



Statistics Norway  
Research Department

Rolf Aaberge and Anthony B. Atkinson

Top incomes in Norway

# Discussion Papers

$$+ 2 \sum_{i>j} \sum_{j=1}^{n-1} \text{COV}_a(X_i, X_j)$$

$$\beta = \begin{pmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_m \end{pmatrix}$$

$$\text{var}\left(\sum_{i=1}^n a_i X_i\right) = \sum_{i=1}^n a_i^2 \text{var}(X_i) + 2 \sum_{i=1}^{n-1} \sum_{j=i+1}^n a_i a_j \text{COV}_a(X_i, X_j)$$

$$x_t = x_0 + \sum_{s=0}^{t-1} \left( \prod_{k=s+1}^{t-1} a_k \right) b_s$$

$$\text{var}\left(\sum_{i=1}^n a_i X_i\right) = \sum_{i=1}^n a_i^2 \text{var}(X_i) + \sum_{i=1}^{n-1} \sum_{j=i+1}^n \left( \prod_{k=i+1}^j a_k \right)^2 (y_i - (\hat{a}x_i + \hat{b}))^2$$



## 1. Introduction<sup>1</sup>

The shares of top incomes in Norway are of considerable intrinsic interest, since the series constructed in this chapter starts as far back as 1875. Based on the same source – the municipal and central government income tax records – the series allows us to trace the evolution of the top of the income distribution over a period when Norway industrialised and then became oil-rich. The Norwegian experience is also of interest on a comparative basis. The studies in Atkinson and Piketty (2007) have shown how income inequality at the top of the distribution has increased in Anglo-Saxon countries, whereas the same rise in top income shares was not experienced by Continental European countries – at least up to the late 1990s. It is therefore interesting to explore what has happened in Scandinavia. The present chapter examines the evidence for Norway, as well as making a comparison with other countries.

The chapter explores in detail the long-run changes at the top of the income distribution in Norway. It differs from a number of other analyses of income distribution in Norway (see for example, Aaberge, Bjørklund, Jäntti, Pedersen, Smith and Wennemo, 2000, Aaberge, Bjørklund, Jäntti, Palme, Pedersen, Smith and Wennemo, 2002, Aaberge and Langørgen, 2006, Bojer, 1987 and 2008, Epland, 1992 and 1998, and Ringen, 1991) in that the chapter focuses on the top income groups. The concentration on the top groups means that we can produce a series extending much further back in time. Norway is indeed unusual in that the income tax data date back to 1875, so that, while there are not data for all years, the results cover more than a century and a quarter.<sup>2</sup> The reader may wonder how far it is possible to construct a consistent series over time, and the results certainly need to be interpreted carefully in the light of changing economic and social circumstances, but there is continuity in the basic source: the data collected as part of administering the municipal and central government income tax.

The primary goal of the chapter is to provide a new data series and to spell out the issues involved in its construction. These issues are often taken for granted by economists, but it is essential to have an understanding of the origins of the data in order to interpret the evidence. The data sources and the methods applied, particularly the derivation of control totals for total population and total income, are set out in Section 2. The results for Norway

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<sup>1</sup> We are most grateful to Erik Fjærli, Bård Lian and Tom Wennemo for their assistance with the analysis of the micro-data and Terje Skjerpen for careful proof reading. We would like to thank the Norwegian Research Council for financial support

<sup>2</sup> In Denmark, the statistics go back further. Sørensen (1993) made estimates using the Danish income tax data

from 1875 to 2006 are set out in Section 3. The next section (Section 4) considers some of the factors that may explain the evolution of Norwegian top income shares over the period since 1875. Section 5 compares the top income shares in Norway with those in four other countries for which the data begin in the last decade of the nineteenth century or in the first decade of the twentieth century: France, Prussia/Germany, Sweden and the UK. The conclusions of the chapter are summarised in Section 6.

## **2. Income tax data on top incomes in Norway**

The use of income tax data for distributional analysis has long historical roots. In the UK, Bowley (1914), Stamp (1916 and 1936), among others, studied the tables of data resulting from the introduction of "super-tax" in 1908. The work of Kuznets (1953) in the US on the *Shares of Upper Income Groups in Income and Savings* was based on the tabulated federal income tax returns. In the Netherlands, Hartog and Veenbergen (1978) constructed a long time series of income distribution estimates from 1914-1972 using the published income tax statistical tables. Fresh impetus has however been given by the work of Piketty (2003) on top incomes for France, in which he employed both tabulations (as in the earlier studies) and individual tax data (micro-data).

The basic ingredients for the calculations of this chapter are the same as those used by Piketty. We use for the first part of the period (prior to 1967) tabulations of the distribution of income as assessed for tax purposes, giving the number of income recipients and total amount of income by ranges of assessed income. For the period since 1967, up to 2006, we use micro-data from the tax register files available to Statistics Norway.

In their tabulated form, the income tax statistics provide less rich information than the micro-data available for more recent years, but the tabulations for Norway often contain considerable detail on the classification of taxpayers by income ranges. For example, *Skattestatistikk for Budsjettåret 1951/52* contains information for the year 1950 giving 44 ranges of income, of which the top 6 apply to those with incomes of NOK 500,000 or more (NOK stands for Norwegian kroner) and contain respectively 5, 2, 2, 0, 1 and 10 income earners. There are published data for every year since 1948, apart from 1956 (on account of the changeover to PAYE (see Appendix 8.A), which was introduced in the income year 1957). The income tax data have been supplemented by the Income Distribution Surveys

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from 1870-1986. The first data for Sweden used by Roine and Waldenström (2008) relate to 1903.

(IDS). The IDS are sample surveys, covering a number of households; the sample size has varied, being 3,393 households and 9,582 people in 1987 and 14,679 households and 39,504 people in 1997. Most of the data in the IDS are collected from the income tax records, but household information is collected from household interview. Non-respondents to the survey are included, with information being substituted from the Central Population Register. The IDS have been conducted for 1958, 1962, 1967, 1973, 1976, 1979, 1982, and annually since 1984 (published in *Inntekts- og Formuesstatistikk*).

Prior to 1948, the data were assembled and published for only a small number of years, but they span a long period. The first tabulations of incomes for the tax were given in Kiær (1892-3) for 1859, but these cover only selected towns and cities. The first national data are those for 1875. Subsequently, income tabulations were published for 1888, 1896, 1902, 1906, 1910, 1913-14, 1929 and 1938. So, over a 60 year period we have 9 observations (for Sweden, Roine and Waldenström (2005 and 2008) have 10 observations for the pre-war period, but their series does not start until 1903). The first tabulations were made as part of parliamentary inquiries. The data for 1910 and 1929 were associated with the population census; and since the municipalities were only required to return the numbers in specified ranges, the data consist only of frequencies. In other years, we have both total numbers and total incomes by range. The income information has been obtained from the tax register for municipal income tax in most of the earlier years (and for 1952-1955), but the data for 1896, 1902, 1938, and 1948-1951 relate to the central government income tax. (The data for 1938 are also classified by taxable income, rather than assessed income). Since 1957, the data have been drawn from the assessment of the central government income tax, but supplemented by data from the municipal tax assessments. Fuller information about the sources of the tabulations for 1875 to 1966 is given in Appendix 8A and Table A.1. Here we should simply note that they are assembled from a variety of sources – including studies by individual authors and parliamentary inquiries, as well as official statistical yearbooks - and that they have not been easy to track down.

The basic limitation of the tax data is that, for many years, they give only partial coverage of the population.<sup>3</sup> Here we follow two approaches, which we can associate with, respectively, Kuznets and Pareto. The approach of Kuznets (1953) was to compare the income tax data with countrywide estimates of the total population and of the total income. In

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<sup>3</sup> Although the tabulations for 1875, 1888 and 1906 included estimates of the number of persons not paying income tax.

the case of the Norwegian data for 1950, for example, the tax data cover some 1 million people with a total income of NOK 7.2 billion. We need to express these numbers as a percentage of the estimated total number and total amount in the economy as a whole. The key issue here is then the derivation of the control totals and these are discussed below. The second method focuses on the distribution *within the top group*. If we have a control total for numbers, we can calculate for example the share of the top 1 percent within the top 10 per cent. This gives a measure of the degree of inequality among the top incomes. Such an approach builds a bridge between Pareto and Lorenz.<sup>4</sup> For this reason, it is referred to below as the Pareto-Lorenz coefficient, since it is the Pareto coefficient derived from the Lorenz curve without resort to the income cut-off level.<sup>5</sup> By considering the share within the taxpaying population, we do not need to estimate the total income, although we still need a total for the population to locate the coefficients in the distribution.

## Control Totals

The control totals are important in providing a degree of consistency over time and across countries. The first control total we are seeking is that for the population. Here we can apply either a total for the number of tax units, since there is joint taxation of the income of husband and wife, or we can apply a total for all adults, taken to be those aged 16 and over. The two series are plotted in Figure B.1, where we have estimated the number of tax units by subtracting the number of married women from total adults (see Appendix B for details). Although taxation is joint, separate filing has become increasingly prevalent as the number of two-earner couples has increased. As is clear from Figure B.1, the total recorded in the income tax statistics was in 1948 well below our calculated total tax units but began to exceed the total at the end of the 1970s, and approached the total adult population. Indeed, from 1998, Statistics Norway ceased to treat married couples with joint taxation as one personal taxpayer. This causes a break in comparability, but the two series were sufficiently close that the increase in the number of taxable units in 1998 was only some 200,000 (6 percent). We have therefore taken as our control

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<sup>4</sup> Suppose that the upper tail of the distribution approaches the Pareto form: i.e. that the cumulative distribution  $F$  is such that  $(1-F)$  is proportional to  $y^{-\alpha}$ , where  $y$  is income. If we assume that this holds exactly within the top income group, then this implies that the share of the top 1 per cent within the top 10 per cent is  $(0.1)^{(1-1/\alpha)}$ . For a specific  $\alpha$ , the same value would be obtained if we took the share of the top 0.1 per cent in the top 1 per cent.

