**Top Incomes in the United Kingdom over the Twentieth Century**

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**Summary:** Recent changes in the distribution of income need to be placed in historical context. The paper provides new evidence about the evolution of top incomes in the UK over the twentieth century. Making use of published tabulations of the income tax statistics, and of microdata for recent years, the author constructs estimates of the shares of top income groups, giving for the first time an annual time series for gross incomes that spans more than 90 years. The paper pays particular attention to the problems of data construction and of the interpretation of tax-based evidence. The resulting statistics have evident limitations, but throw light on periods, such as that between the First and Second World Wars, for which there is little other empirical material. The results bring out clearly how the major equalisation of the first three-quarters of the century in the UK has been reversed, taking the shares of the top income groups back to levels of inequality found fifty years ago. A similar U-shaped pattern is found for the US, but the post-war experience of France is different from that in the UK.

**Keywords:** Income distribution, National income, Taxation, Income tax.
1 Introduction

Little is known about the long-run evolution of the distribution of income. This paper presents evidence about part of the distribution – the very top – covering the period 1908 to 2000. The group of people covered is small, much less than 1 percent of the population at the outset, but they receive a significant share of total personal income. From the data presented, we can trace how this share changed over the course of the twentieth century. This helps us put in perspective recent developments. Attention has tended to focus on the rise in inequality in the 1980s (Atkinson, 1993, Goodman and Webb, 1994), but how far was this a reversal of the post-war redistribution? How much equalisation took place in the twentieth century as a whole?

The main sources used in the paper are published tabulations from the super-tax/surtax returns and from the Inland Revenue’s Survey of Personal Incomes. Micro-data exist only for a small number of recent years, but tabulations of the distribution of total gross incomes go back to 1908, as a result of the introduction of "super-tax", which was an additional income tax levied on top incomes. This event was important not only for its fiscal consequences (and the constitutional crisis generated by the initial rejection of the 1909 Budget by the House of Lords) but also because it provided information for the first time since 1801 on total incomes assessed for income tax purposes. Under the ordinary income tax, with deduction at source and different schedules covering different sources of income, the authorities did not know the total income of individuals, which could be the subject of several separate assessments. Super-tax, which was renamed "surtax" in 1927, remained in existence until 1972, by which time the Survey of Personal Incomes (SPI) was in place to allow the series to be continued.

The super-tax/SPI information provides a unique source of evidence about the distribution of top incomes covering virtually the whole of the twentieth century. No other
source allows us, for example, to track changes in the interwar period. The income tax data have however been strangely neglected. Bowley (1914), Stamp (1916 and 1936), Clark (1932), Champernowne (1936) used the super-tax statistics in the past, but there have been no recent studies. Re-examination of income tax sources in the UK is particularly timely in view of the possibilities of comparison with other countries. In the United States, the study of the shares of upper income groups by Kuznets (1953) was based on the federal income tax returns, covering the period 1913-1948. As he recognised, reference totals for the population and total income allow one to deduce from data covering top income recipients the share in total income of, say, the top 1 percent. Recently, Piketty and Saez (2003) have produced a new series for the US covering the whole period since 1913. In France, Piketty (2001 and 2003) has utilised the income tax returns available from 1915 to calculate the shares in total gross income of top incomes. His results demonstrate the value of looking at a long sweep of history, since they show that the evolution of inequality is not "a long tranquil river", reflecting a steady economic trend. Rapid changes are followed by periods of stability, or by reversals. The present paper allows us to see whether the same is true at the top of the United Kingdom income distribution.

The data used here come from income tax records and suffer from potentially serious problems, even if attention is limited to top income recipients. There is a tendency to under-report certain types of income in order to evade tax; and avoidance has been possible through the use of close companies, trusts, and the conversion of income into capital gains. The definitions of income and unit follow the tax law, and may not therefore correspond to those needed to study income distribution. Much of the evidence relates to gross incomes before the deduction of tax. There is little or no contextual data to help understand the determinants of the distribution, and in this respect the tax records compare unfavourably with micro-data from household surveys. At the same time, alternative sources are not immune from the problems
just identified. Household surveys suffer from item non-reporting or under-reporting by respondents, and from differential non-response, which reduces the representativeness of the observed sample and is especially likely to generate problems at the top end of the distribution. There are shortcomings that arise on account of failure to tailor questions asked to the chosen definitions, particularly when making use of surveys conducted for other purposes. The applicability of survey data may be constrained by its design: for example to using a household unit that does not throw light on the distribution among more narrowly defined units. Tax data have therefore points in their favour, especially when it comes to top income receivers. Income tax data have to be used with caution, and are limited in their content, but they have a role to play, particularly when no other sources exist for the years in question.

2 Super-Tax/Surtax Data and Their Previous Use

The published statistics from the super-tax/surtax returns give a classification of incomes by range of total gross income, by the number of "persons" and "total income assessed". For example, the Ninety-Eighth Report of the Inland Revenue (1956, pages 78-82) for the year ended 31st March 1955 shows that the total number of persons assessed to surtax in 1953-54 was 258,999 and the total assessed income £1,062 million. The published tables contain seventeen ranges: the lowest income range is £2,000-£2,500 a year, and the highest is £100,000 and upwards. The average assessed income of surtax payers was £4,100 a year and 37 people had reported incomes in excess of £100,000 a year. The tables for this year show the division by "earned" and "investment income"; earned income accounting for 62 percent of the total in 1953-54, but only 35 percent of total income in the range from £20,000 a year upwards. The sources of the tabulated data for each individual year (typically the Annual Reports of the Inland Revenue or Inland Revenue Statistics) are given in Appendix A.
As soon as distributional data from the super-tax returns became available, they were used by Stamp (1914 and 1916) and Bowley (1914). From the data for 1911-12, Stamp plotted the logarithm of the cumulative number of incomes against the logarithm of income. The relation is linear if the distribution takes the Pareto form: i.e. the cumulative proportion of people with incomes y and higher, denoted by $H(y)$, is assumed to be such that

$$H(y) = Ay^{-a}$$  \hspace{1cm} (1)

where $a$ and $A$ are constants. (It should be noted that $H(y)$ is the complement of the usual distribution function, measuring down from the top.) Stamp concluded that a Pareto distribution with an exponent of 1.685 fitted well except at the top and bottom, where the number of incomes was less than predicted. Using the same data, Bowley (1914) concluded that a Pareto exponent of 1.5 provided a good fit from £5,000 to £55,000.

The super-tax statistics were used by a number of scholars in the interwar period to compare inequality at the top before and after the First World War. Bowley (1930) concluded "there had been a very marked redistribution ... the very rich have less than half their pre-war income" (1930, page 160). Stamp (1936) took the super-tax data from 1911-12 to 1934-35, interpolating in each year to identify the gross income of the 10,000th person and the 25,000th person. He then examined the correlation between these income levels and indices of price levels. Champernowne (1936, published in 1973) employed both the Pareto diagram for numbers and a corresponding diagram for total income received by persons with incomes y or higher, denoted by $G(y)$. Where the distribution has the Pareto form,

$$G(y) = a/(a-1) A y^{(a-1)}$$  \hspace{1cm} (2)
From (1) and (2), we can see that the mean income of those with incomes \( y \) or higher, is given by

\[
G(y)/H(y) = \frac{a}{(a-1)} y
\]  

(3)

So a steeper Pareto curve, with larger \( a \), has less income above \( y \): a value of 1.5 implies that the mean above \( y \) is 3\( y \), whereas a value of 2 implies that the mean above \( y \) is 2\( y \). In this sense, there is less inequality as \( a \) increases (assuming that the rest of the distribution is adjusted to hold constant the mean - see Chipman, 1974). Champernowne, using the super-tax data from 1912 to 1933, concluded "for each portion of the curve, steepness has been increasing fairly steadily since 1920 (except for the very rich), thus indicating increasing equality, whereas before 1920 this was not the case" (1973, page 84). When his thesis was published in 1973, Champernowne added an appendix covering the period from 1912 to 1966-67. This is the fullest run of years in any study using the super-tax/surtax data. Described by the author as showing "a very considerable reduction" in inequality, the Pareto exponents rose particularly between 1939-40 and 1951-52. These results are again based on absolute numbers: for example, the most extensive cover the range from the 200th richest person to the 51,200th richest. The Pareto exponent for this group, estimated using numbers, increased from 1.75 in 1927-28 to 1.82 in 1939-40, then jumped to 2.34 in 1951-52 and was 2.345 in 1963-64 (Champernowne, 1973, page 88). The findings are affected by the fact that the Pareto distribution is at best an approximation. The exponents estimated using amounts, for the same years, are 1.64, 1.745, 2.28 and 2.34. Whereas the last of these values is virtually identical to that obtained from the distribution by numbers, the values for earlier years tell a different story,
indicating a continuing movement towards reduced inequality in the 1950s.

