MEASURING TAXES ON INCOME FROM CAPITAL: EVIDENCE FROM THE UK

MICHEL P. DEVEREUX
ALEXANDER KLEMM

CESIFO WORKING PAPER NO. 968
CATEGORY 1: PUBLIC FINANCE
JUNE 2003

PRESENTED AT CESIFO CONFERENCE ON MEASURING THE TAX BURDEN ON LABOUR AND CAPITAL, VENICE, JULY 2002

CESifo *Working Paper No. 968*

MEASURING TAXES ON INCOME FROM CAPITAL EVIDENCE FROM THE UK

Abstract

This paper explores the empirical properties of alternative measures of the taxation of income from capital, using UK data over the last thirty years. We analyse measures of effective marginal and average tax rates, based on applying the legal parameters of the tax system to a hypothetical investment; and also measures based on observed tax payments or liabilities, scaled by various measures of income. There is a significant difference between these measures, both in their level and in how they move over time. The implicit assumption in some empirical work that these measures are broadly comparable to each other is not justified.

JEL Code: H2, H3.

Michael P. Devereux
Department of Economics
University of Warwick
Coventry CV4 7AL
United Kingdom
michael.devereux@warwick.ac.uk

Alexander Klemm
Institute for Fiscal Studies
7 Ridgmount Street
London WC1E 7AE
United Kingdom
a.klemm@ifs.org.uk

This paper was prepared for the CESifo conference on "Measuring the tax burden on labour and capital", Venice, July 15-16, 2002. We thank participants at the conference, two anonymous referees and Peter Birch Sorensen for helpful comments and advice. The paper draws on joint work with Rachel Griffith, Michela Redoano and Julian McCrae; we are also grateful for their help and advice, although errors remain our own.

1 Introduction

Devereux (2003) discusses a number of theoretical issues which arise in the measurement of taxes on income from capital. This paper illustrates some of these issues in the context of the development of taxes in the UK over the last three decades. In particular, we provide estimates for the UK for many of the measures discussed in Devereux (2003). In some cases, we also provide alternative estimates of the same measure, based on differences in the underlying assumptions. For example, we provide estimates of effective tax rates with and without personal taxes, for alternative sources of finance and for investments in different assets. We also deconstruct measures of average tax rates based on accounting data and tax revenue data, by investigating in more detail the factors which determine their values.

Since this is, in effect, a companion paper to Devereux (2003), we do not repeat here the analysis in that paper. The focus here is on quantitative differences between alternative measures. The central question is simple to state, although less simple to answer: How important in practice are differences between measures? That is, can empirical researchers pick a measure which is relatively easy to construct, secure in the knowledge that different measures typically generate similar values? Or, to put it another way, is the discussion of alternative ways of measuring taxes on income from capital simply an arcane debate, of little practical interest or use?

The evidence presented below indicates that different measures do indeed generate very different values. We do not go as far as testing alternative measures in, say, an econometric model of investment.[1] However, given the results presented below, it seems highly unlikely that similar econometric results would be generated by using the different measures; not only do the measures take different values, their movement over time is also quite different.

It is of course not surprising that some of these measures differ – after all they do not all attempt to measure the same thing. It is well known, for example, that a given tax regime may have high average rates but low marginal rates. What may be more surprising is that even measures which are designed to capture the same aspect of the tax system can also vary widely. For example, average tax rates differ depending on whether they are constructed using aggregate tax revenue data, accounting data or tax legislation. Such differences reflect, for example, whether the measure is forward-looking, and whether and how different investment projects or firms are aggregated. This suggests that empirical work investigating the taxation of income from capital should take careful account of how those taxes are measured. Measures should be chosen on the basis of how well they conform to the underlying economic theory, and to taxation in practice. A measure chosen on the basis of how easy it is to construct may give misleading results.

We proceed in Section 2 by presenting a summary of a number of different measures, corresponding to the main measures discussed in Devereux (2003). After comparing these broad measures, we then investigate some of them in more detail. In particular, in Section 3, we examine the impact of alternative assumptions on measures of effective

marginal and average tax rates, derived for a hypothetical investment project along the lines of Devereux and Griffith (2003). In section 4, we turn to measures based on accounting data, using data on UK listed companies from Thomson Financial Datastream. In Section 5, we analyse measures based on aggregate data on tax revenues and develop a measure based on income generated in the corporate sector of the economy only. Section 6 briefly concludes.

2 A brief summary of measures

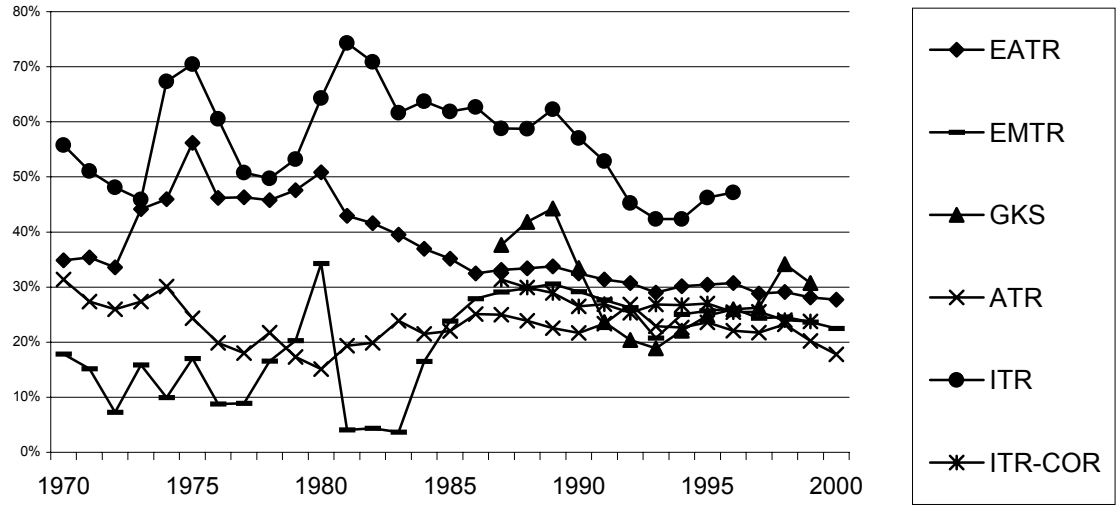
We begin with a brief summary of alternative approaches, based on the analysis and classifications in Devereux (2003). Figure 1 presents a summary of five main approaches and Table 3. 1 presents pairwise correlation coefficients for the measures. Detailed descriptions of the derivation of each measure are provided in the Appendix.

Table 1: Co-efficients of correlation between tax measures from Figure 1

	EATR	EMTR	GKS	ATR	ITR	ITR-COR
EATR	1 *31*					
EMTR	-0.4386* *31*	1 *31*				
GKS	0.6530* *13*	0.7210* *13*	1 *13*			
ATR	-0.1858 *31*	-0.0787 *31*	-0.1870 *13*	1 *32*		
ITR	0.4896* *27*	-0.2566 *27*	0.9334* *10*	-0.1894 *27*	1 *27*	
ITR-COR	0.8129* *13*	0.6374* *13*	0.5073 *13*	0.3833 *13*	0.7011* *10*	1 *13*

Notes: The number in italics indicates the number of observations the coefficient is based on. Starred values are significant at the 5%-level. Only data from 1970 onwards used. Tax measures as in Figure 1.

Figure 1: Overview of tax measures



Notes: Sources and definitions of measures are provided in the Appendix. These notes are only intended to provide a brief explanation and the main assumptions.
EATR: Effective average tax rate. (Economic profit rate 20%, assets: weighted average of plant & machinery and land & buildings, source of finance: weighted average of equity and debt, interest and inflation rates: actual values).
EMTR: Effective marginal tax rate. (Assets: weighted average of plant & machinery and land & buildings, source of finance: weighted average of equity and debt, interest and inflation rates: actual values).
GKS: Effective marginal tax rate based on macroeconomic data, calculated as suggested in Gordon et al. (2003).
ATR: Average tax rate based on company accounts data.
ITR: Implicit tax rate for capital based on macroeconomic data as calculated by Mendoza et al.
ITR-COR: Implicit tax rate based on macroeconomic data for corporate sector only.

This figure reveals enormous variation across alternative measures of the tax rate on capital income. This is supported by the correlation coefficients, which are insignificantly different from zero for most measures, and even negative for some.[2] Some variation is due to fundamental differences in the approach taken, and some is due to differences in data. Before further analysing these differences, we briefly explain assumptions used in Figure 1.

