

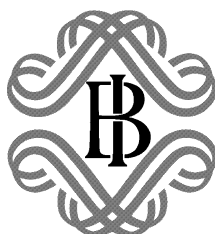
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**Promise and Pitfalls in the Use of “Secondary” Data-Sets:  
Income Inequality in OECD Countries**

by A. B. Atkinson and A. Brandolini



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# PROMISE AND PITFALLS IN THE USE OF “SECONDARY” DATA-SETS: INCOME INEQUALITY IN OECD COUNTRIES

by Anthony B. Atkinson\* and Andrea Brandolini\*\*

## Abstract

Secondary data-sets have come to play an increasing role in empirical economic research. This paper examines the major new secondary data-set assembled by Klaus Deininger and Lyn Squire (DS) at the World Bank. We concentrate on its coverage of the OECD countries. We have particularly in mind the user of income inequality statistics who does not wish to go back to the original data. In order to motivate the analysis, we first present two examples of the problems which may arise, showing how both cross-country comparisons and time-series analysis may depend sensitively on the choice of data. Section 3 of the paper sets the DS data-set in the historical context of earlier exercises in assembling comparative information on income inequality. In Section 4, we consider the methodological issues which arise in the use of income distribution data and their relation to the different sources of evidence. In Section 5, we discuss their implications for the comparison of income inequality across OECD countries, and the use of dummy variables to allow for definitional and data differences. Section 6 is concerned with changes in income inequality over time, and the establishment of consistent series for individual countries. The lessons to be drawn for use of secondary data-sets in the field of income distribution are summarised at the end of the paper.

JEL classification: D31, C80.

Keywords: personal income distribution, secondary data-sets.

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

Secondary cross-national data-sets have come to play an increasing role in empirical economic research. The past decade has seen, for instance, widespread use of the international national accounts data assembled by Summers and Heston (1991). Here our focus is on the major new secondary data-set on income inequality assembled by Deininger and Squire (1996) at the World Bank. Described as “the largest possible”, the Deininger and Squire data-set draws together more than 2,600 observations on Gini coefficients and, in many cases, quintile shares from a wide variety of studies covering 135 developed and developing countries for the years 1947-1994. The statistics were selected by requiring that they be from national household surveys for expenditure or income, that they be representative of the national population, and that all sources of income or expenditure be accounted for, including own-consumption. Further, Deininger and Squire identify in their data-set a “high quality” subset of nearly 700 observations for 115 countries, not more than one per country per year, which they label “accept” for the guidance of users.

The construction of this data-set by Deininger and Squire (referred to below as the DS data-set) is a remarkable achievement, and they deserve full praise for allowing all interested researchers free and easy access to the data.<sup>2</sup> It has been already used, just to give a few examples, by Deininger and Squire themselves (1998) to test the hypothesis of Kuznets (1955) on the relationship between inequality and growth, by Bénabou (1996) to study the convergence of inequality across countries, by Vanhoudt (1997) to assess the effect on inequality of aggregate economic variables and labour market policies, by Checchi (1998) to examine the relationship between inequality in incomes and inequality in educational

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<sup>1</sup> We are very grateful for their most helpful comments on the first version to Francois Bourguignon, Sam Bowles, Andrea Cornia, Klaus Deininger, Karen Gardiner, Raffaella Giordano, Giorgio Gobbi, Richard Hauser, John Hills, Sampsa Kiiski, John Micklewright, Rosa Mulè, Brian Nolan, Thomas Piketty, Tim Smeeding and Lyn Squire. We thank Roland Bénabou and Christina Romer for supplying copies of the data they used, and Hans de Kleijn of CBS (Statistics Netherlands) for supplying data for the Netherlands. The views expressed here are solely those of the authors; in particular, they do not necessarily reflect those of the Bank of Italy.

<sup>2</sup> The data-set is available from World Bank’s web-site, at the address: <http://www.worldbank.org/html/prdmg/grthweb/dddeisqu.htm>.

achievements, by Siniscalco *et al.* (1999) to analyse the process of privatisation in around 100 countries, and by Romer and Romer (1999) to investigate the relation between inequality and monetary policy. Li *et al.* (1998) used the data to test two propositions: that income inequality is relatively stable within countries, and that it varies significantly across countries.

In view of the wide use which they can be expected to have, it is important that such secondary data be subjected to careful scrutiny. This is in the spirit of constructive criticism encouraged by Deininger and Squire in the case of their data-set:

“Although we have attempted to be as objective as possible, we have undoubtedly either missed or misinterpreted a piece of available information in some cases. We hope that making available all the original data reviewed will allow interested readers to correct those lapses or to adapt the data to suit their more specific needs” (1996: 572).

Such scrutiny is not easily applied across 115 countries, since it is necessary to consider the available sources at the level of the individual country. In this paper, we restrict attention to member countries of the Organisation for Economic Co-operation and Development (OECD).<sup>3</sup> We do this because they are countries on which we have previously worked (Atkinson *et al.*, 1995, Atkinson, 1995, Chapter 2, and Brandolini, 1998 and 1999), and because they are countries for which there are alternative sources with which comparisons can readily be made. We appreciate that Deininger and Squire were primarily concerned with establishment of a data-base for developing countries, and that we are shifting focus in concentrating on OECD countries. A number of the points made in the present paper are more compelling for the OECD subset of countries than for developing countries. But we believe them to be important in view of the extent to which the DS data-set is being used to carry out analysis for OECD countries, and the substantial proportion of observations in the

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<sup>3</sup> The original members of the OECD were Austria, Belgium, Canada, Denmark, France, Federal Republic of Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States. Subsequently, the following countries became members: Japan (1964), Finland (1969), Australia (1971) and New Zealand (1973). Although the OECD did not come into existence until 1961, we refer to data for these countries in earlier periods as “for OECD countries”. We do not include those countries which have joined in the 1990s, such as Mexico, Korea and Hungary. We also exclude Iceland and Turkey, as we lack any familiarity with their data. Throughout the paper West Germany refers to the Federal Republic of Germany until 1990 and to the Western Länder thereafter.

data-set accounted for by the OECD: over a quarter of all observations and more than a third of those classified as “accept”.

In writing this paper, we have particularly in mind the user of income inequality statistics who does not wish to go back to the original data. We assume that people who use secondary data-sets do so because they want a “ready made” measure of income inequality, rather than the “bespoke” measure which could be obtained by accessing the micro-data contained, for example, in the Luxembourg Income Study (LIS)<sup>4</sup> or the Living Standards Measurement Study (LSMS) of the World Bank.<sup>5</sup> Even such a bespoke measure is, we should note, not without its problems. The data contained in the LIS database, for example, have already been standardised in a variety of ways, and the results obtained may differ for this reason from those which are published in national sources or which might be calculated from the much more laborious process of securing direct access to the underlying national data-sets. This should be borne in mind since, on a number of occasions, we use the LIS as a standard of comparison.

The creation of secondary data-sets in this field is far from a new activity. The DS data-set has been preceded by earlier collections by, among others, the United Nations agencies,<sup>6</sup> Kravis (1960, 1962), Kuznets (1963), Adelman and Taft Morris (1971), Paukert (1973), Jain (1974, 1975), Roberti (1974), Sawyer (1976), Lecaillon *et al.* (1984) and van Ginneken and

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<sup>4</sup> The Luxembourg Income Study project began in 1983 under the joint sponsorship of the government of Luxembourg and the Centre for Population, Poverty, and Policy Studies (CEPS). It is now based in Differdange (Luxembourg) and it is funded on a continuing basis by CEPS/INSTEAD and by national science foundations and other national institutions. The main objective of the LIS project has been to create a database containing social and economic data collected in household surveys from different countries. The database currently contains information for some 25 countries for one or more years. Documentation concerning technical aspects of the survey data is available to users. The web-site address is <http://www.lis.ceps.lu>.

<sup>5</sup> In the mid-1980s, the World Bank launched the Living Standards Measurement Study to improve the type and quality of household data in developing countries. LSMS surveys have been implemented in over 20 countries, under the World Bank supervision. Though separately conducted, surveys share many common features. Questionnaires usually cover a wide range of data, from income, expenditure, and labour market activities to health and education. In some cases, the micro-data are directly available from the LSMS web-site: <http://www.worldbank.org/html/prdph/lms/lms/home.html>. In other cases, they may be requested from the LSMS Office. For further information, see Grosh and Glewwe (1995, 1998), Grosh and Munoz (1996), and the LSMS web-site.

<sup>6</sup> United Nations (1951, 1981, 1985), United Nations Economic Commission for Asia and the Far East (1967), United Nations Economic Commission for Europe (1957, 1967) and United Nations Economic Commission for Latin America (1970).

Park (1984). These too have been widely used.<sup>7</sup> There have, for instance, been cross-sectional empirical studies of the effect of initial income inequality on economic growth: Alesina and Perotti (1996), Alesina and Rodrik (1992, 1994), Clarke (1995), Perotti (1994, 1996) and Persson and Tabellini (1992, 1994). In the sociological and political science literature, these data-sets have been extensively used to study the impact on income inequality of various indicators of a country's democratic development, of the strength of socialist parties, of the government involvement in the economy, and so forth.<sup>8</sup>

In Section 3 of the paper, we set the DS data-set in the historical context of these earlier exercises in assembling comparative information on income inequality. This is useful not only to better appreciate the advancement achieved by DS, but also to document the extent to which

“dubious figures [have been] passed down from generation to generation” (Deininger and Squire, 1996, p. 571).

In Section 4, we consider the methodological issues which arise in the use of income distribution data and their relation to the different sources of evidence. In Section 5, we discuss their implications for the comparison of income inequality across OECD countries, and in particular the use of dummy variables to allow for definitional and data differences. Section 6 is concerned with changes in income inequality over time, and the establishment of consistent series for individual countries. The lessons to be drawn for use of secondary data-sets in the field of income distribution are summarised at the end of the paper.

First, in order to motivate the analysis, we present in Section 2 two examples of the problems which may arise.

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<sup>7</sup> Collections of income distribution data are also contained in handbooks of social science data. Russett (1964) in the *World Handbook of Political and Social Indicators* took data mainly from Kuznets (1963). The third edition by Taylor and Jodice (1983) made use of Paukert (1973), Jain (1975) and other World Bank publications.

<sup>8</sup> For instance, Paukert's (1973) data were used by Rubinson (1976), Rubinson and Quinlan (1977), Stack (1978, 1979), Jackman (1980), Hewitt (1977, 1980), Weede (1980) and Bollen and Grandjean (1981). The more recent papers by Bollen and Jackman (1985), Muller (1988, 1989), Weede (1989), and Simpson (1990) expanded their data-sets to include also data from Jain (1975), Ahluwalia (1976), Sawyer (1976) and Lecaillon *et al.* (1984), as well as from World Bank publications such as the *World Development Report*.



## 2. Two case studies

We begin with two examples which illustrate the potential pitfalls, and serve, we hope, to encourage readers to tackle the more detailed sections which follow.

