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## Income Tax and Top Incomes over the Twentieth Century \*

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### Abstract

The first section of the paper gives a stylised account of the development of the UK income tax structure over the past 200 years, and refers to recent changes in other OECD countries. The second section turns to the distribution of income and summarises the evidence about the top of the income distribution that can be derived from the income tax data. The main results relate to the UK, but comparisons are made with similar evidence for Canada, France, the Netherlands, and the US. The third part of the paper considers the explanation of the observed changes in the distribution and the impact of progressive income taxation. How far are changes in income shares a reflection of the re-arrangement of income? How far are they associated with changes in the composition of top incomes? Conclusions about distributional incidence have to be based on modelling the determination of the personal income distribution, but such modelling is not typically treated in public finance textbooks. The fourth section of the paper considers how the analysis of distributional incidence can be developed, paying specific attention to the explanation of the upper tail of the distribution.

*Keywords:* Income, Taxation, Income Distribution, Tax Incidence

*JEL Classification:* H2.

### 1. Introduction

Income taxation has a long history in the United Kingdom, which first introduced the tax in 1799. It was repealed, briefly in 1802, and from 1816 to its reintroduction in 1842, since when it has been in continuous operation. Even if, as in this paper, attention is concentrated on the twentieth century, this still gives us a period of experience that is long by the standards of economics. What can we learn from this experience? Of course, the information obtainable from income tax records is limited and I shall be referring particularly to the impact of the income tax on that part of the population best covered by the statistics: the top income groups. The paper focuses on the United Kingdom (UK), but I believe that the methods and findings have wider applicability to countries where income taxation is of more recent origin. It raises issues about the future direction of tax policy that go beyond the concerns of one small island off the western coast of Europe. The subject is indeed of considerable policy

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relevance today, because we have seen in a number of countries, including the UK and the United States, a distinct move away from progressive income taxation. Tax reform has commonly meant cutting top rates of tax and the reduction of graduation in the rate schedule. What are the distributional implications, particularly for top incomes?

The first section of the paper gives a stylised account of the development of the UK income tax structure over the past 200 years, and refers to recent changes in other OECD countries. The second section turns to the distribution of income and summarises the evidence about the top of the income distribution that can be derived from the income tax data. Taxes not only have economic and social effects; they also provide valuable statistical information. These data relate to the UK, but comparisons are made with similar evidence for Canada, France, the Netherlands, and the US. The third part of the paper considers the explanation of the observed changes in the distribution and the impact of progressive income taxation. How far are changes in income shares a reflection of the re-arrangement of income? How far are they associated with changes in the composition of top incomes? Conclusions about distributional incidence have to be based on modelling the determination of the personal income distribution, but such modelling is not typically treated in public finance textbooks. The fourth section of the paper considers how the analysis of distributional incidence can be developed, paying specific attention to the explanation of the upper tail of the distribution.

## **2. A Brief History of Personal Income Tax**

The personal income tax in the UK dates back to that imposed by William Pitt in 1799. As one history describes it, the income tax was «the tax that beat Napoleon» (Sabine, 1966). Not that it was universally popular. One naval officer wrote of the proposal to place a tax on incomes «It is a vile... piece of impertinence – is a true Briton to have no privacy?» (quoted by Sabine, 1966, page 31). The tax was indeed discontinued on the signing of the peace of Amiens, but then reintroduced the year after, to remain in effect until 1816 when it was abolished. It was ordered that, on its abolition, all records held by the tax commissioners should be destroyed. There was supposedly a big bonfire outside Parliament, but the civil service had kept copies. It is not clear that they were useful 26 years later when the tax was introduced again in 1842, but the episode demonstrated the power of a bureaucracy relative to that of the legislature. It should also be noted that the tax had its supporters. The Government proposal to continue the income tax in peacetime was defeated only by a majority of 37 (238 votes against 201).

The income tax was re-introduced in the UK in Peel's Budget of 1842. At first, the high exemption level ensured that only a small minority of the population paid income tax. As incomes rose, more people were brought into the tax net. The burden was moderated by the operation of various systems of abatement, and reduced rates, but towards the end of the nineteenth century, there was increasing pressure for a graduated rate structure and for differentiation between earned and unearned income. The latter was introduced in the 1907 in the form of lower rates charged on earned incomes below a certain level, later extended

more generally, and much later (in 1973) replaced by a surcharge on investment income. Pressure for graduated rates culminated in the Lloyd George Budget of 1909 that introduced supertax, later called surtax, from which developed a stepped structure, with increasing marginal rates of tax.

Before the First World War, the exemption level for income tax was around twice the average tax unit income, and taxpayers were a minority of the population. Stamp (1916, page 449) cites an official estimate for 1912-3 of 1.15 million taxpayers, or some 5% of all tax units (tax unit numbers from Atkinson, 2002, Table A1). The income tax was however to become a mass tax over the course of the twentieth century. By 1930 the exemption level was around average tax unit income, and Barna (1945, page 254) gives a figure of 10 million for the number of taxpayers, in 1937, or some 40% of the total tax units. After the Second World War, the exemption level had fallen to under half average tax unit income, and the majority of the population had become payers of income tax.

In the decades following the Second World War, the income tax threshold in the UK fell further to around a quarter of average income for tax units. The rate structure was graduated, so that, in 1973, for instance, the marginal rate for earned income went from 30% to 75% by steps of first 10% and then 5%. There was an investment income surcharge of 15%. The income tax was a mass graduated tax. In this form, income tax might have been thought to have reached maturity. But the 1980s saw a further twist in the story, with a reduction of the top rate, first to 60% and then to 40%, and the abolition of the investment income surcharge. The changes in the 1988 Budget, introducing a two-rate structure of 25% and 40%, were undoubtedly a major step in the direction of making the system less progressive. The subsequent introduction of reduced rate bands has moderated the effect, but the system remains much less progressive at the top. The income tax in the UK has come to resemble a flat(tish) tax.