- Effective marginal tax rate (EMTR).
- Effective average tax rate (EATR).

These two measures are shown for a general investment, using the approach set out in Devereux and Griffith (2003). We show the effective tax rate for an investment which is partly in plant and machinery and partly in buildings; it is financed partly by new equity or retained earnings and partly by debt.[3] For the EATR we assume a rate of economic

profit of 20%.[4] At this stage we exclude personal taxes; in effect this could be seen as an overall effective tax rate for a non-tax-paying shareholder who did not receive any tax credit associated with dividend payments by UK companies. To make the measures more comparable to the others in Figure 1, we allow the economic parameters to vary over time. That is, the values of the real interest rate and the inflation rate are based on actual values observed in each year. In addition, the weights attributed to alternative assets and sources of finance also vary over time.[5] However, we assume a constant economic depreciation rate for each asset.[6]

- Average tax rate, based on company accounting records (ATR).

This measure is based on individual company accounting records taken from Datastream – more details are provided in Section 4. Broadly, the measure shown here is based on the UK corporation tax liability of the company, expressed as a proportion of the total pre-tax profit (after interest payments and depreciation).

- Overall average tax rate on capital income, based on aggregate tax revenue data (ITR).
- Average tax rate of the corporate sector (ITR-COR)

The fist of these is the measure proposed by Mendoza et al (1994). It is based on the ratio of revenues from all taxes deemed to be on capital to a measure of the operating surplus of the economy. The second is a related measure developed here. It uses a similar methodology, but is restricted to the corporate sector of the economy, so that it is more comparable to the other measures. It is defined as corporation tax revenues divided by corporate income, including profits from financial property income.

- Marginal tax rate of the corporate sector (GKS).

Finally, we also investigate the measure of the marginal tax rate proposed by Gordon et al (2003). For comparison with the other measures we do not include taxes levied at the personal level. This measure is based on the difference between actual tax revenue and the tax revenue which would be generated by a R-based cash flow tax levied in the corporate sector. To compute the latter, we make four adjustments to actual taxable income: (1) add back net interest payments, (2) add back capital allowances, (3) deduct new investment expenditure, and (4) deduct changes in inventories. The precise definitions used are set out in the Data Appendix.

As might be expected, these measures give very different accounts of the development of taxes on capital income in the UK corporate sector over the last three decades. At the extreme, for example, in 1981, at the height of a recession, the EMTR was around 4%, while the Mendoza et al (1994) approach - ITR - generated a rate of slightly under 75%. Of course, these two approaches are not attempting to measure the same thing: the first attempts to measure the impact of taxes on the cost of capital, while the second is based on tax revenues. It has long been known that marginal and average tax rates can be very different from each other. But these difference do imply that, for example, using the ITR as a measure of the impact of tax on investment at the margin could be seriously misleading.

However, even measures which might be thought to be comparable are very different from each other. Compare, for example, the ITR and the accounting measure - ATR. Both are measures of tax revenue – or liabilities – in a year, expressed as a proportion of pre-tax income in the same year. Yet the values of ATR are much lower than those of ITR. Further, they tend to move in opposite directions: the former tends to fall in recessions, while the latter tends to rise. In fact, the correlation between these two series is negative: –0.24.

Both of these measures generate different values and patterns compared to the measure of the effective average tax rate (EATR). By contrast, that is more stable over the period analysed. This reflects the fact that it is based on legal tax provisions, rather than tax revenues. In particular, it tends to be reasonably close to the statutory tax rate. But this helps to pinpoint why the other two measures differ so much. Tax liabilities are equal to the statutory tax rate multiplied by the tax base. The evidence from Figure 1 therefore suggests that the denominator of the ATR measure – accounting pre-tax profits – tend to be higher than taxable profit, while the denominator of the ITR measure tends to be smaller than taxable income. Of course, this is not the whole explanation; the ITR measure relates to a wide range of taxes, and not just to corporation tax.

For this reason we have used the aggregate data to develop an average tax rate measure for the corporate sector only (ITR-COR). This is more comparable to the other average tax rate measures, generally lying between the EATR and the ATR. We discuss it further in Section 5.

There is some similarity in the two measures which are aimed at investigating marginal tax rates: the EMTR and GKS. These both rise during the 1980s to a peak in around 1989 before falling back. However, the decline in GKS in the 1990s is more dramatic: from about 44% in 1989 to just below 19% in 1993. In the second half of the 1990s there is a partial recovery. The EMTR falls from around 31%, but much more slowly. In general, this follows the pattern that the measures based on observed tax liabilities or revenues tend to be rather more volatile than the measures based on legal tax provisions.

One of the important policy issues relating to this analysis is whether increasing globalisation is driving increasing tax competition between countries, and hence lower taxes on capital income. The European Commission (1997) has presented evidence (from the 1980s and first half of the 1990s) in favour of this view, based on a version of the ITR. As can be seen from Figure 1, the ITR in the UK does indeed fall over that time period. There was also a fall in the EATR in the first half of the 1980s – when the statutory tax rate was cut from 52% to 35% - and a smaller fall thereafter (the statutory tax rate has subsequently been gradually cut to 30%).

However, the other measures in Figure 1 do not support this view. The accounting measure – ATR – has remained reasonably stable since 1980, and if anything, has increased. The EMTR increased as a result of the 1984 reforms, but has subsequently fallen a little. As noted above, the GKS measure has been quite volatile.

However, the aim of this paper is not to evaluate whether taxes on capital income have fallen or not.[7] It is rather to compare alternative measures, to try to identify the reasons for differences between them, and to discuss how they might be best measured in practice. In order to address this, we now turn to a closer look at some of the main measures.

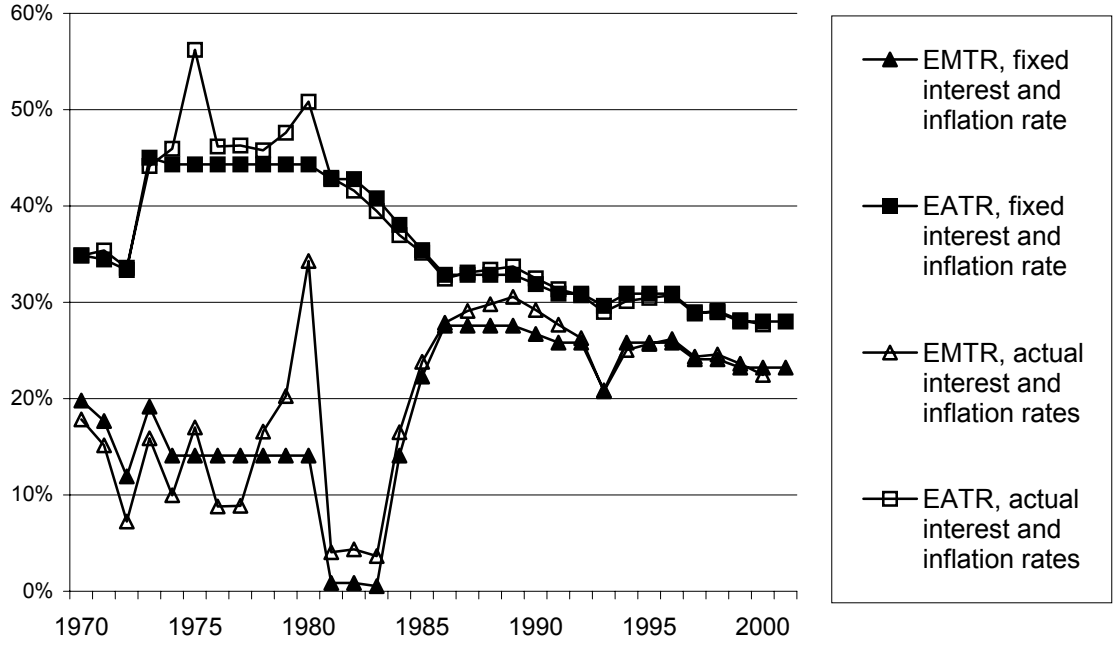
3 Effective Tax Rates

Much of the discussion in the companion paper, Devereux (2003), concerns the assumptions required to generate measures of effective marginal and average tax rates. In particular, that paper raises issues concerning the role of personal taxes, alternative sources of finance, international taxes, and risk. In this paper we will briefly summarise the impact of different assumptions for the first two of these.