### 2.1 *Comparison of income inequality in OECD countries*

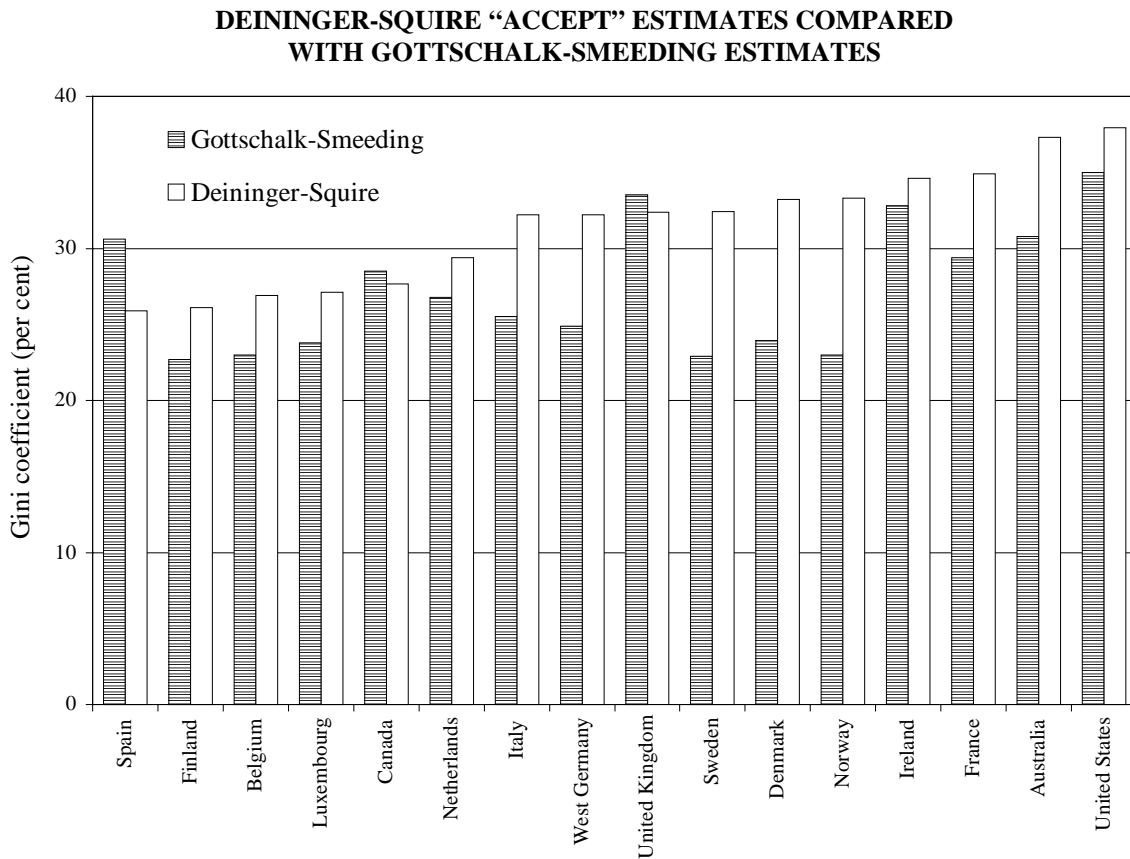
The first example concerns the comparison of income inequality across OECD countries in the early 1990s. Such a comparison of levels is a key question in any income distribution analysis. To this end, we take the observations in the “high quality” subset, labelled “accept” by Deininger and Squire, which is the natural starting point for any user, and compare them with the estimates of Gottschalk and Smeeding (1997) in their *Journal of Economic Literature* survey article. The latter are derived on a comparable basis from the micro-data in the LIS database, and provide a point of reference. These two sets of estimates are displayed in Figure 1, where countries are ranked from left to right in increasing order of the Gini coefficient according to the DS data-set based estimates.<sup>9</sup> In this paper, we make extensive use of the Gini coefficient (area between the Lorenz curve and the diagonal, relative to the whole triangle below the diagonal, or half the mean difference relative to the mean) as a summary statistic, but it must be remembered that a single statistic cannot necessarily reveal all relevant aspects of the distribution: the same value of the Gini coefficient may be consistent with different distributional shapes. Countries differ in the summary measures employed: for example, the Netherlands make extensive use of the Theil coefficient.

The ranking according to DS estimates in Figure 1 is a little difficult to understand. It is surprising to see Sweden, Denmark and Norway in the middle, rather than at the left, and for the United Kingdom to be in the middle (in 1991). The ranking differs from that in Gottschalk and Smeeding (1997), in which, as in Atkinson *et al.* (1995), there is fairly clear geographic pattern, with Scandinavia and Benelux with the lowest Gini coefficients, followed by the large mainland European countries, Southern Europe, and then the Anglo-Saxon countries, with

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<sup>9</sup> The countries shown are the 19 covered in Figure 2 of Gottschalk and Smeeding (1997, p. 661), with the exceptions of Austria, Israel and Switzerland, for which no “accept” estimates exist in the DS data-set.

Figure 1



Sources: Gottschalk and Smeeding (1997, p. 661, Figure 2) and DS data-set, “accept” series.

the United States at the top of the OECD inequality parade. The simple correlation of the Gini coefficients in the two sources is quite low (0.48).

On the face of it, these differences in ranking seem rather surprising, particularly since seven of the DS estimates are described as coming from the LIS database, the source of the Gottschalk and Smeeding estimates. The first reason is to be found in the differences in definition. The DS “accept” estimates include some which relate to gross income, and others to net (disposable) income. They mainly use unadjusted household income but include two estimates on an equivalised basis. In most cases, they apply household-weighting, but in one case (the United Kingdom) observations are weighted by persons. The Gottschalk and Smeeding results are consistently for household disposable income per equivalent person (using an equivalence scale equal to the square root of household size) weighted by persons.

The second reason for the variation in results is to be found in the use of different data. In order to try to understand the reasons why this may lead to different results, we would need to investigate each country in turn. Here we simply take the United States as an illustration. For the United States, the DS estimates are based on the Current Population Survey (CPS), which is the same source as that contained in LIS. However, the DS quintile figures appear to relate to the distribution among families (Bureau of the Census, 1999, Table F-2), which consist of 2 or more related individuals, whereas the basis more comparable with other countries would appear to be households, including single individuals, which is given in Table H-2 of the same source. We understand from personal communication that the DS data-set is to be revised, so that it no longer refers to the subset of the United States population living in families with 2 or more related persons (but there remain other differences – see below).

The conclusion we draw is that users could be seriously misled if they simply download the DS “accept” series. It may make a significant difference to empirical findings. Just to take one example, the conclusion of Romer and Romer (1999), using DS data for the year 1988 (or the closest available year), is that for OECD countries (we do not discuss their findings for a wider range of countries)

“There is a quantitatively large and statistically significant positive association between inequality and average inflation [over the period 1970-1990]. This is true regardless of whether Turkey is included in the sample, and regardless of whether the regression also includes variability [of nominal GDP growth]” (1999, p. 196).

This is based on a regression coefficient of 0.46 with a *t*-statistic of 3.41 (with Turkey included) – see column 1 of Table 1 – and of 0.72 with a *t*-statistic of 2.66 when the standard deviation of nominal GDP growth is included as an explanatory variable. Eliminating Turkey does in fact reduce the significance of the coefficient (column 2 in Table 1). On the other hand, introduction of a dummy variable for those countries where the income distribution data refer to gross, rather than disposable, income (column 3) has the effect of restoring the significance of the inflation coefficient. What however happens if we replace the DS data by those of Gottschalk and Smeeding? First, reducing the sample to the 16 OECD countries

covered by Gottschalk and Smeeding, while retaining the DS data, lowers the  $t$ -statistic, but it remains in excess of 2.0 (column 4). But with the Gottschalk and Smeeding data<sup>10</sup> in place of the DS data, the inflation variable ceases to be significantly different from zero, and the  $R^2$  drops to 0.11 (column 5).<sup>11</sup> (The Gottschalk and Smeeding data relate to disposable income, so that no dummy variable is included for the gross/net distinction.) The conclusions do not appear to be robust: the choice of data matters.

Table 1

**INFLATION AND INCOME INEQUALITY IN OECD COUNTRIES**

Equation	[1]	[2]	[3]	[4]	[5]
	Romer and Romer equation (1)	Romer and Romer equation (3)  excluding Turkey	As [2] + dummy variable for gross income  excluding Turkey	As [3] for a subset of 16 countries	As [4] with Gottschalk- Smeeding data in place of DS
Constant	0.29	0.29	0.247	0.238	0.225
Average inflation	0.46 (3.41)	0.55 (1.89)	0.91 (3.81)	0.68 (2.11)	0.65 (1.35)
Dummy variable for gross income			0.055 (3.82)	0.053 (3.77)	
Sample size	21	20	20	16	16
$R^2$	0.38	0.17	0.55	0.53	0.11
S.e.e.	0.04	0.04	0.029	0.025	0.041

Sources: [1]-[2]: Romer and Romer (1999, Table 9, 197); [3]-[5]: authors' calculations.

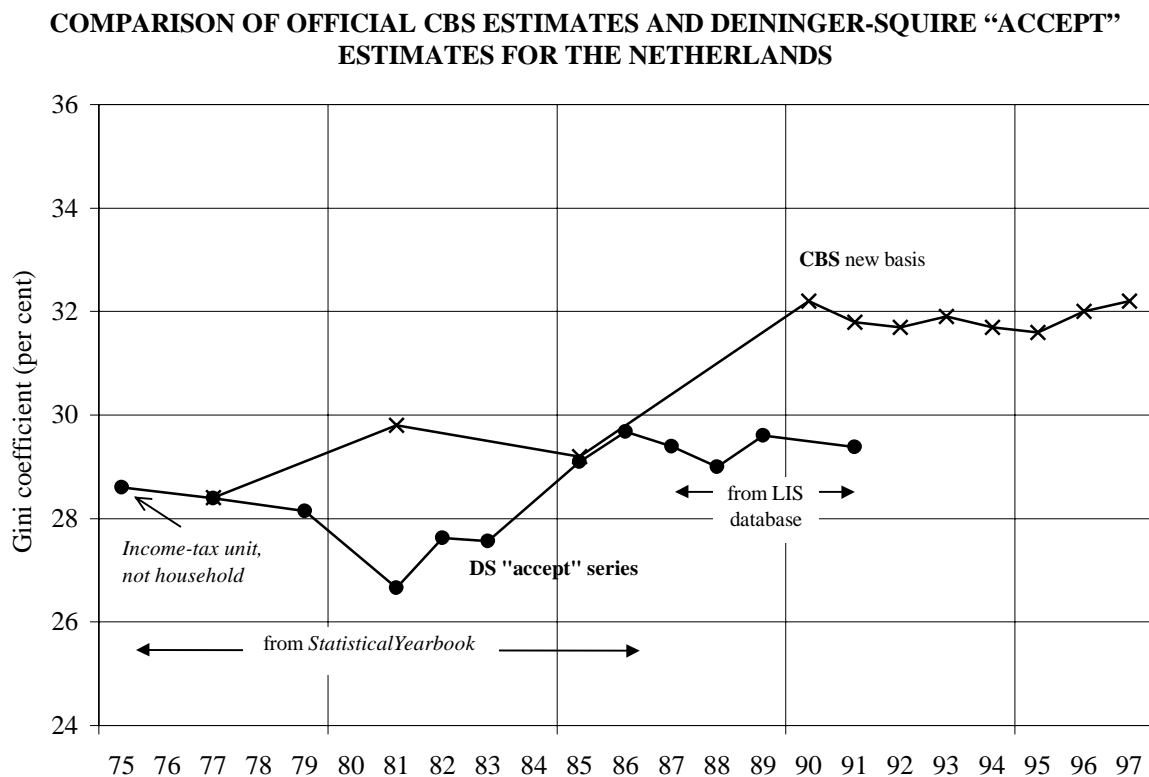
<sup>10</sup> We have replaced the estimate for Italy by the figure of 29.0 from the LIS web-site (see footnote 17 below). With the Gottschalk and Smeeding figure of 25.5, the inflation variable has a  $t$ -statistic less than 1.0.

<sup>11</sup> It must be noticed that, for 11 countries, the Gottschalk and Smeeding figures relate to a later year (1990, 1991 or 1992) than those used in regression [4]. The change in the reference period of the Gini coefficients may however account for only a part of the loss in significance between regressions [4] and [5]. Re-estimating equation [4] with the DS figures for the same year as the Gottschalk and Smeeding ones reduces the  $t$ -statistic of the inflation variable to 1.87 and the  $R^2$  to 0.37.

## 2.2 Trends over time in the Netherlands

Our second example concerns changes in the distribution of income over time, another topic in which there is a great deal of interest. We take the case of the Netherlands, where there have been a number of long-run studies of income inequality using data going back to 1938 (Pen and Tinbergen, 1976) and 1914 (Hartog and Veenbergen, 1978), indicating a significant equalisation. Any compilation of secondary data should certainly take account of these long-run data. It is however the recent estimates on which we concentrate. Today the Netherlands is of particular interest on account of its employment policy, which has led to a remarkable growth in employment and a fall in unemployment since the early 1980s. Observers are asking how far this employment policy, which involved benefit and wage restraint, and increased labour market flexibility (Barrell and Genre, 1999), has led to increased income inequality.