<sup>5</sup> It should be noted that where the distribution is not exactly Pareto, this method would yield a different value for the Pareto coefficient  $\alpha$  from that reached, for example, by using the cut-off value of income and the cumulative

total the number of people aged 16+.<sup>6</sup>

The derivation of a control total for income is more difficult. As in studies for other countries, a point of departure is provided by the total household income series in the national accounts. This series is a useful benchmark in view of the continuity in national accounts and the fact that they provide a link across countries via the United Nations System of National Accounts (SNA). The sources for the household income totals are described in Appendix 8C, but in broad terms they include income from employment and self-employment, interest, rent and dividends, transfers from the government and transfers from abroad. For the years from 1950, we have deducted employers' social security contributions. It should be noted that our totals include all public transfers, although certain of these are tax-free and are missing from the income tax statistics.

In all years, the household income total exceeds the total reported in the income tax tabulations. In 1950, for example, the household income total is NOK 13.1 million, whereas the total recorded in the tax statistics is NOK 7.2 million. In part this difference reflects the incomes of those not covered by the tax statistics; in part the difference reflects differences in definition or in the valuation of income. The second of these differences means that we cannot simply use the national accounts household income totals. An alternative approach to the national accounts is that which starts from the total recorded in the tax statistics and adds an estimate of the income of those not covered by the statistics ("non-filers"). The tabulations published by Kiær (1892-3) for 1875 and 1888 did indeed include estimates of the numbers and total income of those not covered, and in more recent years the same applies to the *Income Statistics* studies. As is noted in *Inntektsstatistikk 1970*, they provide "estimates relating in principle to all personal income receivers and households, including persons with income and property under the taxation limits" (Statistisk Sentralbyrå, 1973, page 16). This alternative approach is discussed further in Appendix 8C, where we conclude that we need to combine the two approaches: a reasonable first approximation to an income concept that allows for those not covered, but is otherwise defined in the same way, is a fixed percentage (72 per cent) of the household income total. The remaining 28 per cent may be seen as corresponding to differences in definition (as with tax-free public transfers or imputed rent on owner-occupied housing) or to income missing from the tax statistics that is assumed to be distributed proportionately to

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frequency distribution, as is frequently done.

<sup>6</sup> It should be noted that no allowance is made for the existence in the tax data of part-year incomes. Part-year units may arise for several reasons. People reach the age of 16 in the course of the tax year; people die in the tax year;

recorded income. Finally, we should note the difference between “gross” and “assessed” income. The latter concept, used in the published tabulations and in the micro-data available to us, subtracts interest paid, premia for pensions and life assurance, and certain other deductions. The subtractions do not include the special allowance for old age or those for seamen.

The use of income control totals allows us to incorporate, into a single series, data drawn from periods when there were differing proportions of taxpayers, but there are strong assumptions underlying their construction.

## **Interpolation**

Since the basic data on which we are drawing prior to 1967 are in the form of grouped tabulations, and 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 per cent), we have to interpolate in order to arrive at values for summary statistics such as the percentiles and shares of total income. Where there is information on both the number of persons and the total income in the range, we use the mean-split histogram. The rationale is as follows. Assuming, as seems reasonable in the case of top incomes, that the frequency distribution is non-increasing, then restricted upper and lower bounds can be calculated for the income shares (Gastwirth, 1972). These bounds are limiting forms of the split histogram, with one of the two densities tending to zero or infinity - see Atkinson (2005). Guaranteed to lie between these is the histogram split at the interval mean with sections of positive density on either side. The mean split histogram is used here. The ranges are in most cases sufficiently detailed that the bounds are close, and little extra precision is obtained by using more ranges.<sup>7</sup> Where the total income information is missing (as for 1910 and 1929), we use a simple Pareto interpolation fitted to the cumulative frequencies for each interval to identify the percentile cut-offs and to estimate the income shares.

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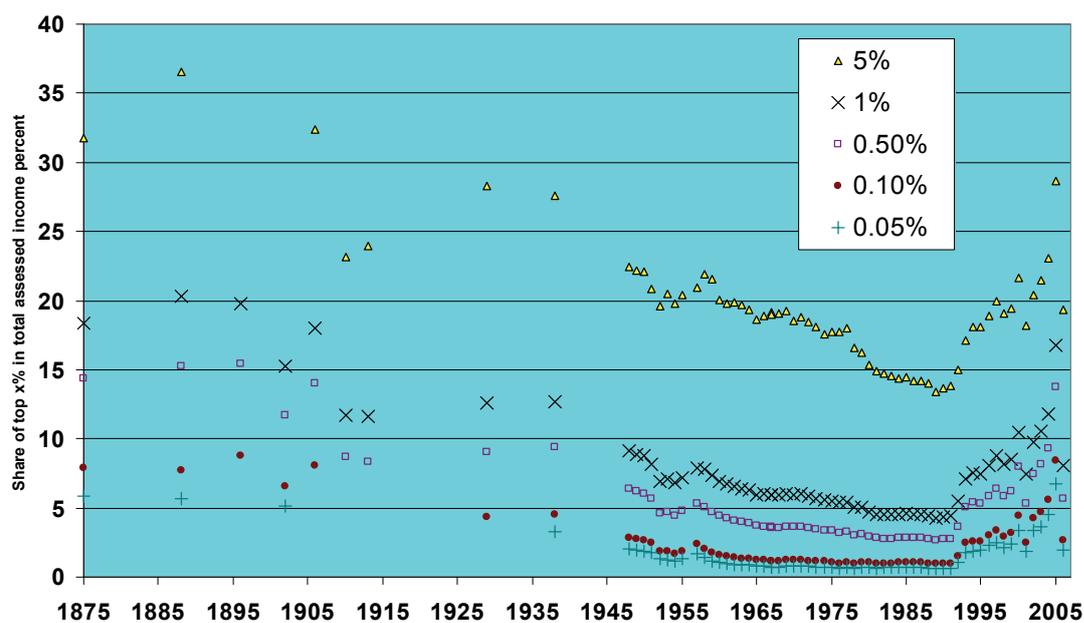
people may emigrate or immigrate.

<sup>7</sup> The tax statistics data typically have more ranges than those given in the publication *Historical Statistics*, but use of the more detailed data for 1948, for example, gave estimates of the shares that differed only in the second decimal place for the percentage shares.

**Table 1. Top income shares, Norway 1875-2006**

	10%	5%	1%	0.50%	0.10%	0.05%
1875	40.00	31.74	18.37	14.37	7.89	5.86
1888	46.60	36.53	20.29	15.26	7.71	5.64
1896			19.80	15.46	8.79	
1902			15.21	11.71	6.59	5.13
1906	42.19	32.36	17.98	13.99	8.03	
1910	31.94	23.15	11.67	8.69		
1913	33.21	23.96	11.61	8.37		
1929	41.32	28.25	12.57	9.06	4.35	
1938		27.56	12.72	9.38	4.56	3.28
1948	34.38	22.46	9.10	6.36	2.83	2.00
1949	34.02	22.14	8.88	6.20	2.74	1.94
1950	34.10	22.09	8.76	6.06	2.63	1.84
1951	32.31	20.80	8.16	5.67	2.51	1.78
1952	31.39	19.57	6.93	4.59	1.87	1.29
1953	33.08	20.49	7.14	4.67	1.83	1.25
1954	31.79	19.79	6.86	4.46	1.70	1.15
1955	32.61	20.37	7.20	4.76	1.90	1.31
1956						
1957	32.72	20.94	7.88	5.35	2.35	1.70
1958	34.72	21.91	7.76	5.09	2.01	1.38
1959	34.20	21.51	7.39	4.73	1.77	1.19
1960	32.17	20.06	6.94	4.44	1.62	1.08
1961	31.77	19.78	6.76	4.29	1.53	1.01
1962	32.20	19.87	6.57	4.11	1.42	0.92
1963	32.03	19.67	6.43	3.98	1.35	0.87
1964	31.45	19.30	6.28	3.88	1.31	0.85
1965	30.65	18.65	5.99	3.69	1.23	0.79
1966	31.05	18.89	5.99	3.66	1.20	0.76
1967	31.25	19.01	5.92	3.58	1.16	0.74
1968	31.31	19.05	5.92	3.58	1.16	0.74
1969	31.46	19.21	6.03	3.67	1.21	0.77
1970	30.29	18.57	5.95	3.66	1.23	0.79
1971	30.81	18.85	5.99	3.68	1.23	0.79
1972	30.32	18.48	5.82	3.56	1.18	0.76
1973	29.60	18.07	5.72	3.50	1.15	0.74
1974	28.93	17.60	5.56	3.41	1.15	0.75
1975	29.41	17.73	5.49	3.33	1.09	0.69
1976	29.73	17.78	5.39	3.23	1.02	0.63
1977	30.09	18.00	5.45	3.28	1.05	0.67
1978	27.67	16.58	5.04	3.04	0.97	0.60
1979	27.01	16.22	5.03	3.09	1.05	0.67
1980	25.65	15.33	4.74	2.93	1.05	0.70
1981	25.00	14.93	4.57	2.79	0.98	0.65
1982	24.68	14.70	4.52	2.78	1.01	0.68
1983	24.32	14.56	4.51	2.79	1.02	0.68
1984	23.92	14.37	4.50	2.81	1.05	0.71
1985	24.02	14.48	4.59	2.88	1.08	0.73
1986	23.47	14.18	4.49	2.81	1.03	0.68
1987	23.44	14.18	4.52	2.83	1.05	0.70
1988	23.07	13.98	4.43	2.75	0.97	0.63
1989	22.22	13.44	4.24	2.64	0.94	0.61
1990	22.51	13.68	4.37	2.72	0.96	0.62
1991	22.56	13.80	4.45	2.78	0.96	0.62
1992	23.58	15.03	5.47	3.64	1.53	1.08
1993	25.91	17.15	7.09	5.05	2.44	1.79
1994	27.27	18.12	7.54	5.38	2.56	1.86
1995	27.22	18.08	7.48	5.34	2.61	1.94
1996	28.19	18.91	8.08	5.88	3.04	2.32
1997	29.49	20.00	8.75	6.42	3.33	2.51
1998	28.35	19.07	8.13	5.87	2.92	2.16
1999	28.65	19.43	8.49	6.21	3.15	2.35
2000	30.81	21.62	10.44	7.98	4.44	3.41
2001	27.21	18.18	7.48	5.28	2.50	1.82
2002	29.26	20.42	9.77	7.48	4.25	3.36
2003	30.27	21.43	10.58	8.18	4.68	3.67
2004	32.17	23.05	11.82	9.30	5.59	4.50
2005	37.67	28.61	16.78	13.71	8.41	6.75
2006	28.78	19.37	8.06	5.71	2.70	1.95

