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Deriving Long-Run Inequality Series from Tax Data*

ANDREW LEIGH

Social Policy, Evaluation Analysis and Research Centre, Research School of Social Sciences, Australian National University, Canberra, Australia

Prior to the last three decades, regular surveys on household income were rare or non-existent in many developed countries, making it difficult for economists to develop long-run series on income distribution. Using taxation statistics, which tend to be available over a longer time span, I propose a method for imputing the incomes of non-taxpayers, and deriving the underlying distribution of income. Because taxation statistics are typically disaggregated by gender, it is possible to derive separate income distribution series for men and women in countries where individuals file separately. I show that over the past four decades, the distribution of adult male incomes and the distribution of family incomes are highly correlated. Applying this method to Australia, I develop a new annual series for inequality from 1942 to 2001. Inequality fell in the 1950s and the 1970s, and rose during the 1980s and 1990s – a pattern similar to that in the UK.

In most developed countries, annual income surveys did not appear until the last 20–30 years. Before this, national statistical agencies frequently changed their definitions of income, while the surveys themselves were conducted intermittently. Consequently, researchers analysing long-run trends in inequality tend to find themselves looking through a glass, darkly.

An alternative to survey data is to compute inequality using tabulated statistics from income tax returns. During and immediately after World War II, the income tax in most industrialised nations evolved into mass taxes, payable not only by the very rich, but also by ordinary workers (Webber and Wildavsky, 1986). Decades before annual income surveys came into existence, taxation statistics can potentially provide a picture of earnings across most of the labour force.

Over the past few years, an emerging literature has made use of statistics from taxation returns to measure top income shares in a variety of countries (top income series for Australia, Canada, France, Germany, Ireland, the Netherlands, New Zealand, Switzerland, the UK and the US will be presented in Atkinson and Piketty, forthcoming). Combining taxation statistics with control totals from the national accounts, these studies have calculated the fraction of income that goes to the top 10 per cent, 1 per cent, 0.1 per cent and so on, from the point at which these taxes were first implemented (typically around World War I). However, the conventional wisdom holds that taxation data cannot be used to analyse the whole income distribution. In particular, the necessity of imputing incomes to non-taxpayers is often regarded as a fatal flaw in the use of taxation statistics.

This paper proposes a new method for using taxation statistics to derive a measure of inequality across the entire population, where long-run income distribution statistics are unavailable. The key income distribution measure of interest to economists is the

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Correspondence: Andrew Leigh, Social Policy, Evaluation Analysis and Research Centre, Research School of Social Sciences, Australian National University, Canberra, ACT 0200, Australia. Email: andrew.leigh@anu.edu.au.

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distribution of family incomes (adjusted for family size). I show that this measure is closely proxied by the distribution of incomes among adult males, and that the gap between the two measures has remained constant over the past four decades, despite changes in family composition and the labour force participation of women.

Using gender-disaggregated taxation statistics from Australia, where individuals file separately, I form a measure of income distribution among adult males from 1942 to 2001. In order to take account of non-taxpayers, I take advantage of the fact that for a number of years, both taxation and census data are available. By subtracting the density function for the distribution of male taxpayers from the density function for all adult males, it is possible to derive a function for the distribution of non-taxpayers, expressed in terms of average income. These functions are then used to impute incomes for non-taxpayers in all years, and produce annual income distribution figures for Australia from 1942 to 2001.

Australia makes a useful case study for calculating income distribution figures because of the paucity of evidence on income distribution in the immediate post-war decades. From the end of World War II until 1968, no official survey asked Australian citizens about their income. In contrast, approximately 80 per cent of Australian men paid tax during this period, making these data a potentially rich source of information on the distribution not only of male income, but also of family income. Although limited use has been made of taxation statistics to measure Australian income distribution (Brown, 1957; Hancock, 1971; Berry, 1977), I am unaware of any attempt to construct income distribution series for all the years since the introduction of the federal income tax.

The remainder of the paper is organised as follows. Section I outlines the method for calculating inequality figures from taxation data, and deals with the main problems that arise in this process. Section II presents the inequality figures, in the form of the gini coefficient, the 90/50 ratio, and the interquartile range. Section III briefly compares these data with what is known about the distribution of household income in Australia in the past two decades, and about long-run trends in inequality in other nations. Section IV analyses how taxation affected inequality in Australia, and section V concludes the paper.

I Method

At the outset, it is important to consider whether taxation statistics can serve as a workable substitute for survey evidence on income distribution. Although there is much to be said in favour of survey data, it should first be noted that taxation statistics do have two advantages over surveys. First, taxation statistics provide a more accurate sampling of top incomes, as surveys may under-sample high earners (Moore *et al*., 2000), and because surveys that use income 'bands' tend to have a cut-off lower than the top band in tabulated taxation statistics.[1] Second, taxation data are generally available on an annual basis, although censuses are irregular and comprehensive labour force surveys did not emerge until much later. For example, the U S Current Population Survey started in 1962, the British Labour Force Survey began in 1972, and the Australian Employee Earnings and Hours Survey commenced in 1974 (though it was only conducted biennially during the 1980s and 1990s).[2]

However, taxation statistics also have three potential drawbacks. First, in a country where the taxation unit is the individual (such as Australia, or the UK since 1990), measures of income distribution across individuals may not provide a sufficiently precise proxy for income distribution across families or households. Second, because not everyone files a tax return, taxation statistics provide an incomplete picture of income distribution across the population. And third, taxation statistics are broken into differing numbers of bands in successive years, so some correction to the inequality measures is necessary. These issues are discussed in turn in this paper.