To begin, though, we first investigate the role played by alternative assumptions regarding the real interest rate and the inflation rate, and by assumptions about the weights corresponding to different assets and sources of finance used in the investment. In Figure 1, we used actual rates in the UK to generate measures of both the effective marginal and average tax rates. This gives some indication of the actual effective rate in any particular year. However, it gives a less clear picture of the degree to which effective tax rates have changed as a result of deliberate tax reform, as opposed to changes in underlying economic circumstances.

To investigate this, in Figure 2 we present series for the EATR and EMTR based on a constant real interest rate (10%) and constant inflation rate (3.5%). We also hold the weights reflecting the different forms of investment and finance constant over time. Variation in the resulting series therefore reflects only the impact of tax reforms. As can be seen from the Figure, these two series correspond closely to those in Figure 1 (which are reproduced here). The broad conclusions stated above are unchanged. Using constant values of these parameters removes much of the year-to-year volatility in the series, but the longer-term movement is not affected.

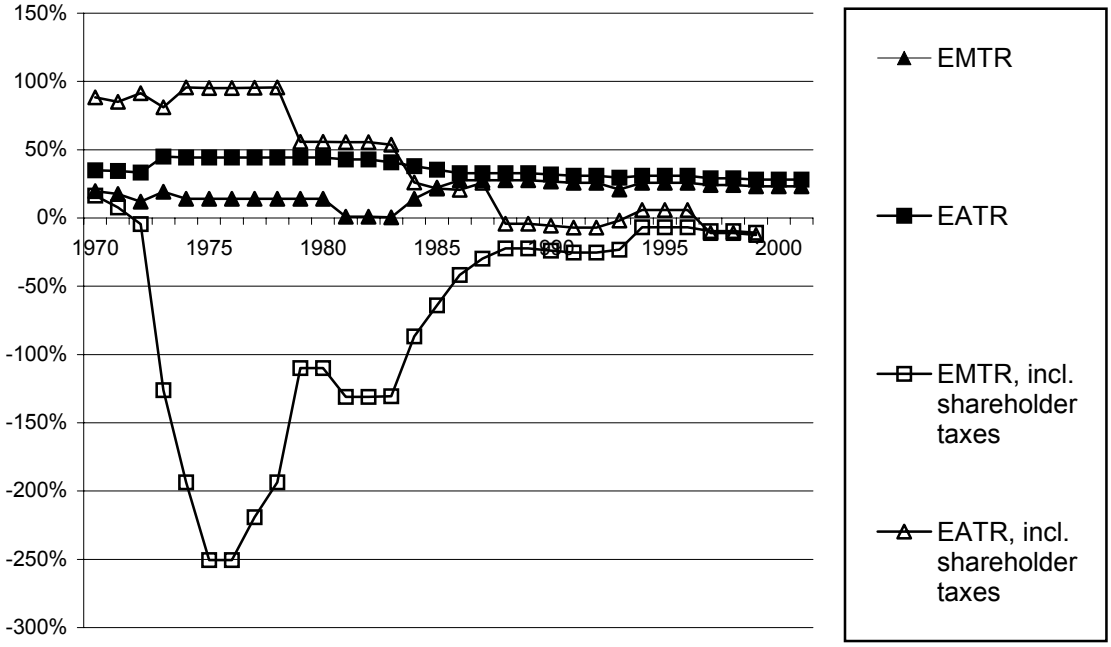
Figure 2: Effective tax rates, assuming fixed or actual inflation and interest rates



Notes: EATR: Effective average tax rate. (Economic profit rate 20%, assets: weighted average of plant & machinery and land & buildings, source of finance: weighted average of equity and debt, interest and inflation rates: as specified).
EMTR: Effective marginal tax rate. (Assets: weighted average of plant & machinery and land & buildings, source of finance: weighted average of equity and debt, interest and inflation rates: as specified).

In Figure 3, we compute the same tax rates under the assumption that the relevant shareholder is a UK taxpayer who faces the highest rate of personal income tax and capital gains tax. Introducing personal taxes has several effects. Most centrally, the required post-tax rate of return from an investment in equity falls, since the post-tax return from the alternative – assumed to be an interest-bearing deposit - also falls as (nominal) interest received is now taxed. The dividend stream is also taxed, but for much of the period analysed, this tax was reduced by the tax credit available under the UK imputation system; and in any case, dividend taxation is only relevant for investment financed by new equity. It should be noted that the top personal income tax rate was very high in the 1970s; in fact, including an investment income surcharge, the rate reached 98% between 1974 and 1978. It has since fallen considerably, and has been at 40% since the late 1980s. Figure 3 is based on the case introduced in Figure 2: the real interest rate, inflation rate and weights are all fixed over time.

Figure 3: Effective tax rates, effect of including shareholder level taxes



Notes: EATR: Effective average tax rate. (Economic profit rate 20%, assets: weighted average of plant & machinery and land & buildings, source of finance: weighted average of equity and debt, interest and inflation rates: fixed).
EMTR: Effective marginal tax rate. (Assets: weighted average of plant & machinery and land & buildings, source of finance: weighted average of equity and debt, interest and inflation rates: fixed).

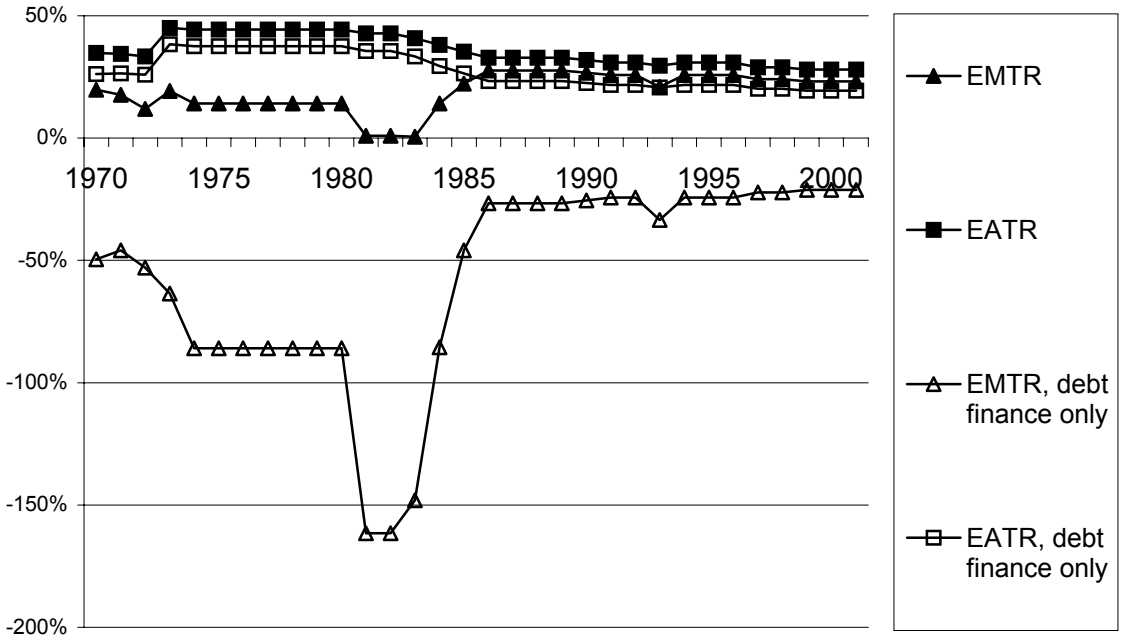
Introducing personal taxes has a dramatic effect on both the EATR and the EMTR[8]. The very high personal tax rates in the 1970s have a striking effect on the EMTR: because nominal interest income was taxed at very high rates, the real post-tax income from lending was negative[9]. As a result, the required pre-tax return from investment in equity is large and negative. As personal tax rates fell, so the EMTR rose. By the end of the period it is close to zero.

For the EATR, there are offsetting effects. As with the EMTR, the high taxation of interest implies a lower discount rate, which raises the net present value of an investment with a given pre-tax return. This tends to reduce the EATR, as it reduced the EMTR. However, offsetting this, the return from the investment is also taxed at a higher level, reflecting the personal tax as well as the corporate tax; this second factor plays a more significant role for an investment which is profitable than for one which is marginal. Consequently, the EATR could move in either direction. In practice, in the presence of personal taxes, the EATR was higher in the 1970s, but fell at intervals through the period. By the 1990s, the EATR was lower than in the absence of personal taxes.