## 2.1. Recent Developments in Other OECD Countries

Tax structures in other OECD countries have followed their own patterns, but a number of countries have made the same reduction in progressive rates at the top in recent decades. The OECD *Jobs Study* noted a decade ago that «there were large reductions in the schedule rates of tax in... Germany, Norway, Sweden, the United Kingdom and the United States... mainly targeted on the higher income groups» (OECD, 1994, page 241). Messere, summarising the experience of ten OECD countries, concluded that «there was a sharp decline in top tax rates between 1985 and 1994, together with a reduction in the number of rates» (1998, page 11). Just to give one index, the average number of tax brackets (for 4 of the countries) fell from more than 10 to slightly over 4 (Messere, 1998, page 13). In some, but not all, countries, base widening and increases in tax thresholds accompanied the reductions in the top rates, and these operated in the direction of increasing effective progression, but it remained the case that the income tax had become less graduated at the top.

Tax reform in the *United States* has been widely documented. The Tax Reform Act of 1986 was described by Pechman as «the most significant piece of tax legislation enacted

since the income tax was converted to a mass tax during World War II» (1987, p 11). The changes in rate structure were indeed dramatic, replacing the fourteen rates going from 11% to 50% by a two-rate structure of 15% and 28% (with an intermediate 33% arising from the phasing-out of the benefit from the personal exemptions and lower rate bands). This «collapse of the rate structure» was seen by Musgrave as «a giant step towards the principle of a flat rate tax» (1987, p 65). Even if these changes have been partially reversed, the current (2003) schedule having six brackets and a top rate of 35%, the tax structure remains very different from that in the 1950s and 1960s. In *Canada*, the Government in 1988 simplified the federal income tax structure in a similar way, replacing the ten-bracket schedule, from 6% to 34%, by three rates of 17%, 26% and 29%. In the case of *Sweden*, the Government announced in 1988 the introduction of a comprehensive tax reform. This plan, billed as the «Tax Reform of the Century» (Agell, Englund and Södersten, 1996), involved a substantial reduction in top marginal tax rates, from around 75% to around 50% (depending on local tax rates). The changes described so far in this paragraph took place in the 1980s and early 1990s. More recently, moves in the same direction have been made in countries such as France and Germany that had been more resistant to the pressures of tax competition.

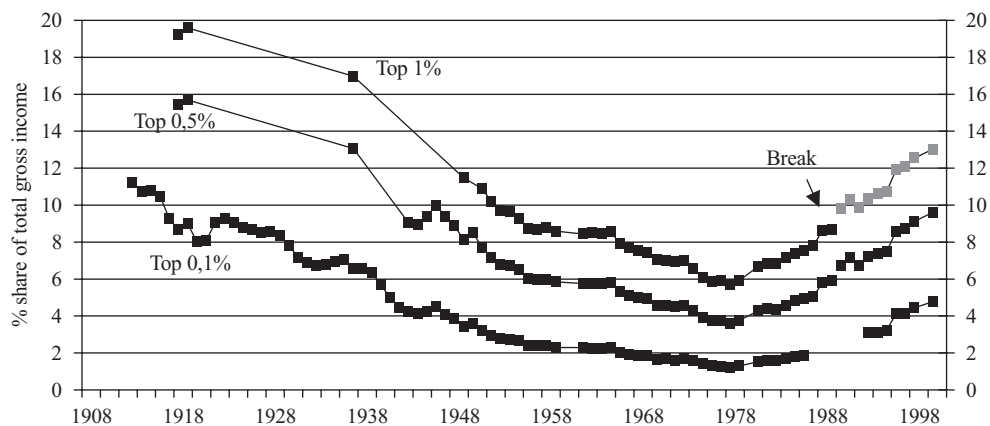
### 3. Evolution of Top Incomes over the Twentieth Century

Has the retreat from a graduated rate structure had significant distributional consequences? This brings us to the distribution of income, and particularly the distribution of top incomes. As already noted, the income tax is a source not just of revenue but also of statistics. Data from the administration of income taxation played an important role in the early construction of national accounts. Recently however income tax data have tended to be neglected. Indeed, they tend to be scorned. The index to Morgenstern's book *On the Accuracy of Economic Observations* (1963) contains the entry «income tax, as reason for lying», and this summarizes well the general scepticism. Income tax data do indeed have many shortcomings. The data are affected by tax evasion and avoidance. Definitions of income and of income unit follow those of the income tax legislation, which varies over time and across countries. Capital income is recorded to differing degrees in different countries, and the same applies to executive compensation in kind and stock options. Income tax data are not, however, alone in giving an incomplete picture: household surveys suffer from differential non-response and under-reporting of income. Moreover, the income tax data have the merits of being available for a much longer period than other sources and, in many countries, of providing annual estimates. The income tax data inform us about periods that other sources cannot reach.

#### 3.1. UK Distribution since 1908

From the supertax (and later the income tax) statistics, it is possible to make estimates of the shares in total income accruing to the top income groups – those subject from 1908 to the graduated taxes (supertax and surtax) – see Figure 1. They are indeed small groups – the top

0.1% is some 25,000 people – but they had a significant fraction of total income – around 10% before the First World War. I refer to «people», but the data relate to tax units, combining the incomes of husbands and wives, up to 1989. The switch to independent taxation, and hence individuals, in 1990 is indicated by the «Break» in the series in Figure 1.



The derivation of these figures from the super-tax and income tax is described in Atkinson, 2002. For the most recent years, information is available in the form of micro-data. The micro-data from 1995 have been used in the estimates shown here, which also differ from those in Atkinson, 2002, in the use of a control total for individuals (rather than tax units) for the years 1990 onwards, and in the use of a more limited control total for income (see Atkinson and Salverda, 2003). The estimates are given in more detail in Atkinson, 2004. The data relate to the United Kingdom, and up to 1920 included what is now the Republic of Ireland.