This review of previous uses of the super-tax/surtax data demonstrates the potential of the source, but also suggest that further exploration would be of value. A re-analysis is necessary to clarify what happened in the years that have been studied previously; and the data for more recent years have not been used. Moreover, the analysis needs to be taken further by relating the absolute numbers and amounts of income to the total population and total income. This would allow us to calculate the income shares of top income recipients, providing an alternative to the Pareto exponent as a summary measure of inequality.

3 The Survey of Personal Incomes

The schedular system of income taxation meant that only in the case of super-tax/surtax did the authorities assess the total income of individuals. However, the Inland Revenue has from time to time carried out special statistical exercises to combine the schedular income tax information to arrive at a distribution of income among taxpayers. In the days before computers, this was a substantial undertaking. One taxpayer may have been assessed under several different schedules, and may have appeared more than once under a particular schedule. These special statistical enquiries now take the form of the annual Survey of Personal Incomes, and I refer to earlier inquiries by the same title, abbreviated to SPI. The SPI figures are also published in the form of tabulations, but micro-data is available for recent years, and has been used for 1995-6 to 1998-9, and 2000-1. The sources of the tabulated data for each individual year (typically the Annual Reports of the Inland Revenue or special publications of the Survey of Personal Incomes or Inland Revenue Statistics) are given in Appendix A.

The first such enquiry was when, at the request of the Royal Commission on the Income
Tax, estimates were made for 1918-19. They covered around a quarter of the population, but here I concentrate on the top 1 percent and smaller subgroups. An estimate for 1919-20 was similarly prepared at the request of the Colwyn Committee (1927). These immediate post First World War SPI figures have tended to be dismissed. Lydall (1959) referred to the data for 1919-20 but discarded this year as "abnormal". Bowley said of the SPI data "its utility was never great", since it was a time of very rapid changes in income (1942, page 113). In this regard, the availability of super-tax estimates on an annual basis helps us put the immediate post-war years in perspective.

The SPI as such officially began in 1949-50, when the Inland Revenue initiated a series of quinquennial inquiries (1954-5, 1959-60, 1964-5, and 1969-79) based on the information contained in the income tax records for a sample of taxpayers. From 1963-4 this was supplemented by smaller annual surveys with a sample size of around 125,000, and the annual surveys are now the sole source. The Central Statistical Office combined the SPI distribution with information from other sources to produce the distribution of income series published for many years annually in the national accounts Blue Book (hence referred to as the "Blue Book" series). Data from the Family Expenditure Survey were used to add in non-taxable income not covered by the SPI and to augment the SPI sample for those tax units that are not included in the tax records. The Blue Book series was last published for 1984/85 and is "now missing presumed dead" (Cowell, 1995, page xi).

In that the SPI data cover a larger fraction of the population, they may be regarded as a superior source to the super-tax/surtax data for those years where we have both. Moreover, for those covered by both sources, the Inland Revenue expected the SPI figures to give more complete coverage, reflecting "the deficiency [in the super-tax statistics] attributable to the leakage which is inherent in a system of direct assessment as opposed to a system of collection
of duty at the source" (Inland Revenue, 1920, page 69; see also Stamp's discussion of Allen (1920, page 122)). Operating in the opposite direction is that the super-tax/surtax figures used here are, in general, based on the final assessment, whereas the SPI do not incorporate all adjustments. In fact the SPI and super-tax/surtax figures are close in almost all cases. Where there is an overlap (for 1918 and 1919, 1937, 1949, 1954, 1959 and from 1962 to 1972), I use the SPI figures.

4 Problems of Using the Income Tax Data

The super-tax/surtax and SPI data depart in several ways from what would be desirable in measuring the annual distribution of income. The main problems are discussed below.

4.1 Timing

Super-tax was initially assessed in year \( t \) on the income computed for income tax purposes in year \( (t-1) \), which itself was in part based on income of the preceding year \( (t-2) \) or an average of the preceding years. This meant that "super-tax figures lag a long way behind the real profits" (Royal Commission on the Income Tax, 1920, page 124). The treatment changed however in the Finance Act 1927, when the name changed to surtax, and the surtax levied in year \( t \) was based on income assessed to income tax in that year. To avoid confusion, and to bring the super-tax data into line with the SPI data, the super-tax years have here been renumbered to refer to the income tax year, so that the super-tax year 1909-10, for example, is labelled 1908-9. Furthermore, to make some allowance for the lags, the data for the financial year (for example, 1928-29) are related to population and total income for the calendar year (for example, 1928). These procedures bring the dating closer to the income actually covered, but the reader should bear in mind that the incomes recorded in the statistics are to a significant
degree based on income in earlier years, with the lag depending on the date, the kind of income, and the (varying) income tax treatment. These lags have to be taken into account in interpreting short-run movements and in any econometric investigation of the relation between top incomes and economic variables such as inflation or the rate of return.

4.2 Part-Year Incomes

The underlying tax records refer to units receiving income at any point in the tax year in question. This includes people who die during the course of the year and people who enter the relevant population, such as school-leavers. In the case of women marrying, or becoming widowed or divorced, they appear twice (once single and once as part of the couple) - see Stark (1978, page 53). The Royal Commission on the Distribution of Income and Wealth (1979, pages 36 and 37) examined the problem of ‘part-year units’. Adjustments to the distribution of before tax income indicated that in 1976/77 the exclusion of such units would have a modest impact on the upper income groups, reducing the share of the top 1 percent by 0.1 percentage point. For our purpose, the key element is therefore the total of tax units, and this is designed to exclude part-year units.

4.3 Definition of income in income tax data

The tax base does not correspond to a comprehensive definition of income. Among the omissions are capital gains and losses, and certain remuneration in kind. It cannot be assumed that these departures from a comprehensive definition have a constant effect over time. The extent and the distribution of missing income vary over time. Incentives for tax avoidance were much less when the top tax rate was under 10 percent than when it was 97.5 percent. Legislation has in some cases extended the tax base (for instance, surtax directions for close
companies) and in others narrowed the base (for example, cessation of the taxation of imputed rents on owner-occupied houses). In the 1960s, the temporary rise in the income shares in 1965 is believed to be due to the payment of unusually large dividends in 1965-66 in anticipation of the introduction of Corporation Tax (Inland Revenue Statistics, 1970, page 61).

The definition of income has also changed on account of improvements in the statistical methods. For instance, from 1985 employees' superannuation contributions were added back to earned income and this change may have contributed to an upward movement in the top income shares. From 1975-6, the figures relate to “total income”, but prior to the SPI 1976-6, the distribution relates to total net income, which differs from total income in that it deducts retirement annuity premiums, alimony and maintenance payments, and allowable interest payments such as those for house purchase. The Central Statistical Office (1978, tables D and E) analysed the distributional consequences of the change in definition in 1975-6 showing that it particularly affected the highest percentile, which increased by 5.6 percent. The effect on top shares was however relatively modest: the share of the top 1 percent in before tax income was shown as rising from 5.6 to 5.7 percent.

These issues need to be borne in mind when interpreting the findings, and I return in Section 7 to the robustness of the conclusions.

4.4 Reference population

One of the key limitations of the earlier studies using the super-tax data is the lack of a link to the aggregate population and aggregate total income. In this paper I have made estimates of the total reference population and total income, building on the foundation provided by the Blue Book distributional estimates constructed by the Central Statistical Office for a number of years from 1938 to 1984/85. Fuller details of sources and methods are given in
Appendices B and C.

Up to 1989, the income tax data relate to the “tax unit”, which consists of a married couple, or of single adult, or of single minor with income in his or her own right. We need, for a reference total, the total number of such units in the whole population, whether tax-paying or not; this is referred to below as the total tax units (which should not be confused with the total number of actual taxpayers). Stark (1972, page 16 and Table 1.4) described the method used in post-war official statistics to arrive at the reference number of tax units. In order to arrive at figures for years not covered by the Blue Book estimates, I take the mid-year population figures of all males and females, aged 15 or over (ignoring additions to and subtractions from the population during the year, since we do not want to include part-year units), and subtract the number of married females. (This procedure ignores minors aged under 15 with income.) Such a breakdown of the population is available for Census years and from the National Register of September 1939. The constructed figures for tax units are then expressed as a percentage of the total population and interpolated linearly to give annual estimates. Comparison of the derived totals of tax units with contemporary evidence about total tax units for the pre-war period suggests that our figures provide a reasonable basis for the reference population.