Figure 2



Sources: CBS: data supplied by the Central Bureau of Statistics for household disposable incomes, weighted by households. DS "accept" series: DS data-set.

Opinions differ. The OECD (Burniaux *et al.*, 1999) class the Netherlands as ++, along with the United States, as having had an increase in inequality of between 7 and 15 per cent (i.e. a Gini coefficient of 28 per cent increased to between 30 and 32 per cent). This is indeed borne out by the figures shown in Figure 2 for the official CBS (Statistics Netherlands) series for the Gini coefficient from 1977 to 1997. This suggests that there was an episode of rising inequality between 1985 and 1990, but that the series has now levelled off. It is important to note that the method of estimation used in the official series has changed (hence the label “new basis”). The changes were in the grossing-up method and the income concept. The first of these adjusted the number of households to the CBS Household statistics and led to an increase in the total number of households and in the proportion of single person households. Changes in the income concept concerned mainly imputed rents for owner-occupied houses and health insurance premia (information supplied by CBS). It may be noted that on the previous basis of estimation the increase from 1985 to 1990 was somewhat less: an increase in the Theil coefficient for disposable income of 2.5 points, compared with 3.3 points with the new series. This illustrates the important point that differences in methodology may affect not just the level but also the trend in inequality. One has to be careful even when the sources appear to be the same.

In contrast, the DS data-set gives a rather different picture. Li *et al.* (1999) conclude that over the period 1975 to 1991 there was no significant trend. The DS data are plotted in Figure 2, which also makes clear that they are based on three different sources. The most recent figures, from 1987, are described as coming from the LIS database, which appears to be a different source from that of the figures published in the *Statistical Yearbook*. The *Yearbook* in turn contains estimates on different bases, and it is only since 1977 that the CBS has provided information on the household distribution of income; estimates for years prior to 1977, such as 1975 in Figure 2, relate to income recipients for tax purposes. It would therefore be misleading to regard the DS “accept” estimates as a continuous series; and one would miss the increase in inequality in the second half of the 1980s.

Both of these examples illustrate the potential pitfalls in using a secondary data-set without due caution. We now go on to explore in more detail the underlying issues.

### 3. The Deininger-Squire data-set in historical perspective

The DS data-set represents a distinct departure from earlier studies in several respects:

(1) in imposing tighter requirements for inclusion in the high quality data-set: that the data be from national household surveys for expenditure or income, that they cover the national population, and that all sources of income or expenditure be accounted for, including own-consumption;

(2) in grading different observations according to the following mutually exclusive categories which they define:

“accept”: included in high quality data set,

“cs”: estimate not classified as “accept” due to availability of estimate from consistent source,

“nn”: based on survey of less than national coverage,

“ps”: estimate not classified as “accept” since there is no clear reference to the primary source,

“est”: estimate based on national accounts or surveys of less than full national coverage,

“wg”: estimate excluded from “accept” category because it was based on the income earning population only or derived from non-representative tax records.

Naturally, users of the data-set tend to gravitate towards the “accept” category; we shall argue that this is a mistake, and that users would be better advised to consider the appropriate estimate for their purposes;

(3) in including multiple observations for the same year, so that there are for example three estimates for Canada 1965, with Gini coefficients 31.61, 33.33 and 36.00.

At the same time, there is an important element of continuity with the earlier studies that we listed in the Introduction. A sizeable number of the estimates included in earlier compilations form part of the DS data-set. In some cases they appear indirectly. For example, one of us (ABA) was surprised that Atkinson (1970) is described as the source for a number of the DS estimates, and equally that it should be stated that “there is no clear reference to the

primary source”. The source can readily be traced, even if the route is a little tortuous. The table in Atkinson (1970) reproduces, with acknowledgement, the Gini coefficients calculated by Ranadive (1965); these in turn were based on the quantile shares given by Kuznets (1963, Table 3), which gives the source as, taking Denmark 1952 as an example, United Nations Economic Commission for Europe (1957, Chapter IX, Table 3) (with the adjustment made by Kuznets described on page 15 of his article). One needs a good library, but documentation is not in principle difficult.

The earlier UN studies have made a major contribution to the DS estimates for OECD countries; at the same time, DS go substantially beyond them, even concentrating on the same time period. The three UN publications (1951; United Nations Economic Commission for Europe, 1957, 1967) contain 37 distinct distributions by year and country (eliminating one overlap and pre-war distributions). In contrast, the DS data-set contains no fewer than 136 observations for the years 1964 and earlier, or 84 if we leave out the non-European countries (Australia, Canada, Japan, New Zealand and the United States).<sup>12</sup> Of the 84 observations, 44 in fact come from the three UN publications, 10 directly and 34 indirectly via other studies.<sup>13</sup> The extent of overlap, illustrated in Figure 3, is interesting, and needs to be borne in mind by users of the data-set.

Examination of the DS data-set brings out a number of aspects. First, 25 of the 44 observations from the three UN publications are simply different summary statistics for a distribution already included. Although the data-set indicates in some cases that there is a more basic source (for example that the estimate of Jain for Denmark in 1953 is derived from the UN), for many of the OECD countries this is not evident to the user (for instance, for the estimates from Paukert). In our view, the data-set needs consolidation. In principle, multiple

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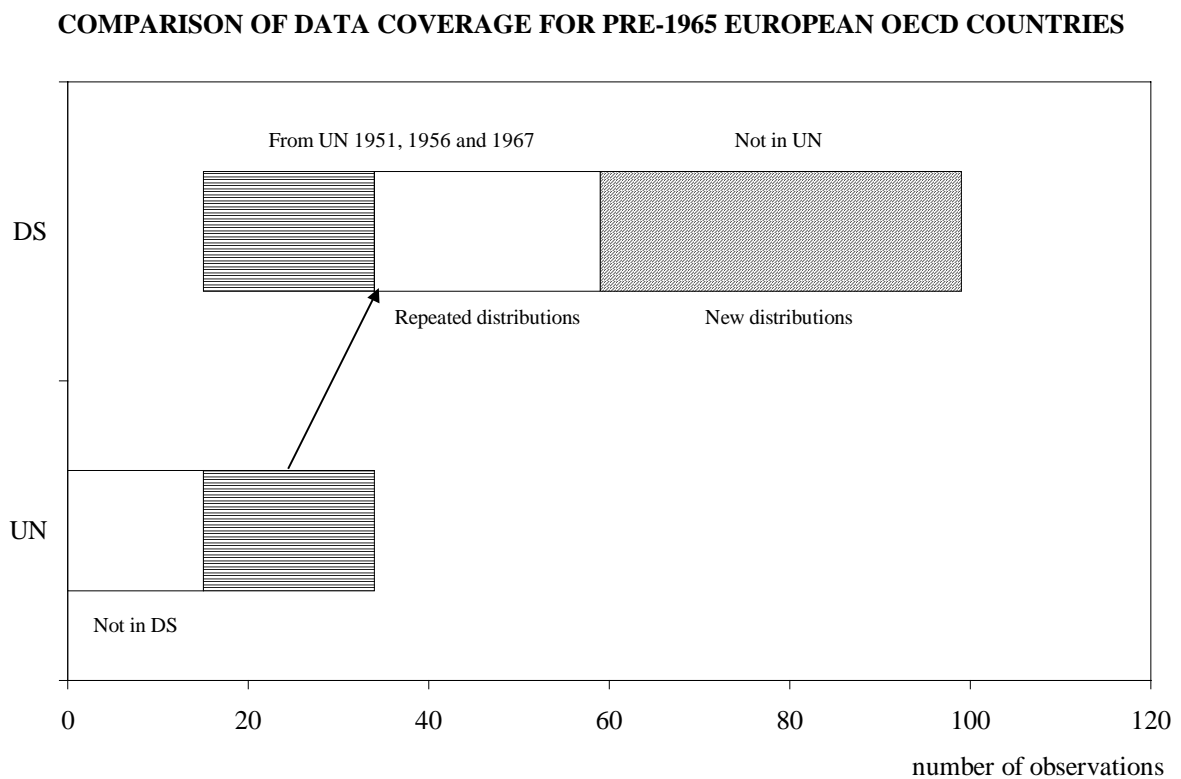
<sup>12</sup> We have not counted the observation for Germany 1964 (source: Cromwell, 1977), which in fact relates to East Germany, nor that for the United Kingdom in 1960 attributed to Cromwell (1977), which does not appear in the original source (Cromwell gives a figure for “England” – in fact the UK – for 1964). As noted earlier, we do not cover Turkey (5 observations) in the paper.

<sup>13</sup> A further 3 are from the later United Nations (1981) study, incorrectly labelled in the DS data-set as UN 1985. In this calculation we have not counted the observation for Germany 1962 drawn from Cromwell (1977), because, contrary to Cromwell’s indication, it does not appear in United Nations Economic Commission for Europe (1967).



observations for the same country and the same date are justified where there are differences in definition (for example household weights versus person weights), or where there are different methods of calculation (for example upper and lower bounds for the Gini coefficient). But it is puzzling to have, for example, three different figures for Japan 1962 with the same apparent definition. The data need to be traced back to the original study and the origins of the difference identified.<sup>14</sup>

Figure 3



Sources: *UN* refers to observations included in United Nations (1951, p. 29, Table 26, and p. 31, Table 28) or United Nations Economic Commission for Europe (1957, Chapter IX, p. 6, Table 3, and p. 22, Table 12; 1967, Chapter 6, p. 15, Table 6.10) and *DS* to those in the DS data-set.

<sup>14</sup> We are not suggesting that the duplicate figures be completely removed from the data-set. In view of their wide use in the past, it is valuable to keep the figures contained in secondary data-sets such as those of Paukert, Jain and Cromwell, but it should be clear that their status is that of *memorandum* items.

Secondly, Figure 3 reveals that there were 15 observations in the UN sources which are not included in the DS data-set, because no direct use was made of United Nations (1951) and United Nations Economic Commission for Europe (1957). There seems also to have been incomplete coverage of the later United Nations publications (1981 and 1985). For some countries the latter are used in the DS data-set (Belgium, France, West Germany, Italy, Portugal and Switzerland), but in others they are used only partially (Finland and Spain), or not used at all (Australia, Canada, Denmark, Japan, Netherlands, New Zealand, Norway, Sweden, United Kingdom and United States). These omissions are curious. It seems to us that compilations of this kind should be cumulative.

Thirdly, there is the important question of documentation. Tracing the genealogy of the observations in the DS data-set has only been possible to us because we have copies of the past studies identified above. Even then, it is not always easy to determine the methods applied. For example, one of us (ABA), in Atkinson (1975, p. 248), has contributed to this problem by modifying the data from Paukert (1973) in a way which is not described in detail and which could not be reproduced from the published text. Today, we have to recognise the need for complete documentation, with precise table numbers, and full account of all adjustments made.

Finally, an important new feature of the DS data-set is that it is available “on-line”. This is a dramatic improvement in ease of access. At the same time, new technology brings with it new problems. For example, in referring to our use of the DS data-set, we should be more precise: it is the data-set as available on 8 August 1998. One of the virtues of an on-line data-set is that it can be updated continually. This does however raise problems for replication. It is not sufficient to cite the DS data-set. For example, the listing that we have of data for January 1996 (used by Bénabou, 1996) has values for the Gini for the same year and definitions that differ from those in the August 1998 data-set by as much as 4 percentage points (Germany) or 5 percentage points (Finland). Put another way, unless researchers are careful to publish the data they are using (a good example is Vanhoudt, 1997), it might be very difficult to reproduce the results if the data-set is updated. There is a need to address the replication problems with on-line data. There should at least be a numbering of the different releases of the data-set; the conservation and availability of all versions seem highly advisable.

