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Inequality, Growth and Welfare: An International Comparison

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1. Introduction[1]

The measurement and interpretation of economic and social welfare has always captured the attention of social scientists. Since Adam Smith's study on the nature and causes of the wealth of nations, economists have tried to clarify concepts such as standard of living or economic progress, the reasons explaining the differences in development between countries, regions or individuals, or the distribution of the benefits of economic growth.

Socio-economic welfare, the term used to integrate the above-mentioned concepts, also concerns both ordinary citizens and politicians since it deals with something directly related to the living conditions and material progress of each society. Nevertheless, welfare, in its basic individual sense as well as in its social dimension, is a concept that is neither simple nor easily agreed upon among social scientists. The scope and complexity of the research generated testifies to this fact.

There exist various different theoretical and empirical approaches to evaluate social welfare[2]. Most of the developments produced in recent years have been linked to analyses on income distribution and inequality. In this field, there has been an increasing methodological refinement concerning the theoretical treatment of welfare. To some extent, these advances contrast with the limited growth of empirical research carried out with the aim of measuring welfare and offering diagnoses and proposals for social reform.

In recent years, however, there has been considerable expansion in the number of studies using social welfare indicators as instruments to evaluate and compare models and countries. There are some reasons that can explain the increase and spread of these types of analysis.

[1] This study has been partly financed by the funding received from the Science and Technology Inter-ministerial Commission (*Comisión Interministerial de Ciencia y Tecnología*) to the Project SEC 98-1090.

[2] Slesnick (1998) offers one of the most up-to-date reviews of these different approaches.

The change in the relationship between economic growth and inequality has been one of several factors that have spurred on the development of adequate analytical instruments. From the end of the seventies, a rather slow economic growth and the containment and even inversion of the trends towards a reduction in inequality have been the main characteristics of the OECD countries. This in turn has lead to a slowdown in the improvement of living standards in many population groups. The increases in income differences and the levels of poverty registered in countries like Australia, Sweden, the United Kingdom or the United States have given rise to a relative stagnation in the standard of living of the low-income segments of the population. This trend has put into question some long-held assumptions on the terms of the apparent trade-off between the goals of efficiency and equity.

The interest aroused by matters associated with real convergence in the European Union in recent years has been a second factor in the need for developing new analytical methods for measuring social welfare. Success in the nominal convergence process, necessary for setting up the European Economic and Monetary Union, does not necessarily guarantee economic convergence on the real variables. It thus seems reasonable to ask to what extent divergences exist in the levels of welfare among the various Member States and what the trends have been in the last few years.

A third factor leading to the growing demand for adequate welfare indicators arises from the need to evaluate the different social effects of how the labour markets function in the United States and Europe[3]. Given that these models have varying results with regard to earnings inequality and unemployment, it is important to examine the question of their different implications concerning social welfare.

Last but not least, the availability of more and better data as well as the development of new and powerful data processing technologies have also been relevant elements in improving our understanding of welfare and the use of measurement indicators.

[3] As several studies have demonstrated, institutional characteristics of labour market and the configuration of tax and benefits programs have played an important role in determining the

Nevertheless, sufficient evidence is still lacking in order to evaluate the degree by which income differences or the rate of economic growth have been relevant in configuring the different welfare situations within the OECD. Traditional growth and development indicators, such as per capita income, offer an approximation to average standards of living. They completely ignore, however, the income dispersion of households situated around the average.

On the other hand, inequality is a relative concept that does not take real standards of living into account. Thus, it does not offer a full picture of the levels of welfare in a specific community. As has been argued on many occasions, differences in per capita income sometimes cause that, in absolute terms, a low-income household in a rich country appears to live better than the middle classes in a poorer country.

The same is true if things are viewed from the perspective of economic dynamism. If the factors contributing to maintaining lower levels of inequality in some countries also lead to a slowdown in growth, it is possible for low-income segments in these countries to lose ground in real terms when compared to those in other more dynamic areas.