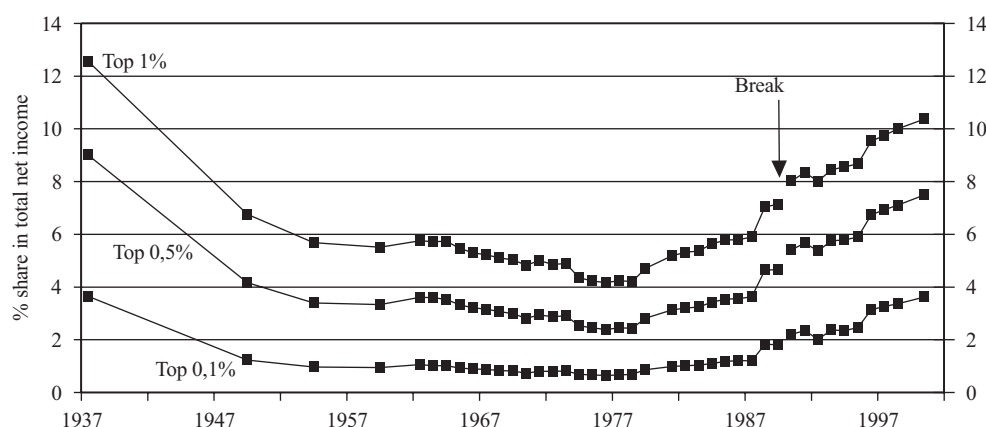
**Figure 1. Shares of top income groups in total gross income in UK**

The figure reveals an intriguing history of decline in the top shares up to the end of the 1970s, intriguing since it is far from a steady downward trend. The First World War saw a significant fall in the share of the top 0.1%. There was some recovery immediately after the War but the top 0.1% ended the interwar period having lost further percentage points, so that their 1939 share of total income was around a half that in 1913. The impact of the Second World War was similar to that of the First World War in that the shares in total income of top income recipients fell: the share of the top 1% in before tax income was reduced from 16.6% in 1938 to 11.2% in 1949. The inequality was still large: in 1944 the Duke of Wellington was reported (Cannadine, 1990, page 630) to have a gross income of some 150 times the mean income. Post-war, the shares of the top groups fell steadily from 1948 for the next ten years, but there was then a plateau, followed by a further fall from 1965 to the late 1970s.

The story of the first three-quarters of the last century was therefore one of significant, if intermittent, declines in top income shares. The overall thrust was firmly in the direction of reduced inequality. But the last quarter century saw a dramatic reversal of direction. Top in-

come shares began to rise steadily and sharply. The share of the top 0.1% in 2000 was 4.8%, well above its 1945 value of 4.2%. Account has to be taken of the move to independent taxation of husbands and wives in 1990 (see Atkinson, 2004), but the share of the top 1% rose by 3 percentage points between 1978 and 1989 and by a further 3 percentage points between 1990 and 2000.

This refers to incomes before tax. The rise in inequality is before allowing for the effects of the reductions in top tax rates. What happened to incomes after income tax? We cannot go so far back in time in this case, but Figure 2 shows the distribution of net incomes from 1937. The rise in after tax inequality is even more marked. Even subtracting 1 percentage point for the break in 1990, the share of the top 1% has risen from 4.2% in 1978 to 9.4% in 2000. The increase has continued after the election of the Blair Government in 1997, and if the trend continues the share will soon reach that observed in 1937. Indeed, in the case of the top 0.1%, we have precisely returned to the situation pre-Second World War.



The derivation of these figures from the super-tax and income tax is described in Atkinson, 2002. For the most recent years, information is available in the form of micro-data. The micro-data from 1995 have been used in the estimates shown here, which also differ from those in Atkinson, 2002, in the use of a control total for individuals (rather than tax units) for the years 1990 onwards, and in the use of a more limited control total for income (see Atkinson and Salverda, 2003). The estimates are given in more detail in Atkinson, 2004. The data relate to the United Kingdom, and up to 1920 included what is now the Republic of Ireland.

**Figure 2. Shares of top groups in total after tax income in UK**

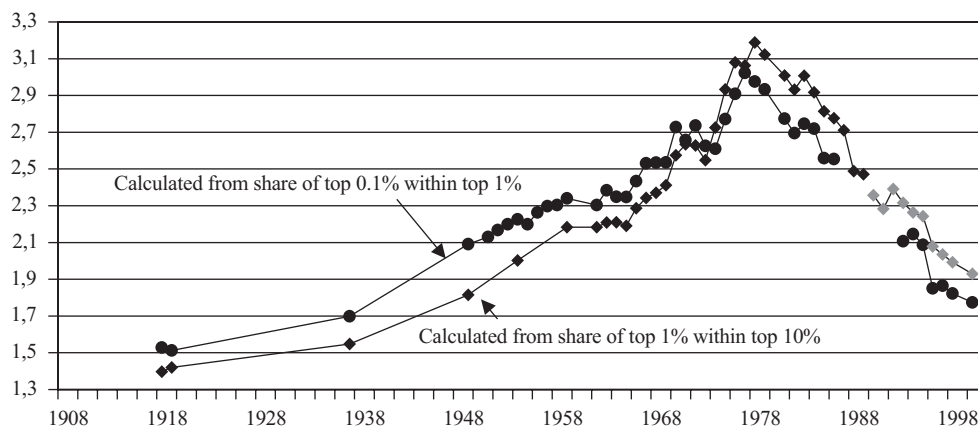
### 3.2. Shares within Shares

The behaviour of the share of the top 1% depends on what is happening both to the distribution *between rich and poor* and to the distribution *among the rich*. In order to focus on the latter, we can look at the «shares within shares». If one takes the UK income distribution in 1979 (a year of relatively low inequality), then according to the income tax data the share

