly

sensitive to the short-run fluctuations associated with economic cycles. Corporate income taxes are known to be among the most volatile of taxes typically collected by OECD governments. This reflects, in part, the fact that the corporate tax base, company profit, is generally more volatile than other tax bases such as those based on personal incomes or expenditure. The volatility also reflects, as subsequent chapters show, the way in which most corporate tax regimes treat profits differently between when they are positive and when they are negative (that is, when losses are made).

Fourth, globalisation is generating increased international capital mobility such that the setting of tax rates on capital in general, and corporate profits in particular, increasingly needs to take account of responses to those tax rates both 'at home' and abroad. This is sometimes claimed to be responsible, in part at least, for the so-called 'race to the bottom' in international corporate tax rates. For example, Devereux *et al.* (2008) have investigated how far OECD countries compete with each other in setting corporate tax rates, and whether this competition can explain the observed declines in statutory tax rates since the early 1980s. They find evidence of what they refer to as 'strategic interaction' between governments over the setting of corporate statutory rates, but only for open economies (those without capital controls on international investment flows). They also show that 'equilibrium' statutory rates fell substantially over recent decades and similarly to those observed empirically. Their conclusion is that the 'reductions in equilibrium tax rates can be explained almost entirely by more intense competition generated by the relaxation of capital controls' (2008, p. 1210).

National corporate tax revenue in open economies therefore

appears increasingly to be vulnerable to international changes in statutory corporate tax rates and other aspects of corporate tax regimes, such as deductions claiming, as evidence discussed in later chapters shows. For tax authorities seeking to fund existing public spending levels, this raises the important issue of how far other tax rates may have to be raised to compensate for 'lost' corporate revenue, either because the corporate rate has to be lowered to be competitive or because, with an unchanged corporate tax rate, the tax base shifts to other countries. If this 'lost revenue' has to be raised from taxes with more or different distortionary impacts, then assessing the consequences of possible corporate revenue changes becomes especially important.

Recent trends in OECD corporate tax rates are shown in Figure 1.1, from Devereux (2008), which shows that there has been a persistent downward trend in OECD countries' corporate tax rates since at least the early 1980s, with a median rate around 50 per cent in 1982, but around 35 per cent by 2004. Whether this trend continues in future may depend on countries' reactions to the increased public indebtedness in some major OECD countries that has followed the global recession of 2008–10.

Countries such as the US, Ireland and the UK that have experienced large increases in public debt may be reluctant to pursue further corporate tax rate reductions. On the other hand, competition from countries with less public debt overhang problems may be able to continue sustainable reductions in corporate tax rates, so putting pressure on the more indebted countries to raise any additional revenues via other taxes.

Though statutory corporate tax rates are arguably the most relevant tax variable affecting profit-shifting decisions by multinational companies (see Devereux and Sorensen, 2005), the ef-

Figure 1.1: OECD Statutory Corporation Tax Rates 1982–2004

fective average tax rates (EATRs) and effective marginal tax rates (EMTRs) are more relevant to investment location and expansion or contraction aspects. These tax rates have also been declining in recent decades. Table 1.1 shows changes in EATRs, for example, for several OECD countries between 1982 and 2004. With the exception of Ireland (already low by 1982) these fall over the period to greater or lesser degrees. In general the highest rates in 1982 tended to fall the most.

The overall revenue impact of changes in statutory or effective rates depends on both any base broadening measures that are undertaken, such as restrictions to depreciation allowances and any behavioural responses to those tax parameter changes; see Devereux and Sorensen (2005). Figure 1.2, from Devereux (2008), shows how corporate tax revenue has moved as a percentage of GDP since the mid-1960s in OECD countries on average. Of particular interest here is the tendency since the early 1980s for corporate tax revenue to increase (except for the GDP-

Table 1.1: OECD Effective Average Tax Rates 1982 and 2004 (percentages)

Country	1982	2004
Australia	37	26
Austria	37	24
Belgium	35	26
Canada	25	28
Finland	45	23
France	34	27
Germany	48	32
Greece	36	23
Ireland	5	11
Italy	26	26
Japan	44	32
Netherlands	38	28
Norway	38	24
Portugal	48	20
Spain	26	26
Sweden	45	21
Switzerland	26	25
UK	26	24
USA	32	25

weighted case where large economies such as the US dominate), despite the general decline in statutory rates.

This general trend growth in revenue, notwithstanding cyclical fluctuations, suggests that corporate tax regimes are becoming more, not less, important sources of government revenue to finance their expenditure programmes. It also suggests that understanding the drivers of behavioural responses to corporate tax rate and other parameter changes may be important for understanding how revenue can be expected to move in response to future tax rate changes.