Figure 4 again reproduces the series based on fixed interest and inflation rates from Figure 2. This time however we also add in a series calculated for investment financed

only by debt. As might be expected, both the EATR and the EMTR are lower in this case, since the impact of interest deductibility is greater. However, the impact is noticeably different between the EMTR and the EATR. Since the latter is defined for a profitable investment, the impact of being allowed to deduct interest payments is fairly small, relative to the income generated from the investment. Hence although there is some benefit, the EATR does not change very significantly. However, in the case of a marginal investment financed by debt, the interest payment is much more striking. In cases where depreciation allowances are close to 100% (in the early 1980s, this was true for buildings as well as for plant and machinery), the EMTR had large negative values.

Figure 4: Effective tax rates, effect of debt finance



Notes: EATR: Effective average tax rate. (Economic profit rate 20%, assets: weighted average of plant & machinery and land & buildings, source of finance: weighted average of equity and debt unless specified otherwise, interest and inflation rates: fixed).
EMTR: Effective marginal tax rate. (Assets: weighted average of plant & machinery and land & buildings, source of finance: weighted average of equity and debt unless specified otherwise, interest and inflation rates: fixed).

In sum, then – as has been pointed out elsewhere – the EMTR depends crucially on assumptions about personal taxes and about the source of finance for the hypothetical investment. The EATR also depends on these factors, although the effects are not as dramatic.

4 Accounting Data

A common approach in empirical work is to estimate measures of the taxation of income from capital using company accounting data. Such data are now fairly readily available in many countries. We make use of the data for all listed UK companies provided by Thomson Financial Datastream. These data are available from around 1969 onwards. The dataset contains just under 3,000 firms. The number of observations per firm ranges from 1 to 32. In total, the dataset contains around 38,000 observations.

The typical approach here is to take the ratio of tax liabilities to pre-tax profit as specified in the profit and loss account. Devereux (2003) analysed such an approach, and compared it to the effective average tax rate described above. Clearly there is a distinction in principle between the two approaches. The accounting ratio represents the impact of tax at a moment in time, and not over the life of a particular investment. Also, it reflects the past history of the company and the tax regime, since many items are carried forward from one year to the next. Nevertheless, it is instructive to compare the two approaches in practice to identify whether they produce similar estimates of an average tax rate.

In using such data, however, many accounting issues need to be considered. First, profit is generally computed on an historic cost basis, which typically overstates true profit in periods of reasonably high inflation. But the tax system, too, is sensitive to inflation. Thus the average tax rate may reflect this distortion to measuring both accounting profit and taxable profit.

Second, most readily available datasets containing accounting records refer to consolidated accounts – and, in particular, the consolidated accounts of multinational companies which reflect profits earned around the world and taxes paid around the world. It may be possible – and often is in the Datastream data – to identify separately home and foreign tax liabilities.[10] But it is more difficult to identify separately profit generated at home and abroad. Depending on the relative size of the foreign activities of the company, this may pose considerable problems. If, for example, we want to find a measure relating to the UK corporation tax, then we would want to include only UK tax, and UK profit. Including all profit would understate the UK tax rate. Including all taxes paid by the company would result in a measure which is contaminated by taxes paid elsewhere.

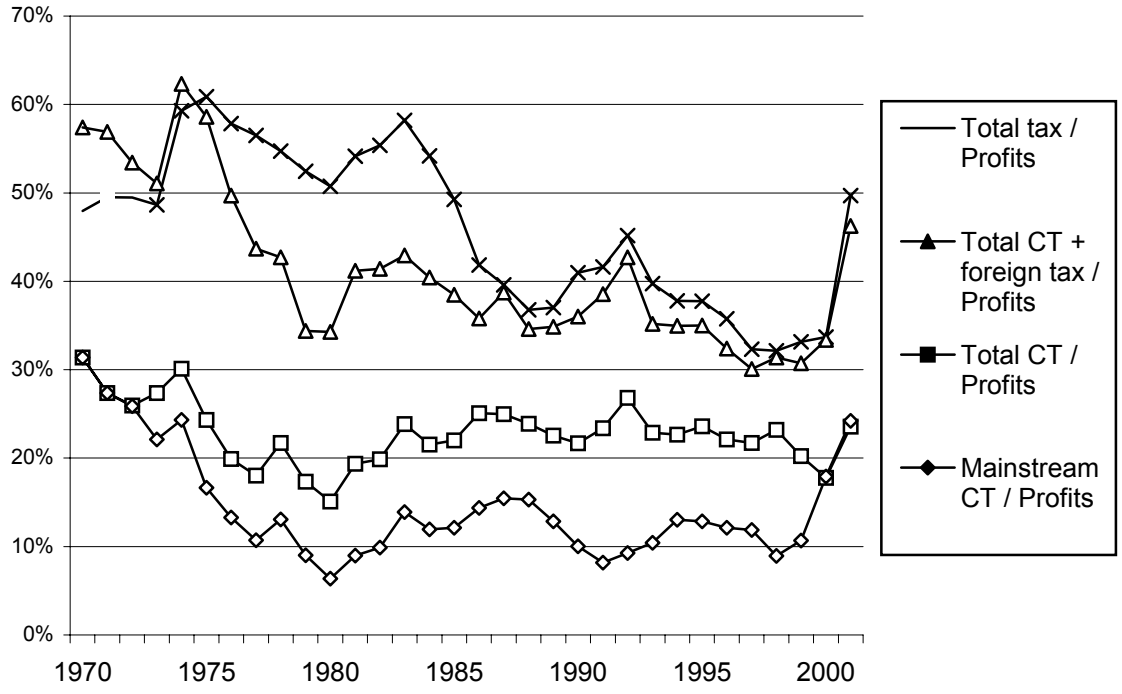
A third problem arises in that the published tax charge may not represent the company's current tax liability. Suppose, for example, that the tax regime is more generous than implied by accounting standards, since depreciation allowances are higher than accounting depreciation charges. Then in a period of investment, the recorded tax charge may exceed the actual tax liability, as accountants include a provision for additional tax to be paid in the future. At the extreme, the recorded tax provision may simply be the statutory rate multiplied by pre-tax profit. Any difference between this and the actual tax liability could be regarded as deferred tax. Of course, in this case, the tax rate generated using the recorded tax charge as a ratio of pre-tax profit would therefore simply be the statutory tax rate.

We can largely avoid the third of these problems, since our data identify deferred tax. In the series shown in Figure 1, we instead make use of an item which is closest to the full UK corporation tax charge.[11] This is divided by pre-tax profit (after depreciation and interest payments) to generate the average tax rate measure.

For comparison, Figure 5 shows this together with three other definitions of taxation:

(i) UK corporation tax plus the overseas tax charge
(ii) Total tax charge as recorded in accounts (including deferred tax)
(iii) UK corporation tax, less advance corporation tax (ACT), but adding back irrecoverable ACT.[12] This can be thought of as a measure of "mainstream" corporation tax before any income tax due on dividends.

Figure 5: Accounting data average tax rates



Notes: The presented series are all variants of the ATR, the average tax rate based on accounting data. CT stands for "Corporation Tax". The series presented in Figure 1 corresponds to the series labelled "Total CT / Profits".

In each case, an average tax rate is formed by taking the ratio of the tax liability to pre-tax profits. Because the four measures of the average tax rate in Figure 5 are all calculated with reference to the same measure of pre-tax profit, the differences between them reflect only differences in the measure of taxation. The differences are striking. First, in the early part of this period, the overseas tax charge was very high, at times even greater than the UK tax charge. Measure (i) therefore results in average tax rates of around 60% in the early 1970s. However, over time, this measure declines substantially. Broadly, by the second half of the 1990s, the base case UK average tax rate was just over 20%, and including the overseas tax charge raised this to around 30%. Measure (ii) –

including overseas tax and deferred tax – results in a similar pattern: very high tax rates in the early 1970s, but dropping substantially over the period.

Although measure (i) does not relate only to UK taxation, arguably it gives a clearer picture of the impact of worldwide taxes, since both the numerator and denominator relate to worldwide activities. Based on this measure, then, there appears to have been a striking decline in the average tax rate. By far the biggest part of this occurred in the 1970s.[13]

The final measure (iii) in the Figure is close to mainstream corporation tax – before any income tax is charged to UK shareholders. As might be expected, this is much lower. It too fell in the 1970s, before partly recovering in the first half of the 1980s. In the 1990s it was fairly stable at around 10% of pre-tax profit.