## *Conclusions*

Regarding the DS data-set as part of a process of developing the resources available to economists, we conclude that:

- (a) a secondary data-set should be a consolidation of earlier work, with multiple observations for the same country and the same date being justified by differences in source, in definition, or in methods of calculation;
- (b) compilations of this kind should be cumulative;
- (c) the secondary data-set should be fully documented, with precise table numbers, and a full account given of all adjustments made, so that they can be reproduced;
- (d) there is a need to address the replication problems with on-line data; there should be a numbering of the different releases of the data-set; and the conservation and availability of all versions seem highly advisable.

## **4. A bewildering variety of estimates**

In the DS data-set, the user is faced with a variety of different types of estimate. The aim of this section is to summarise some of the important ways in which they differ. The first set of differences concerns definitions.<sup>15</sup>

### *4.1 Definitions*

Among the choices to be made in defining the distribution under consideration are:

- (a) choice of reference unit; among the units used have been the household, the inner family, the tax unit, and the individual income earner; the DS data-set is largely based on the household unit, but there are some observations on other bases (such as the 1975 figure for the Netherlands which relates to income recipients);

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<sup>15</sup> Many of these issues have received considerable attention in the literature. See, for instance, Atkinson *et al.* (1995) for a comprehensive discussion; Danziger and Taussig (1979) and Ebert (1997) on the reference unit; Buhmann *et al.* (1988) and Coulter *et al.* (1992a, 1992b) on equivalence scales.

- (b) adjustment for the size ( $n$ ) and the composition of the reference unit; there may be no adjustment, or total resources may be divided by an equivalence scale reflecting size and composition (one example being a per capita income distribution); the DS data-set includes some estimates where adjustments have been made;
- (c) welfare weighting of the single observations, where each observation may receive a weight of 1 or may be weighted according to its size and composition; this welfare weighting is a separate issue from that of the equivalence scale, and it is quite possible to give a weight equal to  $n$  while using an equivalence scale that rises less than proportionately with  $n$ ; this issue is not addressed in the DS documentation (welfare weighting is also a different issue from re-weighting sample data to allow for differential sampling or non-response);
- (d) concept of resource utilised, where a basic choice is that between income and expenditure; in general for OECD countries the DS data-set uses income data, but the “accept” estimates for Spain, for example, relate in 6 of 8 years to expenditure;
- (e) income may be defined in a variety of ways: post-tax income versus pre-tax income after allowing for tax deductions (confusingly, this is often called “net income” in official statistics) versus pre-tax income before deductions; the DS data-set, as already noted, contains a variety of definitions; similar considerations apply to the definition of expenditure (such as the inclusion or exclusion of home production);
- (f) income, or expenditure, may be measured over a variety of time periods; most data refer to a year, but in some cases, such as the United Kingdom, the reference period for earnings is the most recent pay period; this issue is not addressed in the DS documentation.
- (g) where the data refer to an extended period, such as a year, there will be people who are present for only part of the period, on account of entering or leaving the population; these part-year units may be excluded, or included, and, if included, they may be treated

in different ways (for example, a 4-month income multiplied by 3, or treated as a third of a person); this issue is not addressed in the DS documentation.<sup>16</sup>

#### 4.2 Sources

There is a presumption in the DS data-set that the first choice source of data is the national household survey, but there are other sources, notably administrative data. Of these, the most important are income tax records. Historically these have provided long runs of continuous data;<sup>17</sup> today they may be linked with other sources such as social security and labour market agency records.

DS tend to dismiss tax records as non-representative. Clearly they suffer from potentially serious problems: (i) incomplete coverage of those with incomes below the tax threshold, a problem which varies over time with the tax base; (ii) the tendency to under-report certain types of income; (iii) the definition of taxable income may not correspond to that chosen in studying income distribution; (iv) the definition of the tax unit may not be appropriate; and (v) there may be difficulties in treating part-year units. For this reason, they are typically used in conjunction with other sources: for example, social security information for non-taxpayers, and information on total incomes from national accounts.

Household surveys are also subject to problems. These obviously include sampling error, which in turn depends on the size and structure of the sample. Where the survey is part of a panel, there is sample attrition. Any survey faces problems of differential non-response, which reduce the representativeness of the observed sample. This may necessitate grossing-up

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<sup>16</sup> To be fair, little attention is usually paid to this issue. Exceptions are provided by the CBS in the Netherlands, whose changes in the treatment of part-year units limit the continuity of the published series, and by the Central Statistical Office in the UK, which showed that in 1978/79 the exclusion of part-year incomes led to a reduction in the Gini coefficient for income before tax of 2 percentage points (1981, p. 86, Table E).

<sup>17</sup> Reference should be made here to the compilation of historical data for Western European countries by Flora (1987), which states (not quite accurately) that “income tax statistics ... are the only source for an analysis of long-term changes, because the other major source, sample surveys, only covers more recent periods” (1987, p. 612). As is noted, there are difficulties from the varying coverage of income taxation, over time and across countries. Tax data are consequently adjusted by estimating the total number of tax units in the population on the basis of labour force statistics. See Kraus (1981) for further discussion.

procedures based on census, or other population, data. The resulting income distribution estimates may be affected by the accuracy of the latter data and by revisions (for example, where decennial census results become available). There are problems of mis-reporting, or of failure to tailor questions asked to the chosen definitions. These may, as with tax information, mean that there is a need for the adjustment of raw data to exogenous information, such as national accounts.

In some income distribution estimates, information may be combined from several sources to yield “synthetic” estimates. For instance, income tax data on higher incomes may be merged with household survey data for the rest of the distribution, drawing on their relative strengths. The estimates may be adjusted using national accounts or administrative data. Taxes and transfers may be calculated using a simulation model and added to a survey data-set. Such a procedure may be required where the original survey does not contain the information, or where the tax information in the survey relates to a different time period from the income information.

In our view, all sources are imperfect, and ideally a secondary data-set should include information which can be used to assess the reliability of the observations. For example, this could include the sampling errors associated with the Gini coefficients; it could include the proportion of the population covered, in the case of tax records.

#### *4.3 Processing*

The role of secondary data-sets is to make accessible and enlarge the range of “ready made” income distribution statistics. This process can take several forms, and it may be helpful to bear in mind the following distinctions between different sources of the “ready made” income distribution statistics contained in secondary sources:

- (a) calculated from individual national micro data-sets (e.g. Current Population Survey tapes in the case of the United States), where there may be differences between “original” and “public use” data-sets,
- (b) calculated from LIS, LSMS, or other collections of micro data-sets; again these may differ from those available in the original source,

- (c) calculated from tabulations published by (or supplied by) national sources; here it should be noted that national sources may give differing degrees of detail (e.g. the data published in *Statistical Yearbooks* may have fewer ranges than in a specialised publication on income distribution), and that the published sources may be revised or published in alternative forms (e.g. on different definitions),
- (d) calculated from another secondary data-set,
- (e) summary statistics published by (or supplied by) national sources (e.g. the Gini coefficients published by the US Bureau of the Census),
- (f) summary statistics obtained directly from another secondary data-set.

In all cases, the calculations involve decisions being made. There is for example the application of procedures of ‘top-coding’. This may happen in the course of the collection of the data (for instance, in the United States several income items are recorded with a pre-set upper limit; e.g. Bureau of the Census, 1998, p. B7, footnote 3), or as a decision of the researcher to reduce the noise that is typically concentrated in the tails of the distribution (for a theoretical argument in favour of “trimming” see Cowell and Victoria-Feser, 1996). Changes in these procedures may affect the comparability of results. In the United States, Ryscavage concluded that

“Increasing the upper limits, or top codes, in 1993 ... had a significant impact both on the Gini index and on the shares of aggregate income received by various quintiles of the distribution ...” (1995, p. 55).

The Gini was estimated to have increased by 0.7 percentage points on this account, which is large in relation to annual changes (a quarter of the increase in the previous decade). At the bottom of the scale, there is the issue of zero or negative incomes, which cause problems for certain summary measures (not the Gini coefficient). These may be bottom-coded, being set to zero or a small positive number, or may be omitted. All of this needs to be documented.

A second example is the procedure for estimating quantile shares and inequality indices when the original data were used in grouped form in primary sources (such as the case of the United States Gini coefficients; see Bureau of the Census, 1998: p. A1), or were available only in grouped form to researchers. Li *et al.* (1998, p. 29) state that in their study “the

method used to calculate the Gini coefficient varies across different sources”, and consequently recalculate “as many observations as possible” by a standard technique. In practice, they computed the Gini coefficients from parametric Lorenz curves estimated on available grouped data by using POVCAL, a programme designed at the World Bank. POVCAL fits two alternative specifications of the Lorenz curve (the general quadratic and the beta model), and after performing various checks on the results, “it tells you which specification is better for your data” (Chen, Datt and Ravallion, 1998, p. 2). This procedure appears to have been followed for some, but not all, countries in the DS data-set: for example for the United States but not for the United Kingdom. The process may lead to rather different results from those reported in the original studies. It would be advisable, and relatively inexpensive, to include not only the recalculated series but also the original Ginis in the secondary data-set. Equally, the upper and lower bounds with grouped data (obtained with different assumptions about the within-class distribution) are readily calculated and should be included.

In general, we feel that the procedures applied in processing the data should be fully documented, and the user allowed as wide a range of choice as possible. It should be noted that choices such as those regarding interpolation method or treatment of zero incomes may be implicit in the adoption of a statistical package, or the formulae applied in the calculations, and that this may affect the conclusions drawn.

#### *4.4 Conclusion*

This section may be seen as a checklist of points which need to be considered when comparing income distribution data. We have not discussed all of these, rather taking examples to illustrate different approaches, but we feel that such a checklist should be an essential feature of a secondary data-set.

### **5. Dealing with data differences**

How then is the user to proceed when faced with a range of estimates? For example, for the year 1981 in Sweden there are 7 “cs” figures in the DS data-set, based on different



definitions, in addition to that labelled “accept”. Most users are led to ignore these alternative estimates, and rely only on the “accept” figure. The differences in definition across countries, or across time, are typically dealt with by introducing dummy variables.<sup>18</sup> (An example of their use was given in Section 2.1.) Li *et al.* (1998) introduce dummy variables for the use of income or expenditure data, for households or individuals, and for gross rather than disposable income, and conclude that only the first is significant. Romer and Romer (1999, p. 200, note 4) add 6.6 percentage points (see below) to expenditure-based estimates to make them comparable to income-based measures. Deininger and Squire (1996, p. 580) themselves recommend use of dummy variable adjustments.

Deininger and Squire consider first the difference between household and person estimates, concluding that “the difference is not too large” (1996, p. 580). There appears here to be some confounding of the reference unit, equivalisation procedure, and weighting. As noted earlier, these are three distinct issues. It is quite possible to treat each household as a unit, each with the same weight, but to evaluate its status according to the per capita income. These differences can be expected to have different effects.

A second difference considered by Deininger and Squire (1996) is that between income and expenditure, where they find that on average income-based estimates are 6.6 percentage points higher than those based on expenditure. They recommend using such an additive adjustment factor, with the warning that users should test the robustness of their results to this correction.

The third element is the difference between different definitions of income, as illustrated in Section 2.1. Again there is more than a two-fold choice. For instance, a number of countries distinguish between gross income and taxable income, where the latter deducts allowable expenses (such as costs of borrowing). If, however, we focus on gross versus net (disposable) income, then one of the striking findings of the Li *et al.* article is that

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<sup>18</sup> This approach was earlier used by Cromwell (1977) and Das (1977; see also Lydall, 1979, pp. 129-31), with quite large additive corrections being applied, and by Perotti (1996), who favoured a multiplicative adjustment. The same procedure has been followed in other disciplines: Bollen and Jackman (1985), Menard (1986), and Muller (1988).

“The results indicate that differences between coefficients defined on net and gross income [are] not significant” (1998, p. 28).