From 1990, following the introduction of independent taxation for husbands and wives, the total used is that for all individuals aged 15 and over.

4.5 Reference total income

The reference total for income can be defined in several ways. One can start from the national accounts figures for total personal income and work towards a definition closer to taxable income, or one can start from the income tax statistics and add the income of those tax units not covered. Here I adopt the latter approach. The starting point is the total “actual”
income assessed by the Inland Revenue for income tax purposes. The total refers to gross
income assessed, from which is subtracted the incomes of those below the exemption limit
included in the assessments, the income of charities, colleges and other non-profit institutions,
dividends paid to non-residents, allowances for depreciation, and that part of profits not
distributed by companies. To the resulting figure are added, for the years up to 1944, (a) wages
not assessed, (b) salaries below the exemption level, (c) self-employment income below the
exemption level, (d) dividends and other capital income below the exemption level, and (e)
contributory National Insurance retirement and widows’ pensions. The main sources are
Bowley and Stamp (1927), Bowley (1937), Clark (1937), Barna (1945), Feinstein (1972), and
Ramprakash (1975). For the years from 1945, when the income tax coverage had become much
more extensive, the only allowance under (a) and (b) is for occupational pensions. The totals
for wages and salaries for 1949-50, 1954-5 and 1959-60 suggest that the SPI figure is within 5
percent of the national accounts figure, and the majority of that difference is likely to be
attributable to under-recording of those covered. In the same way, in view of the lower
exemption level post 1945, no adjustment is made under (c) and (d), but a sizeable addition is
made under (e).

It should be emphasised that the resulting totals, both before and after 1944, have a
significant error margin. Some periods are better covered than others by the necessary
ingredient series and by contemporary estimates providing points of reference. The war
periods and the years immediately following the First World War are particularly subject to
error. Feinstein (1972) gives a grading of B (“good”) to many of the underlying national
accounts series, indicating an error of ±(5 percent-15 percent). For the war years and 1918-
1920 the upper end of this possible range seems appropriate; for other years ±5 percent may be
a reasonable guide.
5 Interpolation

The basic data on which we are drawing are in the form of grouped distributions, with a number of income ranges, denoted by $i = 1, \ldots, n$, where $n$ is an open-ended top interval, and $y_i$ denotes the lower limit of interval $i$. For each interval $i$, we are assumed to know the total number of income units and the total income, and hence the interval mean denoted by $\mu_i$. This is accompanied by information on the overall mean income, $\mu$, and on the total number of tax units. Since our concern here is with top incomes, we cumulate downwards, so that $H_i$ is the proportion of the population with income in the range $i$ or higher. The total income received by persons with incomes $y_i$ or higher is denoted by $G_i$, where this is expressed per head of the total population, so that the share in total income of persons with incomes $y_i$ or higher is obtained by dividing by the mean income to give $\gamma_i = G_i/\mu$.

Since the intervals do not in general coincide with the percentage groups of the population with which we are concerned (such as the top 0.1 percent), we have to interpolate in order to arrive at values for summary statistics such as the percentiles and shares of total income. For example, in 1968 the SPI data on gross incomes show that 2.33 percent had incomes above £3,000 and their share was 12.17 percent, whereas moving to the next range, 0.77 percent had incomes above £5,000 and their share was 6.48 percent. In order to calculate the share of the top 1 percent, we have to interpolate between 6.48 and 12.17 percent; in order to calculate the top percentile, we have to interpolate between £3,000 and £5,000, which were respectively 2.95 and 4.91 times the mean income.

5.1 Pareto interpolation

The standard current practice, adopted in the US by Feenberg and Poterba (1993 and
2000) and in France by Piketty (2001), is to assume a Pareto distribution, so that $G(y)$ and $H(y)$ have the form shown in equations (1) and (2). This follows a venerable tradition: for example a Pareto interpolation was used in the 1906 report of the House of Commons Committee on Income Tax (House of Commons, 1906, Appendix, pages 222 and 245-6). This method has however properties which are not always appreciated (although doubts were expressed about the use of the Pareto distribution in the US by Gastwirth, 1972), and which have led me to adopt a different approach here. First, the information described above allows us to obtain more than one value for the share. As has been noted by earlier investigators (for example, Barna, 1945, Appendix D), and as we have seen above, in a situation where we have information on both the number and amount of income in the range, more than one value of the Pareto exponent can be fitted. We can for example use the Pareto formula to interpolate the share of total income of the top 1 percent from the two shares (12.17 and 6.48 percent) and two cumulative frequencies (2.33 and 0.77 percent). This is equivalent to fitting a Pareto distribution to the Lorenz curve in the interval. Eliminating $y$ between (1) and (2), $G^a$ is a constant times $H^{a-1}$. By comparing two points, 1 and 2, we obtain a value for $a/(a-1)$ from 

$$
\log[H_1/H_2]/\log[G_1/G_2].
$$

In the example given above, $a/(a-1) = \log[2.33/0.77] / \log[12.17/6.48] = 1.757$, giving a value of $a$ equal to 2.32, and an interpolated share of 12.17

$$(1/2.33)^{1/1.757} = 7.52.$$ 

The same value is obtained using the other endpoint:

$$
6.48(1/0.77)^{1/1.63} = 7.52.
$$

This procedure does not however use the information about the range endpoints, and there is in fact no reason why the endpoints implied by the interpolation should coincide with the actual endpoints. In geometric terms, the slopes at the endpoints of the interpolated Lorenz curve need not equal the interval endpoints (divided by the mean). (The slope of the Lorenz curve is equal to the income at that point divided by the mean.) The implied endpoints can be
calculated from (3) and the definition of $\lambda$. In the example used above, the implied initial point is close to the actual initial point, 2.97 times the mean, compared with 2.95, but the implied upper end point is 4.79 compared with an actual value of 4.91.

Alternative Pareto procedures yield different results. A common method, based on equation (1), is to use the interval endpoints and the cumulative frequencies to estimate $a = \log[H_1/H_2]/\log[y_2/y_1]$. This method does not however guarantee that the interpolated shares are consistent with the interval mean. This approach yields a value of $a$ equal to 2.17, which is appreciably smaller than the value previously calculated (2.32). Adopting another approach, Piketty (2001) treats interval $i$ as an open upper interval, calculating the Pareto exponent from equation (3) using information on $H_i$, $G_i$, and $y_i$. Applied to the range £3,000 and upwards, this gives a value for $a$ of 2.29. Hence from (1), we can calculate the implied value of $A_i$, and hence the percentile income (4.26 times the mean) and then the income share (7.55 percent) of the top 1 percent. This uses all the information at $y_i$, but not that from the next endpoint $y_{i+1}$. If we use the values from £5,000 upward, we obtain a different value of $a$ (equal to 2.40), and a higher value for the percentile (4.40 times the mean) but the interpolated share is very close.

As Piketty has shown, the version of the Pareto method employed by him appears highly robust: he makes comparisons with the results obtained from a sample of the French micro-data and finds errors in the calculated income shares of typically less than 0.05 percentage points. We can however see from equation (3) that the interpolated values of the shares and of the percentiles can only both be robust if the same is true of the value of $a$. The UK data do not appear to follow the Pareto distribution as closely: in the 1968 data, for example, the Pareto exponent estimated in this way varies, over the top 20 percent, from 2.3 to 2.9.

5.2 Upper and lower bounds
An alternative approach to interpolation, not dependant on assumptions about the form of the distribution, works with upper and lower bounds. As illustrated in Figure 1, we want to find the implied share corresponding to a specified cumulative frequency by joining $H_i$ and $H_{i+1}$ in such a manner as to generate a known mean income. This means that there is a constraint on the area integrating $y(H)$ from $H_i$ to $H_{i+1}$. A gross lower bound on the top shares can be obtained by assuming in Figure 1 a horizontal line, not shown, extending right from $H_i$ up to the mean income $\mu_i$ followed by a vertical section to level $H_{i+1}$ (in other words all the mass is concentrated at the interval mean). A gross upper bound on the top shares can be obtained by assuming a vertical line at $y_i$, again not shown, followed by a horizontal line, and completed by a second vertical segment at $y_{i+1}$. This corresponds to concentrating the mass at the endpoints of the interval. With the example of the 1968 SPI data, this generates quite a wide range for the income share of the top 1 percent: from 7.31 to 7.60 percent.