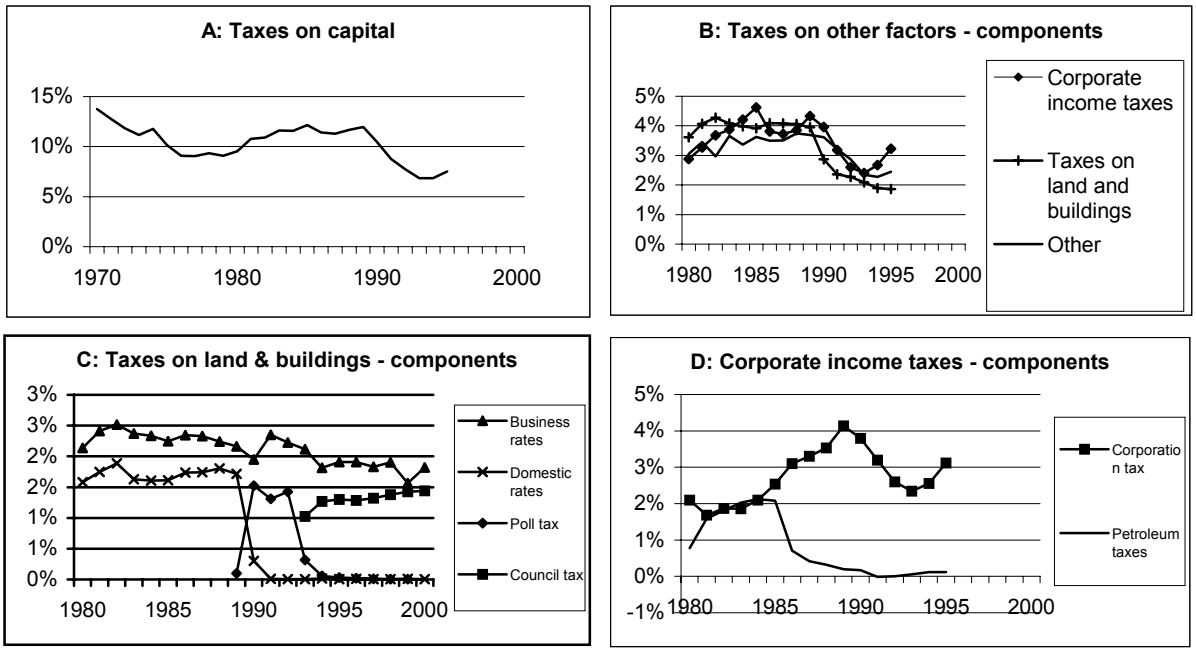
5 Measures based on macroeconomic data

The main outlier in Figure 1 is the overall average tax rate on capital income (ITR). This is based on a measure proposed by Mendoza et al (1994). A similar series was calculated by Eurostat (1998)[14] and is presented alongside the Mendoza measure in Figure 7. In 1970 this measure was at a very high rate of 77%. It moved considerably with the economic cycle in the 1970s, falling to 51% in 1977, but rising to 73% again in the recession of 1981. However, since 1981, it has fallen steadily to 32% in 1994, before rising again slightly. By the mid 1990s, it was at a rate comparable to the statutory tax rate on retained earnings. It is this dramatic fall in the 1980s and early 1990s which drew the attention of the European Commission (1997). It is therefore worth examining this measure in some detail.

The basic approach of this measure is first to classify all taxes – including personal taxes on corporate source income - as being on labour, consumption or capital[15]. The last of these categories is, in effect, a sweep-up category; it includes taxes on capital income, such as corporation tax, and taxes on property income, but it also includes inheritance taxes and gift taxes. To turn this into a tax rate, these tax revenues are divided by a measure of capital income, taken as the aggregate operating surplus of the economy.

Within the group of taxes on "capital", there are two large categories – corporate income taxes and taxes on ownership of land and property. There are a number of other smaller taxes grouped together. Figure 6a shows the overall development of these taxes over time, and Figure 6b shows the development of each group of taxes, both expressed as a proportion of GDP. Each of these groups has generated broadly similar revenue over the period, although all are fairly volatile. Most noticeably, revenue from all three groups has declined as a proportion of GDP since the end of the 1980s.

Figure 6: Analysis of the numerator of the Eurostat implicit capital tax rate



Notes: These panels show components of the numerator of the Eurostat (1998) implicit capital tax rate divided by GDP. Panel A shows the total numerator, panel B splits this up into three components. Panel C splits taxes on land and buildings into subcomponents and panel D splits corporate income taxes into subcomponents.

To examine these patterns further, the other parts of Figure 3.6 examine in turn the development of taxes on land and buildings and corporate income taxes.
Figure 6c investigates the development of taxes on land and buildings by examining its individual components, together with two other forms of property tax that are not included. The relatively constant factor in these taxes is a property tax on businesses, known as business rates.

However, the end of the 1980s and early 1990s witnessed changes in the system of domestic property taxes. In 1989, the domestic property tax (domestic rates) was replaced by the Community Charge. This was based on the number of individuals resident in a property, and is not included by Eurostat (1998) as a tax on land and buildings. In 1993, this was replaced by the Council Tax, which is again levied primarily on the property.[16] However, this is also not included by Eurostat (1998) as a tax on land and buildings[17].

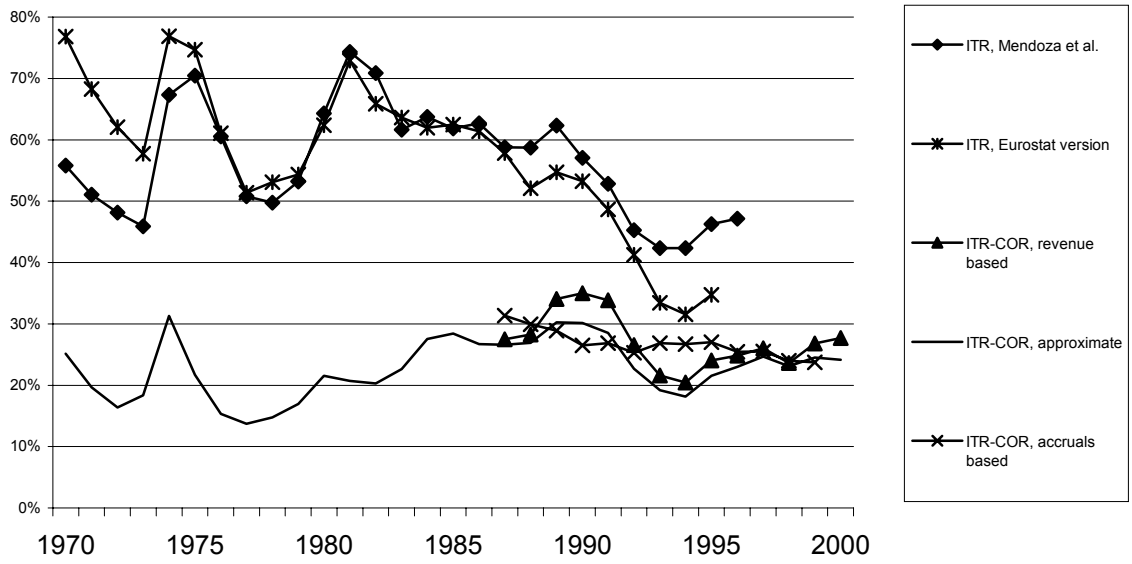
The effect is that the aggregate revenue from taxes on land and buildings (expressed again as a share of GDP) appears to fall sharply in 1990 when domestic rates were abolished. Yet the overall level of these local domestic taxes remained fairly constant over the entire period.

Figure 6d investigates the development of taxes on corporate income over the same period. Here we distinguish between corporation tax, and special taxes on the profits

from North Sea oil and gas production (notably Petroleum Revenue Tax). These special taxes raised considerable amounts of revenue in the first half of the 1980s, but these revenues dropped away sharply after that period due to lower oil prices and more costly production. By contrast, revenue from corporation tax[18] rose sharply over the 1980s, before falling back in the first half of the 1990s. Abstracting from the oil sector, then, it is true that corporation tax revenues fell in the first half of the 1990s; however, the pattern over a longer period shows that this was merely bringing revenue (as a proportion of GDP) back down to its earlier levels. The pattern shown in Figure 6a is therefore rather misleading.