This conclusion is supported by a coefficient on a dummy variable for gross income of -0.80 (their Table 4) with a *t*-statistic of -1.13, or alternatively (their Table 5) of +0.78 with a *t*-statistic of 1.21. This finding by Li *et al.* may, however, be an artefact of their wide country coverage. Certainly in the case of industrialised countries, it runs counter to most national studies of fiscal redistribution, which suggest that direct taxes are mildly progressive in their impact. The *Economic Trends* study in the United Kingdom for 1997/98 shows the Gini coefficient as being reduced by 4 percentage points in moving from gross to disposable income (Office for National Statistics, 1999, Table A). The estimates by Statistics Canada (1996, p. 34) for 1994 show the after-tax Gini coefficient as 4 percentage points lower than that for total money income before tax.

The conclusion of Li *et al.* that there is no significant difference between net and gross distributions is reached by comparing values of the Gini coefficient in countries (or years) where it is measured for gross income and countries (or years) where it is measured net. However, it seems preferable to compare gross and net estimates when both are available for the same country at the same date, as in Deininger and Squire (1996, p. 580). They note that, making use of their alternative “cs” estimates from the LIS database, Gini coefficients for net income were on average 3 percentage points lower but that the difference ranged from 1.87 to 5.66. In Table 2, we have brought together gross and net estimates for the 15 countries for which DS give LIS-based estimates. The table also allows one to compare distributions based on Household weights/Unequivalised for household size with distributions based on Person weights/Equivalised for household size.<sup>19</sup> For these industrialised countries, the net figures are

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<sup>19</sup> It should be noted that the LIS estimates for Italy in Table 2 differ from those in Brandolini and Sestito (1994), who use the same data source, and whose results are included in the DS data-set. One possibility could be some important modification in the basic data brought about by the process of standardisation performed at LIS (the so-called “LIS-ification”). However, the Gini coefficient for after-tax equivalised incomes weighted by persons listed in the official LIS web-site (29 per cent, see Luxembourg Income Study, 1998), is close to the 28.42 per cent reported by Brandolini and Sestito (1994, Table A1), the discrepancy being mainly explained by the different definitions of income. These figures are considerably higher than the 25.52 per cent contained in the DS data-set (all three figures were computed using the same equivalence scale, i.e. the square root of the household size). As a further test, we re-calculated the Gini coefficients using the same routine on the micro-data from LIS, and those from the original Bank of Italy’s archive, obtaining virtually the same

on average between 3 and 4 percentage points less than the gross figures. Mixing net and gross figures, as in the Li *et al.* analysis, cannot be advised.

Table 2

**COMPARISON OF THE DEININGER-SQUIRE “ACCEPT” GINI COEFFICIENTS  
WITH COMPARABLE LIS-BASED ESTIMATES**  
(percentage values)

Country	Year	Household-weight unequivalised				Person-weight equivalised			
		Gross income		Net income		Gross income		Net income	
		LIS	other	LIS	other	LIS	other	LIS	other
Finland	1991	29.61		26.11		26.31		22.31	
Belgium	1992	31.95		26.92		29.24		23.04	
Sweden	1992	31.11		29.16	32.44	26.31		23.31	
Norway	1991	31.81		28.80	33.31	27.29		23.32	
Luxembourg	1985			27.13				23.81	
Denmark	1992	33.20		29.96		28.75		24.34	
West Germany	1984	32.20		28.33 (1)		29.57		24.99	
Italy	1991	28.69		27.12	32.19	27.09		25.52	
Netherlands	1991	30.59		29.38 (2)		29.10		27.58	
Canada	1991	35.08	27.65	31.47		32.73		28.63	
France	1984	34.91		31.94		33.52		29.91	
Australia	1989		37.32	32.85		35.93		30.87	
United Kingdom	1986	36.18		33.29		34.32		30.89	27.80
Ireland	1987	38.90		34.96	34.60	37.90		33.52	
United States	1991	39.15	37.94	35.24		38.51		34.30	

Sources: DS data-set. The figures in boxes are “accept” figures; countries are ranked according to the figures in the last LIS column. – (1) Classified as unequivalised, but person-weight. – (2) Classified as household-weight, but equivalised.

At the same time, a simple constant adjustment does not seem appropriate. For the Household weights/Unequivalised estimates, Table 2 shows a range from 1.2 percentage points to 5 percentage points. Differences across countries, and across time, are to be expected as a result of differences in government fiscal policies and of differences in tax

figures in both cases. It is possible that the 25.52 per cent figure was based on a preliminary version of the data-set.

incidence. A country with an above-average inequality of market income may adopt a more progressive tax system. A more progressive tax system may cause behavioural reactions which widen the distribution of market income.

### *Conclusion*

In our view, the solution to the heterogeneity of the available statistics is unlikely to be the simple additional or multiplicative adjustment. In order to assess differences in income distribution across countries, what is needed is a data-set where the observations are as fully consistent as possible. The widespread availability of micro-data means that this can now be achieved. If users wish to use a secondary data-set, and not go back to micro-data, then we believe that they would be ill-advised to limit themselves to the variables labelled “accept” in the DS data-set. As is illustrated by Table 2, where the “accept” figures are shown in boxes, there are typically other estimates in the data-set which could be used to eliminate the most obvious inconsistencies. Users should decide on their choice of definition and then select the appropriate observations (excluding those unsatisfactory on other grounds), regardless of whether or not they are labelled as “accept”.

## **6. Changes in income inequality over time**

Much attention is focused on changes in inequality over time, including the estimation of multi-country panel models. The finding of Li *et al.* (1998) using the DS data-set is that there is little intertemporal variation in income inequality:

“income inequality is relatively stable within countries” (1998, p. 26).

This will come as a surprise to those worried about widening inequality in industrialised countries. It is true that they find a

“statistically large and quantitatively important time trend” (1998, p. 33)

for seven countries, of which four are from the pre-1990 OECD, but in two cases these are negative (France and Italy), and the two where the trend is large and positive (Australia and New Zealand) do not include the United States and the United Kingdom – in both of which

there has been considerable concern about rising inequality.<sup>20</sup> For the United States and the United Kingdom, they conclude that there is a small positive trend, where “small” is defined as an annual rate of change less than 1 per cent of the country’s predicted 1980 value of the Gini coefficient: i.e. less than some 0.3 percentage points per year.

Why do Li *et al.* reach this conclusion? In part, it reflects their wider coverage. The OECD countries on which we are focusing here account for only 18 of the 49 countries in their sample, and the experience of these countries may be different. In part, it is the result of the way in which Li *et al.* test inter-temporal variability by fitting a linear time trend to the Gini coefficient, whereas this cannot hold for more than a limited period. If a country’s Gini coefficient has followed a U-shape, as in the United States and the United Kingdom in the post-war period, it is quite possible that the estimated coefficient on the time variable comes out close to nil and statistically insignificant. In part, it is due to the underlying data – that are our primary concern in this paper. We consider in turn a number of countries to illustrate two key points: (i) consideration of a wider range of evidence, including data based in part on tax records, allows a richer story to be told, and (ii) ensuring consistency over time requires considerable care and attention to the sources.

### 6.1 United Kingdom

We begin with the United Kingdom.<sup>21</sup> The series labelled “accept” by DS, and shown in Figure 4, was constructed by Goodman and Webb (1994) on a consistent basis,<sup>22</sup> and provides a good foundation for studying the changes over time. The principal source is the Family Expenditure Survey, but it should be noted that the estimates are not based purely on household survey information. Data from the income tax records (Inland Revenue Survey of

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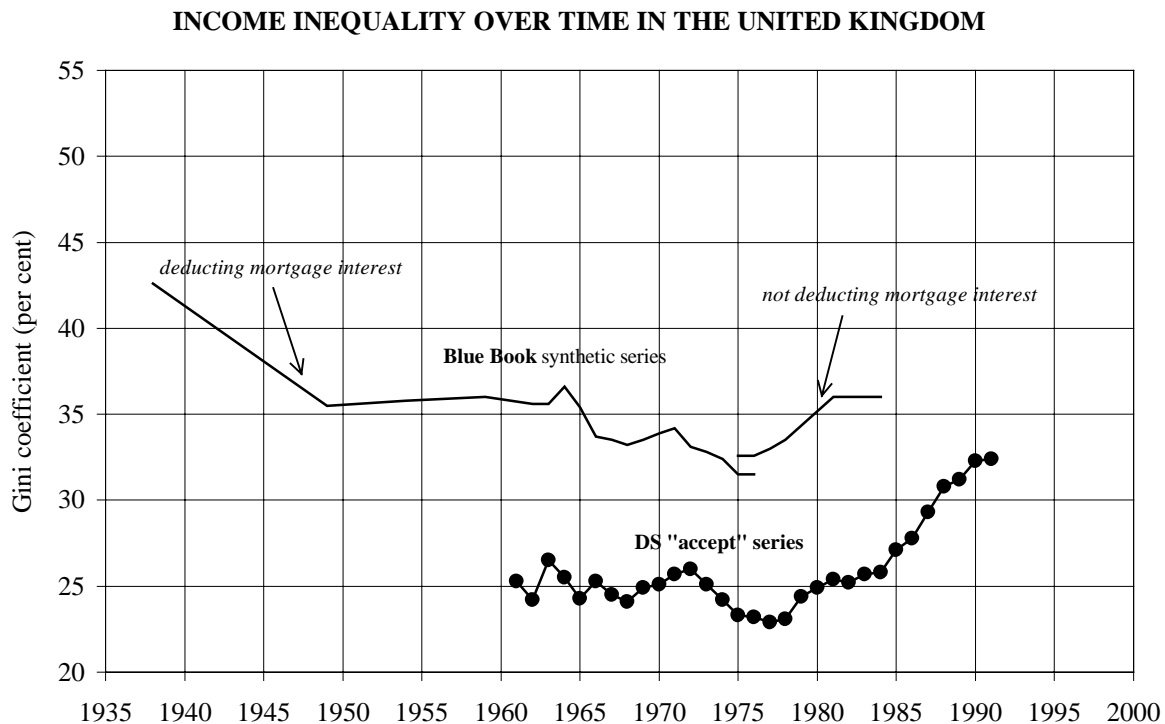
<sup>20</sup> Li *et al.* (1998) refer to this in their footnote 5.

<sup>21</sup> For a description of the sources on income distribution in the United Kingdom see, among others, Stark (1972, 1977), Royal Commission on the Distribution of Income and Wealth (1977, 1979), Atkinson and Micklewright (1992, pp. 272-8), Office for National Statistics (1999); the quality of the FES data was assessed by Atkinson and Micklewright (1983), Wilson (1995) and Banks and Johnson (1998).

<sup>22</sup> In fact the Gini coefficient quoted by DS, which is taken directly from the source (p. A54), relates to a different series from the DS quintile shares which come from p. A4; the Gini coefficients corresponding to the latter are given on p. A2. The difference between the two series is in the treatment of local tax payments.

Personal Incomes) are used to adjust the incomes of the highest taxpayers.<sup>23</sup> The income tax records had formed the main basis for the earlier official Blue Book “synthetic” series for the distribution of disposable income, also shown in Figure 4 (this series has been suspended since the mid-1980s). The Blue Book estimates made much more extensive use of the income tax returns, but were combined with household survey data. It should be noted that the Blue Book series did not use the same definitions as the estimates we have been discussing to this point. It related to tax units rather than households and made no adjustment for differences in size of the unit. It related to annual rather than weekly/monthly income, which brings it closer to the sources for other countries, although there may be a problem of part-year units.

Figure 4



Sources: *Blue Book*: Royal Commission on the Distribution of Income and Wealth (1979, p. 23, Table 2.4; 167, Table A3) for 1938-1976/77, Central Statistical Office (1981, p. 82, Table A) for 1977/78-1978/79, Central Statistical Office (1984, p. 97, Table A) for 1981/82, Central Statistical Office (1987, p. 94, Table A) for 1984/85; tax unit disposable incomes, weighted by tax units. The first sets of figures is for incomes net of amounts spent on mortgage interest (old basis), while the second is for incomes gross of those amounts (new basis). – DS “accept” series: DS data-set.