of the top 10% in gross income was 25.3%: i.e. 2½ times their proportionate share. *Within* the top 10%, the top 10% (i.e. the overall top 1%) had a share of 20.9% of the total income of the decile group: i.e. twice their proportionate share. And the top 10% within the top 1% (the overall top 0.1%) had a share of 22% of the total income of the percentile group. The similarity of these numbers reflects the fact that the upper tail of the distribution has approximately a Pareto form, and in this sense they are not surprising. Assuming that the cumulative distribution  $F$  within the top group is such that  $(1-F)$  is proportional to  $y^{-\alpha}$ , where  $y$  is income, then the within-group share of the top 1% within the top 10%, denoted by  $S_1/S_{10}$  is given by  $(0.1)^{(1-1/\alpha)}$ . The relation can be written

$$\alpha = 1 / [1 + \text{Log}_{10} [S_1/S_{10}]] \quad [1]$$

The larger the Pareto exponent,  $\alpha$ , the smaller is the within-group share. This method of estimating the Pareto coefficient from the relative shares was proposed by Macgregor (1936), who noted that it made a bridge between Pareto and Lorenz. For this reason, to draw a distinction from other methods of estimating the Pareto coefficient (such as from the cumulative frequency distribution), I refer to it as the Pareto-Lorenz coefficient. The Pareto-Lorenz coefficients for the UK are shown in Figure 3. This graph brings out the almost inverted V shape, with a sharp reversal after 1978. Over the period, the coefficient rose from 1.5 in 1918 to over 3 in the late 1970s; it then fell back to a value around 1.8 in 2000 (a small part of the rise is due to the switch to independent taxation).

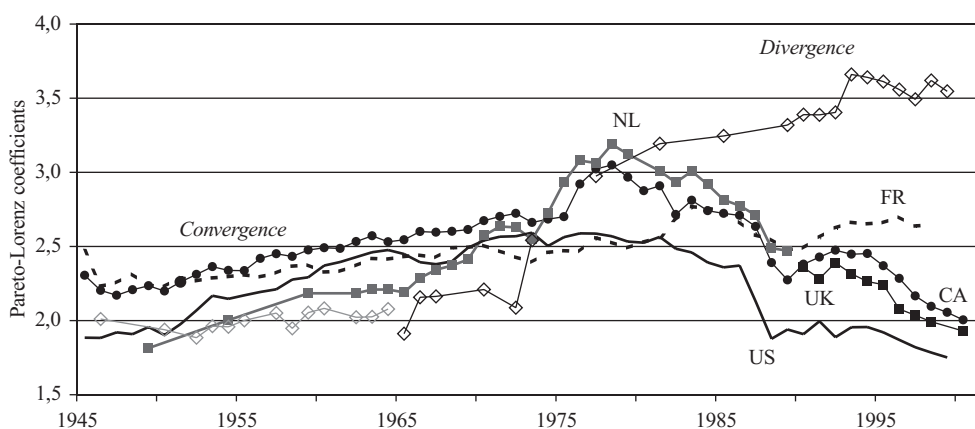


The derivation of these figures from the super-tax and income tax is described in Atkinson, 2002. For the most recent years, information is available in the form of micro-data. The micro-data from 1995 have been used in the estimates shown here, which also differ from those in Atkinson, 2002, in the use of a control total for individuals (rather than tax units) for the years 1990 onwards, and in the use of a more limited control total for income (see Atkinson and Salverda, 2003). The estimates are given in more detail in Atkinson, 2004. The data relate to the United Kingdom, and up to 1920 included what is now the Republic of Ireland.

**Figure 3. Pareto Lorenz Coefficients for the UK**

### 3.3. Experience in Other Countries

My research on top incomes in the UK was stimulated by the work of Thomas Piketty, whose study for France (Piketty, 2001 and 2003) led me to examine the evidence of the UK; and this in turn has led to a group of researchers working on this subject. Figure 4 shows the Pareto-Lorenz curves for five OECD countries since the Second World War. It should be remarked that there are differences in the definitions of tax units and of control totals for income (see Atkinson and Leigh, 2003), which may affect the comparability of both levels and trends. The series for Canada, for example, relates to individuals, and this may have been affected differently by the rise in the proportion of married women in paid employment.



Canada from France from Saez and Veall, 2002, Table B1; France from Piketty, 2001, pages 620-621; Netherlands from Atkinson and Salverda, 2003, Table; UK see Figures 1 to 3; US from Piketty and Saez, 2003, Table II, and updated information supplied by Emmanuel Saez.

**Figure 4. Income Inequality at the Top in Five Countries 1945-2000**

Looking across the evidence in Figure 4 for the five countries (Canada, France, Netherlands, the US and the UK), we see two striking features of the period. The first is the similarity in the trend towards reduced inequality (rise in the Pareto coefficient) for the first part of the half-century. The Pareto exponents were already quite similar, but they converged further. By 1973 the Pareto-Lorenz coefficients had reached to 2.4 in France, 2.6 in the Netherlands, UK and the US, and 2.7 in Canada. The second striking feature is the subsequent divergence. In Canada, the UK and the US the Pareto exponents fell. The US and the UK switched position, but by 2000 the values are essentially the same as in 1949. It is true that the turning point came later in the UK and Canada (around 1978), but the overall time-path in the three Anglo-Saxon countries is similar. In contrast, as pointed out by Piketty (2001), France did not see a sharp upward movement in inequality. Compared with 1970, the French



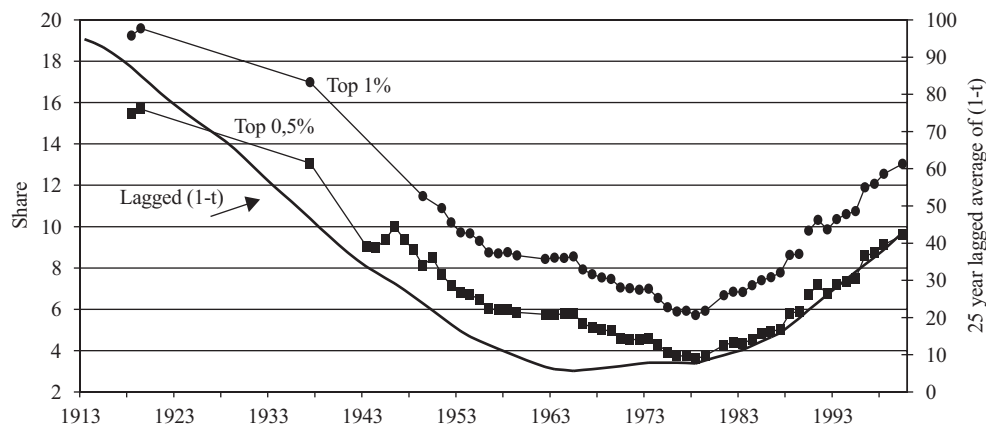
Pareto-Lorenz coefficient in 1998 is higher. The same is true in the Netherlands, where the Pareto-Lorenz coefficient rose noticeably. These Continental European countries were apparently moving to the beat of a different drum.