This study offers some reflections on the above questions and will try to present some empirical evidence in an attempt to improve our understanding on welfare. After reviewing the empirical criteria used to measure welfare in comparative contexts and explaining our methodology (section 2), section 3 deals with major trends in some OECD countries. In section 4, the effects on welfare of the distribution of economic growth by income levels are analysed using real income changes at three different points of the distribution scale. A cross-national comparison of the absolute income levels of the low, median and high-income households in every country is carried out in section 5. Finally, in the last part of the paper, our attention is focused on a synthetic measure of welfare based on the notion of combining average income and inequality in some kind of two-dimensional welfare index.

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redistributive consequences of changes in the labour market and in the production process. See among others Gottschalk and Smeeding (1997) or Ruiz-Huerta et al. (1999).

2. Empirical Criteria to Measure Welfare in a Comparative Perspective

Comparing income distributions in terms of inequality and welfare has generated a wide-ranging and fruitful literature in recent decades. This is particularly true since the publication of Atkinson's important contribution in 1970. Today a whole series of results, which constitute a very powerful analytical framework, are available. These results can provide important diagnostic and prescriptive tools for a wide variety of situations.

These tools, however, are not always easy to use in empirical work. This is especially true in fields lacking homogeneous information such as international comparative studies. It may be for this reason that there still exists an important gap between theoretical developments and practical applications with regard to measuring inequality and welfare. GDP per capita is still almost always used, implicitly or explicitly, to evaluate the level of achievement of economic policies or specific social models[4].

As was mentioned above, in this paper we will pay special attention to the applicability of measuring instruments in the context of an international comparative study. This will be carried out within the theoretical approach of income distribution analysis. Unlike other approaches, this one is characterised by a clear individualistic grounding that emphasises the purely economic factors of welfare.

The logic of such an approach requires the resolution of two main problems. Firstly, the need to find a variable that can serve as a proxy of individual welfare. This topic has been widely discussed in different though closely inter-related fields such as welfare economics, consumer theory or poverty analysis. The different answers given to this question in these fields serve to underline the difficulties that we must confront.

[4] In spite of reasons convincingly exposed by economists from long time ago. See for example Seers (1972).

Secondly, methods are needed that can summarise this individual information with a view to obtaining an indicator to measure aggregate welfare or at least rank the differing situations. This would require bridging the gap between the concept of individual welfare and the more problematic one of aggregate or collective welfare. It is widely known that interpersonal comparisons of utility are necessary to carry out such an aggregation and that these cannot be developed without adopting, implicitly or explicitly, a whole range of value judgements. A reliable welfare index should make such ethical assumptions explicit. Likewise, such an indicator would be more powerful in so far as its results are valid for a wider range of value judgements.

The theoretical and methodological problems associated with analysing inequality and welfare will not be discussed in depth[5]. We would like, however, to briefly explain the main decisions that must be taken when studying these issues and the options to be followed in the empirical work. Some specific questions will be analysed in greater detail at the beginning of each section.

a) Income and individual welfare

The first problem we have to solve is to define the operative variables that can serve as reasonable proxies for individual economic welfare. This problem has proved to be difficult to satisfactorily resolve in practice. Very ambitious theoretical definitions are often difficult to put into practice in empirical work, especially when a variable is needed to be used in international comparisons.

Income is the indicator most frequently used to measure the economic situation of an individual within the approach we are adopting. Following Simons' (1965) traditional definition, income would indicate the consumption flow that an individual could maintain without altering the level of his/her wealth. It can be easily argued that this variable represents the main conditioning factor of individual welfare. Thus, it should constitute the core of our analysis.

[5] See Lambert (1993) or Cowell (1995, 1999) for comprehensive reviews on these issues.