<sup>23</sup> The method applied by Goodman and Webb is parallel to that used in the official *Households Below Average Income* series (e.g. Department of Social Security, 1998). No such adjustment is made to the *Economic Trends* series (e.g. Office for National Statistics, 1999).

The Blue Book series is not included by DS in their data-set, but it allows a longer-run perspective. According to these estimates, between 1938 and 1949 the Gini coefficient fell by over 7 percentage points. It then appeared to be relatively stable in the period 1949 to 1964, although this was the result of the Lorenz curve shifting in at the top and out at the bottom: the share of the bottom 50 per cent fell from 26.5 per cent to 25.2 per cent (Atkinson and Micklewright 1992, Table BI2). This is a caution against reading as much into constant Gini coefficients. There were then falls in the Gini coefficient in the second half of the 1960s and in the period up to 1977, followed by the increase in inequality already described. By enriching the DS data-set in this way, we can tell a fuller story. It is certainly not one of stability.

## 6.2 *United States*

As already noted, the DS “accept” estimates, dating back to 1947, refer to a subset of the population: families with 2 or more related persons. In Figure 5, we bring together the Bureau of the Census Current Population Survey (CPS) estimates for families with those for the whole population (families and unrelated individuals), a series which started in 1967. The difference between the two series narrows over the period 1967 to 1992 from 5.1 percentage points to 3 points, so that this could not be adequately represented by a fixed effect. Moreover, the DS series departs from CPS families estimates in using the interpolation procedure in POVCAL applied to grouped data rather than the officially calculated Gini coefficients. In the case of the 1991 data, for instance, the Census Bureau give a Gini coefficient of 39.7, whereas the DS calculation is 37.94. The CPS series also illustrates the fact that all such series are frequently subject to methodological revision. As noted earlier, there was a particularly sharp break between 1992 and 1993, due to changes in top-coding and in data collection methods (Ryscavage, 1995). This break is shown in Figure 5, and it would be misleading to treat the series as continuous.

As in the United Kingdom, the series may be taken further back in time. Until the early 1970s, a second set of statistics was produced by the Bureau of Economic Analysis (BEA, formerly Office of Business Economics). The BEA statistics differed from the CPS series not only for the more comprehensive income definition, but also for being estimated “from a wide variety of sources, including – besides field surveys such as the CPS – tax returns, other

business and governmental administrative records, and the income type aggregates as contained in the National Income Accounts” (Budd and Radner, 1975, p. 451).<sup>24</sup> As statistics roughly comparable with the BEA series were estimated for three pre-war years, 1929, 1935/36 and 1941 (see Goldsmith *et al.*, 1954; Goldsmith, 1958a), we are in a position to examine the post-war evidence against the background of what happened in the inter-war period.

Figure 5 depicts how income concentration, as measured by the Gini coefficient, changed in the United States since 1929. The BEA pre-tax data exhibited a sharp fall between 1929 and 1944, followed by fairly moderate oscillations around a flattened trend until 1971. Once again, the observed fall in inequality must be interpreted with caution. For instance, in the mid-1960s Miller examined the evolution of quintile shares and concluded that

“these figures hardly support the view held by many Americans that incomes in our society are becoming more evenly distributed. The changes that took place – ending about a quarter of a century ago – involved in large measure a redistribution of income among families in the top and middle brackets. Although the share received by the lowest income groups increased slightly during the war, since then it has not changed”. (Miller, 1966, p. 3).

A series for the period 1944-1968 computed by Budd (1970) on CPS grouped data for families and unrelated individuals showed greater volatility, but did not contradict the long-run pattern of the BEA series.<sup>25</sup> Some noticeable fluctuations were also shown by the CPS series for families alone, although the overall tendency was more of a modest decline rather than stationarity.

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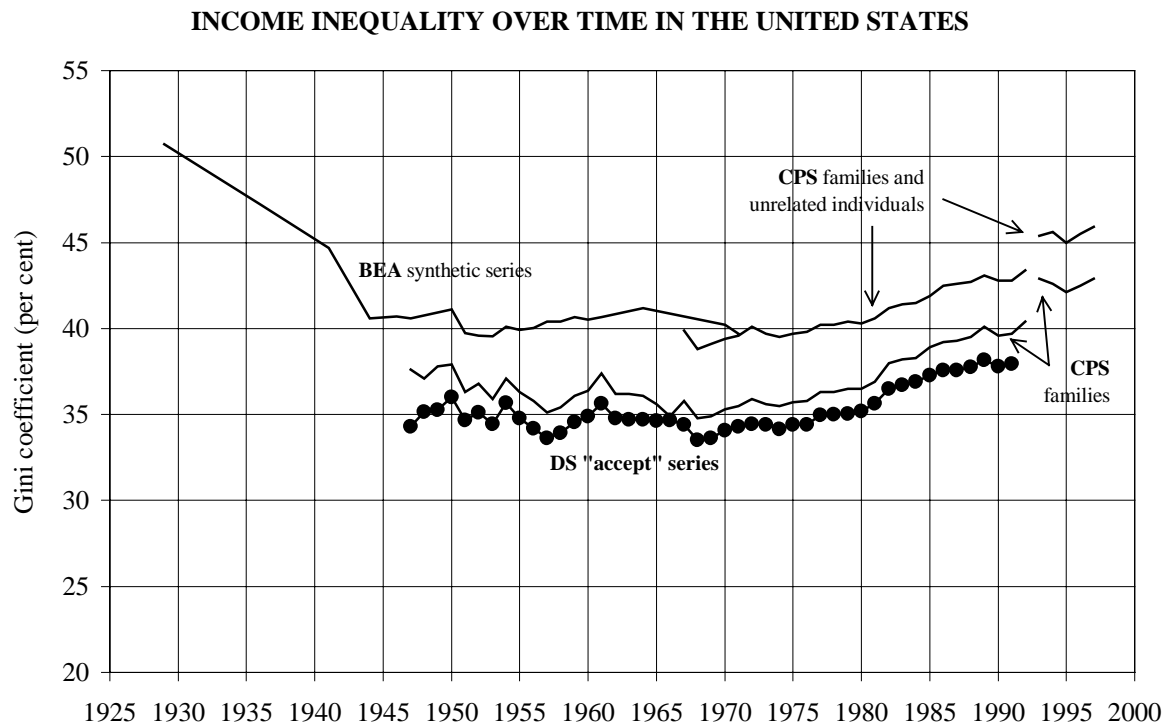
<sup>24</sup> By construction, the BEA figures were adjusted to match the national accounts personal income series. BEA estimates were released for the years 1944-1963, except for 1945, 1948 and 1949, and for 1964, 1970 and 1971, although these later figures were not entirely comparable with the older ones (see Fitzwilliams, 1964; Radner and Hinrichs, 1974). We did not use the data for 1962 and 1963 because they were “relative unreliable extrapolations of the 1961 estimates” (Radner and Hinrichs, 1974, p. 26). For descriptions of the BEA methodology see Office of Business Economics (1953) and Goldsmith (1958b) for the old series, and Budd and Radner (1975) for the new series; for comparisons of BEA and CPS figures, see Goldsmith (1958a), Miller (1966) and Budd and Radner (1975).

<sup>25</sup> Alternative series were estimated by Schultz (1969) on CPS grouped data for the period 1944-1965, and Taussig (1976) on CPS grouped data from 1947 to 1974 and computer tapes from 1958 to 1974. Both series tended to give broadly the same picture, although Schultz’s estimates showed larger year-to-year fluctuations and a mildly positive trend after correcting for cyclical factors.



To describe the United States experience as one of a small positive trend towards inequality does not seem an adequate account of a century which has seen episodes of significant change joined by periods of relative constancy.

Figure 5



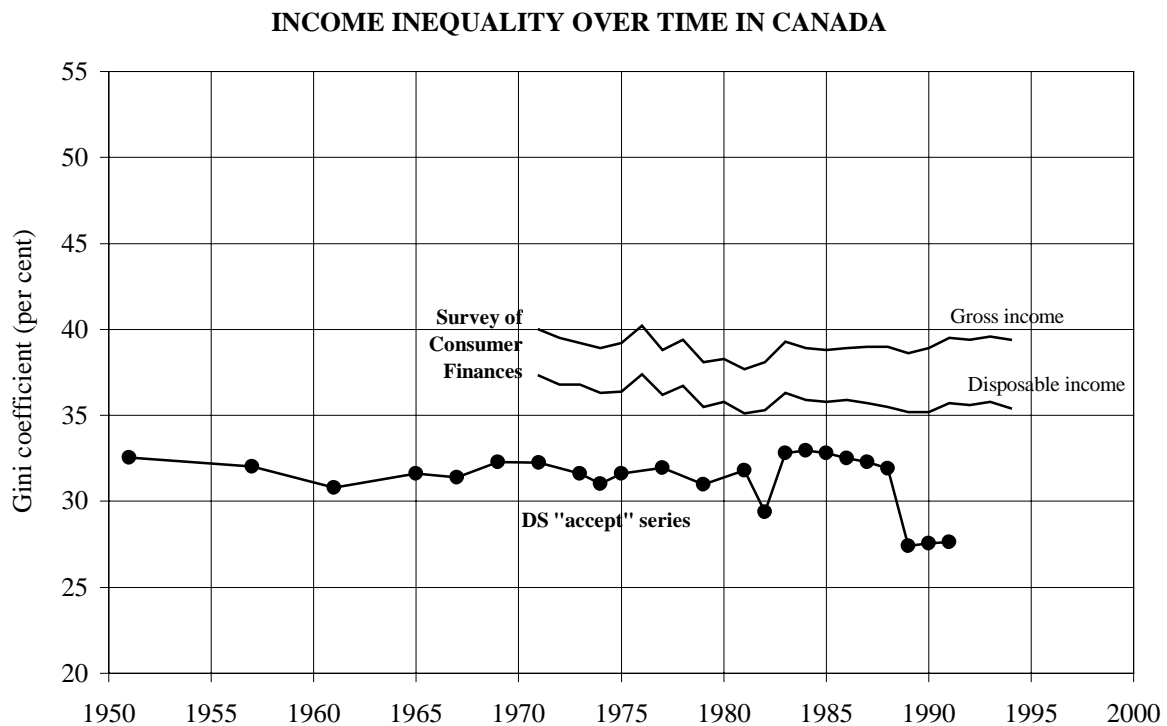
Sources: *BEA*: Figures computed from BEA grouped data (assuming interval means known and a piecewise linear distribution except for a Paretian top interval; negative incomes recoded to zero) drawn from Brandolini (1998, pp. 48-9, Table A1): family gross personal incomes (the figure for 1936 actually refers to 1935/36), adjusted to national accounts. Original data drawn from: Goldsmith (1958a, p. 93, Table 8), for 1929, 1935/36 and 1941, Fitzwilliams (1964, p. 5, Table 4) for 1944-1961, and Radner and Hinrichs (1974, p. 21, Table 3) for 1964, 1970, 1971; data for 1962 and 1963 ignored because based on extrapolations. – *CPS families*: Bureau of the Census (1999, Table F-4): total gross money incomes, for families; some minor breaks in underlying data were ignored, but a major break in 1993 was shown. – *CPS families and unrelated individuals*: Bureau of the Census (1998, p. B6, Table B3): total gross money incomes, for families and unrelated individuals; some minor breaks in the underlying data were ignored, but a major break in 1993 was shown. – *DS “accept” series*: DS data-set.

### 6.3 Canada

Figure 6 shows the changes over time in the DS “accept” data-set from 1951 for the distribution of gross income. While the conclusion appears correct that there has been an insignificant trend over time, there are three problems. First, as in the United States, the DS

series appears to relate to families rather than families and unrelated individuals. It is to the latter that the other series, also based on the Survey of Consumer Finances (SCF), in Figure 6 relate, which may account for the fact that the SCF estimates show greater inequality in gross (and disposable) income. Second, there appears to be a sharp drop in the DS series between 1988 and 1989 of 4.5 percentage points, which is not mirrored in the official SCF series. Third, to the best of our knowledge, the SCF has only included rural households since 1965 (see Stark, 1977, pp. 25-30). The DS data for 1951 to 1961 cannot therefore be described as “national”.