#### 4. Taxation and the Distribution of Top Incomes

How far has income taxation been responsible for this pattern of distributional change? For some people it is self-evident that progressive income taxation was responsible for the decline in top income shares over the first three-quarters of the last century, and that the subsequent reversal was due to the tax cuts at the top of the scale.

##### 4.1. Taxes and Top Shares in the UK

As apparent support for this view, Figure 5 shows the UK shares of the top income groups (in gross income) plotted on the same chart as the top rate of tax on investment income. The tax rate is a moving average over the preceding 25 years, so that it assumes that the present income shares are influenced by cumulated past taxes. The fit is not perfect but there is a very close correspondence.



Income shares see Figures 1 to 3; tax rates from *Annual Reports* of the Inland Revenue, various years (for example, the 111<sup>th</sup> Annual Report for the year ending 31 March 1968 contains the standard rate of tax from 1938-39 to 1968-69 (Table 25), to which has to be added the top rate of surtax given in Table 52). The tax rate relates to investment income.

**Figure 5.** UK Top income shares plotted against 25 year lagged average of  $(1 - t)$

At the same time, one should regard this empirical association sceptically. It stimulates questions rather than provides a definitive answer. First, there is the question as to how far

the tax-associated change is to be found in the reported income shares but not in the underlying distribution. Are the changes in taxes causing people to change the form in which income is received? Secondly, there is the question of the incidence of taxation. Would not economic theory predict that a rise in the tax would affect economic behaviour? Surely we cannot simply assume that the gross incomes are unchanged? The standard analysis of an income tax shows a supply and a demand curve for labour. If the supply is reduced, then part of the tax is shifted to the demand side via a rise in the gross wage. Should we not expect the inequality of gross wages to rise when the tax rate is increased, and to fall when top taxes are cut? This consideration points to the need for a model of the distribution of income in order to explore tax incidence. The third question concerns the relation between the top tax rates and the tax treatment of the rest of the population. The share of the top 1% in total income depends on how taxes are affecting total income. The movement of the share is a function not just of the top tax rates but also of the top tax rate relative to other rates. This consideration points to examination of the shares within shares: the Pareto-Lorenz coefficients. For this, we need a model that explains the shape of the upper tail.

#### 4.2. Taxes and the Re-Arrangement of Income

The rise in UK top marginal tax rates (on investment income) from 5% in 1907 to 50% in 1919 and then to 97.5% in 1945 provided an incentive for taxpayers to re-arrange their tax affairs in order to receive income in forms that avoided, or evaded, taxation. The decline in observed income shares may be in part a reflection of increasing conversion of income into forms that do not appear in the income tax statistics. As just noted, for the *shares* of top groups to fall, this requires either that the incentive has increased relative to that for the average taxpayer, or that the top income groups have greater opportunity to re-arrange their incomes. It does indeed seem plausible to assume that there is indeed greater opportunity, both because investment income constitutes a larger proportion and because of the selective nature of remuneration packages.

The thesis that the decline in top shares reflected income re-arrangement was powerfully argued by Titmuss in his book *Income Distribution and Social Change* (1962). Investment in public companies that paid low dividends but generated high capital growth allowed return to be converted into capital gains that were either tax-free or taxed at a lower effective rate. Evidence is naturally hard to obtain, and is largely circumstantial. Atkinson (2002a) examines the effect of imputing to the top 1% their estimated share of retained earnings, allowing for the declining share of personal holdings as the holding of pension funds and life assurance companies increased over the post war period. The results show that the decline in the share of top 1% in total income is reduced but is still to be observed. Re-arrangement is part, but not all, of the story.

More recently, top tax rates have been reduced. The top rate on investment income in the UK was cut from 98% to 75% in 1979, from 75% to 60% in 1984, and from 60% to 40% in 1988. These cuts may have worked in the reverse direction. In the United States, a large increase in the top shares was observed after the Tax Reform Act of 1986. Feenberg and Poterba note that «it might in part have been the result of high-income taxpayers responding

to lower marginal tax rates by reporting more of their 'true' income as taxable income... for example, through a decline in nontaxable employer-provided benefits or through a reduction in tax evasion» (2000, page 267). Gordon and Slemrod argue that «the jump in the observed income of the high-income individuals during the 1980s could in part reflect the effects of a reduction in income shifting [between corporate and personal tax bases] and an increased use of wage compensation in response to the drop in personal tax rates relative to corporate rates» (2000, page 245). In their analysis of top income shares in the US, Piketty and Saez (2003) note the surge that happened after 1986 (see Figure 4), but point out that the average increase from 1885 to 1994 is not significantly higher than the increase from 1978 to 1984 or from 1994 to 1998. Again, it appears that income re-arrangement may have played a role, but cannot provide a full explanation.