(i) Using the Distribution of Male Incomes to Proxy Inequality Between Families

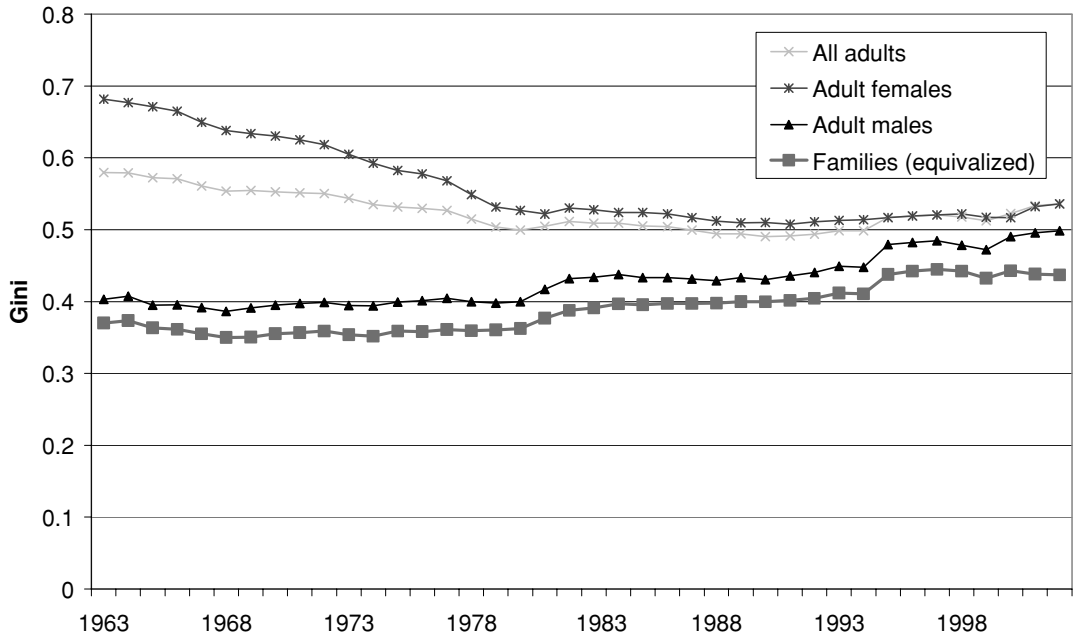
While analysing inequality in a society, the most commonly used measure is the distribution of incomes across families or households, which assumes complete income-sharing within the income unit. So as to take account of economies of scale in household expenditures, incomes are then adjusted by the size of the income unit. Although complex equivalence scales are sometimes used, a common method is simply to divide total income by the square root of the number of family/household members (this is the technique used, for example, by the Luxembourg Income Survey).[3] Another issue is whether to treat each income unit as a single observation, or whether to assign the

[1] In the case of Australia, the top income band in the 1996 census was 'over $78 000'; whereas the top band for taxation statistics in the financial year 1995–1996 was 'over $1 000 000'.

[2] Australia has also had a monthly Labour Force Survey since 1978. But unlike its US and UK counterparts, the survey does not ask respondents about their incomes.

[3] See www.lisproject.org/keyfigures/methods.htm

FIGURE 1
How Closely do Measures of Inequality Track One Another? (Using US CPS Data)



same equivalised income to each person in the income unit, and then treat each person as a separate observation. Here, I use the latter method, on the basis that the former underweights persons living in larger households.

How does this ideal measure of inequality – equivalised family incomes – compare with the distribution of male incomes? In the 1950s and 1960s, when female labour force participation was relatively low, it is reasonable to think that the two measures of income distribution would have been quite close to one another. But changes over the past generation could conceivably have shifted the balance. Rising female labour force participation, greater assortative matching and changing household composition could conceivably have caused male inequality and family inequality measures to diverge.

Determining how well male inequality proxies family inequality is ultimately an empirical question. Answering, it requires data on both male incomes and family incomes over a generation or more. I therefore briefly turn away from Australia, and instead use data from the US – another country that has experienced many of the same demographic shifts as Australia over recent decades (e.g. rising female labour force participation, high immigration rates and changing family composition).[4] Using microdata from the US Current Population Survey from 1963 to 2002, I calculate the 'ideal' measure of inequality – equivalised family income.[5] I then calculate three possible proxies – inequality among adult males (those aged 20 years or more), inequality among adult females and inequality among all adults. These four series are plotted in Figure 1.

[4] For example, average household size fell from 3.3 (1960) to 2.6 (2000) in the US, and from 3.6 (1961) to 2.6 (2001) in Australia. Women as a share of all employed persons rose from 33 per cent (1960) to 46 per cent (2000) in the US, and from 23 per cent (1954) to 45 per cent (2003) in Australia.

[5] Family income is equivalised by dividing by the square root of the number of family members. All figures are person-weighted, and all negative and zero incomes are recoded to $1 (as most inequality measures can only be calculated from positive incomes). The inequality measure used here is the gini coefficient, but the results are comparable if other measures of inequality, such as the Atkinson indices or the coefficient of variation, are used instead. I discard data from the March 1963 Current Population Survey (for incomes in 1962), as it appears to be contaminated by an unrealistically number of high incomes.

As this chart shows, the gap between male inequality and family inequality is smaller than that between female inequality and family inequality, or between individual inequality and family inequality (although male inequality and family inequality did diverge slightly in the years 2000–2002). Over the 40-year time span, male inequality is on average 4 gini points above family inequality, and the gap between the two varies very little (the standard deviation of the difference is just 0.6 gini points). Regressing family income inequality on male inequality returns a coefficient of 0.92 (SE = 0.04), with an insignificant constant. In contrast, both female inequality and individual inequality are considerably further away from family inequality, and the standard deviation of either gap is an order of magnitude higher. Of course, it is possible that the pattern that holds true over the past 40 years does not hold for the full post-war period, or that the pattern which holds true for the US does not hold true for Australia. But the evidence from US inequality measures does seem to suggest that during the period in question, adult male inequality will be a good proxy for family inequality, and a considerably better proxy than any other measure of individual inequality. Moreover, as the results in section III will show, male inequality and household inequality in Australia followed a similar pattern over the period 1981–2000.

(ii) Incorporating Incomes of Non-Taxpayers

In calculating measures of inequality, some assumptions must be made about the accuracy of tax returns as a measure of actual income. Taxation statistics suffer from under-reporting of incomes and from outright avoidance (those who earn more than the taxable threshold, but do not file a return). In addition, some people are not required to file a return, as their incomes fall below the taxable threshold (because Australia has no earned income tax credit, and over-withholding is minimal, there are few incentives for those below the threshold to file a return).

Unfortunately, there is little relevant Australian evidence on the extent of under-reporting and tax avoidance in Australia. In the US, Bloomquist (2003) estimates that under-reporting of income during the period from 1980 to 2000 amounted to approximately 3–5 per cent of total income, and that under-reporting as a fraction of total income decreased slightly as income rises. Christian (1994) also finds a non-trivial degree of over-reporting of incomes, which suggests that this may partially offset the under-reporting bias.