The lesson of the analysis of Figure 6 is that the interpretation of an aggregate average tax rate on capital can be problematic. In this case, the fall in the tax rate is caused by a move from a purely property-based tax to a tax that is less directly related to property, together with a fall in the oil price and hence the profitability of the off-shore oil extraction business. Clearly neither change has more than an indirect effect on the taxation of on-shore capital in the UK.

Figure 7: Implicit tax rates



Notes: ITR are implicit tax rates on capital from different sources, ITR-COR are implicit tax rates for the corporate sector calculated under different assumptions.

For comparison with the other measures in this paper, which analyse taxes on capital income generated in the corporate sector, it would be useful to have an average tax rate applying to income generated in the corporate sector. We therefore develop such a measure here[19]. The numerator of this measure is in principle straightforward: total UK corporation tax receipts (before deducting ACT). However, the appropriate denominator is trickier. Broadly, we generate a measure of income generated by the corporate sector,

net of interest payments to the personal sector, or abroad. Because of the deductibility of interest for tax purposes, interest payments from the corporate sector to the personal sector are taxed by the personal income tax system. As we do not include personal income taxes on interest in the numerator, our measure would be biased downwards if we did not make this adjustment.[20] Figure 7 presents this series (labelled "ITR-COR, revenue based") for the UK. Unfortunately, it is not possible to generate precise estimates of this measure back as far as 1970. We therefore also present an approximation to the measure ("labelled ITR-COR, approximate"), in which the denominator is not corrected for net interest payments by the corporate sector. These two series are fairly close during the period in which they are both available.

As can be seen, both are considerably lower than the original tax rate on capital proposed by Mendoza et al. and the version used by Eurostat. The corporate sector average tax rate does drop significantly in the first half the 1990s. However, it recovers in the second half of the 1990s, and the level by the end of the 1990s was around that at the beginning of the 1980s. We can thus conclude that an overall average tax rate on capital can be very misleading, certainly if its taken to be an approximate measure of the average tax rate on income generated in the corporate sector.

We also take one further step in developing this measure, to offset volatility in the measure due to timing. As taxes are paid with a lag, the tax rate is counter-cyclical: in a recession profits fall, but revenues do not (at least initially) since they are largely based on the previous year's profits. The opposite happens in a boom. We abstract from this effect by using a series on corporation tax accruals,[21] rather than revenues. As a result, much of the volatility of the ITR measure disappears. It is also interesting to note that after all of those adjustments, the measure has become much more similar to the measure based on accounting data, the ATR.

The remaining measure of the group of measures based on macroeconomic data is the marginal tax rate of the corporate sector based on the approach by Gordon et al. (2003). Just as the ITR-COR (except for the accruals version) is more volatile than the effective average tax rate measures based on tax legislation, so the GKS measure is more volatile than the effective marginal tax rate. For the few years during which both are available, the correlation is however strong, with a co-efficient of correlation of 0.72.

6 Conclusion

This paper explores the properties of alternative measures of the taxation of income from capital, by applying them to data for the UK over the last thirty years. We consider several types of measures, reflecting both average and marginal rates.

The main comparison between the broad measures is shown in Figure 1. It is clear that there is a significant difference between the measures, both in their level and in how they move over time. The implicit assumption in some empirical work that these measures are broadly comparable to each other is not justified. Rather it can make a substantial

difference whether the measure is based on a hypothetical investment or observed tax liabilities or revenues; whether it is average or marginal; and whether data are derived from company accounts or aggregate revenue series.

The remaining analysis considers the derivation of the measures in more detail, and documents how different values can be derived by making different assumptions, or using alternative forms of data. Section 3 shows how effective tax rate measures based on hypothetical investments depend crucially on assumptions regarding personal taxes; the source of finance used; and whether underlying economic parameters are allowed to vary over time. Section 4 demonstrates how use of alternative definitions of taxation from company accounts can give a markedly different picture of the development of taxes over time. Section 5 explores measures based on aggregate revenue data. It shows how very broad measures of taxes on "capital" depend crucially on what taxes are included in the measure. It also indicates how a measure more focused on corporate income can be developed.

In general, the broad conclusion is that appropriate choice of methodology and careful use of data are both vital in the construction and use of tax rates which are intended to summarise the taxation of income from capital. In using such measures, researchers should take care both about the general approach taken, and also about detailed choices made in the construction of tax rates.

DATA APPENDIX

1 Effective Tax Rates

These are calculated as defined in Devereux and Griffith (2003). Further details – including details of the corporate tax regime - are also available in Devereux, Griffith and Klemm (2002).

Weights for the use of alternative assets and sources of finance are based on the mean of the Datastream sample set out below, where:

weight for plant and machinery = w_{pm} = 328/(327+328)

weight for debt = w_D = 321/392,

and where the codes refer to the following Datastream variables:

321 total loan capital
327 gross value of land and buildings
328 gross value of plant and machinery
392 total capital employed

These weights are applied within each hypothetical investment. Thus, instead of computing the effective tax rate for a single hypothetical investment – say in plant and machinery financed by debt – we consider an investment which consists partly of plant and machinery and partly of buildings, financed by debt and equity. We then compute one effective tax for the combined investment.

The real interest rate and inflation rate are either assumed to be fixed at 10% and 3.5% respectively, or in cases where they are allowed to vary, National Statistics data are used. The real interest rate then is the 20-year government bond rate (AJLX) plus an 8% premium and inflation is the GDP deflator calculated using GDP in nominal (YBHA) and 1995 (ABMI) prices.

2 Accounting data tax measures

The measure in Figure 1 is ATR=160/154.

The other measures in Section 4 are (i) (160+167)/154 (ii) 172/154 (iii) (160-ACT+164)/154, where ACT is (181+187)s/(1-s) and where s is the net ACT rate.

The numbers refer to the following Datastream account items:

154 pre-tax profit
160 corporation tax

164	irrecoverable ACT
167	overseas tax
172	total tax charge
181	preference dividends
187	ordinary dividends

The dataset was obtained by downloading data on all UK quoted firms (including dead firms) from Thomson Financial Datastream. From an initial dataset of nearly 4000 firms, we dropped all observations with accounting periods that differed by more than 30 days from a year. We also dropped observations lacking core data such as sales (104) and cash-flow (182+136). Finally we dropped all firms for which we had less than four consecutive observations. This left us with a sample of nearly 3000 firms and 38000 observations

3 Gordon-Kalambokidis-Slemrod (2003) measure.

This measure is defined as:

$$\text{GKS} = \frac{\text{Tax revenue current system} \;-\; \text{tax revenue R - base tax}}{\text{Tax revenue current system} \;-\; \text{tax revenue under R - base} \;+\; (1-\tau)r\ \text{capital stock}_{t-1}}$$

where:
Tax revenue current system – tax revenue R-base tax =
$\tau\left(\text{EABC} + \text{NHCK} - (\text{NHCM} + \text{EABG}) - \text{CAPALL} + \text{NHCJ} + \text{DBGP} + \text{DBGM} + \text{NHCI}\right)$
lagged capital stock = $(\text{CIXH} + \text{CIXJ} + \text{CIXI})_{t-1}$
τ is the statutory corporation tax rate, and *r* is the real interest rate as defined above.

The four letter codes represent the following National Statistics data series:

EABC	interest received (non-financial corporations)
NHCK	interest received (financial corporations)
EABG	interest paid by (non-financial corporations)
NHCM	interest paid by (financial corporations)
DBGP	gross fixed capital formation (non-financial corporations)
NHCJ	gross fixed capital formation (financial corporations)
DBGM	changes in inventories (non-financial corporations)
NHCI	changes in inventories (financial corporations)
CIXH	net capital stock (private non-financial corporations)
CIXJ	net capital stock (public non-financial corporations)
CIXI	net capital stock (financial corporations)

Data on capital allowances were taken from Inland Revenue Statistics:

CAPALL	capital allowances of corporations in financial year.

4 Measures based on aggregate tax revenues

The Mendoza et al. measure was taken from E. Mendoza's personal web page (http://www.econ.duke.edu/~mendozae/). The Eurostat measure was constructed as described in Eurostat (1998) using Eurostat data.