### 4.3. Sources of Income

In order to explore the impact of taxation on the underlying distribution, we need first to consider the composition of income. In particular the explanations are likely to be different for earned and unearned income. In examining this aspect, a simple decomposition may be helpful. Taking for illustration the share of the top 1%, this can be broken down as follows:

$$\begin{aligned} \text{Share of top 1\%} = & \text{Proportion of earned income} \times \textit{Share of top 1\% of earners} \times \\ & \times \text{Alignment coefficient for earnings} + \text{Proportion of investment income} \times \\ & \times \textit{Share of top 1\% with investment income} \times \text{Alignment coefficient for investment income} \quad [2] \end{aligned}$$

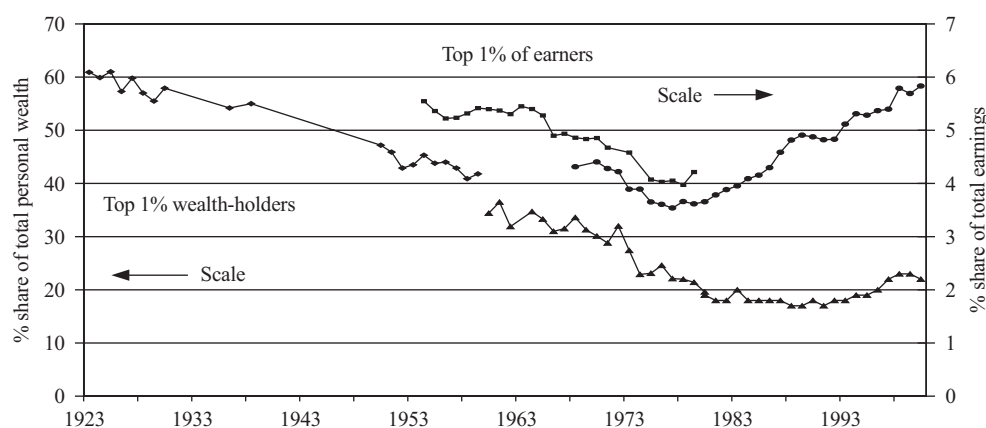
The «alignment coefficient» for earnings is the share in earnings of the top 1% of income recipients divided by the share of top 1% of earners. Since the top 1% of earners are not necessarily in the top 1% of income recipients, the coefficient is by definition less than or equal to 1.

The decomposition brings out the relation with the composition of incomes: the shares of earned and unearned income in total gross income. These shares are related to, but not identical to, factor shares in GNP. They are not the same, because the figures relate to households. Between households and the total economy stand various institutions, including the company sector, pension funds, and the government. Reference has just been made to the re-allocation of income between persons and corporations. We have seen the growth of pension funds. These funds own shares in companies and hence receive dividend income. This dividend income is then paid to pensioners, in whose hands it is treated as deferred earnings, so that – in these statistics – it does not appear as unearned income.

The share of the top 1% depends on its share in total earnings and total investment income. This depends in turn on the distribution of these sources. For example, we can take just earned income, and look at the share of the top 1% of earners. This is the first italicised term in equation (2). But the top 1% of earners are not necessarily the same people as the top 1% of income recipients. This is where the alignment coefficient enters the picture. There may be zero alignment in that all the top 1% of income recipients live off investment income: they have zero

earnings and hence a zero share. Or it may be that earned and unearned incomes are perfectly correlated: so that the members of the top 1% are the same people in all three distributions.

In the theoretical analysis of the next section, I focus on the shares in earnings and the shares in investment income (the terms in italics in equation [2]). Figure 6 shows for the UK the share of the top 1% of individual earners and the top 1% of wealth-holders, wealth being taken as an indicator of investment income. It should be noted that there are breaks in both series due to differences over time in the sources (see the Note on Sources of Figures). In the case of the earnings series, there is an overlap, which demonstrates that the movements over time were similar for that period. Account should also be taken of the fact that the series refer to *individuals*, whereas the income series in Figures 1 to 4 refer until 1990 to *tax units*, combining the incomes of husbands and wives. The changes in the income series in part reflect the increased importance over the twentieth century of the earnings of married women.



*Wealth data* up to 1980 from Atkinson, Gordon and Harrison, 1989, Table 1, from 1980 to 1985 from Inland Revenue Statistics 1997, Table 13.5, from 1986 onwards from IR website Personal Wealth T13.5, 29 July 2003, data for 1999 and 2000 provisional. There are potentially three breaks in the wealth series. The first is in 1938. The estimates up to 1938 relate to England and Wales; those from 1938 relate to Great Britain. The estimates for the year of overlap (1938) are identical, and the series have therefore been shown as continuous. The second break is in 1960, when the coverage of the underlying estate data was extended and more accurate estimates became possible of the wealth of the excluded population. The estimates of Atkinson and Harrison, 1972, page 166, suggest that the share of the top 1% was reduced by some 7-percentage points. The third break is in 1980, when the series switches to the official Inland Revenue estimates. The overlap for that year suggests little apparent difference.

*Earnings data* from Atkinson and Voitchovsky, 2004, Table 2. The earnings data from 1954 to 1979 are from the series on individual annual *principal source Schedule E income* published in the IR Annual Reports; the definition of earnings includes occupational pensions (but not National Insurance pensions) in addition to employment income, although relatively few of the top earners are in current receipt of occupational pensions. The earnings data from 1968 are from the New Earnings Survey, a survey of employers that provides information on earnings in the current pay period. The sample used excludes those whose pay was affected by absence during the survey period. The estimates from 1975 onwards are derived from micro-data.

**Figure 6. Shares of Top Earners and Top Wealth-holders in UK**

The share of top 1% of individual earners in Figure 6 exhibits the same post-war pattern as the overall distribution, with a steady reduction in inequality from the mid-1950s to the late 1970s, and then a definite reversal. By 2001 the share of the top 1% of earners is above that for 1954, particularly when allowing for the break in the series. The time path of the share of top wealth-holders in total wealth is rather different, exhibiting a long-run decline from 1923 that continued until around 1990. The share then began to increase.