With regard to those who are not required to file income tax, it is possible to be somewhat more precise. Since the introduction of a federal income tax in 1941, all Australians citizens and residents with incomes over the taxable threshold have been required to file income tax returns.[6] Annual tabulations of these returns have been published, with a 1- or 2-year lag, by the Commissioner of Taxation (see Leigh, 2004 for details).

Figure 2 shows taxpayer to population ratios for males and females aged 20 years or more. By the end of World War II, over half of Australian men filed a tax return, and three-quarters did by the end of the 1940s.[7] This figure remained above 90 per cent until 1970, and has fluctuated around 70–80 per cent since. (In contrast, the fraction of adult women who paid tax only rose above 50 per cent in the mid-1980s, making it unfeasible to impute incomes to non-taxpaying women.)

Figure 2 also shows the standard taxable threshold as a fraction of average male income. In 1942, the threshold was 33 per cent of average male income (down from 70 per cent the year before). Since then, the taxable threshold has remained at about this level or below.[8] Note that over the past few decades, the fraction of adult males paying tax has declined, despite the fact that the taxable threshold as a fraction of average income has moved downwards. Most recently, this may well be due to a policy change implemented in the 1997–1998 tax year, under which adults at or above the age threshold for the aged pension are subject to a higher taxable threshold. For example, in the 2003–2004 tax year, the taxable threshold for males aged 65 or over was $16 806 for married individuals and $20 500 for single individuals.

I now embark upon imputing incomes to those males who do not pay tax. To gauge the distribution of non-taxpayers, I compare the distribution of male income in taxation statistics with those from seven official surveys – income distribution surveys carried out in 1968–1969 and 1973–1974, and censuses in 1976, 1981, 1986, 1996 and 2001.[9] In each of the seven

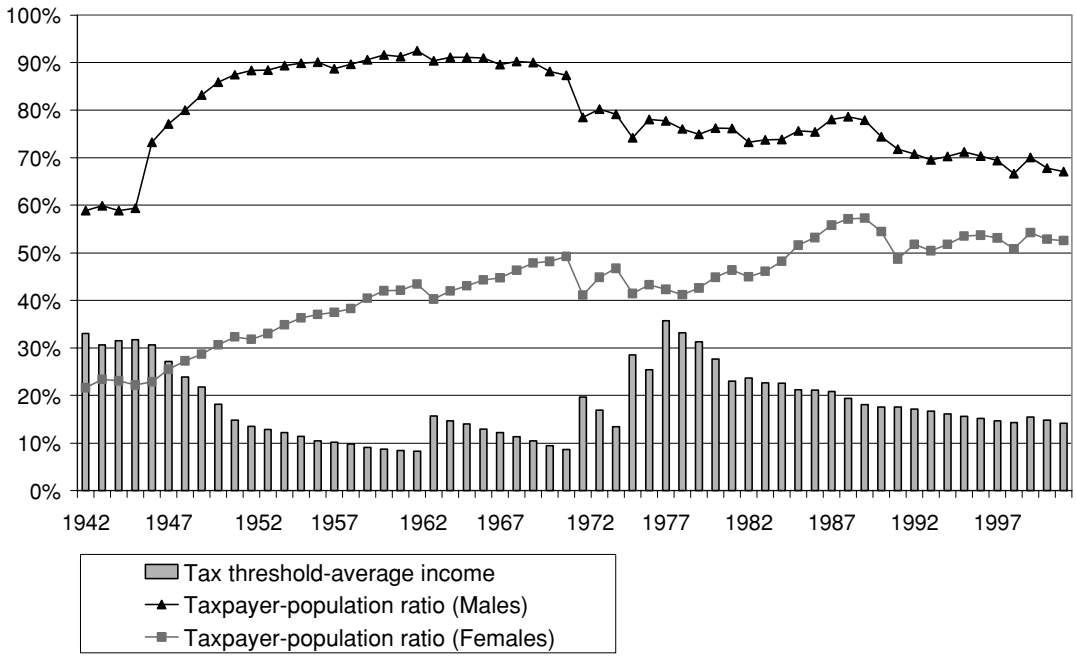
[6] The Australian taxation year runs from July 1 to June 30, so for simplicity, I will refer to the financial year 1941–1942 simply as 1941.

[7] Prior to 1941, taxation statistics can be used to measure the distribution of top incomes (see Atkinson and Leigh 2005), but not the distribution as a whole.

[8] For more detail on the history of income taxation in Australia, see Smith (1993, 2001).

[9] These surveys asked for all income, including transfers. Income ranges were typically defined by both weekly and annual earnings (with the annual range being 52 times the weekly range). The 1991 census is excluded because it did not include an option to either record nil income (as did other censuses), or a near-zero income (the 1968–1969 and 1973–1974 surveys both had bottom bands equivalent to 0–3 per cent of average male earnings, whereas the lowest band in the 1991 census was substantially higher: 0–10 per cent of average earnings).

FIGURE 2
Taxpayers in Australia



Population is those aged 20 years and over. Average male income for 1941–1942 to 1944–1945 is average earnings in manufacturing (Withers et al., 1985); 1945–1946 to 1980–1981 is the average earnings per employed male (Withers et al., 1985); 1981–1982 to 1983–1984 from Reserve Bank Economic Statistics, Table 4.18; and 1984–1985 onwards is from Australian Bureau of Statistics 6302.0

surveys, the definition of income is essentially the same as that published in the taxation statistics, leading one Australian Bureau of Statistics report to conclude that 'both sets of data are relatively comparable' (Gibbs and Knight, 2000, p. 14).[10]