Neither gross bound is shown in Figure 1 as tighter bounds can be obtained if we assume, as seems reasonable for the upper ranges, that the density is non-increasing (Gastwirth, 1972). The non-increasing density assumption means that the interval mean, $\mu_i$, lies to the left of the midpoint. We can then identify the point $Q$ that is the same distance to the right of $\mu_i$ as $y_i$ is to the left. One way of generating the required mean is to have a uniform density over the interval $[y_i, 2\mu_i-y_i]$; this is given by the heavy lines $H_iRQH_{i+1}$. Subject to the requirement that the implied density be non-increasing, this gives a lower bound to the interpolated share, since it gives the least to those above any specified value of $H$. This “refined” lower bound may be seen as a special case of a split histogram (Cowell and Mehta, 1982), with constant density up to $(2\mu_i-y_i)$ and then a zero density for the rest of the interval. Since $QP$ is parallel to $H_{i+1}H_i$, any triangle with $H_{i+1}H_i$ as a base, and an apex on $PQ$, has the same area, and hence preserves the mean. At the other extreme is the dashed triangle that, by massing as many people as possible.
at $y_i$, gives a “refined” upper bound on the share, subject to the density being non-increasing. In the 1968 example, the refined bounds are much tighter: from 7.45 to 7.55 percent.

Examination of the UK data shows that, while in some years the distance between the refined upper and lower bounds could be twice that found in 1968, for many years the refined bounds differ only by 0.01. In presenting the results below, I take an average of the refined bounds. From Figure 1, we can see that it may not be sensible to “average” the two bounds as such; instead I take a central value using the mean split histogram: the triangle shown by dotted lines with vertex on PQ at the mean. In a very few cases the non-increasing density condition is not satisfied, in that the mean is above the interval midpoint. In these cases, the gross lower bound is used.

The derivation of the bounds for the income shares is based on the argument that a mean-preserving equalising transfer cannot raise the share of the top $x$ percent. The same argument does not apply to the top percentiles (an equalising transfer from people inside the top $x$ percent to people at the boundary raises the $x$-percentile). Hence, the same bounds do not apply to percentiles. From Figure 1, we can see that, taking any desired value of $H$ between $H_i$ and $H_{i+1}$, and reading across horizontally, either the gross upper bound or the gross lower bound is equal to the relevant income limit ($y_i$ or $y_{i+1}$). This suggests that the resulting bounds are likely to be wide and that it is worthwhile seeking tighter bounds by making the assumption that the density function is non-increasing. For any specified value of $H$, we can then generate a refined lower bound, which lies initially along $H_iP$ but then follows PQ. The refined upper bound for the percentile is generated by $H_iR_{i+1}$. (The non-increasing density assumption rules out the massing of density at the upper limit.) These refined bounds are used in the text below.

For the SPI data in 1968, they yield a range from 4.08 to 4.51 times the mean (the range limits are from 2.95 to 4.91 times the mean).
6 Top Incomes over the Twentieth Century

Figures 2 summarises the results obtained from the super-tax/surtax and SPI sources. Together, these sources cover virtually the whole of the twentieth century. Where there are missing years, the lines have been linearly interpolated. The break in the series in 1990 corresponds to the switch to independent taxation of husbands and wives. The graph shows the percentile shares in total gross income; the text also makes reference to the percentile income levels, expressed relative to the mean. Figures for 1920 and earlier include what is now the Republic of Ireland.

6.1 Before and After the First World War

When super-tax began, it was payable on incomes in excess of £5,000 a year, which was some 65 times the average income of tax units. Super-tax payers were only some 0.05 percent of total tax units, yet they received over 8 percent of total income. To give some idea of just how exclusive they were, we may note that in 1913 the salary of High Court judges was £5,000, as was that of the Chancellor of the Exchequer (Routh, 1980, pages 64 and 73). The Chancellor was however soon to become liable to super-tax, as in the first war Budget of 1914 the threshold was lowered to £3,000. The lowering of the threshold more than doubled the number of super-tax payers and allows us to calculate the share of the top 0.1 percent. In 1913 this share was some 11.6 percent of total income (see Figure 2), and the top thousandth had all more than 40 times mean income.

Before 1914 there is no apparent trend in the share of the top 0.05 percent, but the First World War, marked by the first set of vertical lines in Figure 2, saw a significant fall in their share: from 8 percent to 6 percent in 1920. The top 0.1 percentile fell in the same way from 40
times the mean to 30 times the mean. These are large changes. It may be noted that, despite relatively broad ranges, the bounds for the shares of the top 0.05 percent are quite close: 8.51 to 8.60 percent in 1913. The bounds for the percentiles are initially rather wider: in 1913 the bounds for the starting point of the top 0.05 percent are from 62 to 73 times the mean. The bounds for the percentiles become closer as the brackets in the original tabulations become less broad: by 1920 the range for the starting point of the top 0.05 percent is from 50.7 to 51.3 times the mean, which is certainly small in relation to other sources of error.

How far was the fall in the First World War temporary and how far a reflection of secular decline? The subsequent interwar period has been strangely neglected. In his historical study of UK income inequality, Soltow (1968) did not use any data for the interwar period, jumping from 1913 to 1962. Williamson's analysis (1985) stops in 1919; Lindert (2000) goes direct from 1911 to 1938. Figure 2 allows us to track the developments of the share and percentiles over the 1920s and 1930s. The estimates show that there was some recovery in the share of top incomes in the early 1920s as prices fell sharply, reflecting the fact that a significant source of income (rents) tended to remain unchanged in money terms. Lags in the income tax data may be important here, with the recovery partly reflecting the delayed entry of profits made during the war (a matter of considerable public concern at the time). But after the initial recovery, the top 0.05 per cent lost further ground. The years 1929-1932 saw a rapid decline. The share of the top 0.05 percent fell from 6.2 percent in 1929 to 5.0 percent in 1932, a fall of a fifth in three years. This reflects the significance of capital income. Over this period, the dividends paid on ordinary shares fell by an estimated 17.5 percent (Pratten, 1993, page 194, applying the price index to the index of real dividends). At the end of the interwar period, the share of the top 0.05 percent in total income was approaching a half that in 1908. It may be noted that the next 0.05 percent (see the bottom curve in Figure 2) saw much less marked
overall change over the interwar period: their share in 1939 was 1.7 percent, compared with 2.0 percent in 1920. The income required to be in the top 0.1 percent was still some 30 times the mean at the end of the 1930s. Looking at the shares of the top 0.5 percent and 1 percent, for which we have only figures at the beginning and end of the interwar period, we see that the downward slope is similar to that of the top 0.05 percent. Between 1918 and 1937, the 0.95 percent not in the top 0.05 percent saw their share fall only from 12.7 percent to 12.2 percent. This highlights the "localised nature of redistribution," as was found by Brittain (1960) for a later period (1938-1949), to which we now turn.

6.2 The Second World War and the "Golden Age"

1938 is the first year for which there are official statistics for the income distribution as a whole (the "Blue Book" estimates). The official estimates show the share of the top 1 percent in before tax income as being sharply reduced from 16.6 per cent in 1938 to 11.2 per cent in 1949 (Royal Commission on the Distribution of Income and Wealth, 1979, Table 2.4), with an even more dramatic change in after tax income. Our surtax-based estimates show a similar picture for those higher up the scale. The share of the top 0.05 percent fell from 4.6 percent in 1939 to 3.0 percent in 1945, and the decrease was not confined to this group: the share of the next 0.05 percent fell from 1.7 percent to 1.3 percent. The 0.1 percentile fell from 30 times mean income to 20 times. While there was some immediate post war recovery in 1946, the downward trend continued: the shares of the top groups fell steadily from 1946 for the next ten years.

From the later-1950s to 1965 there was a plateau, as is shown most clearly by the share of the top 1 percent in Figure 2, but this was only temporary. From 1966 to 1978 there was a further significant fall in the share of top incomes, with a brief pause during the Conservative
Government in the early 1970s. The share of the top 1 percent fell from 8.5 percent to under 6 percent. To be in the top 0.1 percent in 1945 one needed an income around 20 times the mean; by 1978 an income 8 times the mean would have sufficed. Taking the period 1945 to 1978 as a whole, we can see that there was a very substantial reduction in top incomes. It was not a steady downward trend, being punctuated by periods of stability, but the effect was to more than halve the shares of top income groups.