Finally, the global recession in 2008–10 has demonstrated the potential volatility of corporate tax revenues over the short term.

Figure 1.2: OECD Corporation Tax Revenue as a Percentage of GDP 1965–2004

It has been found that this phenomenon can affect the corporate tax receipts of different countries in very different ways. The most obvious cases of dramatic short-term impacts include Ireland, with its heavy reliance on overseas (mainly US and EU) multinationals, and the UK and US, which both experienced relatively severe banking sector crises and have corporate tax regimes that rely relatively heavily on the financial sector – both domestically-owned and foreign-owned.

The importance of this recession-related volatility, and the difficulties of forecasting it, are seen clearly in the Irish and UK cases in Tables 1.2 and 1.3 respectively. Table 1.2 shows that, for Ireland, an estimated corporate tax receipts total of €6,000 for 2008 was expected to continue at around that level (€5,950) for 2009 at the time of the 2009 Budget in October 2008.² Within six months however this estimate had been cut

²These data are taken from *Government of Ireland, Department*

to €3,740 for 2009, and by Budget 2010 (in December 2009), projected receipts for 2010 were further reduced to €3,210. In other words, the global recession had both a devastating effect on corporate tax receipts and on the ability to forecast these over the short term. Receipts in 2009 look likely to be around only 60 per cent of their 2008 level with a further fall to around 54 per cent expected in 2010. These are very large short-term changes by any standards.

Table 1.2: Corporate Tax Receipts, Ireland 2008-2011: €Millions

	2008	2009	2010	2011
Estimate made at:	Estimated outturn	Estimate	Projection	Projection
Budget 2009: (14 October 2008)	6,000	5,950	5,710	6,240
Budget 2009: (7 April 2009)		3,740	3,840	4,325
Budget 2010: (9 December 2009)		3,790	3,210	

The UK situation is rather different from Ireland, as seen in Table 1.3.³ The UK corporate tax receipts are especially sensitive to the country's large financial sector, and the country's banking crisis in 2008-09 both immediately reduced that sector's corporate tax payments and raised required tax revenues in the future to pay for the government's bail-out of failing or vulnerable banks such as Northern Rock and the Royal Bank of Scotland.

The impact on corporate tax receipts can be seen in Table 1.3 which records the outturns, estimates and projections of receipts

of Finance, Budget 2009, 2009 Supplementary, 2010, available at: www.budget.gov.ie/Budgets/2010/2010.aspx.

³These data are from H. Treasury *Pre-Budget Reports, 2006-2009*, available at: www.hm-treasury.gov.uk/prebud_pbr09_index.htm.

Table 1.3: Corporate Tax Receipts, UK 2006/07-2010/11 : £Billions

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Estimate at:	o = outturn; e = estimate; p = projected					
PBR 2006	42.4 ^o	48.0 ^e	53.8 ^p			
PBR 2007		44.8 ^o	46.8 ^e	51.5 ^p		
PBR 2008			46.9 ^o	45.5 ^e	42.4 ^p	
PBR 2009				43.7 ^o	34.1 ^e	40.9 ^p

at the time of the Pre-Budget Reports (PBRs) in 2006–09, usually announced between October and December of each year. Whereas in 2006 it was expected that corporate tax receipts would rise by around 27 per cent from £42.4 billion 2005/06 to £53.8 billion in 2007/08, the 2009 PBR suggests that the outcome was only around 10 per cent growth (to £46.9 billion 2007/08) with a substantial fall to £34.1 billion estimated for 2009/10. Apparently, however, a rapid recovery to £40.9 billion 2010/11 is still projected though the PBR 2009 (p.182) nevertheless notes that, under current forecasts: ‘this leaves corporation tax from the [non-North Sea] sector below its 2007–08 level, even by 2014–15’.

As in the Irish case, these are dramatic short-term reductions in corporate tax receipts such that understanding the likely determinants of these changes is clearly important for tax policy. The timing and magnitude of the global banking crisis and subsequent recession might not have been easily predicted or calibrated, but once potential changes in the corporate tax base can be identified or forecast, accurately predicting corporate tax revenues can be enhanced by suitable models capable of capturing the key determinants of these processes. This book offers some insight into the short-term volatility of corporate tax revenues at a time when understanding this volatility is especially pertinent

for many governments' tax policy settings.