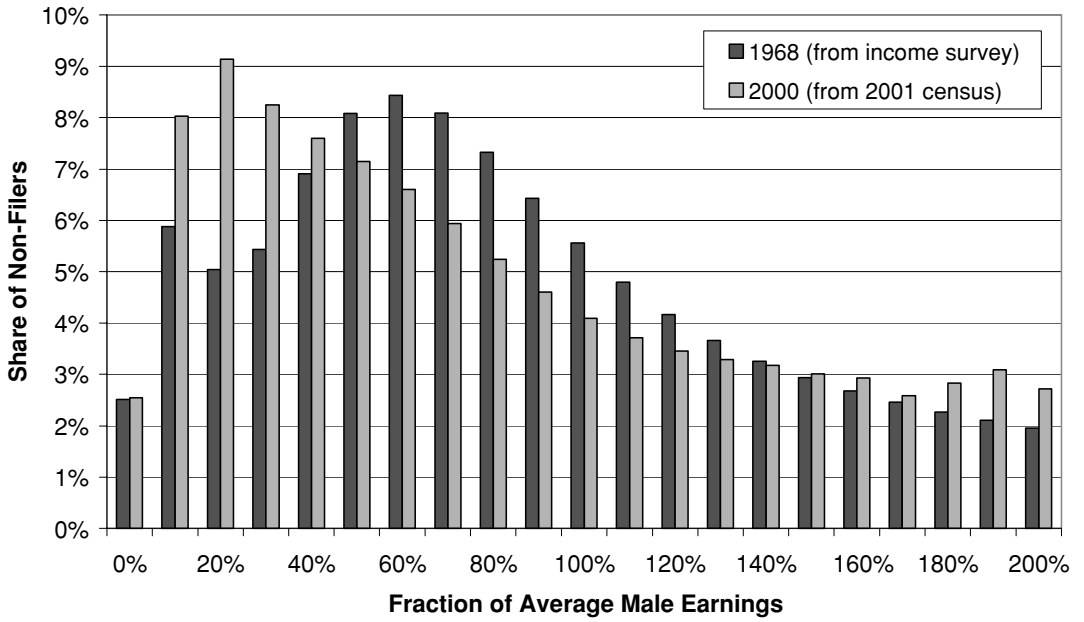
To determine the income distribution of non-taxpayers, a kernel density function is estimated for the seven surveys and their corresponding tax years (e.g. the 2001 census and the 2000–2001 tax year). The function is estimated at 21 points – starting at zero, and continuing in 10 per cent intervals to twice average male income. As the top income band in the income surveys is approximately twice the average income, it is not possible to reliably estimate the kernel density functions beyond this point.[11]

By normalising the area under the kernel density function to 1, and multiplying by the relevant population, it is possible to obtain an estimate for the number of males at zero earnings, 10 per cent of average earn-

[10] In particular, both the income surveys and taxation statistics include transfers and self-employment income. One potential difference could arise from the wording of the census income question in the 1980s and 1990s. In these years, the census asked for the 'the gross income (including pensions and allowances) that the person usually receives each week from all sources'. Although the income ranges are given in both weekly and annual amounts, individuals might interpret this question as asking for median weekly income, not mean weekly income. In this case, an individual with 'lumpy' income might report a lower figure in the census than on their tax return.

[11] A Gaussian kernel density function is used, though results do not vary significantly with an Epanechnikov kernel function. The most important decision in using a kernel density function is the bandwidth. The standard formula for the optimal bandwidth is $w = 0.9 \times \text{SD} \times n^{-0.2}$, where SD is the standard deviation of log income, and n is the number of bands. Sala-i-Martin (2002) reports that SD is 0.6 in most European countries, and 0.9 in the US. Given that Australian income inequality is somewhat below that of the US, SD = 0.8 is assumed. The number of income bands in the different surveys and corresponding tax tables varies between 14 and 38, and averages 25, so I set $n = 25$. This results in a bandwidth of 0.37.

FIGURE 3
Distribution of Non-Filers Based on Difference Between Taxation and Census Data



ings, 20 per cent of average earnings and so on up to 200 per cent of average earnings. By comparing the number of males under the tax distribution with the number of males under the survey distribution, I can estimate the distribution of non-taxpayers in a given year.

Figure 3 shows the distribution of non-taxpaying males, relative to average income, for the first and last surveys: 1968 and 2000. Because the taxable threshold was lower (as a fraction of average income) in 1968 than in 2000, it is not surprising that the typical non-taxpayer is also richer (as a fraction of average income) in 1968. In each case, the distribution of non-taxpayers is approximately log-normal. In both years, approximately 2 per cent of non-taxpaying males actually report zero incomes – indicating that setting the incomes of non-taxpayers to zero would substantially overstate the extent of inequality.

From 1968 onwards, I impute incomes to non-taxpayers using the survey that is closest in time to the tax year in question. For example, the distribution of non-taxpayers derived from combining the 2001 census with the 2000–2001 tax statistics is used to impute incomes for non-taxpayers not only in 2000–2001, but also in 1998–1999, 1999–2000 and 2001–2002. Because no official income surveys were conducted from World War II to 1968, I use the 'non-taxpayer function' from 1968 to estimate the income distribution of non-taxpayers in earlier years. Although this is the only available option, there is indeed a potential for bias if the income distribution of non-taxpayers was markedly different in prior years. Although there is no way of determining the extent of such bias, it is limited by the fact that there is less imputation to be done in the 1950s and 1960s – as nine out of 10 male adults paid tax during these decades.

Based on this distribution, I impute earnings for non-taxpayers in all the years. For example, in 1950–1951, there were 2 731 100 males aged 20 years or over in Australia, but only 2 410 836 male taxpayers. Using the average annual male income in 1950–1951 ($576 in current dollars), and the distribution of non-taxpayers from the 1968 income survey, the 320 264 non-taxpaying males were allocated incomes between zero and $1152 (twice average male income).[12]

[12] Some readers of an earlier version of this paper queried whether it would not be better to assume a small level of tax avoidance, and then that all non-taxpayers had incomes at or below the taxable threshold. In the working paper version of this paper (Leigh, 2004), I experiment with three alternative specifications, in each case assuming that 5 per cent of adult

(iii) Taking Account of Differing Numbers of Taxation Bands

Most of the measures of inequality shown herein will be presented in terms of the gini coefficient, because it is the most commonly used measure of inequality in the literature. However, taxation statistics are presented in varying numbers of bands, ranging from 18 to 38. As inequality is negatively correlated with the number of bands (Dixon *et al*., 1987; Mills and Zandvakili, 1997), the gini is first estimated using a standard non-parametric formula, and then multiplied by $N/(N-1)$, where N is the number of bands (for more details on this correction, see Deltas, 2003; Leigh, 2004).[13] Therefore, where P_i is the fraction of the population in group i, and S_i is the share of total income in group i and all groups below, with $S_0 = 0$, the formula used to calculate the gini is:

$$\text{Gini} = \frac{N}{N-1}\left[1 - \sum_{i=1}^{N} P_i\,(S_i + S_{i-1})\right].$$