6.3 The final two decades of the century

The year 1979, when Mrs Thatcher was elected, proved to be a turning point for the top income shares. In the next two decades, the shares of top income groups in the UK recovered the ground lost since the Second World War. In interpreting the rise shown in Figure 2, we need to bear in mind the introduction of independent taxation for husbands and wives. Until 1990, the incomes of husband and wife were aggregated in the SPI data (this applied even where they had elected for separate taxation). The data from 1990 relate to individuals, and the reference total has been correspondingly adjusted. As may be seen from Figure 2, there was a distinct hiatus in 1990. But the upward trend continued at the same rate. Between 1978 and 1989 the share of the top 1 percent rose by three percentage points; between 1990 and 2000 the share of the share of the top 1 percent rose by a further three percentage points. Even allowing for the break in 1990, the share of the top 1 percent has more than doubled since 1978. The share of the top 0.5 percent has increased by proportionately more. The share of the top 0.05 percent, the group with which we began in 1908, is 3.5 percent in 2000, or 70 times their proportionate share.

Taking into account the break in the series, it seems safe to conclude that the shares of top incomes are now broadly back where they were at the end of the Second World War. The
last quarter of the twentieth century saw an almost complete reversal of the decline in observed inequality at the top that had taken place in the preceding twenty-five years. Of particular note is the increase in top shares post 1997. Whatever has happened to the rest of the income distribution, the shares of the very top income groups have continued to rise.

6.4 Net of tax incomes

The statistics given above relate to incomes before tax. From the SPI data from 1937 onwards we can estimate the distribution by income after the deduction of income tax, and this is shown in Figure 3. The after tax shares are smaller, reflecting the progressive nature of the income tax, and the scale in Figure 3 is correspondingly larger than that in Figure 2. But the same basic pattern emerges. There was a sharp fall from 1937 to 1954, then a plateau until 1965, followed by a further fall up to 1978. The share of the top 0.1 percent was nearly halved in the thirty years after 1949. But then the process went into reverse. The share of the top 1 percent increased from 4.2 percent in 1977 to 7.1 percent in 1989, and rose by a further 2 percentage points from 1990 to 2000. The share of the top 0.1 percent increased from 0.66 percent in 1977 to 1.81 percent in 1989, and rose by a further 1.4 percentage points from 1990 to 2000.

6.5 Conclusion

In this paper, I am considering groups much smaller than those typically treated in distributional analyses, on the grounds that income change for the rich can be quite different from that evidenced by the rest of the distribution. The super-tax/SPI evidence shows that income shares at the very top fell dramatically for the first three-quarters of the century, and then recovered strongly. Since 1979, the shares of top income groups recovered the ground lost
since the Second World War, and have continued to rise since 1997.

7 Robustness of the Conclusions

In presenting the empirical evidence of Section 6, I have emphasised changes across the century. To this extent, the conclusions are robust to errors that are constant over time. If top incomes are consistently understated in the income tax data, the direction of movement is still correctly measured. There is however good reason to suspect an increasing departure of recorded income from true total income. The decline in observed income shares over the first three-quarters of the century may be in part a response to the advent of high marginal rates of tax; there may have been increasing conversion of income into forms that do not appear in the income tax statistics. In 1957, the Economist commented on the small number of surtax payers and the low surtax yield, which "offend the evidence of one's eyes" (February 9, 1957, page 490). Kaldor observed "for a period of more than a decade not more than a few dozen taxpayers in the whole country had a taxed net income of more than £6,000, whilst the scale of living of the 'upper ten' has remained appreciably higher than this" (1955, page 228).

7.1 Effect of retained company profits

The conclusions regarding trends over time are particularly at risk on account of increased retention of profits. The use of private companies as an avoidance channel was a continuing concern to the Inland Revenue. Equally, investment in public companies that paid low dividends, but generated high capital growth, allowed return to be converted into tax-free capital gains, which do not appear in the statistics. A number of past studies examined the effect of imputing to persons the undistributed profits of businesses. Seers noted that "undistributed profits, which largely belong to the upper brackets, have increased from £257
millions in 1938 to £940 millions in 1947” (1951, page 34) and went on to investigate the impact of allocating the undistributed profits of companies to individuals. The effect on those with incomes above £2,000 (broadly the top 0.5 percent) would have been to raise their share of total incomes by a factor of a quarter in 1938 but by as much as two-thirds in 1947 (Seers, 1951, pages 34 and 35). On this basis, the pre-tax share of the top 1 per cent was little different pre and post-war. However, this calculation assumes that the top group retained the same share of equity capital as in 1937, whereas in reality insurance companies, pension funds and other financial institutions held an increasing proportion. As argued by Lydall (1959), the share of the top 1 percent in total equity declined.

In order to test the robustness of the conclusion reached regarding the downward trend from 1937, an approximate adjustment can be made for the increase in retained earnings in the 1940s and 1950s, taking account of the changing pattern of share ownership. For certain benchmark years, information exists about the proportion of shares that are personally held (the sources used here are Barna (1945, pages 72-73) and Atkinson (1972, page 42)). The fraction of personally held shares owned by the top 1 percent is approximated using information for 1937 (Barna, 1945, Table 77) and Inland Revenue Statistics 1973 (Table 94). Retained earnings are from Feinstein (1972, Table 11). Figure 2 shows the share of the top 1 percent as virtually halving over the 20 years from 1937 to 1957; the adjusted share, attributing to the top 1 percent their estimated share of retained earnings, falls from 20.7 percent to 13.9 percent, a fall of a third. The decline in the share is reduced but is still very substantial.

7.2 Recent tax cuts

More recently, top tax rates have fallen. The top rate on investment income in the UK was reduced from 98 to 75 percent in 1979, from 75 to 60 percent in 1984, and from 60 to 40
percent in 1988. Tax cuts may have reversed the previous tendency for top income shares to be under-recorded in the tax statistics. 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 non-taxable employer-provided benefits or through a reduction in tax evasion" (2000, page 267). Gordon and Slemrod argue “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 6 below), but point out that the average increase from 1985 to 1994 is not significantly higher than the increase from 1978 to 1984 or from 1994 to 1998.

The same factors may have operated in the UK, although there are other reasons to expect the shares to be increasingly understated, including the replacement of earned income by stock options. From Figure 2, there appears to have been a jump in the UK in 1988, but this is modest in relation to the overall upward movement from 1979 to the end of the century. Income re-arrangement may have played a role, but it does not seem likely that it provides a full explanation.

7.3 Shares within shares

The estimated shares of top income groups depend on the reference totals for the total tax units and for total income. While the population figures are not subject to great error, there is a larger margin of error for the income totals, particularly in the earlier part of the century,
the war years, and 1918-1920. It is therefore interesting to consider the distribution within the top groups, since this relative distribution does not depend on the reference total for income (it does depend on the reference total for tax units). It also throws further light on the changing shape of the distribution. As we have seen, the equalisation in the first three-quarters of the century was not uniform across top income groups. Figure 4 shows the share of the top 0.1 percent within the top 1 percent, and the share of the top 0.05 percent within the top 0.5 percent. This demonstrates the concentration of income within the top groups: in 1937, for example, the top tenth of the top 1 percent had over a third of the total income of that select group. The time paths for the two groups are remarkably similar, and mirror those for the top income shares in Figure 2. Concentration within the top groups fell sharply over the first three-quarters of the century and then reversed. This conclusion is not affected by any errors in the estimation of the income reference total.

8 Comparisons with France and the US

As noted in the Introduction, it is interesting to compare the experience of the United Kingdom with that of other countries with similar data. Such an exercise immediately raises issues of comparability. The findings for each country reflect the specific income tax laws in operation; the format of the available data differs across countries; researchers make different assumptions in constructing reference totals for population and for total income. These considerations should be borne in mind when comparing the UK results presented here with those of Piketty (2003, Table A1) for France and of Piketty and Saez (2003, Table A1) for the United States.