In focusing on the shares of earned income and of capital income, I am leaving out some potentially important elements. From equation [2] we can see that taxes potentially affect all elements in the decomposition. There has for example been a shift in the overall composition of income. It should be observed that the scales of the two vertical axes in Figure 6 are different: the scale for the share of the top 1% of earners runs from 0 to 7%; the scale for the top 1% of capital runs from 0 to 70%. Wealth, and investment income, is much more unequally distributed than earnings. *Ceteris paribus*, a shift away from investment income to earned income will reduce the top income shares. Together with the changes in the distributions of earnings and capital, this is causing the alignment coefficients to change. In the US, according to Piketty and Saez, «the coupon-clipping rentiers have been overtaken by the working rich», whereas «in France, in contrast top incomes are still composed primarily of dividend income (2003, page 37). To the extent that personal income composition reflects the factor distribution, then we can draw on the classical theory of tax incidence to examine the role that taxation may have played in the observed shift in income composition (see for example Atkinson, 1994).

## 5. Modelling Tax Incidence at the Top of the Distribution

As Musgrave brought out in his classic *The Theory of Public Finance*, «while textbooks continue to refer to the theory of factor pricing as the theory of distribution, the significance of the classical approach has been reduced in various ways» (1959, page 223). Musgrave notes that we need to study incidence in terms of size brackets of personal income, and shows a hypothetical Lorenz curve. He does not however go on to consider models of the size distribution. He cites Dalton's *Principles of Public Finance* (1939) but not his book on *Some Aspects of The Inequality of Incomes in Modern Communities* (1920), which can be read with profit today for its analysis of the personal distribution. In this section, I consider a selection of formal models of the upper part of the personal distribution that allow us to examine the incidence of taxation.

### 5.1. Capital Accumulation

The first model is based on savings accumulation. Meade (1964) developed a theory of individual wealth holding, allowing for accumulation and transmission of wealth via inheritance, and this model has been analysed in a general equilibrium setting by Stiglitz (1969). With equal division of estates at death, a linear savings process, and persistent differences in earnings, in the long-run the distribution of wealth mirrors the distribution of earnings

(Atkinson and Harrison, 1978, page 211). Alternative assumptions about bequests can however generate long-run equilibria where there is inequality of wealth even where earnings are equal. Stiglitz shows how the operation of primogeniture in passing on wealth can lead to a stable distribution with a Pareto upper tail, with

$$\alpha = \log_e [1 + n] / \log_e [1 + sr(1-t)] \quad [3]$$

where  $sr(1-t)$  is the rate of accumulation out of wealth,  $r$  being the rate of return and  $t$  the tax rate, and  $n$  is the rate of population growth (Atkinson and Harrison, 1978, page 213). For stability, the population growth rate has to exceed the rate of accumulation by the wealthy, so it follows that  $\alpha$  is greater than 1. The faster the rate of accumulation, the closer  $\alpha$  is to 1.

The model is highly stylised but provides a starting point for analysing the decline and then rise of the top shares over the post war period. The impact of taxation in this model is via past accumulation, and we have therefore a possible explanation for Figure 5, which related the lagged average of tax rates to the share of the top 1%. The behaviour of the gross shares reflected the impact of past taxes in reducing accumulation: the rich at time  $t$  have smaller shares because taxes reduced their capacity to save in years prior to  $t$ . On the other hand, we have not yet addressed the incidence question: we need to allow for the effect of taxation on the rate of return via the impact on total capital accumulation. The Stiglitz model, by assuming that savings are proportional to income, assumes away any feedback from the changing distribution of wealth to the rate of return, but once we introduce graduated rates of taxation, we lose the linearity. Even with only two rates of taxation, we need to allow for the changing amount of income above the kink in the tax schedule. One aspect of progression can however be introduced if we allow for the tax rate,  $t_i$ , on investment income to be higher than that,  $t_e$ , on earned income. This generates a model with differential savings propensities out of gross investment and earned income, as in the Kaldor (1961) model, although with the propensities reversed. If  $\lambda$  denotes  $(1-t_i)/(1-t_e)$ , the net of tax income from investment relative to that from earnings, and  $\theta$  denotes share of wages relative to profits in national income, then in steady state the gross rate of return is given by

$$r s (1 - t_e) [\theta + \lambda] = r s (1 - t_i) [\theta/\lambda + 1] = n \quad [4]$$

An increase in the tax on investment income reduces  $\lambda$  and hence raises the steady state rate of return. To some degree therefore the effect of the tax is shifted. It may be seen, however, from the second form of the expression that the net of tax return is reduced, so that the shifting is less than complete. Qualitatively, the earlier conclusion regarding the distributional implications remains valid. The analysis clearly needs however to be extended to a graduated rate structure, which is a more complex exercise.

## 5.2. Models of Top Earnings

In considering possible explanations in terms of earned incomes, the empirical representation in terms of the Pareto exponent again provides a direct link to theoretical models. One

set of theories that lead directly to predictions concerning the Pareto exponent are those dealing with executive remuneration in a hierarchical structure. The model advanced by Simon (1957) and Lydall (1959 and 1968, page 129) generates an approximately Pareto tail to the earnings distribution, with a Pareto exponent given by

$$\alpha = \log_e[\text{span of managerial control}] / \log_e[1 + \text{increment with promotion}] \quad [5]$$

More recent theories, such as tournament theory (Lazear and Rosen, 1981), have provided an explanation of the size of the necessary increment. If one considers the position of people at particular level in an organisation, deciding whether or not to be a candidate for promotion to the next rank, then they are comparing the certainty of their present position with the risk of taking a new position in which they may fail, and lose their job. The higher rank job also involves greater effort. In the very simplest case, they weigh the mean gain against the variance, as a measure of risk. With a linear trade-off between mean and variance, which is equivalent to a quadratic utility function, the required gross of tax increment to make the person indifferent is a function of the tax rate that contains a mean term which increases with the tax rate and a variance term that decreases with the tax rate. There are two competing effects. On the one hand, the tax reduces the financial gain from promotion and more is needed to compensate for the increased effort. On the other hand, the tax reduces the risk of the new job: the government shares part of the risk. We can see then a further possible reason why the gross inequality may vary positively with  $(1-t)$ .