The measuring problems associated with the above-mentioned concept are also well-known. One of the main difficulties is related to the unit of time to be used. The annual periods usually referred to by this kind of data may be insufficient to reach trustworthy conclusions regarding the economic position of households due to the possible existence of transitory variations. Economic welfare is really determined by the flow of income into households over longer periods of time than a single year. However, the lack of longitudinal sources impedes the elaboration of long-term comparisons based on the life cycles of household members[6].

The second problem concerns the difficulty in measuring some components of the theoretical definition of income. Capital gains, the value of leisure or of non-monetary consumption are just some well-known examples of this. The problem is greater when it comes to international comparative studies in which a common base is needed to establish the comparisons.

The variable chosen for this study has been *annual disposable income*, which offers this necessary common base. It includes all monetary income flowing into the household after paying direct taxes and social security contributions. The main advantage of this indicator is the fact that its definition varies little from country to country, especially after the homogenisation process of the databases to be used (see below).

Nevertheless, disposable monetary income suffers from the limitations mentioned above, in particular the existence of differences in the extension or incidence of non-monetary income among the different countries and income groups. This problem could, to some extent, bias comparisons based on this indicator. Although the studies undertaken to date do not suggest that the results are altered in a clear manner[7], an exhaustive comparison that includes factors such as the differing extension in the availability of free public services has as yet to be undertaken.

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[6]Some authors have suggested using consumption instead of income to resolve the problem mentioned above due to lesser degree of temporary variability of this indicator. Such a solution could be interesting for national analyses, but it is not as yet viable for international comparative studies due to the lack of comparable micro-data. An attempt in this direction can be seen in Sastre, M. (1999), chapter IV, where a comparative analysis in terms of consumption is made for Spain and the United States.

[7] See Smeeding et al. (1993).

Inequality and welfare comparisons based on income require at least two important additional adjustments. Firstly, we are interested in income as an approximation of individual welfare. We have, however, information on *household* income. In order to classify individuals and households by income levels, it is necessary to establish some kind of adjustment that takes into account the fact that households of different sizes have different needs and are also capable of achieving differing economies of scale with regard to consumption. Thus, a decision must be taken about the *equivalence scale* chosen.

As is known, an equivalence scale is a function that calculates adjusted income or "equivalent income" from income and a vector of household characteristics. The parametric approximation proposed by Buhmann et al. (1988) will be used in this study. According to Buhmann's proposal, if there are i= 1, 2, 3, …, n individuals grouped together en k=1, 2, 3, …, m households, the equivalent income of an individual i who lives in household k is given by:

$$x_i = \frac{x_k^H}{(s_k^H)^f} \qquad 0 \leq f \leq 1$$

where x_k^H represents all the income received by the k^{th} household, s_k^H the size of the household and f the parameter that defines the equivalence scale. This parameter can be interpreted to be the unadjusted income elasticity with respect to household size. Its conventional range of variation is from 0 to 1. The lower f is, the greater are the economies of scale achieved by the household. f=0 and f=1 would thus represent extreme adjustments. The first would suggest complete economies of scale and the second the absolute lack of them.

A parameter scale of f=0.5 is used in this study. It is an intermediate value coinciding with the ones applied in other comparative studies[8]. Typically, adopting one or other equivalence scale does not significantly alter the classification of countries with regards to inequality, nor does it change the trends in any substantial

[8] Gottschalk and Smeeding (1997) or Atkinson, Rainwater and Smeeding (1995), for example.

way[9]. It does, however, affect the different groups' levels of relative income as well as the levels of countries' average income[10]. The greater the economies of scale we assume, the greater will be the comparative income level of countries with higher average household size. We will come back to this question below.

The second adjustment concerns prices, which must be taken into account whenever we need to establish income comparisons in real or absolute terms. As a general rule, two levels of income are directly comparable if, and only if, their price vectors are identical. When prices differ, it is necessary to utilise an income deflactor to obtain comparable results regarding the real amounts of goods and services[11].