**Figure 1. Share of top income groups in total assessed income, Norway 1875-2006**



### 3. Results for top incomes in Norway

Table 1 shows the results for Norway from 1875 to 2006 for the percentile shares covering the following six groups: top 10 per cent, 5 per cent, 1 per cent, 0.5 per cent, 0.1 per cent, and 0.05 per cent. The results relate to individuals (aged 16 and over) and to assessed (net) income before tax. The estimates from 1967 are based on micro-data; those up to 1967 are based on tabulated data. The shares of the top 5 per cent, 1 per cent, 0.5 per cent and 0.1 per cent are graphed in Figure 1.

For the post-war period, Table 1 and Figure 1 show the top income shares first falling and then rising sharply. In 1948, the share of the top 0.1 per cent was 2.8 per cent of total income: this group on average had 28 times their proportionate share. By the 1980s, the share of the top was less than 1 per cent. The share of the top 1 per cent in 1948 was 9 per cent; by the 1980s, it had more than halved. The decline in top income shares may have begun during the war years (we lack data for individual years between 1938 and 1948), but it continued after the Second World War. Apart from some recovery in the latter part of the 1950s, the top income shares in Norway declined for the best part of 50 years.

The change in direction may have been due to the liberalization of the capital markets in the 1980s, but the turning point in Figure 1 is clearly 1992. Since this coincides with the reform of income taxation, it creates interpretational difficulties, as evidenced by the

volatility of the top income shares in recent years (for example, the share of the top 1 per cent in 2005 is twice that in 2006). These are discussed further below. Taken at face value, however, the upswing in top income shares was sharper than the preceding downward trend. The income share of the top 1 per cent has more than doubled in 15 years. The rise in top income shares since the end of the 1980s has reversed the decline of the previous 40 years. Moreover, this increase has been largely confined to the top 1 per cent. Whereas the share of the top 1 per cent rose by some 7 percentage points between 1991 and 2004, the share of the next 4 per cent increased by only about 2 percentage points, and there was virtually no rise in the share of those in the top 10 per cent but not in the top 5 per cent.

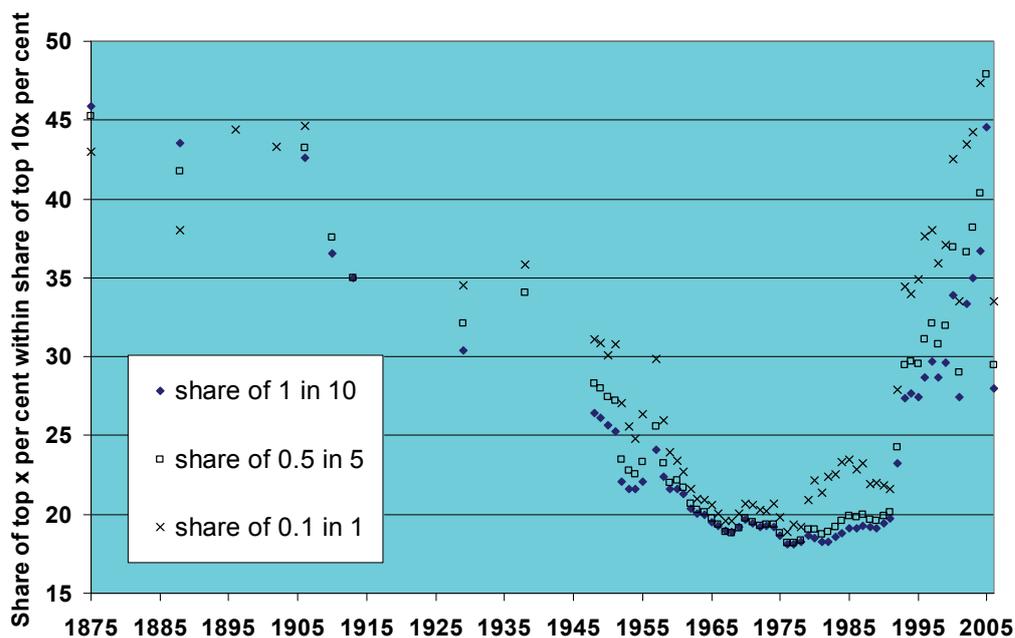
The recent rise in top income shares is not surprising. Our main purpose here is to place the recent rise in historical perspective. What had happened before 1938? The estimates in Table 1 have to be qualified by the fact that they are drawn from a variety of sources, not a single regular series, and that the control totals are only approximate. But they suggest that the top income shares were high. The three estimates for the nineteenth century show the share of the top 1 per cent to be around 20 per cent and that of the top 0.5 per cent to be around 15 per cent. The latter group had some 30 times their proportionate share. To reduce these figures to the shares observed for 1948 would require the control totals to be out by a factor of 100 per cent, which seems implausible. Were the top shares rising or falling? Movements in fact occurred in both directions. There was a rise in the shares of the top 10 per cent, 5 per cent and 1 per cent between 1875 and 1888. Between 1896 and 1902 there was a definite fall; there was some recovery in 1906, but then a further fall, with the share of the top 1 per cent losing 6 percentage points. After the First World War (in which Norway was not a combatant) there was some recovery in the top shares.

The uncertainties surrounding the control totals for income can be avoided if we look at the “shares within shares”, as displayed in Figure 2. The within-group distribution is shown for the share of the top 1 per cent within the top 10 per cent, the share of the top 0.5 per cent within the top 5 per cent, and the share of the top 0.1 per cent within the top 1 per cent. These confirm that the nineteenth century distribution was highly unequal: at the beginning of the period, the within-group shares were in excess of 40 per cent. A decline was then initiated after 1906 and, despite some recovery between 1929 and 1938, the within-group shares were more like 30 per cent in 1948, and by the end of the 1960s under 20 per cent. The general U-shape is similar to that for the top shares, but with the difference that, while the rise in concentration was sharpest

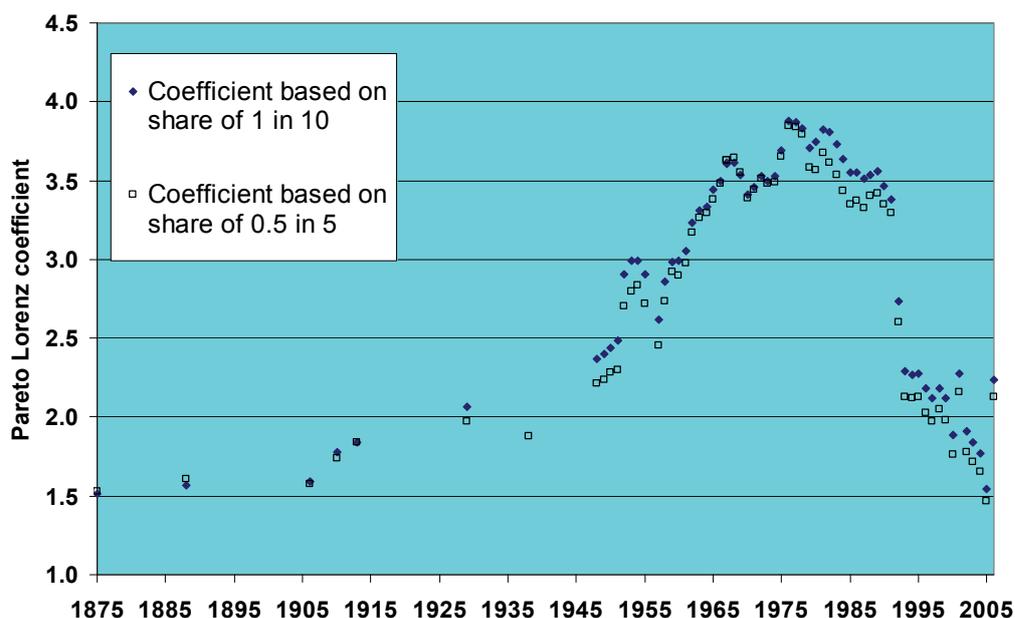
after 1991, it had already begun in the 1980s.