The estimates for France start in 1915 and cover a larger fraction of the population. As may be seen from Figure 5, the share of the top 0.1 percent was higher in the UK before the
First World War, but the wartime fall was larger, so that in 1919 the shares of all three groups shown are close. The UK saw a greater recovery of top shares after the First War, and the difference was retained until 1945, with remarkably similar temporal patterns for the share of the top 0.1 percent. Since 1945, however, the story has been quite different. The UK had a marked downward movement from 1946 to 1978, but the French top shares were broadly stable from 1946 to 1967, so that by this time the top shares were smaller in the UK than in France, and the gap continued to widen up to 1978, despite the fall in top shares in France post-1968. The UK share of the top 1 percent moved from 2½ percentage points higher in 1949 to 2 percentage points lower in 1978. The difference was however rapidly reversed with the post-1978 rise in top shares in the UK. It is striking that France did not share this upward trend. The French shares were not constant; they rose and then fell. But in 1998 the top shares in France were virtually identical to those in 1978 – and not very different from those in 1945. The latter statement was approximately true of the UK in 1998, but the UK had reached the position by a different route – and in the UK the recent trend is strongly upwards.

The evolution of top income shares in the UK resembles more closely, at least in broad outline, that in the United States, shown in Figure 6. Again the pre-First World War share of the top 0.1 percent was higher in the UK, and this remained generally the case until 1939, although the US series exhibited wider fluctuations. By 1950 the top shares were very similar in the two countries, and there then followed a period when the series for the two countries moved closely together. In 1965, however, top shares in the UK renewed their downward fall, and by 1978 there was less concentration at the top in the UK: the share of the top 1 percent in the UK had fallen below that in the US by 2 percentage points. Since then, even though top shares in both countries began to rise around the same time, the gap has widened. By 2000, the share of the top 1 percent in the US was close to 17 percent, whereas that in the UK was 13 percent.
9 Conclusions

The UK income tax statistics, neglected in recent years, can be used to generate new evidence about top incomes, providing for the first time a series that spans virtually the whole of the twentieth century. The new data paint a picture that, if blurred in places, allows us to draw broad conclusions about long run developments. Before the First World War, income in the UK was highly concentrated, with the top 0.1 percent having more than 10 percent of total gross income. The degree of inequality was probably greater than in France and the US. Top income shares fell markedly in both World Wars, but this was not the only factor at work. While there was some immediate post war recovery, peacetime saw several periods of significant equalisation. The magnitude of the change may be need to be qualified in the light of fiscal re-arrangement, but there have been distinct periods of equalisation, notably the period from 1923 to 1933 including the Great Crash, from 1946 to 1956, and from 1965 to 1978 (with a pause in the early 1970s).

Taking the period from 1908 to 1978 as a whole, we have seen that the top income shares in the UK fell dramatically. The share of the top 0.1 percent declined from over 10 percent to 1¼ percent. Concentration within top income groups showed a similar move towards equality. There were correspondingly marked falls in top income shares in France and the US, but the equalisation was stronger in the UK in the period after the Second World War. The year 1979 was however a turning point for the top income shares in the UK. In the next two decades, the shares of top income groups recovered the ground lost since the Second World War, and have continued to do so since 1997. This is true of incomes net of tax, and of the concentration within the top groups. The UK has not yet returned to the extent of inequality
found before the Second World War, but the trend of the 1990s continued for a further decade would bring us close to the distribution of 1937.

Examination of the time series picture, and the comparisons with France and the US, suggest that explanations of the observed changes in the distribution of top incomes are likely to be complex and manifold. There is no steady trend, or smooth U-shape. There have been episodes of equalisation, followed by plateaux. Looking across countries, we see periods of convergence but also of divergence. Most dramatically, the top shares in France were virtually unchanged in 1998 compared with 1978, whereas the UK and the US had seen large increases. These differences may in part be attributable to policy, but we also need to look at the differing role, across time and across countries, of the forces affecting capital accumulation and the determination of top earnings.
Acknowledgements

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Colwyn Committee (1927) *Report of the Committee on National Debt and Taxation*. 


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UK observations shown by lines without markers.

Share of top x% in total income percent

France top 1%
France top 0.5%
France top 0.1%
UK top 1%
UK top 0.5%
UK top 0.1%

Figure 6 Comparison of shares of total personal income of top percentile groups in the UK and US 1908-2000
Appendix A  Sources of Supertax/Surtax and SPI Data

The super-tax/surtax are taken from published tabulations, mostly from the Annual Reports of the Commissioners of Her Majesty's Inland Revenue, referred to as AR, or in the more recent years from Inland Revenue Statistics, referred to as IRS.

Table A1 Sources for UK Super-Tax and Surtax Data

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<td>AR 1966-67</td>
<td>111</td>
</tr>
<tr>
<td>1965-66</td>
<td>AR 1967-68</td>
<td>86</td>
</tr>
<tr>
<td>1966-67</td>
<td>IRS 1970</td>
<td>48</td>
</tr>
<tr>
<td>1967-68</td>
<td>IRS 1971</td>
<td>53</td>
</tr>
<tr>
<td>1968-69</td>
<td>IRS 1972</td>
<td>53</td>
</tr>
<tr>
<td>1969-70</td>
<td>IRS 1973</td>
<td>56</td>
</tr>
<tr>
<td>1970-71</td>
<td>IRS 1974</td>
<td>24</td>
</tr>
<tr>
<td>1971-72</td>
<td>IRS 1975</td>
<td>22</td>
</tr>
<tr>
<td>1972-73</td>
<td>IRS 1975</td>
<td>22</td>
</tr>
</tbody>
</table>
Table A2 Sources of UK SPI Data

The tabulated SPI data are taken from AR or IRS or the special reports on the SPI, referred to as SPI, or one-off sources such as the report of the Colwyn Committee (1927).

<table>
<thead>
<tr>
<th>Income tax assessment year</th>
<th>Nature of survey</th>
<th>Source(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1918-19</td>
<td>special exercise</td>
<td>AR 1919-20, page 70</td>
</tr>
<tr>
<td>1919-20</td>
<td>special exercise</td>
<td>Colwyn Committee (1927), Appendix XIV</td>
</tr>
<tr>
<td>1962-63</td>
<td>annual</td>
<td>AR 1963-64, page 83 before adjustment for wives’ earnings deficiency and page 88; income after tax from page 83 after adjustment for wives’ earnings deficiency.</td>
</tr>
<tr>
<td>1963-64</td>
<td>annual</td>
<td>AR 1964-65, page 82 before adjustment for wives’ earnings deficiency and page 87; income after tax from page 82 after adjustment for wives’ earnings deficiency.</td>
</tr>
<tr>
<td>1966-67</td>
<td>annual</td>
<td>No correction made for investment income deficiency in SPI from 1966-67</td>
</tr>
<tr>
<td>1967-68</td>
<td>annual</td>
<td>AR 1967-68, page 96 before adjustment for wives’ earnings deficiency; income after tax from page 73.</td>
</tr>
<tr>
<td>1968-69</td>
<td>annual</td>
<td>IRS 1971, page 73; income after tax from page 73.</td>
</tr>
<tr>
<td>1969-70</td>
<td>quinquennial</td>
<td>IRS 1971, page 73; income after tax from page 73.</td>
</tr>
<tr>
<td>1972-73</td>
<td>annual</td>
<td>IRS 1974, page 42; income after tax from page 42.</td>
</tr>
<tr>
<td>1973-74</td>
<td>annual</td>
<td>IRS 1975, page 43; income after tax from page 43.</td>
</tr>
<tr>
<td>1974-75</td>
<td>annual</td>
<td>IRS 1976, page 36; income after tax from page 36.</td>
</tr>
<tr>
<td>1975-76</td>
<td>annual</td>
<td>IRS 1977, page 43; income after tax from page 43.</td>
</tr>
<tr>
<td>1976-77</td>
<td>annual</td>
<td>Data from now on relate to total income before deduction of allowable expenses such as mortgage interest</td>
</tr>
<tr>
<td>1979-80</td>
<td>annual</td>
<td>SPI 1977-78, page 16; income after tax from page 16.</td>
</tr>
<tr>
<td>Year</td>
<td>Type</td>
<td>Data Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1980-81</td>
<td>annual</td>
<td>SPI 1982-83, frequencies by ranges from page 8, page 9 for after tax income, but no information available on amounts.</td>
</tr>
<tr>
<td>1981-82</td>
<td>annual</td>
<td>SPI 1982-83, frequencies by ranges from page 8, page 9 for after tax income, and information on amounts by ranges supplied by Inland Revenue.</td>
</tr>
<tr>
<td>1982-83</td>
<td>annual</td>
<td>SPI 1982-83, page 10; income after tax from page 10.</td>
</tr>
<tr>
<td>1983-84</td>
<td>annual</td>
<td>SPI 1983-84, page 10; income after tax from page 10.</td>
</tr>
<tr>
<td>1984-85</td>
<td>annual</td>
<td>SPI 1984-85, page 10; income after tax from page 10.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Independent taxation introduced; data now relate to individuals.</td>
</tr>
<tr>
<td>1990-91</td>
<td>annual</td>
<td>IRS 1993, page 34; income after tax from page 34.</td>
</tr>
<tr>
<td>1993-94</td>
<td>annual</td>
<td>IRS 1995, page 34; income after tax from page 34.</td>
</tr>
<tr>
<td>1994-95</td>
<td>annual</td>
<td>IRS 1996, page 35; income after tax from page 35.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Micro data used for following years.</td>
</tr>
<tr>
<td>1995-96</td>
<td>annual</td>
<td>IRS 1997, page 34; income after tax from page 34.</td>
</tr>
<tr>
<td>1996-97</td>
<td>annual</td>
<td>IRS 1998, page 34; income after tax from page 34.</td>
</tr>
<tr>
<td>1997-98</td>
<td>annual</td>
<td>IRS 1999, page 36 for gross income (with top range from page 32); income after tax from page 32.</td>
</tr>
<tr>
<td>1998-99</td>
<td>annual</td>
<td>IRS 2000, page 41 for gross income (with top range from page 37); income after tax from page 37.</td>
</tr>
<tr>
<td>2000-01</td>
<td>annual</td>
<td>IR website, pi t05 1 for gross income; pi t03 1 for after tax distribution.</td>
</tr>
</tbody>
</table>
Appendix B  Construction of Reference Totals for Population