A few other minor issues arising from the use of taxation statistics to measure income distribution are addressed in the working paper version of this paper (Leigh, 2004, Appendix 3).

males do not pay tax, and then that: (i) all non-taxpayers have zero incomes; (ii) all non-taxpayers earn precisely the taxable threshold amount; or (iii) all-non filers have incomes below the taxable threshold, and the observed distribution of taxpayers is a truncated lognormal distribution. The trends from these three alternative specifications are qualitatively consistent with the specification presented in this paper, in that they show a decline in inequality in the immediate post-war years, and a rise in the 1980s and 1990s. But the alternative specifications do not accord with the primary specification with respect to the 1970s, and show a rise in inequality in the 1980s which is substantially larger than that recorded in any other surveys. For this reason, the census imputation method is preferred, and it is this specification that I will focus on in this paper.

[13] A substantial literature exists on the construction of inequality indices from grouped data (see, for example, Gastwirth and Glauberman, 1976; Slottje, 1990; Ortega *et al*., 1991; Ryu and Slottje, 1996; Wodon and Yitzhaki, 2003). Much of the discussion has centred around the question of whether parametric or non-parametric estimation of inequality indices is preferable, with most papers advocating a parametric approach. In the present case, however, a non-parametric approach is favoured, as it is then possible to adjust for the bias induced with changes in the number of bands from year to year.

II Inequality Trends

Table 1 shows the pre-tax and post-tax male gini coefficients, based on taxation statistics for filers, and imputing incomes for non-taxpayers. In addition, Table 1 also presents two other measures of income distribution, which are mostly unaffected by imputation – the 90/50 ratio and the interquartile range. These ratios are calculated using linear extrapolation, and (unlike the ginis) are not adjusted to account for the number of income bands.

Figure 4 provides a graphical depiction of these trends, indicating that male pre-tax inequality during World War II stayed relatively stable, and then fell steadily during the 1950s, except for a brief spike upwards during the wool boom of 1950–1951.[14] During the 1960s, inequality remained flat and fell again during the early-1970s. In 1978, inequality in Australia was at its nadir. At this point, it might have been possible to argue that Australian inequality traced out a Kuznets curve path (Kuznets, 1955), but the pattern since has rendered this untenable. From the late-1970s onwards, inequality has been on a steady upwards trajectory. Australia today is more unequal than at any time in the post-war era, with the exception of the brief 1950–1951 spike. The post-tax gini has followed a relatively similar path to the pre-tax gini.

Figure 5 charts the interquartile range and 90/50 ratio. Both appear to have followed a somewhat similar path to the gini. Of note is the fact that over the past two decades, the interquartile range has risen more rapidly than the 90/50 ratio.

III Comparison with Other Inequality Data

Having constructed a series of male inequality data, it is instructive to compare these figures with the recent data on income distribution in Australia, and long-run inequality trends in other developed countries. The leading studies of Australian inequality are that of Butlin (1983), who uses variation in minimum wages across industries, and finds a fall in inequality, as measured as the skilled/unskilled wage ratio, from 1901 to 1968 (consistent with the series presented above). Hancock and Moore (1972) use similar sources, but conclude that although occupational wage dispersion fell in the 1930s and 1940s, it rose from 1953 to 1966

[14] Some readers of an earlier draft questioned whether the 1950–1951 spike might be an error in the data. It is worth noting that this shock is also reflected in other Australian economic statistics. For example, nominal GDP in financial year 1950–1951 was 33 per cent higher than in the previous year.

TABLE 1
Inequality Among Male Adults in Australia

Year	Interquartile range (75/25)	90/50 ratio	Gini (pre-tex)	Gini (post-tax)
1942	1.97	1.77	0.348	0.235
1943	1.96	1.77	0.349	—
1944	1.96	1.76	0.341	0.231
1945	1.93	1.79	0.344	0.237
1946	1.81	1.77	0.336	0.236
1947	1.77	1.78	0.355	0.262
1948	1.73	1.77	0.358	0.265
1949	1.73	1.80	0.364	0.272
1950	1.69	1.85	0.427	0.303
1951	1.69	1.72	0.348	0.227
1952	1.65	1.72	0.341	0.235
1953	1.65	1.70	0.328	0.230
1954	1.68	1.69	0.320	0.235
1955	1.69	1.75	0.320	0.236
1956	1.69	1.81	0.327	0.240
1957	1.70	1.78	0.315	0.234
1958	1.69	1.80	0.304	0.243
1959	1.71	1.78	0.308	0.247
1960	1.74	1.77	0.309	0.247
1961	1.74	1.76	0.309	0.249
1962	1.79	1.86	0.315	0.252
1963	1.75	1.85	0.312	0.249
1964	1.77	1.80	0.305	0.241
1965	1.77	1.78	0.303	0.242
1966	1.80	1.82	0.307	0.245
1967	1.82	1.81	0.308	0.247
1968	1.87	1.79	0.309	0.247
1969	1.89	1.80	0.312	0.248
1970	1.88	1.80	0.310	0.250
1971	1.89	1.80	0.308	0.249
1972	1.79	1.76	0.282	0.225
1973	1.82	1.80	0.291	0.229
1974	1.86	1.73	0.293	0.209
1975	1.73	1.73	0.266	0.181
1976	1.79	1.72	0.270	0.187
1977	1.82	1.71	0.271	0.194
1978	1.74	1.70	0.261	0.180
1979	1.83	1.72	0.267	0.190
1980	1.92	1.72	0.278	0.201
1981	1.92	1.75	0.280	0.204
1982	1.94	1.78	0.283	0.207
1983	1.99	1.78	0.289	0.213
1984	2.01	1.79	0.295	0.207
1985	2.06	1.81	0.302	0.207
1986	2.07	1.82	0.309	0.211
1987	2.09	1.84	0.325	0.234
1988	2.20	1.90	0.349	0.263
1989	2.20	1.93	0.336	0.242
1990	2.31	1.97	0.338	0.254
1991	2.27	2.00	0.342	0.259
1992	2.32	2.00	0.348	0.265
1993	2.34	2.03	0.350	0.267
1994	2.24	2.00	0.353	0.255
1995	2.35	2.05	0.359	0.283
1996	2.41	2.08	0.365	0.288
1997	2.46	2.06	0.370	0.292
1998	2.50	2.08	0.376	0.304
1999	2.41	2.07	0.381	0.282
2000	2.36	2.08	0.383	0.279
2001	2.36	2.09	0.378	0.275