The data illustrated above in Figure 1.2 for the OECD capture the observed movement of tax revenues with respect to GDP (other 'anchors', such as the relevant tax base, are sometimes used as alternatives). This is commonly referred to as tax buoyancy. To understand the contribution of the corporate tax structure and abstract from other factors that influence revenue growth, such as behavioural responses, changes in compliance and so on, it is usual to examine the built-in flexibility or fiscal drag of the tax. The next section defines these concepts more precisely and highlights recent UK evidence.

1.2 Tax Buoyancy and Fiscal Drag

This section examines, using UK data, variations in taxes and profits over time. This helps to highlight some important empirical features which motivate further detailed analyses of the corporation tax system. Furthermore, it emphasises the need to distinguish between the two different concepts of tax buoyancy and fiscal drag. The former, tax buoyancy, is measured simply by the proportional change, from year to year, in total corporation tax revenue divided by the proportional change in total profits over the period: it therefore has the properties of an elasticity. In practice, changes in revenue are influenced by, among other things, changes in the corporation tax regime itself over the period. The concept of fiscal drag refers on the other hand to the variation in tax revenue which arises purely with an unchanged tax structure as profits vary; that is, the tax rates, thresholds and regulations concerning eligible deductions are held constant. Fiscal drag is therefore often referred to as

the built-in flexibility of the tax system, and is measured by the revenue elasticity, defined as the proportional change in tax revenue divided by the proportional change in profits. If the tax paid is a fixed proportion of gross profits, taxes and profits increase in the same proportion and the elasticity is unity. Any tax structure having an increasing average tax rate as profits increase displays a revenue elasticity of greater than unity.

A feature of aggregate corporation tax revenue is that it varies substantially from year to year. This raises the question of whether the variability arises from variations in the relationship between profits and taxes or whether profits themselves are variable, particularly in relation to GDP growth. The vast majority of corporation tax is paid at a fixed marginal rate. It may therefore initially be thought that tax revenue simply increases in proportion to total corporate profits, suggesting that the revenue elasticity is unity and that variability in revenue arises fundamentally from profit variations linked to GDP growth along with actual changes in the corporation tax regime. However, it will be seen that this is far from being the case – the revenue elasticity of corporation taxes is indeed capable of significant variations and of displaying values substantially different from unity.

1.2.1 Corporation Tax Buoyancy in the UK

Corporation tax revenues can be measured either in cash or accrual terms. The former measures the amount of tax paid by companies and received by the UK Revenue and Customs department (HMRC) in a given period, while the latter measures the corporation tax liability as assessed using the tax code dur-

ing a given period (usually a fiscal year).

Using HMRC data on corporation tax accruals and profits, available on a consistent basis from 1992/93, Figure 1.3 shows the growth rates of tax accrual, dT/T , and gross taxable profits, dP/P , compared to GDP growth, $d(GDP)/GDP$. These HMRC profit data relate only to company profit as declared for tax purposes and therefore treats all company gross losses as zero profits. They are therefore quite different from profits in companies' commercial accounts which include both positive profits and losses. This demonstrates the much greater variability in gross profit growth compared with GDP growth rates. Furthermore, although both corporation tax accruals and profits are relatively volatile, their growth rates follow quite different patterns. This latter feature contributes substantially to highly volatile corporation tax buoyancy in Figure 1.4.

Figure 1.3: Corporation Tax, Profit and GDP Growth Rates

Tax buoyancy is measured as the growth in tax revenue (receipts or accruals) divided by the growth in profits or GDP.

Figure 1.4: Corporation Tax Buoyancy

Figure 1.4 shows the accruals-based buoyancy measure, with respect to GDP and profits, and compares this with a receipts-based measure. The accruals-based measure of profits used here is the HMRC measure of gross taxable trading profits and other taxable income and net capital gains.⁴ Corporation tax accruals are derived directly from the HMRC measure of gross profits liable to UK tax, so this provides a more consistent denominator for the accruals-based buoyancy measure from 1992/93. The buoyancy of corporation tax receipts can be examined over a longer period by using the Office of National Statistics measure of profits – the gross operating surplus of financial and non-financial companies, denoted F+NF GOS. This is also shown in Figure 1.4. Constructing receipts buoyancy measures using economy-wide gross operating surplus, GOS, yields similar

⁴ See http://www.hmrc.gov.uk/stats/corporate_tax/table11_2.pdf. Corporate tax accrual is also available from this source.

evidence of volatility though peaks and troughs often do not coincide. Economy-wide GOS includes F+NF GOS as well as the gross operating surplus of households, non-profit institutions (serving households) and general government.