Total Population

The sources for total population are:

1900-1965 Feinstein (1972), Table 55, column 1, mid-year home population of Great Britain and Ireland (up to 1920) and Great Britain and Northern Ireland (from 1921), except years 1915-1920 and 1939-1945 when total population including those serving overseas;


Blue Book Estimates of the Total Number of Tax Units

The Blue Book totals for the number of tax units are used where these exist. The source is Atkinson and Micklewright (1992, Table BI1) except for the following taken direct from the national accounts National Income and Expenditure (NIE):

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1 A figure for the total number of tax units in 1938 appears in the Report No 7 of the Royal Commission on the Distribution of Income and Wealth (1979), page 23, but this is simply assumed to be equal to that in 1949 (see paragraph 2.26). For some years in the 1950s and early 1960s, the CSO extrapolated the distributional data from the most recent Survey of Personal Incomes. While the distributional data are open to question (Stark, 1972, page 19), the total number of tax units and total income (allocated and unallocated) contain independent information, and have been used here.
1952: NIE 1953, Table 16;  
1953 NIE 1954, Table 18;  
1955 NIE 1959, page 26;  
1956,1957 NIE 1960, page 20;  
1958 NIE 1961, page 20;  

**Constructed Total Tax Units**

The constructed figures for total tax units for the period prior to 1949 and 1984-1989 are the total number of males aged 15 and over, plus the total number of females aged 15 and over, less married females. The sources are:


1921: Mitchell (1988), Population and Vital Statistics Table 4 for population by age for England and Wales and for Scotland, and Table 5 for proportion of females married; figures adjusted to allow for Northern Ireland (NI) by multiplying by the ratio of the total NI population in 1922 to that for England and Wales and Scotland in 1921 from Mitchell (1988) Population and Vital Statistics Table 3.

1931: AAS 1935-46, Table 9, Great Britain figures adjusted proportionately to UK using Northern Ireland totals (Table 6).

1939: *National Register 1939*, Table M, Great Britain figures adjusted proportionately to UK using Northern Ireland totals (page ix).

1951: AAS 1981, Table 2.8.

1961: AAS 1992, Table 2.6.


The calculated number of units is expressed as a percentage of total population, and the percentages interpolated linearly, the results being multiplied again by total population to give figures for all years. Applying the resulting interpolated percentage to the total population
gives the constructed figures. For 1984 the constructed figure essentially coincides with the Blue Book figure; for 1949 the constructed figure is some 2 percent higher.

**Reference Total Units**

The final series is obtained as follows:

i) for 1908-1948, constructed tax units adjusted proportionately in line with the 1949 Blue Book figure (i.e. multiplied by 0.977);

ii) for 1949-1984, Blue Book figures (interpolated linearly for 1950, 1951, 1979, 1980, 1982 and 1983);

iii) for 1985-1989, constructed tax units.

**Assessment**

In the 1920s and first half of the 1930s, there was considerable interest in deriving numbers for the total occupied population, as a basis for estimating national income. Clark (1934), for instance, describes the way in which he moves from numbers of taxpayers to the size of the occupied population. Here we are interested in what can be learned about the reverse process: working back from the occupied population to the number of tax units. For the 1920s, Clark (1932, page 76) gives the number of incomes in the UK for 1924 as 19.065 million and for 1928 as 20.145 million. To obtain the number of tax units, we have to subtract married women in the occupied labour force and add retired or unoccupied men and single women. The constructed figures for tax units for 1924 and 1928 are 23.3 million and 24.0 million, but the *Census of Population 1921* indicates an adjustment of 4.4 million, so that there is close agreement. For the pre-First World War period, Bowley (1919, page 11) gives a total of 20.15 million for the total number occupied in 1911 (this includes Southern Ireland). This is in line with the constructed total of 22.8 million for all tax units in 1911, since calculations
from the *Census of Population 1911* suggests an adjustment of 2.4 million.

For 1938 the constructed total of tax units of 24.9 million is rather higher (by some 4 percent) than the estimate of 24 million of Lydall (1959, page 6), since he takes the population aged 18 or over (rather than 15 or over). Seers (1949, page 254) arrived at the still lower figure for 1938 of 23½ million by a different route:

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>units above income tax exemption level from tax records</td>
<td>10 million</td>
</tr>
<tr>
<td>employees, excluding wives, earning below exemption level</td>
<td>11½ million</td>
</tr>
<tr>
<td>self-employed below exemption limit</td>
<td>½ million</td>
</tr>
<tr>
<td>rentiers, excluding wives, below exemption limit</td>
<td>1½ million</td>
</tr>
</tbody>
</table>

The latter number seems rather low for the total of units who are retired or unoccupied and below the exemption level (in 1939 there were aged 65 and over in Great Britain 1.845 million males and 1.572 million non-married females (*National Register 1939*, Table M)). In contrast, the calculations given in the Beveridge Report show for Great Britain in 1939 a total of persons aged 15 and over, minus "housewives", of 27.6 million (Beveridge, 1942, page 123), which is higher than our estimate. The constructed estimate is therefore bracketed by these earlier figures.²

² An alternative approach is adopted by Barna (1945, page 65). He calculates that in 1937 each tax unit above the exemption limit has an average of 2.57 members. We can apply this to the surtax figures and then divide by the total population. The top 0.1 percent in 1938 would then be 47,500 people or 18,500 tax units; this may be compared with the 24,900 tax units we obtain. On the other hand, this has shifted the definition to a population basis (rather than tax units), which will give a different result if non-taxpayers have smaller family size.
Appendix C Construction of Reference Totals for Income

The construction of the total personal income (before tax) series differs from that in Atkinson (2002), although it uses many of the same sources, notably Feinstein (1972), and the national accounts (NIE). The aim is to arrive at a total formed by adding to the income of those covered by the income tax statistics an estimate of the income, defined in the same way, of those not covered. The estimates in Atkinson (2002) correspond to a more extensive definition of “allocated total income” made by the Central Statistical Office (CSO), which includes non-taxable income in kind and non-taxable social security benefits, of which the most important in the 1970s were social assistance, sickness/industrial injury benefits, NI disability pensions, invalidity pension and NI unemployment benefit (Ramprakash, 1975, page 82). (At that time, family allowances were taxable; child benefit, introduced in 1978, is tax-free.) In 1972, the total income covered by the Survey of Personal Incomes (SPI) was £40,778 million, to which the CSO estimated £2,538 million should be added for the taxable income of those not covered and £2,448 million for non-taxable income (Ramprakash, 1975, page 92). Here we make in principle the first, but not the second, of these additions.

The methods are described below, first for the period from 1945 and then for the period prior to 1945. For the years 1969 to 1975 we may compare the resulting estimates with the CSO estimates of added income. In 4 of the 7 cases, the estimates made here are below those of the CSO, and in 3 above. The mean of the CSO estimates is 3.6% higher. Given that we were limited to materials available over throughout the 50-year period, this degree of agreement seems reassuring.