Our average tax rate for the corporate sector, based on tax revenue, is defined as:

$$\frac{\text{ACCD} + \text{ACCJ}}{\text{Gross operating surplus - depreciation + net taxable property income}}$$

where

Gross operating surplus = NQBE+NQNV-NSRV-EAXB

$$\text{Depreciation} = \left(1 - \frac{\text{EAXB}}{\text{NQBE} + \text{EABC} + \text{FAOG} - \text{EABG} - \text{FBXO}}\right)\text{DBGF} + \text{NHCE}$$

Net taxable property income = EABC+NHCK+FAOG+NHDH-EABG-NHCM-FBXO-NHDK

The four letter codes represent the following National Statistics data series:

NQBE:	Gross operating surplus, non-financial corporations
NQNV:	Gross operating surplus, financial corporations
NSRV:	Adjustment to property income (FISIM), financial corporations
EAXB:	Gross trading profit of quasi-corporations
EABC:	Interest received, non-financial corporations
NHCK:	Interest received, financial corporations
FAOG:	Rent received, non-financial corporations
NHDH:	Rent received, financial corporations
EABG:	Interest paid, non-financial corporations
NHCM:	Interest paid, financial corporations
FBXO:	Rent paid, non-financial corporations
NHDK:	Rent paid, financial corporations
ACCD:	Corporation tax revenues
ACCJ:	Petroleum revenue tax revenues
DBGF:	Capital consumption, non-financial corporations
NHCE:	Capital consumption, financial corporations

The approximate measure is defined in a similar way, with the difference that net taxable property income is not deducted from the denominator:

$$\frac{\text{ACCD} + \text{ACCJ}}{\text{Gross operating surplus - depreciation}}$$

The accruals based tax rate is defined as:

$$\frac{\text{Tax liability} + \text{ACT set-off}}{\text{gross operating surplus} - \text{depreciation} + \text{net taxable property income}}$$

where the “tax liability” and “ACT set-off” are taken from Inland Revenue Statistics, table 11.4, various years.

References

Bretschger, L. and F. Hettich (2002) "Globalisation, Capital Mobility and Tax Competition: Theory and Evidence for OECD Countries", *European Journal of Political Economy* 18, 695-716

Daveri, F. and G. Tabellini "Unemployment, Growth and Taxation in Industrial Countries" *Economic Policy* 30, 49-104

Devereux, M.P. (2003) "Measuring Taxes on Income from Capital", in P. Birch Sorensen ed. Measuring the Tax Burden on Capital and Labour, Cambridge, Mass: MIT Press, chapter 2.

Devereux, M.P. and R. Griffith (2003) "Evaluating Tax Policy for Location Decisions", *International Tax and Public Finance*, forthcoming.

Devereux, M.P., R. Griffith and A. Klemm (2002) "Corporate Income Tax Reforms and International Tax Competition", *Economic Policy* 35, 451-495.

European Commission (1997), 'Towards Tax Co-ordination in the European Union: a Package to Tackle Harmful Tax Competition', COM(97) 495 final.

Eurostat (1998) "Structures of the Taxation Systems in the European Union" Office for Official Publications of the European Communities, Luxembourg.

Gordon, R., L. Kalambokidis and J. Slemrod (2003) "If Capital Income Taxes are so High, why Do We Collect so Little Revenue? A New Summary Measure of the Effective Tax Rates on Investment", [*chapter X of this book*].

Inland Revenue (various years), *Inland Revenue Statistics*, London: The Stationary Office

Mendoza, E.G., G.M. Milesi-Feretti, and P. Asea (1997) "On the Ineffectiveness of Tax Policy in Altering Long-Run Growth: Harberger's Superneutrality Conjecture", *Journal of Public Economics* 66(1), 99-126

Mendoza, E.G., A. Razin and L.L. Tesar (1994) "Effective Tax Rates in Macroeconomics: Cross-country Estimates of Tax Rates on Factor Incomes and Consumption", *Journal of Monetary Economics*, 297-323.

National Statistics, data from "Time Zone" at www.nationalstatistics.gov.uk

Nicodeme, G. (2001) "Computing Effective Corporate Tax Rates: Comparisons and Results" Economic Paper No. 153, DG Economic and Financial Affairs, European Commission.

OECD (1991) "Taxing Profits in a Global Economy: Domestic and International Issues", Paris: OECD.

OECD (2001) "Tax Ratios: A Critical Survey" Tax Policy Studies No. 5, Paris: OECD.

OECD "Revenue Statistics Database" from www.sourceoecd.org

Volkerink, B., J.-E. Sturm and J. de Haan (2002) "Tax Ratios in Macroeconomics: Do Taxes Really Matter?" *Empirica* 29, 209-224

ENDNOTES

[1] Volkerink et al. (2002) do that, at least for two different definitions of such tax rates: the one suggested by Mendoza et al (1994) and a version suggested in their paper. They replicate some recent empirical studies and find that results by Mendoza et al. (1997) and Daveri and Tabellini (2000) are not substantially changed by using their measure.

[2] Because of different sample sizes due to limited data availability, care needs to be taken when comparing coefficients. For example, the correlation between ITR and ITR-COR suggests that the movements in these measures are significantly positively correlated. However, calculated over a longer time period of 27 observations using an approximate version of the ITR-COR (see section 5), the co-efficient drops to 0.39 and becomes insignificant.

[3] That is, we consider only one investment, which is a weighted average of different assets and sources of finance. We do not compute effective tax rates for each type of asset and then find a weighted average of these.

[4] This choice is somewhat arbitrary. The EATR as measured here lies between the EMTR and the statutory tax rate. An economic profit rate of around 20% generates an EATR which can differ from each of these extreme points.

[5] These are based on data from company accounting records, taken from Thomson Financial Datastream. Further details are given in the Data Appendix. On average, these weights are: 57% plant and machinery; 43% buildings; 90% equity; 10% debt.

[6] The rate for plant and machinery is 12.25%, and the rate of buildings is 3.61%. These rates are taken from OECD (1991).

[7] See Devereux, Griffith and Klemm (2002), for an analysis of this issue.

[8] Without personal taxes it makes no difference whether equity finance represents new equity or retained earnings. With personal taxes the two differ. In Figure 3.3 we assume all equity finance is new equity.

[9] We implicitly assume here that the tax system is symmetric: that is loss-making firms receive a tax rebate. In practice this is not generally true. Losses can be carried back to offset against earlier profit, but only in a very limited way. Beyond that, they can be carried forward indefinitely to set against future profit. But in doing so, the loss-making firms bears a cost of delay in receiving the tax credit.

[10] This is not always true. In some cases, tax liabilities which are clearly labelled as overseas tax in the published accounts, are not separately identified in Datastream. This would lead us to overstate the UK tax liability.

[11] Datastream account item 160, labelled "Corporation Tax".

[12] ACT can be thought of as a prepayment of the shareholders' income tax due on dividend payments by the firm, and was paid by firms until 1999. Until 1997, it could be reclaimed by zero-rated shareholders. ACT payments by the firm could be offset against the full tax charge, but only to the extent that gross dividends did not exceed taxable profit. ACT which was unlikely to be offset within a reasonable period was charged against profit, and was known as irrecoverable ACT

[13] This may also be a more reliable measure, given the possible problems in under-recording overseas tax in Datastream.

[14] OECD (2001) suggests some modifications to the Mendoza et al. measure. For the UK their changes reduce the estimate of the tax rate on capital income by on average 9 percentage points. However, the pattern over time is hardly affected, so we do not present

this measure here. The proposed changes to the definition do not affect property taxes or petroleum taxes, so that the following analysis would equally apply to their measure.

[15] In Eurostat terminology this is referred to as a tax rate on "factors of production other than employed labour" rather than "capital". It is however usually interpreted as the tax rate on capital, so we stick to this simpler label.

[16] Council tax is based on the value of residential property, but it also depends on the circumstances of the residents of a property. There are discounts for second homes and properties inhabited by one person only. For some residents it is waived, e.g. for full-time students.

[17] The Mendoza et al. tax rate does include the Community Charge or the Council Tax.

[18] This includes corporation tax on North Sea activities.

[19] There have been previous attempts to define such tax rates for the corporate sector, e.g. Bretschger and Hettich (2002), Nicodeme (2001), OECD (2001) and literature cited therein. None of them have however attempted to deal with taxable property income, including interest.

[20] See the Data Appendix for details. Note that these adjustments are even more important if one wished to calculate such a tax rate for a sub-sector of the economy, e.g. the manufacturing sector. The net interest flows from this sector to the financial sector would be substantial.

[21] From Inland Revenue Statistics.