When establishing comparisons among countries, it is necessary to take international differences in price structures into account in order to evaluate their levels of welfare. Given that transforming nominal values into a common currency using official exchange rates does not ensure comparability with regard to purchasing power, purchasing power parities must be used. All cross-national comparative results presented in this study are based on the use of such parities.

b) Inequality

Inequality is a normative concept. For this reason, many statistical measurements of dispersion are not directly applicable when analysing inequality. An axiomatic approach has been developed in recent decades that has contributed to focusing the debate on the properties that a good inequality index must comply with. Some of these, like anonymity, are difficult to question. Others, like scale invariance, are generally, though not unanimously, accepted. Relative inequality indexes comply

[9] We do not include any sensibility analysis in this paper. It can be found in Martínez, Ruiz-Huerta and Ayala (1998), where we examine changes in the results when alternative parameters are used (ϕ=0,25 and ϕ=0,75).

[10] See Coulter at al. (1992) for a detailed empirical analysis of the way inequality indices change when different equivalence parameters are chosen.

[11] Ideally it would be necessary to use specific price indices for each household, as proposed by Ruiz-Castillo (1995), in order to better analyse the distributive effect of inflation. Nevertheless, it is not possible to get this kind of information from the sources used in this study.

with this property, for which inequality would not vary if all incomes were multiplied by the same factor. All the measures utilised in this paper are included in this group[12].

Some of the most adequate indexes for measuring inequality, such as the Atkinson indexes, are very rarely used in empirical work, particularly so when international comparisons are undertaken. On the other hand, some simpler but less attractive indexes from a theoretical viewpoint, such as the Gini index or the coefficients between income decile limits, are more widely used. The main reason behind this is the greater reliability offered by these elementary measures in international comparisons, due to the fact that they are less affected by the anomalies noted in extreme incomes. These anomalies are caused by differences in the way negative income or item non-response are treated, or the re-coding of the highest incomes to a maximum amount to avoid high-income earners being identified. Such practices can lead to erratic behaviour in the inequality indices that are more sensitive to the distribution extremes, like the Atkinson or the Theil measures.

This paper is fundamentally based on the Atkinson indices, though the Gini coefficient and the two basic Theil measures have also been obtained. The mathematical expression that defines the whole family of Atkinson indices is the following:

$$A_\varepsilon = 1 - \left[\frac{1}{n}\sum_{i=1}^{n}\left(\frac{x_i}{m}\right)^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}} \qquad \text{for } \varepsilon > 0,\ \varepsilon \neq 1$$

$$A_\varepsilon = 1 - \exp\left[\frac{1}{n}\sum_{i=1}^{n}\mathrm{Ln}\left(\frac{x_i}{m}\right)\right] \qquad \text{for } \varepsilon = 1.$$

Where n is population size, x_i income of the i^{th} individual, m the distribution's average income and e an inequality aversion parameter which allows us to introduce different value judgements as to the degree of concavity of the income utility function.

[12] Jenkins (1991a) and Cowell (1995) offer good revisions of the main problems to be confronted in inequality measurement.

The Atkinson indices comply with all the desirable axiomatic properties, barring decomposability (not very important in our context). They also have the advantage of having an explicit ethical grounding. As we shall see below, this makes them exceptionally adequate to form part of an abbreviated social function like the one used in section 6.

To avoid problems associated with the deficient quality of low-income or high-income data, we have employed truncated distributions[13] that exclude the 2% of the population situated at both ends of the distribution scale. This would constitute a problem if the main objective of the analysis were severe poverty or extreme wealth. In our case, however, the gains in direct comparability more than compensate for the loss in generality when a small part of the population is left out of the analysis.

c) Social welfare

Supposing we could accept that income reflects individual welfare, enormous difficulties must still be encountered in order to be able to draw conclusions on social welfare. The implicit principle behind the approach adopted in this paper is that individual economic welfare depends basically on personal equivalised income. If we could assign a utility $U(x)$ to each income x, and assuming the social welfare function to be additively separable, then we could also readily associate the average utility of an income distribution with social welfare:

$$W(x) = \int U(x)\, f(x)\, dx$$

where $f(x)$ is the density function of incomes.