Figure 6



Sources: *Survey of Consumer Finances*: Statistics Canada (1996, p. 34, Table 6): SCF data for family and unrelated individuals for total gross money incomes and total disposable incomes. – *DS "accept" series*: DS data-set.

Overall, the available evidence from the SCF (Figure 6) suggests that in Canada the distribution of disposable incomes among families and unrelated individuals has not varied much since 1965, although we may discern episodes when inequality was descending (second

half of the 1970s). This pattern, which contrasts with that in the United States and the United Kingdom, has been described as “stasis amid change” (Wolfson, 1986). At the same time, we may note that the gap between gross and disposable income inequality widened somewhat over the period.

#### 6.4 France

The DS “accept” series on the distribution of gross incomes in France, shown in Figure 7, is based on the INSEE *Enquête sur le Revenu Fiscaux* (ERF). Despite the aversion of DS to data based on tax returns, the ERF data are largely derived from fiscal records, with tax-exempt incomes such as social transfers being imputed by INSEE on the basis of entitlement (see Bégué, 1976, p. 99). The alternative source used by INSEE, also shown in Figure 7, is the household budget survey (EBF, *Enquête sur les Budgets Familiaux*).<sup>26</sup>

According to the official figures based on the ERF (see Canceill and Villeneuve, 1990; Sandoval, 1989; Concialdi, 1997), income inequality remained stable between 1956 and 1962, and then fell considerably until 1975. At this point the DS “accept” series shows a marked fall: by 8 percentage points between 1975 and 1979, but this appears to be due to a break in continuity, since there is no evidence of such a dramatic fall in other sources. This is a warning against treating the DS “accept” series as one that is consistent over time.

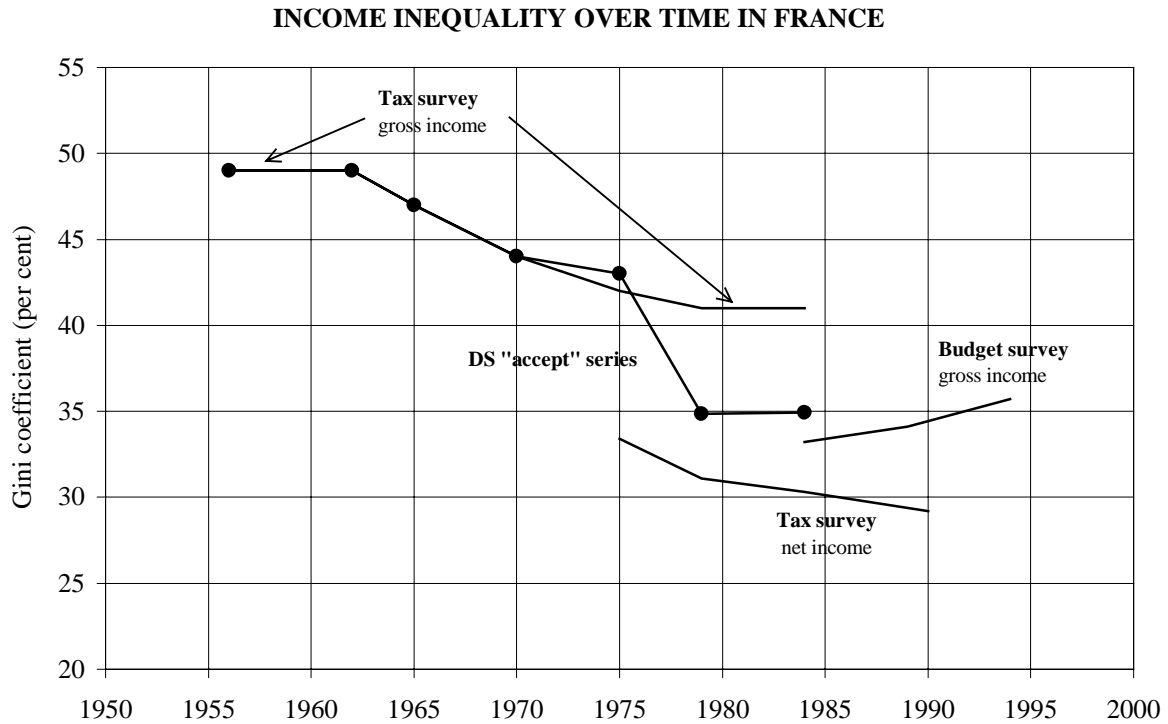
The evidence for the 1980s is somewhat mixed, but, whatever the direction, the changes appear to have been modest. In the early 1990s, there may have been an increase in inequality but only a moderate one. As put in a recent study by INSEE (1996),

“in the first part of the 1990s, inequalities in living standards have increased, but this increase is not spectacular ... This tendency may be contrasted with the clear reduction in inequalities observed up to the mid-1980s. Between these two periods, the latter part of the 1980s was a period of transition, when there was little change in inequalities” (quoted by Atkinson, 1997, p. 35).

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<sup>26</sup> For information on income sources see Stark (1977, pp. 46-66), Concialdi (1997) and Atkinson (1997).

Figure 7



Sources: *Tax survey gross income*: Estimates of INSEE on ERF data as reported by United Nations (1981, p. 108), for 1956, and Concialdi (1997, p. 256, Table 11.11) for 1962-1984: household gross money incomes excluding non-taxable incomes (most social security transfers, some property incomes), weighted by households. – *Tax survey net income*: INSEE (1995, p. 32, Table 15): ERF data for household equivalent disposable incomes, weighted by households; OECD equivalence scale. – *Budget survey gross income*: INSEE (1996, p. 35): EBF data for household equivalent gross incomes, weighted by households; OECD equivalence scale. – *DS "accept" series*: DS data-set.

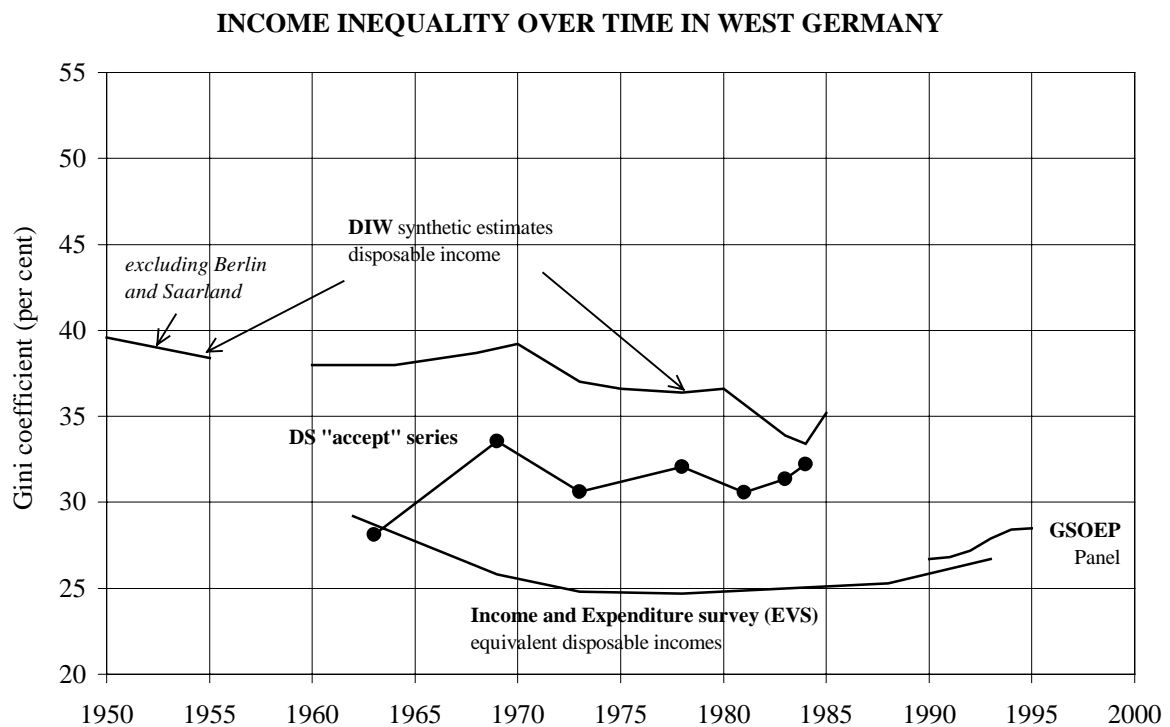
### 6.5 West Germany

For many years, in the Federal Republic of Germany the main source of income distribution statistics was the “synthetic” series estimated by the Deutsches Institut für Wirtschaftsforschung (DIW). The DIW series, shown in Figure 8, is included in the DS data-set but labelled “est”. It is the result of a complex process of imputation and matching of different statistical sources; as remarked by Stark,

“though the exercise is akin to the CSO’s ‘Blue Book’ estimates or the BEA figures in the USA the remoteness from basic data is so large that DIW itself distinguishes the latter as ‘primary statistics’ and its own as ‘model estimates’ (*Modellrechnungen*)” (1977, p. 67).

Information on household incomes was periodically gathered by the Federal Statistical Office with the Income and Consumption Survey (EVS, *Einkommens- und Verbrauchsstichprobe*), conducted for the first time in 1962-63. Since 1983 a regular source of microdata has been the German Socio-Economic Panel (GSOEP), that was extended to Eastern Länder in 1990 when they still constituted the German Democratic Republic.<sup>27</sup>

Figure 8



Sources: *DIW*: DIW “synthetic” estimates by Guger (1989, Chart 1): household disposable incomes. – *Income and Expenditure Survey*: 1962-1988 from Becker (1996, Table 1) and 1993 from Hauser (1999, p. 101, Table 5): elaboration on data from EVS for household equivalent disposable incomes, weighted by persons (excluding foreign family heads); OECD equivalence scale. – *GSOEP Panel*: Hauser (1996, Table 1): elaboration on data from GSOEP for household equivalent disposable incomes, weighted by persons (excluding foreign family heads); OECD equivalence scale. – *DS “accept” series*: DS data-set.

The “accept” series in the DS data-set is particularly heterogeneous. It consists of two different sub-series, since the first 2 figures use net income while the remaining 5 are for gross incomes; it is derived from three different original sources, i.e. the EVS for 1963, 1969, 1973,

<sup>27</sup> For further information on German sources see Stark (1977, pp. 67-96) and Hauser and Becker (1997).

1978, 1983, the German Transfer Survey (*Transferumfrage*) for 1981, and the GSOEP for 1984. Whether it is wise to use the figures as one consistent time series is debatable. The break due to the shift from net to gross incomes could be easily dealt with by resorting to the available LIS-based estimates on an after-tax basis. The problem of the sources would, however, remain. For instance, Hauser and Becker (1997) highlight the differences between the EVS and GSOEP, and consider separately the series derived from either sources.

Taken at the face value, the DS “accept” figures suggest a large rise in inequality (more than 5 percentage points) between 1963 and 1969, and a fall of more than 4 percentage points between 1969 and 1973. This is quite different from the statistics from the same source (EVS) reported by Becker (1996, Table 1), which are shown in Figure 8. The latter indicate a decline over both periods. After 1973, the DS series suggests a modest rise over the next 10 years, which is virtually absent in the EVS (Becker, 1996) series. Hauser finds a modest increase in inequality after the mid-1980s using the EVS data (Hauser, 1999), and in the early 1990s using the GSOEP data (Hauser, 1996).<sup>28</sup> The DS data-set does not cover this period.