CESifo Working Paper Series

(for full list see www.cesifo.de)

---

903 Mika Widgrén, Enlargements and the Principles of Designing EU – Decision-Making Procedures, April 2003

904 Phornchanok Cumperayot, Dusting off the Perception of Risk and Returns in FOREX Markets, April 2003

905 Kai A Konrad, Inverse Campaigning, April 2003

906 Lars P. Feld and Stefan Voigt, Economic Growth and Judicial Independence: Cross Country Evidence Using a New Set of Indicators, April 2003

907 Giuseppe Bertola and Pietro Garibaldi, The Structure and History of Italian Unemployment, April 2003

908 Robert A.J. Dur and Otto H. Swank, Producing and Manipulating Information, April 2003

909 Christian Gollier, Collective Risk-Taking Decisions with Heterogeneous Beliefs, April 2003

910 Alexander F Wagner, Mathias Dufour, and Friedrich Schneider, Satisfaction not Guaranteed – Institutions and Satisfaction with Democracy in Western Europe, April 2003

911 Ngo Van Long, Raymond Riezman, and Antoine Soubeyran, Trade, Wage Gaps, and Specific Human Capital Accumulation, April 2003

912 Andrea Goldstein, Privatization in Italy 1993-2002: Goals, Institutions, Outcomes, and Outstanding Issues, April 2003

913 Rajshri Jayaraman and Mandar Oak, The Signaling Role of Municipal Currencies in Local Development, April 2003

914 Volker Grossmann, Managerial Job Assignment and Imperfect Competition in Asymmetric Equilibrium, April 2003

915 Christian Gollier and Richard Zeckhauser, Collective Investment Decision Making with Heterogeneous Time Preferences, April 2003

916 Thomas Moutos and William Scarth, Some Macroeconomic Consequences of Basic Income and Employment Subsidies, April 2003

917 Jan C. van Ours, Has the Dutch Miracle Come to an End?, April 2003

918 Bertil Holmlund, The Rise and Fall of Swedish Unemployment, April 2003

919 Bernd Huber and Marco Runkel, Optimal Design of Intergovernmental Grants under Asymmetric Information, April 2003

920 Klaus Wälde, Endogenous Business Cycles and Growth, April 2003

921 Ramon Castillo and Stergios Skaperdas, All in the Family or Public? Law and Appropriative Costs as Determinants of Ownership Structure, April 2003

922 Peter Fredriksson and Bertil Holmlund, Improving Incentives in Unemployment Insurance: A Review of Recent Research, April 2003

923 Bernard M.S. van Praag and Adam S. Booij, Risk Aversion and the Subjective Time Discount Rate: A Joint Approach, April 2003

924 Yin-Wong Cheung, Kon S. Lai, and Michael Bergman, Dissecting the PPP Puzzle: The Unconventional Roles of Nominal Exchange Rate and Price Adjustment, April 2003

925 Ugo Trivellato and Anna Giraldo, Assessing the 'Choosiness' of Job Seekers. An Exploratory Approach and Evidence for Italy, April 2003

926 Rudi Dornbusch and Stanley Fischer, International Financial Crises, April 2003

927 David-Jan Jansen and Jakob de Haan, Statements of ECB Officials and their Effect on the Level and Volatility of the Euro-Dollar Exchange Rate, April 2003

928 Mario Jametti and Thomas von Ungern-Sternberg, Assessing the Efficiency of an Insurance Provider – A Measurement Error Approach, April 2003

929 Paolo M. Panteghini and Guttorm Schjelderup, Competing for Foreign Direct Investments: A Real Options Approach, April 2003

930 Ansgar Belke, Rainer Fehn, and Neil Foster, Does Venture Capital Investment Spur Employment Growth?, April 2003

931 Assar Lindbeck, Sten Nyberg, and Jörgen W. Weibull, Social Norms and Welfare State Dynamics, April 2003

932 Myrna Wooders and Ben Zissimos, Hotelling Tax Competition, April 2003

933 Torben M. Andersen, From Excess to Shortage – Recent Developments in the Danish Labour Market, April 2003

934 Paolo M. Panteghini and Carlo Scarpa, Irreversible Investments and Regulatory Risk, April 2003

935 Henrik Jacobsen Kleven and Claus Thustrup Kreiner, The Marginal Cost of Public Funds in OECD Countries. Hours of Work Versus Labor Force Participation, April 2003

936 Klaus Adam, George W. Evans, and Seppo Honkapohja, Are Stationary Hyperinflation Paths Learnable?, April 2003

937 Ulrich Hange, Education Policy and Mobility: Some Basic Results, May 2003

938 Sören Blomquist and Vidar Christiansen, Is there a Case for Public Provision of Private Goods if Preferences are Heterogeneous? An Example with Day Care, May 2003

939 Hendrik Jürges, Kerstin Schneider, and Felix Büchel, The Effect of Central Exit Examinations on Student Achievement: Quasi-experimental Evidence from TIMSS Germany, May 2003

940 Samuel Bentolila and Juan F. Jimeno, Spanish Unemployment: The End of the Wild Ride?, May 2003

941 Thorsten Bayindir-Upmann and Anke Gerber, The Kalai-Smorodinsky Solution in Labor-Market Negotiations, May 2003

942 Ronnie Schöb, Workfare and Trade Unions: Labor Market Repercussions of Welfare Reform, May 2003

943 Marko Köthenbürger, Tax Competition in a Fiscal Union with Decentralized Leadership, May 2003

944 Albert Banal-Estañol, Inés Macho-Stadler, and Jo Seldeslachts, Mergers, Investment Decisions and Internal Organisation, May 2003

945 Kaniska Dam and David Pérez-Castrillo, The Principal-Agent Matching Market, May 2003

946 Ronnie Schöb, The Double Dividend Hypothesis of Environmental Taxes: A Survey, May 2003

947 Erkki Koskela and Mikko Puhakka, Stabilizing Competitive Cycles with Distortionary Taxation, May 2003

948 Steffen Huck and Kai A. Konrad, Strategic Trade Policy and Merger Profitability, May 2003

949 Frederick van der Ploeg, Beyond the Dogma of the Fixed Book Price Agreement, May 2003

950 Thomas Eichner and Rüdiger Pethig, A Microfoundation of Predator-Prey Dynamics, May 2003

951 Burkhard Heer and Bernd Süssmuth, Cold Progression and its Effects on Income Distribution, May 2003

952 Yu-Fu Chen and Michael Funke, Labour Demand in Germany: An Assessment of Non-Wage Labour Costs, May 2003

953 Hans Gersbach and Hans Haller, Competitive Markets, Collective Decisions and Group Formation, May 2003

954 Armin Falk, Urs Fischbacher, and Simon Gächter, Living in Two Neighborhoods – Social Interactions in the LAB, May 2003

955 Margarita Katsimi, Training, Job Security and Incentive Wages, May 2003

956 Clemens Fuest, Bernd Huber, and Jack Mintz, Capital Mobility and Tax Competition: A Survey, May 2003

957 Edward Castronova, The Price of 'Man' and 'Woman': A Hedonic Pricing Model of Avatar Attributes in a Synthetic World, June 2003

958 Laura Bottazzi and Marco Da Rin, Financing Entrepreneurial Firms in Europe: Facts, Issues, and Research Agenda, June 2003

959 Bruno S. Frey and Matthias Benz, Being Independent is a Great Thing: Subjective Evaluations of Self-Employment and Hierarchy, June 2003

960 Aaron Tornell and Frank Westermann, Credit Market Imperfections in Middle Income Countries, June 2003

961 Hans-Werner Sinn and Wolfgang Ochel, Social Union, Convergence and Migration, June 2003

962 Michael P. Devereux, Measuring Taxes on Income from Capital, June 2003

963 Jakob de Haan, Jan-Egbert Sturm and Bjørn Volkerink, How to Measure the Tax Burden on Labour at the Macro-Level?, June 2003

964 Harry Grubert, The Tax Burden on Cross-Border Investment: Company Strategies and Country Responses, June 2003

965 Kirk A. Collins and James B. Davies, Measuring Effective Tax Rates on Human Capital: Methodology and an Application to Canada, June 2003

966 W. Steven Clark, Using Micro-Data to Assess Average Tax Rates, June 2003

967 Christopher Heady, The 'Taxing Wages' Approach to Measuring the Tax Burden on Labour, June 2003

968 Michael P. Devereux and Alexander Klemm, Measuring Taxes on Income from Capital: Evidence from the UK, June 2003