The aggregation described above requires, however, a concrete form of the utility function to be specified. This is something that economists have been reluctant to undertake. An important line of research has investigated how far can we go in ranking income distributions without assuming a particular form for the utility function, though imposing some minimum desirable conditions to it.

[13] Following the procedure proposed by Cowell, Litchfield and Mercader-Prats (1999).

Atkinson (1970) showed that when two distributions have the same average income, the Lorenz domination criteria also implies a domination in terms of welfare for any increasing and strictly concave income utility function. This result can be easily extrapolated to cases in which the most egalitarian distribution has a higher average income. When the Lorenz curves cross or when the distribution with lower inequality also has a lower average income, distributive analysis has developed instruments that allow normative conclusions to be reached, like generalised Lorenz curves or supplementary information on variances. In many cases, though, it may be necessary to restrict the range of admissible social welfare functions.

Some of these developments are based on a combination of average income and inequality data[14]. The notion consists of designing an abbreviated form of the social welfare function that would enable all the information contained in the income distribution to be summed up by only two parameters: average income and inequality. In this way,

$$W(x) \equiv \omega\,[m(x), I(x)]$$

Abbreviated social welfare functions can offer an attractive instrument in international comparisons when other criteria, such as generalised Lorenz curves, are frequently inconclusive. In section 6 we shall examine this tool in greater detail and choose a concrete mathematical expression that can be used in the empirical analysis.

d) Data

We have applied the above-mentioned methodology to a wide range of surveys contained in the *Luxembourg Income Study* (LIS) database. This database groups together and homogeneously treats income micro-data from a variety of countries. Table 1 shows the specific sources used in this study for the various countries and years considered. Most of the sources are large cross-sectional surveys. The information for France (1979 and 1984), Norway and Sweden is based on

administrative or tax registers, while panel data are available for Germany and Belgium.

TABLE 1
Sources of data used in the international comparison

Country/Years	**Name of Survey**
Australia (1981, 1985, 1989, 1994)	Income and Housing Survey
Belgium (1985, 1988, 1992)	Standard of Living and Housing Survey
Canada (1981, 1987, 1991, 1994)	Consumer Finances Survey
Germany (1978, 1983)	Family Budget Survey
Germany (1984, 1989, 1994)	German Socio-Economic Panel
France (1979, 1984)	French Income Tax Survey
France (1984, 1989)	Family Budget Survey
Italy (1986, 1991, 1995)	Bank of Italy Income Survey
Norway (1979, 1986, 1991, 1995)	The Survey of the Norwegian Tax Files
Spain (1980/81, 1990/91)	Family Budget Survey
Spain (1985, 1990, 1995)	Continuous Family Budget Survey
Sweden (1981, 1987, 1992)	Income Distribution Survey
United Kingdom (1979, 1986, 1991, 1995)	Family Budget Survey
United States (1979, 1986, 1991, 1994, 1997)	Continuous Population Survey

To analyse the Spanish distribution indicators we have used both the 1980/81 and 1990/91 Family Budget Surveys and the 1985, 1990 and 1995 Continuous Surveys (not included in the LIS database). The sample size of the latter is considerably smaller than that of the former and the income is evaluated quarterly, and not in an annual basis, thus producing results which are not strictly comparable. We have, nevertheless, opted to include these surveys in the study as they provide the only means of obtaining information since the beginning of the 1990's.

An usual problem when dealing with survey data is the sub-estimation of income. The income declared in such surveys is lower than the aggregate income shown in National Accounts. Furthermore, measuring errors affect each source of income differently. These errors are greater when calculating income derived from self-employment, property and certain kinds of social security benefits.