The similarity in the levels and movements of the shares within groups indicates that the upper tail of the distribution is close to Pareto in form. In 1906, the shares for the three groups were 42.6, 43.2 and 44.7 per cent. Translated into Pareto-Lorenz coefficients, these give values of 1.59, 1.57 and 1.54. The Pareto coefficients for 1875 and 1888 are similar. The values for all years are plotted in Figure 3, which shows the Pareto-Lorenz coefficients based on the share of the top 1 per cent within the top 10 per cent and the share of the top 0.5 per cent within the top 5 per cent. The rise in the coefficient – or fall in concentration at the top – began after 1906, but accelerated after 1948, when the coefficient was around 2.25, increasing to a point where it was close to 4 at the end of the 1970s. The Pareto coefficient then began to fall in the 1980s, at such a rate that for most years this century, it has been below 2.0. The shape of the distribution has changed in such a way that we have been through a complete cycle, of declining concentration followed by increasing concentration, with the increase taking place at a faster rate.

**Figure 2. Share within shares, Norway 1875-2006**



**Figure 3. Pareto-Lorenz coefficients, Norway 1875-2006**



#### **4. Explaining the observed evolution in Norway**

From being a pre-industrial society dominated by agricultural production Norway gradually developed into an industrial country during the second half of the 19<sup>th</sup> and first half of the 20<sup>th</sup> century. The economic growth during this period was accompanied by a shift in population from rural to urban areas. In the late 1870s only one seventh of the population lived in towns. Although Norway was in many respects a poor country by Western-European standards around that time, it benefited from a large and effective shipping sector enjoying particularly favourable market conditions<sup>8</sup>. However, the high profits gained by the ship-owners also partly explain why the share of the top 0.5 per cent approached 15 per cent in 1875, or 30 times their proportionate share. Except for a few years around 1880, the so-called Kristiania crash in 1899 with subsequent recession until 1904, and another recession around 1908-09, Norway experienced steady and relatively high economic growth until the recession in the late 1920s and early 1930s. Our estimates show that the top income shares increased from 1875 until 1896, but had been sharply reduced by 1902 due to the Kristiania crash<sup>9</sup>. Moreover, the recession around 1908-09 may explain the decline in the estimates of the top

<sup>8</sup> Shipping as well as fish and timber accounted for 12 per cent of GDP around 1870 (Sejersted, 1992).

<sup>9</sup> The Kristiania crash meant a collapse in the financial and housing markets.

income shares in 1910 and 1913, compared with 1906. Overall, although there have been periods of some recovery in the share of top incomes during the first two decades of the 20<sup>th</sup> century, the long-term trend suggests a downward decline. For instance, the share of the top 0.1 per cent halved from 8.8 per cent in 1896 to 4.4 per cent in 1929. Based on the estimated top income shares for 1929 and 1938 we cannot claim that there has been a further decline during the 1930s. However, as for most other European countries the Second World War had a major impact on the level as well as on the distribution of income. Our estimates show that the share of the top 0.5 per cent fell from 9.4 per cent in 1938 to 6.4 per cent in 1948.

It is interesting to compare these figures with the estimates of the concentration of capital in Norway constructed by Ohlsson, Roine, and Waldenström (2006). Their first observation is for 1789, but the relevant starting point here is 1868, when they estimate the share of the top 1 per cent in total wealth to be 36 per cent. Their next estimate, for 1912, is virtually identical at 37.2 per cent, as is the third figure, for 1930, of 37.6 per cent. It was in the post-war period that the share of the top 1 per cent began to fall: from 34.6 per cent in 1948.

The early part of the post-war period was characterized by rather strict central planning of the economy, very progressive taxation and gradual expansion of the welfare state. Over this period, the top income shares fell steadily and reached a turning point in the late 1980s/early 1990s. The share of the richest 0.5 per cent fell from 6.4 per cent in 1948 to 2.8 per cent in 1991. It should be noted that the turning point came some 15 years after oil began to flow from the North Sea; by 1991 production had been at a high level for a number of years. The recovery of the shares of top incomes that took place in the early 1990s is more likely to be related to a major reform of the financial markets in the late 1980s that included abolishment of credit rationing and to a major tax reform in 1992 that included a significant reduction in taxes on capital incomes was introduced in 1992.

The implementation of the 1992 tax reform coincided with a change in the business cycles from a long period of recession with high unemployment and real interest rates to more favorable economic conditions with lower unemployment and interest rates. Moreover, a structural change from traditional manufacturing to services and technology took place in this period. Thus, all together the conditions for a rise in top income shares appear particularly favorable in the early 1990s. Indeed, our estimates show a sharp rise for the top income shares during the 1990s. This trend can be explained by a sharp increase in dividends and

capital gains among the richest households after the 1992 tax reform.<sup>10</sup> Official Norwegian income statistics show a large increase in dividends received by households after the 1992 tax reform. The reported capital gains rose as well, but not as much as dividends. A government white paper<sup>11</sup> concluded that "The increase in income from 1986 to 1996 has, in relative terms, been greatest for those with the highest incomes" and that "The most important reason for the greater increase in high incomes is that capital incomes have been more unevenly distributed in the 1990s. This was due in particular to the sharp increase in dividend payments and gains from the sales of shares etc." As demonstrated by Fjærli and Aaberge (2000) dividend receipts and capital gains received by the highest decile increased substantially soon after the implementation of the 1992 tax reform. However, as suggested by Fjærli and Aaberge (2000) this pattern might partly be due to income shifting; i.e. actions taken by taxpayers to reclassify income. Moreover, a temporary tax on dividends explains the decline in top income shares in 2001, whereas the implementation of a permanent dividend tax from 2006 gave strong incentives for owner-managers of closely held firms to increase dividends in 2005. Thus, the sharp rise in top income shares in 2005 is a result of changes in dividends that are well above what might be considered as normal returns from shares.

To account for the interpretational difficulties related to reported dividends, it appears more relevant to use a measure derived from a Hicksian version of the definition of income. The "Hicksian" measurement of the stock returns is less sensitive to changes in income reporting behavior than the conventional income definition and may thus provide a better basis for analyzing the trend in top incomes during the pre- and post-reform period (1986-2004). To account for the effect of income shifting and strengthen the comparability of top incomes before and after the 1992 tax reform, we provide results of top incomes for the period 1986-2004 based on imputed returns from shares, which is assessed as the product of the estimated market value of the households' stocks<sup>12</sup> and the long-run average rate of return (8.9 per cent) on the Oslo Stock Exchange (OSE)<sup>13</sup>. Figure 4 shows the results with the two different income concepts. The assessed income figures used in earlier graphs, for

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<sup>10</sup> In the case of Sweden, Björklund et al. (1995) report a jump in income inequality in Sweden from 1989 to 1991 due to realized capital gains that possibly can be explained by changes in the tax legislation.

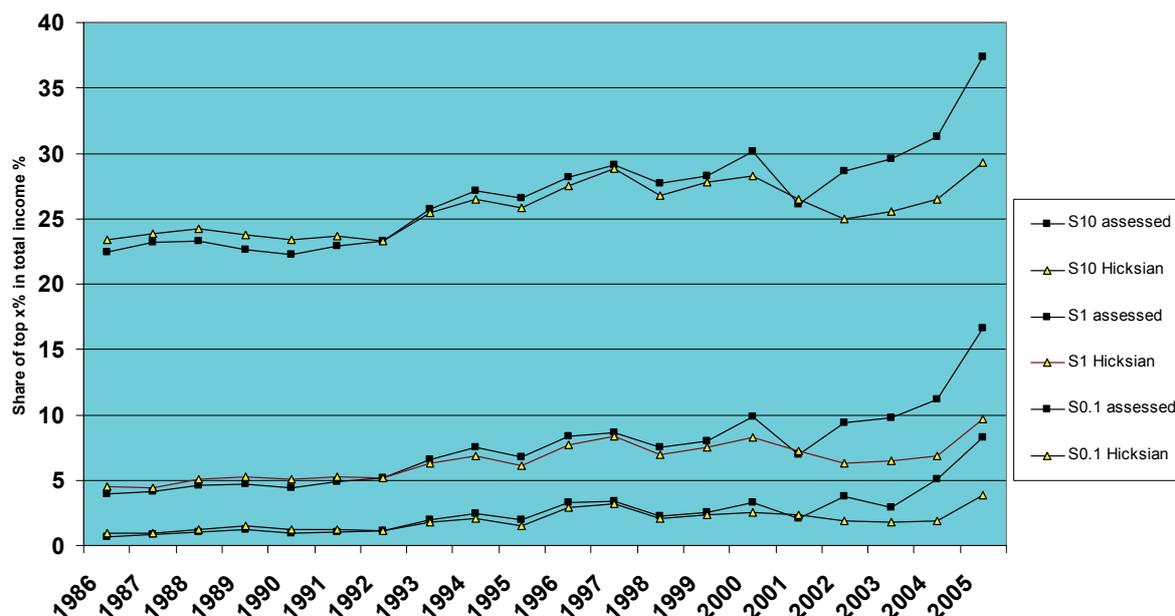
<sup>11</sup> The Equitable Redistribution White Paper (the E.R. White Paper) on the distribution of income and living conditions in Norway, Ministry of Health and Social affairs (1998-1999).