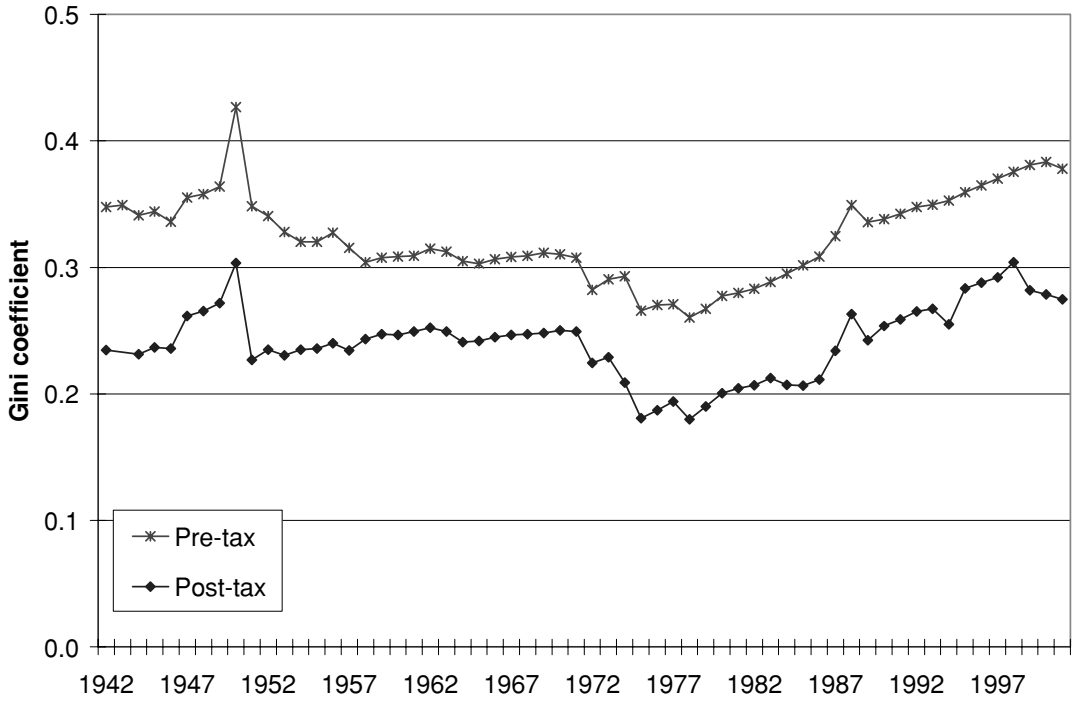
Notes: Year is the financial year starting on July 1 (e.g. 1942 is the financial year 1 July 1942 to 30 June 1943). 1943–1944 post-tax estimate omitted as a result of the shift to pay-as-you-earn (see Leigh, 2004 for details).

(in contrast, the gini coefficient presented here is stable over this interval, though the 90/50 ratio rose). Using census data, Jones (1975) finds that inequality fell from 1915 to 1968, while McLean and Richardson (1986) conclude that inequality fell between 1933 and 1980. Both the studies are consistent with the findings presented here. The leading studies of recent trends in Australian inequality include Borland and Wilkins (1996), Harding (1997) and Harding and Greenwell (2002). Taken together, these three studies indicate that income inequality grew in the 1990s, though there is some disagreement over whether inequality also grew in the 1980s. The inequality series presented here favours the view that inequality rose in both decades.

Over the past two decades, the most reliable measures of inequality are those from the Australian Bureau of Statistics' *Survey of Income and Housing* (ABS Cat. 6523.0) and its predecessor surveys. Figure 6 compares the estimates for pre-tax male inequality computed from taxation statistics with estimates for non-equivalised pre-tax inequality among income units, as produced by the Australian Bureau of Statistics since 1981.[15] Figure 6 also plots the income share of the richest 10 per cent of adults, from Atkinson and Leigh (2005). Male inequality appears to follow the same broad sweep as the two other measures of inequality, and to have risen at about the same pace as household inequality in the past two decades. This provides further evidence that male inequality is a acceptable alternative for household inequality in earlier years.

[15] The ABS has not published gini coefficients based on pre-tax income since 1999–2000. The figure for 2000–2001 was calculated using microdata from the confidentialised unit record file.

FIGURE 4
Distribution of Male Incomes in Australia 1942–2001



The 1943–1944 post-tax gini is omitted as a result of the shift to pay-as-you-earn (see Leigh, 2004 for details).

If we assume that male inequality is an acceptable alternative for household inequality, then we can ask the question: how do these estimates compare to trends in other developed nations? Figure 7 shows Australian income inequality trends with those from three other countries for which long-run data are available – the UK, the US and West Germany.[16] Although the levels are not comparable, it is possible to compare Australia's trends with these three nations. The Australian pattern appears to be closest to that of the UK, which saw stability during the 1960s, a small decline in the early-1970s, and a steady rise since.[17] While it is difficult to be sure what explains the similarity between Australia and the UK since 1960, possible factors are that both countries have experienced similar trends in unemployment and unionisation; both reduced top marginal tax rates at a similar time; and both were similarly affected by the internationalisation of the market for English-speaking chief executives.