## 6.6 Conclusions

From this, far from exhaustive, review of the changes in income inequality in 5 OECD countries, we conclude that the distributions of income do not universally exhibit stability over time. Nor is there a common trend in inequality. There is a diversity of experience, with some countries exhibiting little variation in the dispersion of disposable income, but others, such as the United States and the United Kingdom, having seen episodes when inequality fell and periods when it increased substantially. Within a single country, the net and gross distributions may behave differently over time, as may the distributions for households and for families. On the one side, this means that a dummy variable adjustment is inappropriate. On the other side, to talk of a single trend is potentially misleading in the light of changing

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<sup>28</sup> Hauser and Becker (1997) found a virtually unchanged concentration of household equivalent disposable incomes in the two sub-periods from 1973 to 1983 (EVS), and from 1983 to 1990 (GSOEP). For consistency with the EVS, households with a foreign head were excluded in the GSOEP; such exclusion caused a slight underestimation of inequality. The EVS data also excluded households with more than six members, and with incomes above certain limits (except for 1962/63).

demographic structure, redistributive patterns, etc. Piecing together information from different sources, coupled with an awareness of their relative strengths and weaknesses, allows one to tell a richer history of changes in income inequality. All of which points to the need for a blend of quantitative and qualitative analysis, and the avoidance of mechanical use of the data-set.

We also draw certain methodological conclusions. We have a less definite opinion than Deininger and Squire on the rejection of “synthetic” estimates and those based on tax records. Given the present-day availability of household survey data, it is understandable that researchers regard with caution data obtained from other sources. But we do not consider that tax-based data should be rejected out of hand for OECD countries at least, particularly when used in conjunction with other information. The DS data-set in fact already includes sources based on tax returns (as for France). Synthetic estimates, such as the Blue Book series in the United Kingdom and that of the Bureau of Economic Analysis in the United States, are in several respects superior to other series based exclusively on survey data. The well-known deficiencies of survey estimates for items such as investment incomes may be serious enough to counterbalance the necessarily arbitrary assumptions made in synthetic estimates. They also, in the case of the United Kingdom, include the non-household population.

## **7. Overall conclusions**

Secondary data-sets are assuming an ever-increasing importance in empirical research in economics. It is therefore essential that they be constructed on clear principles and subject to close scrutiny and verification. In this paper we have taken as a case study the data for OECD countries contained in one such data-set, that of Deininger and Squire, which has already played a significant role in research. Our examination from the standpoint of the potential user leads us to make the following proposals with regard to the construction and development of secondary data-sets on income distribution:

- (a) a secondary data-set should be a consolidation of earlier work, with multiple observations for the same country and the same date being justified by differences in source, in definition, or in methods of calculation;
- (b) compilations of this kind should be cumulative;
- (c) the secondary data-set should be fully documented, with precise table numbers, and a full account given of all adjustments made, so that they can be reproduced;
- (d) there is a need to address the replication problems with on-line data; there should be a numbering of the different releases of the data-set; and the conservation and availability of all versions seem highly advisable;
- (e) classification of estimates needs careful consideration; we do not find the DS “accept” category helpful; we feel that researchers would be ill-advised to limit themselves to these estimates;
- (f) instead it would be preferable to include as many definitions as possible, where these should allow for differences in units of analysis, equivalence scales, welfare weighting, concept of resources, and time period; the coding introduced by DS should be extended to cover all of these (an international standard would be very desirable);
- (g) simple “dummy variable” adjustments for differences in definitions are not a satisfactory approach to the heterogeneity of the available statistics; differences in methodology may affect not only the level but also the trend in inequality (so that it may not be sufficient to apply a fixed effect correction in panel data estimation);
- (h) there is no real alternative to seeking data-sets where the observations are as fully consistent as possible; at the same time, the choice of definition on which to standardise may affect the conclusions drawn;
- (i) in the case of the OECD countries studied here, we do not agree with the rejection by DS of “synthetic” estimates based on fiscal records and external information; they have limitations, but so do other sources, and they extend the time period over which income distributions may be studied;



- (j) we are not convinced that at present it is possible to use secondary data-sets safely without some knowledge of the underlying sources; and we caution strongly against mechanical use of such data-sets.

## Appendix: Time series for Gini coefficients in selected countries

Table A1

### GINI COEFFICIENTS IN THE UNITED KINGDOM, THE UNITED STATES AND CANADA (percentage values)

	United Kingdom			United States			Canada		
	DS accept series	Blue Book synthetic series		DS accept series	BEA synthetic series	CPS families	CPS families and unrelated individuals	DS accept series	Survey of Consumer Finances
1929					50.7				
1936					47.2				
1938		42.6							
1941					44.7				
1944					40.6				
1946					40.7				
1947				34.28	40.6	37.6			
1948				35.16		37.1			
1949		35.5		35.28		37.8			
1950				36.02	41.1	37.9			
1951				34.68	39.7	36.3		32.56	
1952				35.10	39.6	36.8			
1953				34.46	39.5	35.9			
1954		35.8		35.66	40.1	37.1			
1955				34.80	39.9	36.3			
1956				34.20	40.0	35.8			
1957				33.62	40.4	35.1		32.04	
1958				33.92	40.4	35.4			
1959		36.0		34.54	40.7	36.1			
1960				34.88	40.5	36.4			
1961	25.3			35.62	40.7	37.4		30.80	
1962	24.2	35.6		34.80		36.2			
1963	26.5	35.6		34.72		36.2			
1964	25.5	36.6		34.70	41.2	36.1			
1965	24.3	35.4		34.64		35.6		31.61	
1966	25.3	33.7		34.68		34.9			
1967	24.5	33.5		34.40		35.8	39.9	31.41	
1968	24.1	33.2		33.50		34.8	38.8		
1969	24.9	33.5		33.64		34.9	39.1	32.30	
1970	25.1	33.9		34.06	40.2	35.3	39.4		
1971	25.7	34.2		34.30	39.7	35.5	39.6	32.24	40.0 37.3
1972	26.0	33.1		34.46		35.9	40.1		39.5 36.8
1973	25.1	32.8		34.42		35.6	39.7	31.60	39.2 36.8
1974	24.2	32.4		34.16		35.5	39.5	31.03	38.9 36.3
1975	23.3	31.5	32.6	34.42		35.7	39.7	31.62	39.2 36.4
1976	23.2	31.5	32.6	34.42		35.8	39.8		40.2 37.4
1977	22.9		33.0	34.98		36.3	40.2	31.97	38.8 36.2
1978	23.1		33.5	35.02		36.3	40.2		39.4 36.7
1979	24.4			35.06		36.5	40.4	31.00	38.1 35.5

Table A1 (continued)

	United Kingdom		United States			Canada		
	DS accept series	Blue Book synthetic series	DS accept series	BEA synthetic series	CPS families	CPS families and unrelated individuals	DS accept series	Survey of Consumer Finances
1980	24.9		35.20		36.5	40.3		38.3 35.8
1981	25.4	36.0	35.62		36.9	40.6	31.80	37.7 35.1
1982	25.2		36.48		38.0	41.2	29.40	38.1 35.3
1983	25.7		36.70		38.2	41.4	32.80	39.3 36.3
1984	25.8	36	36.90		38.3	41.5	32.97	38.9 35.9
1985	27.1		37.26		38.9	41.9	32.81	38.8 35.8
1986	27.8		37.56		39.2	42.5	32.50	38.9 35.9
1987	29.3		37.56		39.3	42.6	32.28	39.0 35.7
1988	30.8		37.76		39.5	42.7	31.91	39.0 35.5
1989	31.2		38.16		40.1	43.1	27.41	38.6 35.2
1990	32.3		37.80		39.6	42.8	27.56	38.9 35.2
1991	32.4		37.94		39.7	42.8	27.65	39.5 35.7
1992					40.4	43.4		39.4 35.6
1993								39.6 35.8
1994					42.9	45.4		39.4 35.4
1995					42.6	45.6		
1996					42.1	45.0		
1997					42.5	45.5		
					42.9	45.9		

## Sources

*United Kingdom: DS "accept" series:* DS data-set. All figures classified as *Pe* (recipient unit: person equivalent), *N* (net income) and *Nat'l* (national coverage), coming from a single source (Goodman and Webb, 1994). – *Blue Book:* Royal Commission on the Distribution of Income and Wealth (1979, p. 23, Table 2.4, p. 167, Table A3) for 1938-1976/77, Central Statistical Office (1981, p. 82, Table A) for 1977/78-1978/79, Central Statistical Office (1984, p. 97, Table A) for 1981/82, Central Statistical Office (1987, p. 94, Table A) for 1984/85; tax unit disposable incomes, weighted by tax units. The first set of figures is for incomes net of amounts spent on mortgage interest (old basis), while the second is for incomes gross of those amounts (new basis). The figure for 1961/62 is not included because based on extrapolations and not on the Inland Revenue Survey of Personal Incomes (see Stark, 1972, p. 19).

*United States: DS "accept" series:* DS data-set. All figures classified as *H* (recipient unit: household), *G* (gross income) and *Nat'l* (national coverage), coming from a single source (USBC). – *BEA:* Figures computed from BEA grouped data (assuming interval means known and a piecewise linear distribution except for a Paretian top interval; negative incomes recoded to zero) drawn from Brandolini (1998, pp. 48-9, Table A1): family gross personal incomes (the figure for 1936 actually refers to 1935/36), adjusted to national accounts. Original data drawn from: Goldsmith (1958a, p. 93, Table 8), for 1929, 1935/36 and 1941, Fitzwilliams (1964, p. 5, Table 4) for 1944-1961, and Radner and Hinrichs (1974, p. 21, Table 3) for 1964, 1970, 1971; data for 1962 and 1963 ignored because based on extrapolations. – *CPS families:* Bureau of the Census (1999, Table F-4): total gross money incomes, for families; some minor breaks in underlying data are ignored, but a major break in 1993 is shown. – *CPS families and unrelated individuals:* Bureau of the Census (1998, p. B6, Table B3): total gross money incomes, for families and unrelated individuals; some minor breaks in the underlying data are ignored, but a major break in 1993 is shown.

*Canada: DS "accept" series:* DS data-set. All figures classified as *H* (recipient unit: household), *G* (gross income) and *Nat'l* (national coverage), coming from two sources (Canada SY, until 1971; IDS Canada, since 1973). – *Survey of Consumer Finances:* Statistics Canada (1996, p. 34, Table 6): SCF data for family and unrelated individuals for total gross money incomes and total disposable incomes.



## Sources

*France: DS “accept” series:* DS data-set. All figures classified as *H* (recipient unit: household), *G* (gross income) and *Nat’l* (national coverage), coming from two sources (UN 1985, until 1975; LIS Data base, since 1979). – *Tax survey gross income:* Estimates of INSEE on ERF data as reported by United Nations (1981, p. 108), for 1956, and Concialdi (1997, p. 256, Table 11.11) for 1962-1984: household gross money incomes excluding non-taxable incomes (most social security transfers, some property incomes), weighted by households. – *Tax survey net income:* INSEE (1995, p. 32, Table 15): ERF data for household equivalent disposable incomes, weighted by households; OECD equivalence scale. – *Budget survey gross income:* INSEE (1996, p. 35): EBF data for household equivalent gross incomes, weighted by households; OECD equivalence scale.

*West Germany: DS “accept” series:* DS data-set. All figures classified as *H* (recipient unit: household) and *Nat’l* (national coverage); figures for 1963 and 1969 are classified as *N* (net income), coming from UN 1985; figures since 1973 as *G* (gross income), coming from LIS Data base. – *DIW:* DIW “synthetic” estimates by Guger (1989, Chart 1): household disposable incomes. – *Income and Expenditure Survey:* 1962-1988 from Becker (1996, Table 1) and 1993 from Hauser (1999, p. 101, Table 5): elaboration on data from EVS for household equivalent disposable incomes, weighted by persons (excluding foreign family heads); OECD equivalence scale. – *GSOEP Panel:* Hauser (1996, Table 1): elaboration on data from GSOEP for household equivalent disposable incomes, weighted by persons (excluding foreign family heads); OECD equivalence scale.

*Netherlands: DS “accept” series:* DS data-set. All figures classified as *He* (recipient unit: household equivalent), *N* (net income) and *Nat’l* (national coverage), coming from two sources (Netherlands SY, until 1986; LIS Data base, since 1987). – *CBS:* data supplied by the Central Bureau of Statistics for household disposable incomes, weighted by households.

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