<sup>12</sup> The procedure for estimation of the market values of non-quoted stocks is explained in Fjærli and Aaberge (2000).

<sup>13</sup> The OSE index is a total return-index that includes dividends.

comparability with the results for earlier years, are shown by solid squares; and the imputed Hicksian measures are shown by shaded triangles.<sup>14</sup> The Hicksian series rises less fast, particularly after 2001, but still shows a definite increase: even leaving aside 2005, the share of the top 1 per cent rises by more than a half over the period.

**Figure 4. Different income definitions, Norway 1986-2005**



## 5. Comparison with other countries

The Norwegian data are of particular interest in view of the long period covered. In this section we compare the top income shares with those in four other countries for which the data begin in the last decade of the nineteenth century or in the first decade of the twentieth century: France, Prussia/Germany, Sweden and the UK. (The data for the United States do not commence until 1913.) Before doing so, we emphasise that the estimated top shares differ across countries in both sources and methods. The income tax is different and the differences inevitably affect the way in which income is measured. At the same time, the series are closer

<sup>14</sup> These estimates are based on the Income Distribution Surveys, which are a sample, and hence may differ from the earlier results based on the tax registers. It should also be noted that we have used the same control totals as before, rather than construct new totals for each definition. Note, however, that the estimates for top (assessed net) income shares based on data from sample surveys differ only slightly from the corresponding top income shares based on register data.

than is often the case for cross-country comparisons in that they are drawn from the same kind of source. We are not comparing household surveys in one country with register data in another. Figure 5 shows the shares of the top 0.1 per cent in each of the five countries. It should be noted that the geographical boundaries have changed. This is particularly important for Germany, where the figures prior to the First World War (1918) relate to Prussia, those from 1925 to the Weimar Republic and the Third Reich, and those from 1950 to the Federal Republic, including from 1991 the former East Germany. The figures for the UK include the whole of Ireland up to 1920.

The first comparison is with Norway's neighbor: the dark diamonds are the estimates for Norway; the hollow diamonds are those for Sweden. As may be seen, with a few exceptions (such as the figure for Sweden for 1916 that is off the scale) the two series follow each other closely until recent decades. For the period since 1980, we have shown the Swedish estimates with (light shading) and without (hollow diamonds) the inclusion of capital gains. The series with capital gains is closer in definition to that for Norway, and the series are indeed closer, but the rise in top shares is larger in the Norwegian case. The same is evident in Figure 6, which shows the shares of the top 1 per cent. Between 1980 and 2004, the share of the top 1 per cent more than doubled in Norway but rose less than a half in Sweden. The differential rise in Norway took place after 1990, long after oil production caused Norwegian GDP per capita to overtake that of Sweden. According to the estimates of Maddison (2003), Norwegian GDP per capita, purchasing power parity adjusted, was some 85 per cent of that in Sweden for much of the post-war period (having fallen during the Second World War), but began to rise in 1975, reaching 100 per cent around 1980 and continuing upwards.

Comparing Scandinavia with Continental Europe, we can see that the top shares in France (shown by hollow squares) start at a similar level at the beginning of the twentieth century, and then fall in a broadly similar way up to 1950. But the post-war period is different. The top shares did not fall in France in the way they did in Scandinavia, or in the UK (shown by shaded upright crosses). Nor did top shares rise in France in the period up to 1998, although this has changed subsequently – see Landais (2007).<sup>15</sup> The case of Germany is even more different. Initially, in the 1890s and early 1900s, the top income shares in Prussia were similar to those in Scandinavia, and they show the same rise in the First World War as

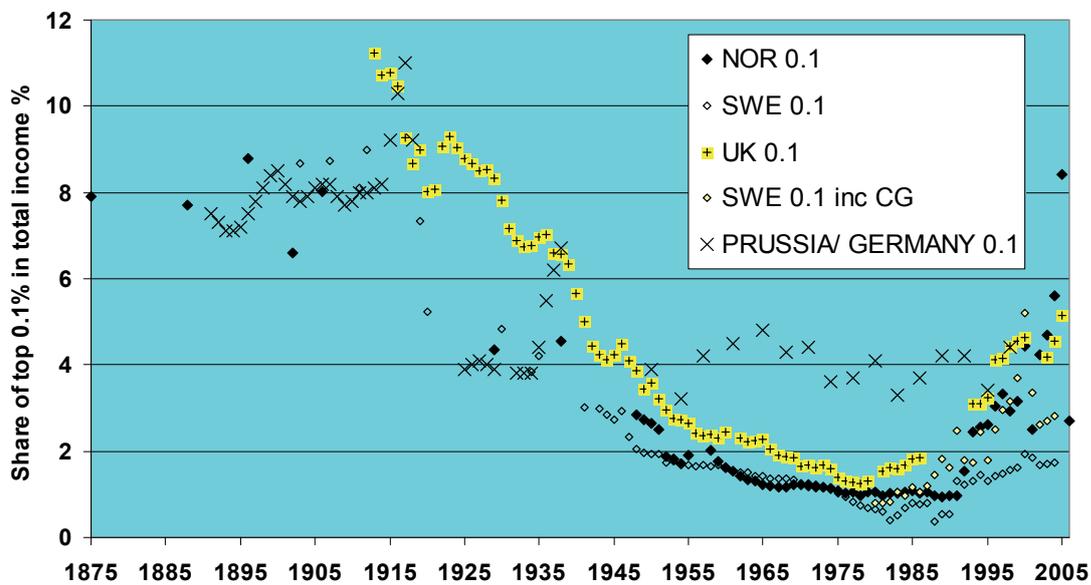
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<sup>15</sup> He shows that the top percentile increased from 604 per cent of the median in 1998 to 641 per cent in 2005.

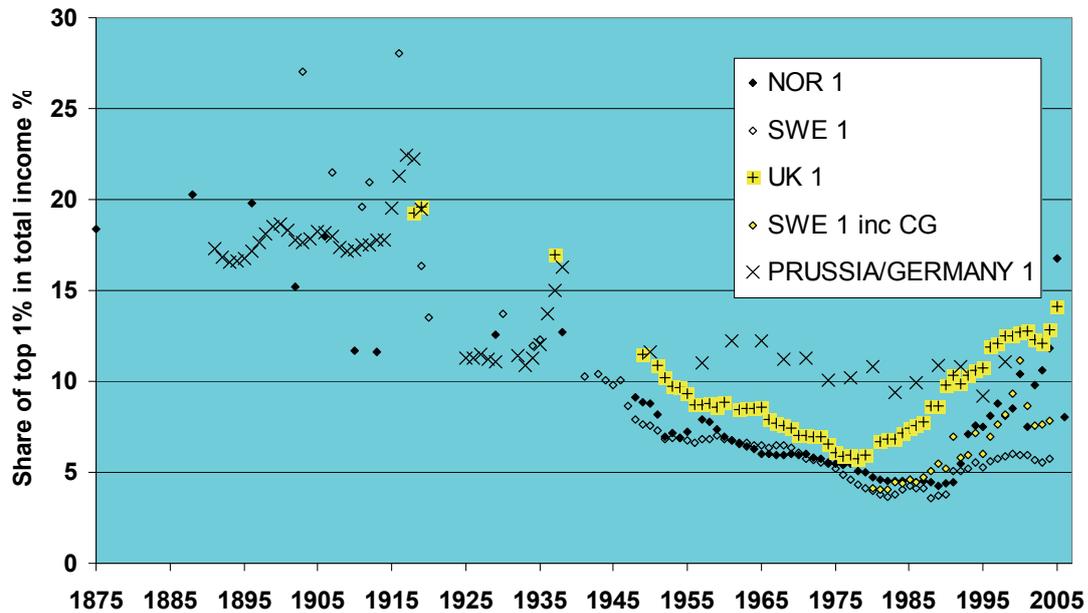
in Sweden. But the Weimar Republic was marked by stability in top shares, and they increased during the Nazi period: the share of the top 1 per cent increased from 11 per cent in 1933 to 16 per cent in 1938. (See the discussion in Dell, 2002, pages 374-375). Over the post-war period, there was no strong trend: the share of the top 1 per cent varied between 9 and 12 per cent.

The comparison of the shares may be affected by the methods employed in each country to estimate control totals for income. Figure 7 shows the Pareto Lorenz coefficients, which are not affected by the totals, and allow us to see the changing shape of the top of the distribution. We can see that at the time of Pareto, the coefficient were similar, and close to 1.55, in all five countries. The interwar period saw the decline in concentration. In four of the five countries, there was an inverted V, but with differences in the height and location of the turning point. In France, the turning point is less pronounced, but the recent estimates of Landais (2007) show the Pareto-Lorenz coefficient as falling from 2.4 in 1998 to 2.2 in 2005. Perhaps the most striking feature is that the Pareto-Lorenz coefficient today is so little different from the time when Pareto was writing.