It can be seen that accrual buoyancy with respect to GDP varies approximately within the range -5 to $+5$, where $+5$ implies that tax grew five times as fast as GDP. However, negative buoyancy values can arise either because GDP growth is negative or because tax growth is negative, but not both. If both are negative, a positive buoyancy value results. Receipts and accruals buoyancy can be seen to be quite different, at least on an annual basis. This reflects the different profit series used in the denominator of each measure and the impact of timing differences between corporation tax receipts and accruals.⁵ The large negative values arise in years of negative profit growth which are not sufficiently large or sustained to produce negative tax growth. However, unusually large negative profit growth of almost -4 per cent in 2001–02 led to a fall in tax accruals for that year such that accruals buoyancy remained positive. Large positive or negative buoyancy values tend to arise when annual GDP or profit growth is close to zero, so that the small denominator generates a high buoyancy value.

The tax buoyancy observed in Figure 1.4 could result from a number of factors. First, the built-in flexibility, or fiscal drag, properties of the tax structure generate automatic changes in revenues as the tax base changes. Second, revenue can be af-

⁵Corporation tax in the UK can be paid either in advance or in arrears of a company's assessed liability. Hence, tax receipts and accruals rarely match exactly in a given fiscal year and can sometimes vary markedly. For example, in 1999 when the Quarterly Instalment Payment (QIPs) system was introduced, receipts exceeded accruals by around 25 per cent as both current and some future liabilities had to be paid.

fectured by discretionary changes in tax rates or other tax parameters. Third, changes in revenue can be influenced by changes in compliance effort or efficiency of collection. Although there have been numerous discretionary changes to the corporation tax regime in the UK over the period examined here, and possibly changes in corporation tax compliance of unknown magnitude, it would be surprising if these factors could substantially account for the observed volatility in corporation tax buoyancy. This raises the question of whether fiscal drag, as captured by the tax revenue elasticity, can explain the observed buoyancy volatility.

1.2.2 Fiscal Drag and Revenue Elasticity

Fiscal drag is a familiar feature of income taxes where the existence of fixed or income-related tax allowances, and rising marginal tax rates generate a rising share of total income paid in income tax as average incomes rise. Fiscal drag is therefore a common feature of progressive taxes. It can be measured in unit-free terms by the revenue elasticity of a tax – the automatic percentage increase in tax revenue divided by the percentage increase in the tax base. For progressive taxes this elasticity exceeds one, as revenue rises proportionately faster than the tax base.

Despite numerous studies of the fiscal drag properties of personal income and, to a lesser extent, indirect taxes, there is very little existing analysis of corporation tax fiscal drag. For surveys of, and contributions to, the literature on fiscal drag of income and indirect taxes, see Creedy and Gemmell (2006) and Heinemann (2001). This may reflect, in part, a view that there

is less normative significance to a tax that leads to companies with larger profits paying proportionately more tax, compared to a tax where individuals or households with higher personal incomes pay proportionately more tax. Furthermore, where most corporation tax revenue is paid by companies at a single rate, fiscal drag is often presumed to be of little quantitative significance.

In the UK, there are two non-zero corporation tax rates of 19 per cent and 30 per cent: this simple summary conceals the complexity of the structure, which is described in more detail in Chapter 2. However, the lower, 'small company rate' of 19 per cent is levied on companies with net taxable profits (that is, profits after all deductions) below £1.5 million. Even this value exaggerates the importance of the 19 per cent rate since, for companies in groups, the £1.5 million threshold is split between all the companies in the group. It therefore contributes only a small fraction of total revenue raised, the remainder being collected at the 30 per cent rate. Increasing company profits, which push companies across the net profit threshold when they begin to pay tax at the 30 per cent rate, are therefore unlikely to be an important contributor to the overall fiscal drag properties of the UK corporation tax system.

However, UK corporation tax has two features which could contribute importantly to fiscal drag. First, various deductions, allowable against profits or in the form of tax credits, mean that about 60 per cent of gross profit declared for tax purposes is tax-free. Thus for a typical company, the marginal tax rate on profit is higher than its average tax rate. This generates fiscal drag. Second, profits either before or after deductions can be negative, but negative profits (losses) are not eligible for

a tax refund. Though various deductions (for example, group relief) provide a form of tax refund on some losses, this is not sufficient to ensure that the effective refund on a given loss is equal to the effective tax on an equivalent amount of profit. The following chapter provides a more detailed analysis of the tax structure and determinants of individual and aggregate revenue elasticities.