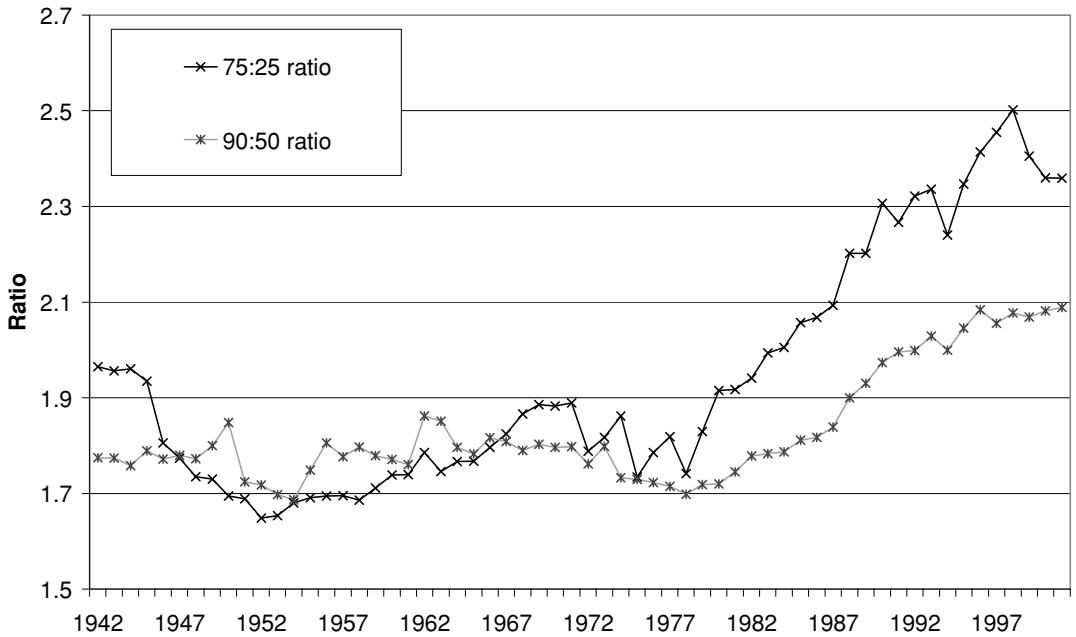
IV Taxation and Inequality

What impact does taxation have on inequality in Australia? Using taxation data, it is possible to estimate two distributions: one based on market income plus transfers and the other based on market income

[16] US (CPS) series is on a family basis, using pre-tax income, from 'Table F-4: Gini Ratios for Families', available at www.census.gov/hhes/income/histinc/f04.html. UK (IFS) series is on a household basis, using net income, from Goodman and Webb (1994). UK (LIS) series is on a household basis, calculated using disposable income, from the Luxembourg Income Survey, available at www.lisproject.org/keyfigures/ineqtable.htm. West Germany (DIW) series is on a household basis, using net income, from Guger (1989).

[17] This remains true even when other countries are considered. Atkinson (2002) presents data on trends in household inequality for six other countries – Finland, Canada, Sweden, Norway, the Netherlands and Italy – in addition to the UK, US and West Germany. The UK remains the closest match to Australia.

FIGURE 5
Distribution of Male Incomes in Australia: 1942–2001



plus transfers, less income taxes. Both are shown in Figure 4. The gap between these two distributions is the redistributive effect of the taxation system. To measure the redistributive effect, I apply three of the most common measures: the index of Reynolds and Smolensky (1977), denoted as 'RS'; the index of Musgrave and Thin (1948), denoted as 'MT'; and the index of Suits (1977). These capture three distinct aspects of redistribution. The Reynolds–Smolensky index is the difference between the post-tax and pre-tax ginis; the Musgrave–Thin index is a measure of the ratio of the post-tax and pre-tax ginis; and the Suits index measures the concentration of taxes with respect to income (the Suits index is calculated like a gini coefficient, but with income on the horizontal axis and tax payments on the vertical axis). Of these three measures, the Suits index is said to be the most commonly used (Congressional Budget Office, 1988). Where G_A and G_B are the gini coefficients for after-tax and before-tax income, respectively:

$$\text{RS index} = G_A - G_B$$

$$\text{MT index} = \frac{1 - G_A}{1 - G_B}$$

and where K denotes the area below the line of proportionality, and L denotes the area below the Lorenz curve of tax payments against income:

$$\text{Suits index} = 1 - \frac{L}{K}.$$

Figure 8 graphs the three indices over the period 1942–2001. For ease of interpretability, I present $1 - RT$, so a movement upwards always represents a more redistributive tax system. During the 1940s and 1950s, the three indices agree that personal income taxation in Australia became less redistributive, whereas the MT and RS indices suggest stability in the 1960s and a more redistributive effect in the 1970s; the Suits index suggests a declining redistributive effect during both the decades. Over the past two decades, the Suits and RS indices suggest that the redistributive effect of taxation has basically been stable, whereas the MT index indicates that the taxation system has become slightly more redistributive.[18] This reflects the fact that when the level of pre-tax inequality is higher, the MT index gives a higher weight to any absolute change in the gini, whereas the other two indices do not. Applying

[18] Smith (2001) calculates the Musgrave–Thin index using data only for taxpayers, and finds that the taxation system in the 1990s was less redistributive than in the 1970s. But when changes in the number of taxpayers are taken into account, the opposite appears to be true.