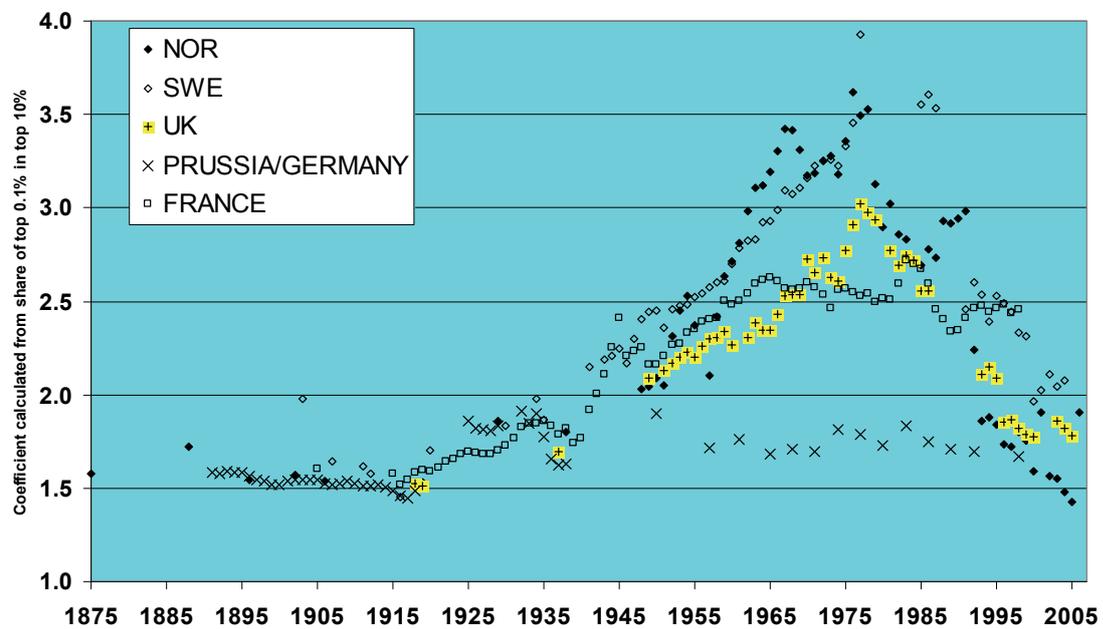
**Figure 5. Comparison of share of top 0.1 per cent, Norway, France, Prussia/Germany, Sweden and UK 1875-2006**



**Figure 6. Comparison of share of top 1 per cent, Norway, France, Prussia/Germany, Sweden and UK 1875-2006**



**Figure 7. Pareto-Lorenz coefficients for Norway, France, Prussia/Germany, Sweden and UK 1875-2006**



## 6. Conclusions

Top incomes in Norway are of considerable interest since the series for their share in total income constructed in this chapter starts as far back as 1875, so that we have estimates covering 130 years, a period in which Norway first industrialised and then became an oil exporter.

The estimates of top income shares presented here must be qualified by the fact that they are drawn from a variety of sources, not a single regular series, and that the control totals are only approximate. But they suggest that the top income shares in the nineteenth century were high: the share of the top 1 per cent was around 20 per cent and that of the top 0.5 per cent around 15 per cent. The Pareto-Lorenz coefficients obtained by examining the shares within shares (that do not depend on the control totals for income) were around 1.55 for 1906 and earlier years. This indicates a high level of concentration: the top 1 per cent received more than 40 per cent of the total income of the top 10 per cent. Were the top shares rising or falling? Movements in fact occurred in both directions. There was a rise in the shares of the top 10 per cent, 5 per cent and 1 per cent between 1875 and 1888. Between 1896 and 1902 there was a definite fall; there was some recovery in 1906, but then a further fall, with the share of the top 1 per cent losing 6 per centage points. The time-path can be interpreted in the light of events such as the Kristiania crash of 1899, followed by a recession, and the recession around 1908-09. During and after the First World War, there was some recovery in the top shares.

The early part of the post Second World War period was characterized by central planning of the economy, very progressive taxation and gradual expansion of the welfare state. Over this period, the top income shares fell steadily: the share of the richest 0.5 per cent fell from 6.4 per cent in 1948 to 2.8 per cent in 1991. The Pareto-Lorenz coefficient was around 2.25 in 1948, but rose close to 4 at the end of the 1970s. There was then, as in Sweden, the UK and the US, a turning point. The turning point for the Pareto-Lorenz coefficient came in the 1980s. The shape of the distribution has changed in such a way that we have been through a complete cycle, of declining concentration followed by increasing concentration, with the increase taking place at a faster rate. The turning point for the top income shares came at the start of the 1990s, rather later than in the UK and the US, and some 15 years after the start of substantial oil production. We have drawn attention to the role in increased top income shares of capital market reforms, but also emphasised the impact of changes in the tax system that

distorted the statistical picture. In view of this, we have proposed an alternative set of estimates of “Hicksian” income imputing a long run return to capital. The Hicksian series rises less fast, particularly after 2001, but still shows a definite increase.

In sum, the Norwegian experience has been broadly similar over the twentieth century to that in the UK and in Sweden (but not Germany) in that top shares, and the concentration among top incomes, have first fallen and then risen. Note, however, that the top shares rose less sharply in Sweden than in Norway between 1990 and 2006. Moreover, the figures for Norway also – intriguingly – suggest that the nineteenth century may have been rather different.

## **APPENDIX A: Sources of tabulated income tax data for Norway from 1875**

For the period 1875 to 1938, the sources are those described in the text and set out in detail in the first rows of Table A.1. As is clear, these early data have had to be assembled from a variety of sources, including a remarkable set of publications by A N Kiær, director of Det Statistiske Centralbureau (Central Bureau of Statistics of Norway) for many years, parliamentary papers, and analyses of the population censuses. In Table A.1, Oth. Prp stands for *Odelthings Proposition* and Sth. Prp stands for *Storthings Proposition*, both parliamentary papers. The income tax tabulations for the post-war period are published in a variety of places, as described in Table A.1, where HS denotes *Historisk Statistikk 1978* (Historical Statistics 1978); SY denotes the *Statistisk Årbok* (Statistical Yearbook); and Sk denotes *Skattestatistikk* (Tax Statistics). The tables in these publications show assessed income, after deductions such as those for interest paid but before subtracting the special allowances for age, disability, etc. In this sense, they are “net” incomes (i.e. net of deductions) but more extensive than “taxable income”. Since 1957, the assessment is for the central government income tax in the case of taxpayers paying central government income tax; for other taxpayers it is based on the municipal income tax assessment.

The results for the period 1967 to 2006 are based on the micro-data in the tax register files, but Table A.1 lists the sources for tabulations up to 2002. Statistics Norway has in the postwar period published analyses of the income distribution data in a series called *Inntektsstatistikk* (for example Statistisk Sentralbyrå, 1971) and later called *Inntekts- og Formuesstatistikk*. There have been a number of studies by Statistics Norway of changes over time (for example, Statistisk Sentralbyrå, 1972, that compares 1958, 1962 and 1967, Strøm, Wennemo and Aaberge, 1993 that covers 1973 to 1990 and Epland, 1998 that covers 1986 to 1996).

**Table A.1 Sources of Norwegian Income Tax Data** (\* before a source denotes more detailed)

<b>Year</b>	<b>Source</b>	<b>Further source</b>
1875	* Oth. Prp., number 11 for 1881, pages 20-25.	Kiær (1892-3), page 110.
1888	Kiær (1892-3), pages 99-101 and 105	
1896	Sth. Prp., number 89 for 1898, pages 24-31.	
1902	Sth. Prp., number 10 for 1903-1904, pages 150-155 and 160-169.	
1906	Rygg (1910), pages 50 and 69.	
1910 (frequencies only)	Statistisk Sentralbyrå, 1915a, page 29*.	
1913-4	Statistisk Sentralbyrå, 1915a, page 30*.	
1929 (frequencies only)	<i>Statistisk Årbok</i> , 1936, page 11.	
1938 (classified by taxable income)	<i>Statistiske Meddelelser</i> , 1941, No 11 and 12, page 333.	
1948	HS 1978, page 572.	
1949	HS 1978, page 572.	* Sk 1950/51, page 96.
1950	HS 1978, page 572.	* Sk 1951/52, page 204; SY 1953, page 275.
1951	HS 1978, page 572.	* Sk 1952/53, page 202; SY 1954, page 265.
1952	HS 1978, page 573.	
1953	HS 1978, page 573.	

<b>Year</b>	<b>Source</b>	<b>Further source</b>
1954	HS 1978, page 573.	
1955	HS 1978, page 573.	
1956		
1957	HS 1978, page 573.	
1958	HS 1978, page 572.	Same figures in Sk 1958, page 40.
1959	HS 1978, page 572.	
1960	HS 1978, page 572.	
1961	HS 1978, page 572.	
1962	HS 1978, page 573.	
1963	* HS 1978, page 573.	SY 1966, page 181.
1964	* HS 1978, page 573.	SY 1967, page 184.
1965	* HS 1978, page 573.	SY 1968, page 189.
1966	* HS 1978, page 573.	SY 1969, page 185.
1967	* HS 1978, page 574.	
1968	* HS 1978, page 574.	SY 1971, page 206.
1969	* HS 1978, page 574.	SY 1972, page 214.
1970	HS 1978, page 574.	* SY 1973, page 216.
1971	HS 1978, page 574.	* SY 1974, page 230.
1972	HS 1978, page 574.	* SY 1975, page 290.
1973	HS 1978, page 574.	* SY 1976, page 294.
1974	HS 1978, page 574.	* SY 1977, page 298.
1975	SY 1978, page 298.	
1976	SY 1979, page 302.	
1977		Sk 1977, page 52.
1978	SY 1980, page 296.	
1979	SY 1981, page 296.	Sk 1980, page 55.
1980		Sk 1980, page 55.
1981		Sk 1982, page 50.
1982	SY 1985, page 335.	* Sk 1982, page 50.