This section has used terms such as profits, deductions and tax base without defining them precisely. In the remainder of this book, the corporation tax base is defined as gross (taxable) profits; that is gross profits defined for tax purposes – total profits declared to HMRC as potentially liable to corporation tax. This is distinct from the accounting definition of gross profits where some items of income or expenditure in company accounts are treated differently (for example, interest payments and capital expenditure). Net (taxable) profits are gross (taxable) profits minus all deductions, where deductions are defined as all tax allowances claimed in the form of profit offsets (for example, capital allowances) plus the profit offset equivalents of tax credits (for example, double taxation relief). Corporation tax liability is therefore obtained by multiplying the relevant corporation tax rate by net profits.

1.3 Outline of the Book

The remaining substantive chapters of this book are divided into three Parts. Part II is largely concerned with theoretical aspects. It begins in chapter 2 by looking closely at the corporation tax structure in the UK and examining the likely implications for the revenue elasticity of individual corporations and in aggregate.

A fundamental feature of the income obtained by corporations, unlike that of individuals, is that it can be negative; that is, corporations can and indeed many do make losses. In dealing with positive and negative profits, the tax structure is asymmetric, in that while positive net or taxable profits (defined as gross profits less eligible deductions) are taxed, no rebate is available in respect of losses. However, past losses can be used to some extent to offset current profits. This means that the examination of corporation tax revenue cannot escape a detailed treatment of dynamic aspects. Chapter 3 concentrates on the implications of this asymmetry, particularly for the responses of firms to taxation. Such responses, in the form of income shifting, are examined in further detail in chapter 4. The greater ability to shift activities to other tax jurisdictions or to shift profits overseas, through the use of transfer pricing, is yet another characteristic of corporations that distinguishes them from individual taxpayers, and thus requires careful consideration. Special attention is given in each chapter to the potential and likely characteristics over the business cycle, where variations involve some firms moving between losses and positive profits.

Further analysis requires the construction of a dynamic simulation model, and this is described in Part III. A central feature of the model, referred to as CorpSim, is the generation of a distribution of firms and their profits, along with the dynamics of profit changes over time. This is complicated by the fact that few data are available, contrasting with the situation facing studies of personal incomes. A further feature of corporation taxes, which no longer exists for personal income taxes, is the division of profits into schedules relating to different sources of corporate income. Hence the model must be capable of gener-

ating a joint distribution of profit sources for each firm, along with their time profile over the business cycle. This component of the model is described in chapter 5. The second chapter in Part III, chapter 6, describes the modelling of the use by firms of capital allowances and losses in generating deductions. Again, this presents a special challenge in the case of corporation taxes compared with personal income taxes, where relatively few deductions are available. In particular, firms are able to form groups for tax purposes, whereby losses in one firm can be used – under certain conditions – to offset profits in another firm in the group. Chapter 6 describes an algorithm, or more precisely a series of algorithms, used to compute net or taxable profits for single firms and for firms within groups in such a way that their tax payments are minimised.

Part IV then uses the simulation model, CorpSim, to examine profits and taxes over hypothetical business cycles. Chapter 7 considers the revenue elasticity, while chapter 8 examines profit-shifting responses to tax changes.

1.4 Conclusions

This chapter began by reviewing recent changes in corporation tax rates and revenues. It was suggested that, despite systematic reductions in rates, corporation taxation has become a relatively more important source of revenue for many countries. Special attention was then given to the buoyancy of corporation tax receipts and accruals in the UK in recent years. Buoyancy measures the growth in revenues as a ratio of the growth in profits, or GDP. This ratio is highly volatile from year to year. The chapter then considered whether such volatility could be

a feature of the inherent or fiscal drag properties of the UK's corporation tax system. To measure fiscal drag – describing the way tax revenues grow relative to profits for an unchanged tax regime – the tax revenue elasticity measure is used.

The volatility has serious implications for attempts to forecast corporation tax revenue. Experience has shown that corporation taxes are among the most difficult to forecast, using conventional methods based, for example, on regressions of taxes and profits over time. Such regressions, using lag structures and observations over a long time period, may be able to approximate the long-run buoyancy of corporation taxes, and limited cyclical aspects. For example, applying the tax and profit data used in Figure 1.4 to a simple log-log regression of tax revenue on profits, over the period 1978–2004, produces a long-run buoyancy parameter (the coefficient on log profits) of 1.1. With cyclical volatility, such parameter estimates can depend, of course, on the start/end date. An equivalent regression over 1984–2004 yields a parameter of 0.92. However their inability to capture discretionary tax changes mean they cannot distinguish the *ce-teris paribus* effects of the revenue elasticity.

This variability suggests that further analysis requires a more detailed treatment of the characteristics of the corporation tax structure and variations in profits and taxes over time, particularly over the business cycle.