FIGURE 6
Comparison with Other Inequality Measures

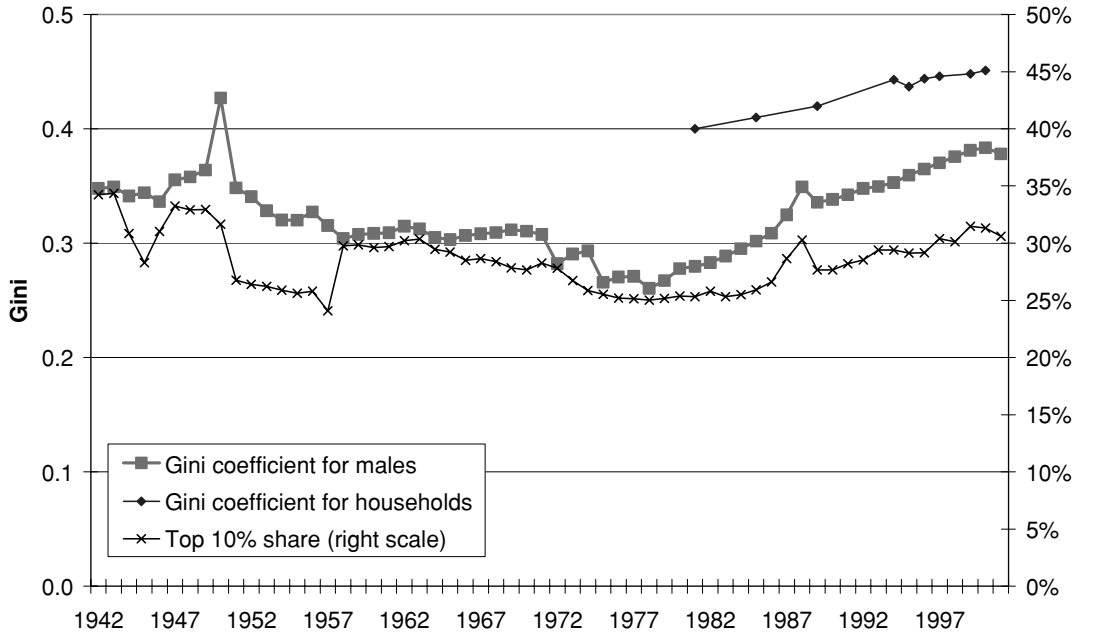
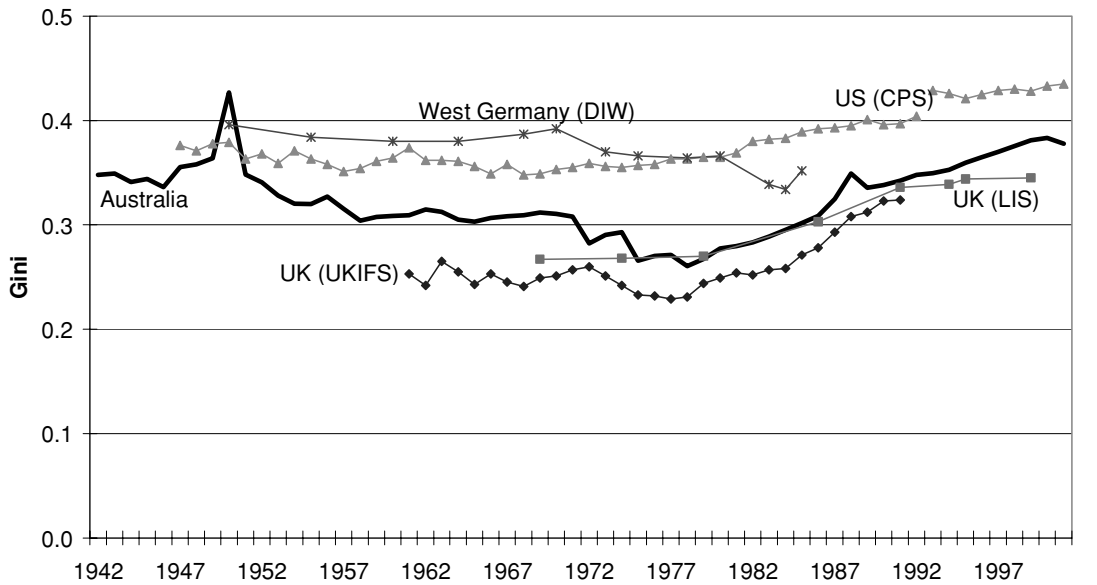
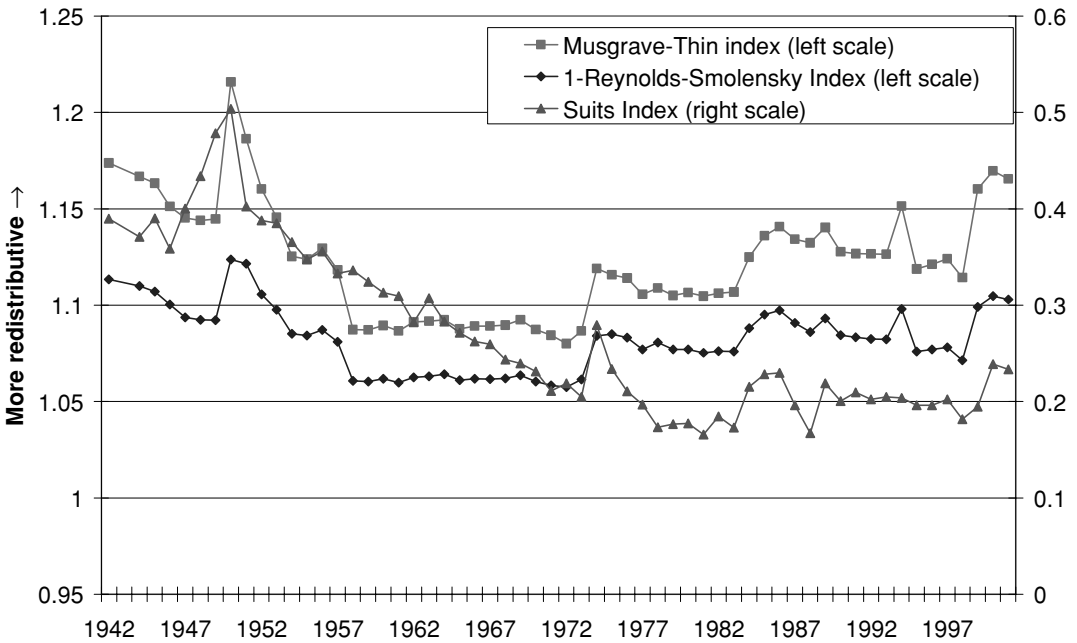


FIGURE 7
Comparing Trends in Australian Inequality with West Germany, the UK and the US



Note: Levels are not comparable across series; only trends.

FIGURE 8
Redistributive Effect of the Personal Income Tax: 1942–2001



a social welfare function in which redistribution is not weighted more highly in a more unequal society, one would conclude that the redistributive effect of Australian personal income taxation remained basically constant during the 1980s and 1990s.

V Conclusion

Measuring inequality using taxation statistics is never a first-best option. But in the absence of adequate survey data, taxation statistics can help to fill in gaps in our knowledge about long-run trends in inequality. By using only the incomes from male taxpayers; imputing the incomes of non-taxpayers based on the observed distribution of taxpayers; and adjusting the gini coefficient for the number of income bands, it is possible to considerably narrow the confidence interval around inequality measures that are derived from taxation statistics.

In the case of Australia, taxation statistics can be used to derive an annual measure of male inequality for the past 60 years, including a quarter-century in which no income distribution figures were previously available. The resulting series indicates that pre-tax inequality in Australia fell in the 1950s and 1970s, and rose during the 1980s and 1990s, with post-tax inequality following much the same pattern. For other countries in which mass taxation preceded high-quality income surveys, such analysis may prove similarly fruitful.

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