<b>Year</b>	<b>Source</b>	<b>Further source</b>
1983	SY 1986, page 182.	
1984	SY 1987, page 174.	
1985	SY 1988, page 171.	
1986	SY 1989, page 168.	
1987	SY 1990, page 163.	
1988	SY 1991, page 163.	
1989	SY 1992, page 163.	
1990	SY 1993, page 160.	
1991	SY 1994, page 162.	
1992	SY 1995, page 135.	
1993		
1994	SY 1996, page 141.	
1995	SY 1997, page 161.	
1996	SY 1998, page 161.	
1997	SY 1999, Table 161.	
1998	First year that jointly taxed married couples not treated as 1 unit. SY 2000, Table 225.	
1999	SY 2001, Table 202.	
2000	SY 2002, Table 204.	
2001	SY 2003, Table 204	
2002	SY 2004, Table 205 (table dropped from 2005 edition)	

## **APPENDIX B: Sources of total population data for Norway**

The starting point is the total population at 1 January each year taken from the Statistical Yearbook 2007, Table 47 for years since 1900; figures for 1875, 1888 and 1896 from Statistisk Sentralbyrå (1949, Tabell 14, also in Maddison, 2003, page 37).

The population aged 16 and over for years from 1948 to 2006 was supplied by Statistics Norway. For years prior to 1948, data for 1 January (or 31 December of the previous year) are given for years ending in “1” or “6” up to 1991 in *Historisk statistikk 1994* (Statistics Norway, 1995), Tabell 3.5. The proportions were linearly interpolated between years when data were not available, and the interpolated per centages applied to the total population to give the figures in Table B.1.

Figures on the number of married women are given for a number of years up to 1991 in *Historisk statistikk 1994* (Statistics Norway, 1995), Tabell 3.7. The data on the number of married women for 1995 are from SY 1996, Tabell 37, for 1997 from SY 1997, Tabell 39, 1998 from SY 1998, Tabell 42, 1999 from SY 1999, Tabell 41, 2000 from SY 2000, Tabell 63; 2001 from SY 2001, Tabell 54; 2002 from SY 2002, Tabell 54; 2003 from SY 2003, Tabell 53; 2004 from SY 2004, Tabell 53, 2005 from SY 2005, Tabell 57, 2006 from SY 2006, Tabell 58, and 2007 from SY 2007, Tabell 59. The proportions are again linearly interpolated between years when data were not available, and the interpolated per centages applied to the total adult population. Total tax units are obtained by subtracting the calculated number of married women from the total adult population.

The resulting control totals for total adults and total tax units are shown for the period since 1876 in Figure B.1, and compared with the totals in the tax data. The tax totals converge towards the control total, and are essentially identical from 1998 when independent taxation was introduced. It may be noted that the figures for the early years that included an estimate of the number of individuals not paying tax, such as 1876 and 1889, are closer to the control totals.

**Table B.1 Control total for population, Norway 1875-2007**

	Total tax units 000	Total adult population 000	Total recorded in tax statistics 000
1875	847	1,140	705
1888	919	1,241	790
1896	980	1,321	70
1902	1,062	1,426	69
1906	1,077	1,446	677
1910	1,115	1,496	520
1913	1,176	1,550	774
1929	1,451	1,917	895
1938	1,648	2,176	410
1948	1,734	2,404	955
1949	1,732	2,419	1,011
1950	1,727	2,429	1,047
1951	1,721	2,439	948
1952	1,720	2,452	1,413
1953	1,719	2,465	1,440
1954	1,720	2,479	1,425
1955	1,721	2,495	1,418
1956	1,724	2,514	
1957	1,729	2,526	1,397
1958	1,735	2,539	1,386
1959	1,745	2,557	1,372
1960	1,756	2,579	1,440
1961	1,771	2,605	1,456
1962	1,792	2,636	1,484
1963	1,816	2,671	1,478
1964	1,836	2,701	1,530
1965	1,854	2,729	1,504
1966	1,871	2,754	1,543
1967	1,888	2,779	1,698
1968	1,905	2,805	1,771
1969	1,922	2,830	1,816
1970	1,939	2,855	1,738
1971	1,953	2,876	1,788
1972	1,974	2,902	1,855

	Total tax units 000	Total adult population 000	Total recorded in tax statistics 000
1973	1,995	2,930	1,902
1974	2,015	2,955	1,910
1975	2,035	2,981	1,947
1976	2,055	3,005	2,013
1977	2,078	3,029	2,074
1978	2,102	3,054	2,133
1979	2,124	3,078	2,199
1980	2,154	3,102	2,295
1981	2,185	3,128	2,286
1982	2,218	3,156	2,330
1983	2,252	3,186	2,318
1984	2,285	3,213	2,461
1985	2,319	3,241	2,545
1986	2,353	3,270	2,609
1987	2,387	3,297	2,788
1988	2,424	3,330	2,906
1989	2,458	3,357	2,917
1990	2,483	3,372	3,035
1991	2,504	3,387	3,072
1992	2,527	3,405	3,105
1993	2,549	3,422	
1994	2,569	3,436	3,182
1995	2,590	3,451	3,192
1996	2,607	3,463	3,227
1997	2,625	3,477	3,286
1998	2,643	3,492	3,465
1999	2,664	3,511	3,490
2000	2,684	3,531	3,503
2001	2,701	3,548	3,514
2002	2,719	3,563	3,536
2003	2,742	3,586	
2004	2,765	3,563	
2005	2,795	3,586	
2006	2,830	3,607	
2007	2,872	3,635	

## APPENDIX C: Sources of total income data for Norway

The starting point is a series for total household income provided for 1978 to 2006 by Statistics Norway. Total household income is made up of (i) compensation of employees (not including employers' social security contributions), (ii) operating surplus of self-employed businesses, (iii) property income, (iv) transfers from government and from abroad, and (v) income not elsewhere classified. The estimate for 2006 is provisional.

In order to extrapolate this series backwards, we have made use of series that are as comparable as possible, given the available materials from *Historisk statistikk* 1994 and earlier editions. In each case, the series have been linked at years where the estimates seem most comparable (for this reason we have started with 1979, rather than 1978). So that if the 1979 value from the Statistics Norway series is  $A_{1979}$ , and first linked series is for 1975 to 1979, given by  $B_{1975}, \dots, B_{1979}$ , then for 1978 we take the value of  $B_{1978}$ , multiplied by  $A_{1979}/B_{1979}$ .

Working backwards we have used the *Nasjonalregnskap 1968-1979*, Tabell 33, pages 138-139 for the New Definition of Private Income for 1968 to 1978. For 1948 to 1968, we have used the Old Definition of Private Income from *Historisk statistikk 1978* (Statistics Norway, 1978), Tabell 59 (page 104) for 1965 to 1968 and from *Historisk statistikk 1968* (Statistics Norway, 1968) Tabell 70 (pages 110-111) for 1946, 1950 to 1964.<sup>16</sup> In each case employers' social security contributions were subtracted from the total of private income; these were taken from *Nasjonalregnskap 1969-1980*, Tabell 30 (for 1969 to 1974), *Nasjonalregnskap 1962-1978*, Tabell 29 (for 1962 to 1968), *Nasjonalregnskap 1953-1969*, Tabell 14 (for 1953 to 1961), and *Nasjonalregnskap 1968-1979*, Tabell 14 (for 1949 to 1952, with an estimate for 1946).

For years prior to 1946, we use the Old Definition of Private Income from *Historisk statistikk 1978* (Statistics Norway, 1978), Tabell 59 (page 104), where estimates are given at 5 yearly intervals. The figures are linked to the estimate for 1950. The figures for intermediate years (such as 1902 and 1906) have been interpolated using the series for "private gross income" from *Nasjonalregnskap 1900-1929*, Tabell 7. For the nineteenth century, annual estimates of the Old Definition of Private Income are given in *Langtidslinjer i Norsk Økonomi 1865-1960* (Statistics Norway, 1966, Tabell VIII). It should be noted that employers' social security contributions are not deducted.

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<sup>16</sup> 1948 has been extrapolated from 1946 using the household income series in *UN National Income Statistics 1938-1948*, 1950, page 130. 1949 has been extrapolated from 1948 using the GDP figures in *Historisk Statistikk 1994*, Tabell 22.1.

The resulting series for total household income is shown in Table C.1, together with the total income recorded in the tax statistics (up to 2002). The latter falls short of the total household income for two main reasons: (i) the omission of the income of those not covered by the tax statistics and (ii) the differences in income definitions, including the difference between total gross income and gross income as assessed for tax purposes. In our estimates, we wish to correct for the first of these, but not the second. This means that we cannot simply take the total household income series.<sup>17</sup> Instead, we adjust the series making use of other information about the income of those not covered. As noted in the text, the earliest tabulations published by Kiær (1892-3) for 1876 and 1889 included estimates of the numbers and total income of those not covered. In 1889, the number of non-filers were estimated at 318,025 with an average income of NOK 262. The addition increased the total numbers from 51 per cent of total tax units to 86 per cent (it is of course a smaller per centage of total adults); it increased the total income from 49 per cent to 63 per cent of the calculated control total. If the remaining 14 per cent of tax units were to be allocated the same average income as the non-filers, this would bring the total income to 68 per cent of the calculated control total.