Adjustments from 1945

The starting point is the total income reported in the SPI, which is “total net income” until 1974 and then “total income”, from the sources given in Table A2. The 1980 figure is
interpolated logarithmically using personal sector gross income in 1979 and 1981. Where the SPI totals are not available, we take the “actual income” reported by the Inland Revenue Annual Reports (AR) less estimated undistributed profits. The sources are: 1945-51 from AR 1952-3, page 46; 1952-60 from AR 1961-2, page 43; 1961-2 from AR 1965-6, page 50. Undistributed profits are taken as the average of those in year t and year (t-1) from Feinstein (1972), page T30 (except years 1944 and 1945 – see below).

To this must be added the adjustment for those not covered by the tax returns. The CSO estimates for 1972 show a total of £100 million adjustment for the under-coverage of earned income. This is less than a quarter of the difference between the SPI total and the national accounts figure for wages, salaries and pay of HM Forces, and is only 0.3% of the latter figure. It might be thought that the adjustment should be higher in the earlier post-war years, but the totals for 1949-50, 1954-5 and 1959-60 suggest that the SPI figure is within 5% of the national accounts figure, and the majority of that difference is likely to be attributable to under-recording of those covered. In view of this, we make no adjustment for earned incomes post-1945. It is also assumed that dividend and interest income is covered at source.

The elements allowed for are therefore (a) NI retirement and widows’ pensions and (b) occupational pensions, which together accounted for 94% of the adjustment for under-coverage in 1972/73. The two items are treated separately for all years where the SPI totals distinguish them: 1962-2000, except 1981. The adjustments are obtained by subtracting the totals recorded in the SPI from reference totals. The sources of the reference totals are:

Occupational pensions: Direct estimates of the total paid in occupational pensions are only available for a number of years. The NIE total refers to “pensions and other benefits from life assurance and superannuation schemes”, which includes items such as lump-sum payments on retirement or death, and refunds of contributions, which are not treated as part of taxable income. This total cannot therefore be used unadjusted. For the 1970s the CSO made estimates of the amounts of occupational pensions. The sources are (for tax years): 1972-3 from NIE 1975, page 109; 1973-4 from NIE 1976, page 111; 1974-5 from NIE 1977, page 115; 1975-6 from NIE 1978, page 119; 1976-7 from NIE 1979, page 115; 1977-8 from NIE 1980, page 110. The new system of national accounts SNA 1993 allows the total pensions in payment to be distinguished: sources (calendar years) 1990 and 1991 from NIE 1999, page 209, 1993-2000 from NIE 2001, page 223. The calendar year figures were converted to a tax year basis by taking 0.75 of the figure for year t and 0.25 of the figure for year (t+1). Inspection of these figures showed that pensions in payment were around 55% of the national accounts total in the 1970s but had risen to around 70% in 1990, as would have been expected as pension schemes matured. A proportion of 55% was taken prior to 1978 and interpolated linearly between 55 and 70% between 1978 and 1990. The actual CSO figures were used for 1991-1998.

Remaining Years: The SPI years 1949, 1954 and 1959 have totals for all pensions, and these were used with the sum of the reference totals described above. The figures for 1945-1948 were extrapolated backwards from 1949 using the total for NI retirement and widows’ pensions. The adjustments in the SPI years were expressed as a percentage of the total NI and occupational pensions, and the percentages interpolated to give figures for 1950 to 1953, 1955 to 1958 and 1960 and 1961. The figure for 1981 was interpolated using the total for NI retirement and widows’ pensions.

It is interesting to compare the resulting totals with total personal sector gross income. The adjusted total shows a distinct decline, from a figure in excess of 80% at the start of the 1950s to below 75% in the second half of the 1990s. Compared with the totals in Atkinson (2002), those employed here are smaller, as would be expected with a less extensive definition, by an amount which is around 5% in the first part of the post-war period and which rises to around 10% in the second half, although there is considerable variation and in some years the difference is 15%.

Adjustments Prior to 1945

The starting point is the total “actual” income assessed by the Inland Revenue for income tax purposes. It should be noted that, although the UK income tax administrative data at
this time provided no distributional information, the totals can be used. The total refers to gross income assessed less (a) the incomes of those below the exemption limit included in the assessments, (b) the income of charities, colleges and other non-profit institutions, (c) dividends paid to non-residents, and (d) allowances for depreciation. From this we subtract that part of profits not distributed by companies and add:

- wages not assessed
- salaries below the exemption level
- self-employment income below the exemption level
- dividends and other capital income below the exemption level
- contributory NI retirement and widows’ pensions.

According to Bowley and Stamp, the income reviewed for the fiscal year commencing in April of year \( t \) may be treated as “virtually identical” with income for the calendar year \( t \): “it would be identical for Schedules A and B, and is closely similar for Schedules C and E” (1927, page 16). The main difference concerns Schedule D, which was then assessed on a basis of an average of the preceding 3 or 5 years. This latter treatment was changed to a one-year lag in 1926 (AR 1927-28, page 56). According to Clark, “the actual income for the calendar year 1928 [is] the sum of the assessments under Schedules A, B and C for 1928-9 and under Schedules D and E for 1929-30” (1932, page 32). We cannot here make a separate adjustment for the latter schedules, except when subtracting undistributed profits.

Details of adjustments:

Assessed income. The sources are (years refer to income tax years commencing in April) 1908 from AR 1913-4, page 100; 1909-1918 from AR 1919-20, page 62; 1919-1923 from AR 1927-8, page 73; 1924-28 from AR 1933-4, page 63; 1929-35 from AR 1938-39, page 56; 1936-1942 from AR 1945-6, page 52; 1945 from AR 1946-47, page 65; 1943 and 1944 linearly interpolated.

Wages assessed. The wages included in the tax assessments are shown for most years in the sources given above. (It should be noted that a distinction is drawn between “wages” and “salaries”.) 1943-45 calculated as same % as in 1942. Wages assessed prior to 1918 interpolated using the 1911 figure from Feinstein (1972, page 173), and information on the exemption limit. Where the exemption limit was reduced by a factor \((1+x)\), the amount of wages assessed is assumed to rise according to the formula \((1+x)^4\).
**Undistributed profits.** Post-1927 figure for year (t-1), previously average of years (t-1) and year (t-2). 1920-1938 from Feinstein, 1972, page T30; 1912 from Colwyn Committee, 1927, page 18; other years prior to 1920 interpolated using gross trading profits of companies and income from self-employment (undivided total) from Feinstein, 1972, page T5; 1939-1944 taken as equal to the 1938 figure.

**Total wages.** Total wages from Feinstein, 1972, page T55. The figures are reduced by 5% to allow for the fact that some wage income would have escaped the attention of the Inland Revenue. The percentage deducted is a matter of judgment, but seems reasonable in the light of the post-1944 figures after the introduction of PAYE (collection at source).

**Self-employment and dividends.** The pre-1918 figures for salaries and self-employment income are based on the estimates for 1911 given by Bowley (1937, page 81). The total of £264 million for salaries and self-employment earnings is close to the figure of £285 million given by Cannan et al (1910, page 64). They are extrapolated backwards to 1907 and forwards to 1917 using the series for salaries from Feinstein (1972, page T55) and self employment income from Feinstein (1972, pages T5 and T6), reduced when the exemption limit changed using exponent of 3 for salaries and 1.5 for self employment income, allowing a one year lag when the exemption limit was lowered from £160 a year to £130 in 1915-16. The figure of £50 million for “Dividends and other capital income” below the tax threshold is taken from Bowley (1937, page 81). It is identical to the figure given by Cannan et al (1910, page 64) for 1911, and it is assumed to apply to all pre-First World War years.

**Retirement pensions.** The figures relate to the contributory pensions first introduced in 1926. Figures up to 1934 from Clark (1937, page 141); 1935-38 from *Hansard* 14 December 1939, column 1316; 1939-44 interpolated from the figure of £95 million in Minister of Reconstruction (1944, page 52).

It is again interesting to compare the resulting totals with total personal sector gross income. In Atkinson (2002), the totals were taken as 88.5% of personal sector gross income prior to 1938. The new totals calculated here are higher than this proportion in the period before the First World War, by some 5% on average. They are then below 88.5% for the rest of the period, as would be expected with a less extensive income concept. For 1938, the total is £4,320 million, compared with the CSO total for allocated income of £4,463 million (i.e. about 3% less). If the new figures are more consistent over time, then Atkinson (2002) may have overstated the downward trend in top income shares.

**Net of Tax Incomes**
From the totals for gross income are subtracted the figures for total income tax recorded in the sources listed in Table A2.

References for Appendices