A second explanation of the rise in inequality in the second half of the post-war period is provided by the «superstar» theory of Rosen (1981). The expansion of scale associated with globalisation and with increased communication opportunities has raised the rents of those with the very highest abilities. As in the title of the book by Frank and Cook (1995), it is a *Winner-Take-All Society*. Where the «reach» of the top performer is extended by technical changes such as those in Information and Communications Technologies (ICT), and by the removal of trade barriers, then the earnings gradient becomes steeper. Moreover, Frank and Cook (1995) argue that the winner-take-all payoff structure has spread beyond fields like sport and entertainment: «it is fair to say that virtually all top-decile earners in the United States are participants in labor markets in which rewards depend heavily on relative performance» (Frank, 2000, page 497). This could explain the fall in the Pareto coefficient in the past quarter century. Indeed Rosen made precisely this prediction in 1981, referring back to Marshall's *Principles*, where Marshall identifies «the development of new facilities for communication, by which men, who have once attained a commanding position, are enabled to apply their constructive or speculative genius to undertakings vaster, and extending over a wider area, than ever before» (1920, page 685).

What is then the effect of taxation? Frank (2000) has argued that the effect of progressive income taxation is to reduce the number of people entering occupations where the most talented collects the whole rewards. Talent is not known ex ante, and the anticipated rewards for the winner,  $V(N)$ , increase (at a diminishing rate) with the number entering,  $N$ . If entrants compare the expected gain,  $V(N)/N$ , with the wage in an alternative occupation, then a gradu-



ated tax that imposes a higher rate on the winner will reduce the number of entrants and hence the size of the final rewards. This is a third example of a situation in which the shares of the top groups in gross income is a decreasing function of the tax rate.

The superstar theory needs to be extended to take account of the inter-relation between the distributions in different countries. We do not have parallel universes. The changes in the US affect what happens in other countries, and vice versa. We can in fact contrast the two earnings theories considered here. On the managerial pay story, we might expect competition to drive up managerial pay insofar as they share a common market. The cuts in taxation in the US will in this case spill over to other countries causing their top shares to rise. But on the superstar theory the relation may be negative. We may start with separate superstars but as the market opens up, then US superstars have global reach and they may scoop the whole of the pool. In this way the top shares in the different countries may be negatively inter-dependent.

## 6. Summary

The history of income taxation in the United Kingdom over the past two centuries has seen its evolution from an elite tax, charged at a low rate, to a graduated and differentiated tax, becoming in the twentieth century a mass progressive tax, with a stepped schedule of marginal rates and higher taxes on investment income. The last two decades, however, have seen a retreat from graduation and the abolition of differentiation.

From the UK income tax data, one can estimate the shares of top income recipients in total gross income for almost the whole of the twentieth century. Data from income tax records suffer from a number of evident shortcomings, but they have the merits of being available for a much longer period than other sources and of providing annual estimates. The estimates show a substantial, if intermittent, decline in UK top income shares up to the end of the 1970s, followed by a dramatic reversal, with the share of the top group in 2000 being above its 1945 value. The rise in after tax inequality is even more marked.

Evidence on top income shares for five countries (Canada, France, Netherlands, the US and the UK) over the post-1945 period exhibits two striking features. The first is the similarity in the trend towards reduced inequality for the first part of the half-century; the second is the subsequent divergence. In Canada, the UK and the US, top income shares have risen; in France and the Netherlands there is no apparent increase in recent decades.

At first glance, it appears that progressive income taxation was responsible for the decline in UK top income shares over the first three-quarters of the last century, and that the subsequent reversal was due to the tax cuts at the top of the scale. Tax policy can explain both the U-shaped pattern of top income shares over time and the differences between the Anglo-Saxon countries and Continental Europe. We need however to consider how far the observed pattern may reflect the re-arrangement of income, rather than genuine distributional change, and the incidence of income taxation. Evidence is naturally hard to obtain, but it appears that income re-arrangement may have played a role, but cannot provide a full ex-



planation. In terms of explaining the genuine distributional changes, decomposition into the component parts suggests that we look at the concentration of wage and capital incomes, as well as the share of earnings and investment in total income. The observed fall and rise in top income shares may have been influenced by taxation via several different routes.

In order to explore further the distributional incidence of income taxation, we need to model the top of the income distribution, a subject that is rarely treated in public finance textbooks. Examination of three different models, one of capital accumulation and two of top earnings, indicates three different mechanisms by which higher top tax rates may have reduced the top shares in gross income. If that is the case, the retreat post 1979 from graduated and differentiated income taxation may in part be responsible for the rise in gross income inequality and, *a fortiori*, for the even sharper rise in the shares in net income.

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**Resumen**

En el primer epígrafe de este trabajo se ofrece una visión reelaborada de la evolución de la estructura del IRPF británico en los últimos 200 años y se analizan los cambios recientes experimentados por el impuesto en los restantes países de la OCDE. El segundo epígrafe analiza la distribución de la renta y resume las conclusiones que se pueden extraer de los datos sobre el IRPF relativas al extremo superior de la distribución de la renta. Los principales resultados se refieren al Reino Unido, pero se ha realizado también una comparación con Canadá, Francia, Holanda y Estados Unidos obteniéndose una evidencia similar a la de nuestro país. El tercer epígrafe analiza los cambios observados en la distribución de la renta y los efectos de la imposición progresiva sobre la renta en la misma. ¿Hasta qué punto las variaciones de las distintas participaciones en la renta reflejan una reordenación de esta última? ¿Hasta qué punto se asocian con variaciones en la composición de las rentas más elevadas? Las conclusiones sobre la incidencia distributiva deben basarse en un modelo de determinación de la distribución de la renta personal, pero en general tal modelo no se estudia en los manuales de Hacienda Pública. La cuarta parte de este artículo trata de cómo desarrollar el análisis de la incidencia distributiva, prestando especial atención a la especificación del extremo superior de la distribución.

*Palabras clave:* renta, imposición, distribución de la renta, incidencia impositiva.

*Clasificación JEL:* H2.