Moving on to the twentieth century, the study of the income distribution in 1958, 1962 and 1967 (Statistisk Sentralbyrå, 1972, pages 13-14) included estimates of total *assessed* income, including those not covered by the tax statistics, which were, respectively, 66, 67 and 69 per cent of the national accounts total household income figure. (It should be emphasized that one reason for the difference lies in the difference between assessed and gross income: for example, a number of deductions are made from gross income to arrive at assessed income.) From *Inntektsstatistikk* (IS), we can obtain estimates for 1970 of 67 per cent (IS 1970, pages 26-27), for 1973 of 66 per cent (IS 1973, page 47) and for 1979 of 67 per cent (IS 1979, page 55). The highest per centage attained by the total recorded in the tax statistics is 72 per cent. More recently, over the period 1997 to 2002, total ordinary income “allmenn inntekt” in the tax return accounts varied between 62 and 66 per cent of the total household income figure (source: *Sjølvmeldingsstatistikk 2002*, page 31). (Over the same period, gross income in the tax return statistics was around 85 per cent of the total household

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<sup>17</sup> In 1948 for example, the totals in the tax statistics are 0.955million people and NOK 5,931 million. The control total for adults is 2.404 million, so that 1.449 million people are not covered. Total household income from our constructed series is NOK 11,480 million. If all the difference was to be allocated to those not covered, then they would have an average of NOK 3,829 each, which seems implausibly high.

income figure.<sup>18</sup>) In the light of these findings covering a long span of years, we have decided, as a reasonable first approximation, to take as a control total a fixed per centage of our calculated total household income. This approach is close to that adopted for Sweden by Roine and Waldenström (2005 and 2008), where they took a constant per centage of total personal income for the period 1943 to 2003, and not dissimilar to that applied in the UK (Atkinson, 2007a), where the control totals varied around 80 per cent of total personal income (see Atkinson, 2007, Figure 2.4). The per centage we have taken is 72 per cent, which is the maximum reached by the tax return statistics totals. To the extent that this per centage represents an upper bound, we shall be under-estimating the top income shares. The resulting figures are shown in the third column of Table C.1 and are plotted in Figure C.1.

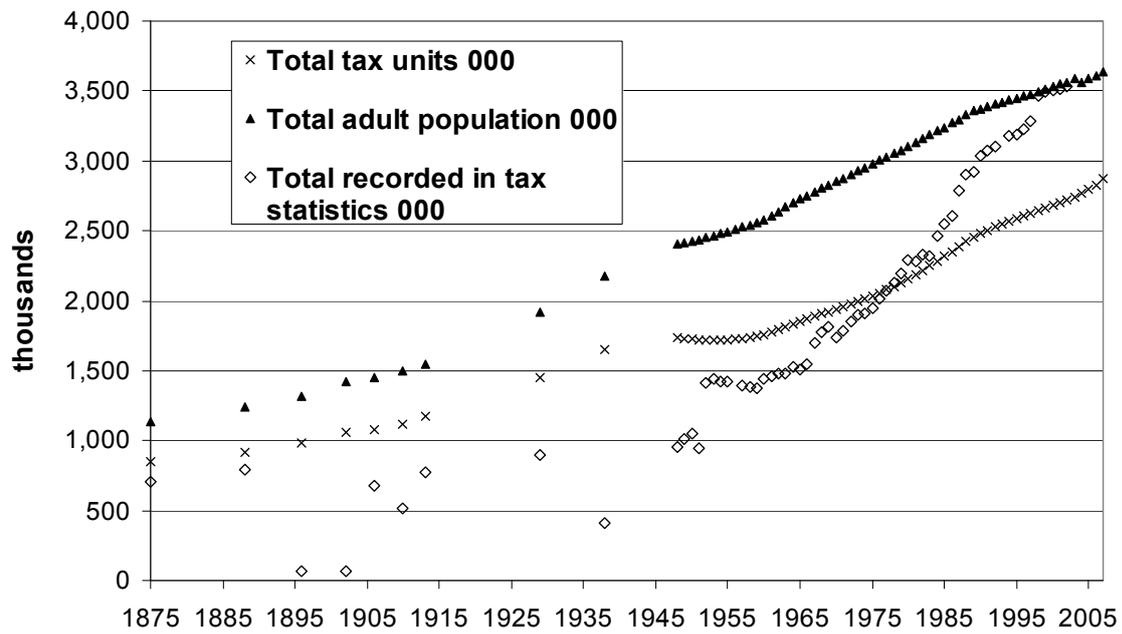
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<sup>18</sup> The study of the income distribution in 1958, 1962 and 1967 (Statistisk Sentralbyrå, 1972, pages 13-14) included estimates of total gross income, including those not covered by the tax statistics, which were, respectively, 82, 87 and 88 per cent of the national accounts total household income figure. From *Inntektsstatistikk* (IS), we can obtain estimates for 1970 of 85 per cent (IS 1970, pages 26-27).

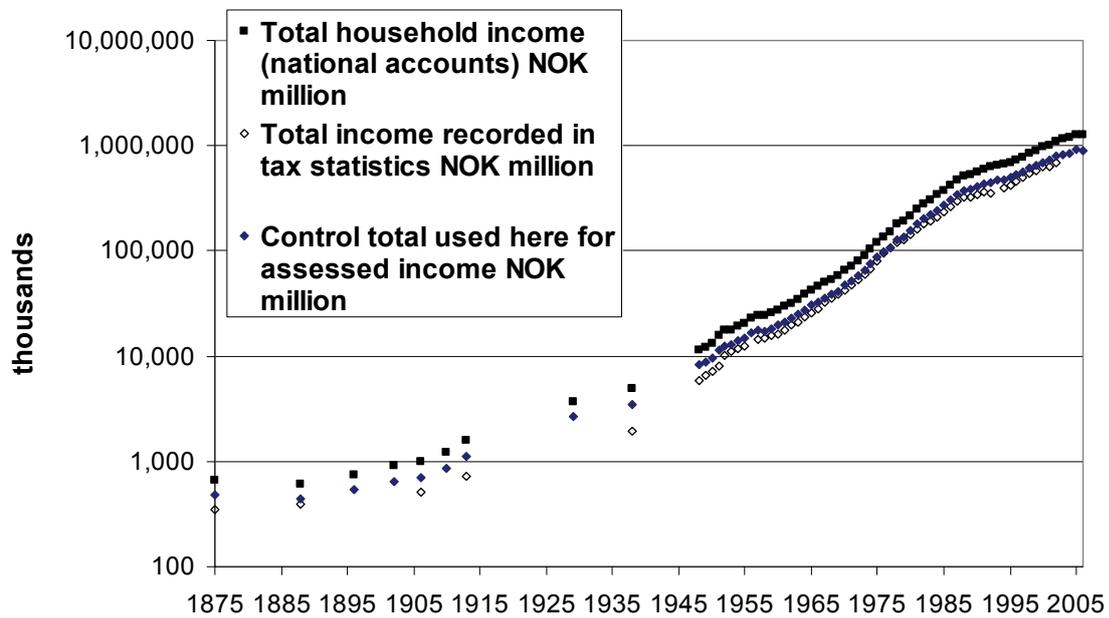
**Table C.1 Control total for income, Norway 1875-2007**

	Total household income (national accounts) NOK million	Total income recorded in tax statistics NOK million	Control total used here for assessed income NOK million
1875	661	346	476
1888	614	389	442
1896	747		538
1902	906		652
1906	983	512	708
1910	1,202		866
1913	1,569	720	1,130
1929	3,688		2,656
1938	4,857	1,952	3,497
1948	11,402	5,930	8,209
1949	12,222	6,515	8,800
1950	13,143	7,152	9,463
1951	15,934	7,993	11,472
1952	17,438	10,227	12,556
1953	17,722	11,183	12,760
1954	19,521	11,670	14,055
1955	20,592	12,471	14,826
1956	23,195		16,701
1957	24,563	14,326	17,685
1958	24,029	14,976	17,301
1959	25,530	15,595	18,382
1960	27,223	16,435	19,601
1961	29,651	17,810	21,349
1962	31,939	19,732	22,996
1963	34,606	21,192	24,916
1964	38,284	23,590	27,564
1965	42,486	25,524	30,590
1966	45,621	28,058	32,847
1967	49,813	32,719	35,865
1968	53,156	35,188	38,272
1969	57,698	38,612	41,543
1970	65,298	42,164	47,014
1971	72,354	48,191	52,095
1972	79,767	53,195	57,432
1973	90,184	59,207	64,933
1974	103,615	66,984	74,603
1975	120,025	80,009	86,418
1976	136,588	95,168	98,343
1977	150,757	108,070	108,545
1978	178,788	121,173	128,727
1979	190,439	128,381	137,116
1980	217,588	144,882	156,663
1981	248,579	162,487	178,977
1982	279,463	181,161	201,213
1983	307,078	194,071	221,096
1984	339,380	211,376	244,354
1985	373,063	234,995	268,605
1986	421,492	261,425	303,474
1987	477,366	298,626	343,704
1988	515,143	320,907	370,903
1989	538,194	326,637	387,500
1990	567,289	347,545	408,448
1991	594,972	361,241	428,380
1992	624,043	351,941	449,311
1993	647,302		466,057
1994	660,718	397,216	475,717
1995	695,236	421,611	500,570
1996	730,657	456,163	526,073
1997	775,023	500,224	558,017
1998	850,023	550,394	612,017
1999	901,566	582,616	649,128
2000	968,408	627,174	697,254
2001	1,015,802	627,414	731,377
2002	1,096,054	682,206	789,159
2003	1,147,856		826,456
2004	1,182,727		851,563
2005	1,269,053		913,718
2006	1,253,443		902,479

**Figure B.1 Total taxpayers in tax data and control total, Norway 1875-2007**



**Figure C.1 Total income in tax data and control total income, Norway 1875-2006**



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