[14] See Jenkins (1991b), Tsakloglou (1992), Dutta y Esteban (1992), Lambert (1993), Ruiz-Castillo (1995a, 1998) or Del Rio and Ruiz-Castillo (1996).

Although the classification of countries in terms of welfare will not be affected if the patterns of sub-estimation are similar among countries, existing information seems to suggest that the problem could have different ranges of magnitude in the various countries[15]. Thus, all the comparisons involving absolute income levels are based on corrected data. The procedure has been to scale up all individual incomes so that total income fits the Household Disposable Income of the National Accounts. This method is, naturally, only an imperfect approximation. It eliminates, however, the most evident negative effects of the differences in quality among the surveys.

Finally, as explained above, we have worked with truncated distributions in order to avoid contamination due to the lower quality of extreme income registers. So, when calculating inequality indices, we have eliminated the 2% of observations at each extreme of the income distribution from the sample[16].

3. Growth, inequality and welfare in OECD countries: a preliminary view

As has been argued above, the way in which income is distributed among the population is crucial when evaluating social welfare. The eleven countries under study differ as much with respect to inequality of disposable income as in terms of the trends and intensity of distributive changes that have taken place recently. On the other hand, disparities in average real income and the rate of growth achieved recently also exist, some of which are quite significant. In this section we will take a look at changes in average income and inequality in these countries. As a result, we can form a preliminary picture of the changes in these two fundamental variables and determine the possibility of reaching some clear-cut conclusions about their impact on welfare.

[15] See Atkinson, Rainwater and Smeeding (1995).
[16] A greater percentage (3%) has been excluded from the lower tail of the French income distribution when using the Family Expenditure Survey (1984 and 1989), due to the exceptionally high proportion of zero and negative values in this survey.

TABLE 2
Trends of average income and inequality

Country	Period	Average annual change (%)		W(x)
		μ(x)	I(x)	
Australia	1981-85	-0.09	1.19	–
	1985-89	1.24	1.78	~
	1989-94	0.29	2.69	~
	1981-94	**0.47**	**2.10**	~
Belgium	1985-88	3.01	0.76	~
	1988-92	3.50	0.40	~
	1985-92	**3.47**	**0.56**	~
Canada	1981-87	0.87	-0.72	+
	1987-91	0.45	-0.01	+
	1991-94	-0.79	0.14	–
	1981-94	**0.35**	**-0.30**	**+**
France	1979-84	-0.32	0.24	–
	1984-89	1.63	-3.97	+
	1979-89	**0.64**	**-1.89**	**+**
Germany	1978-83	-0.06	0.03	0
	1984-89	1.97	-0.59	+
	1989-94	-0.59	3.20	–
	1978-89	1.20	-0.25	**+**
	1978-94	**0.62**	**0.28**	~
Italy	1986-91	3.13	-1.60	+
	1991-95	-1.30	10.29	–
	1986-91	**1.07**	**3.31**	~
Norway	1979-86	1.94	1.56	~
	1986-91	0.53	-1.47	+
	1991-95	2.36	1.10	~
	1979-95	**1.72**	**0.46**	~
Spain	1980-85	-1.01	2.92	–
	1985-90	5.38	-4.23	+
	1990-95	0.48	1.13	~
	1980-95	**1.56**	**-0.30**	**+**
Sweden	1981-87	0.40	4.15	~
	1987-92	2.23	0.99	~
	1992-95	-1.73	-1.61	~
	1981-95	**0.57**	**1.77**	~
U. Kingdom	1979-86	1.26	3.60	~
	1986-91	3.06	3.80	~
	1991-95	2.37	0.76	~
	1979-95	**2.34**	**3.34**	~
U. States	1979-86	1.48	2.93	~
	1986-91	0.89	-0.17	+
	1991-94	1.22	2.70	~
	1994-97	1.55	-0.33	+
	1979-97	**1.41**	**1.55**	~

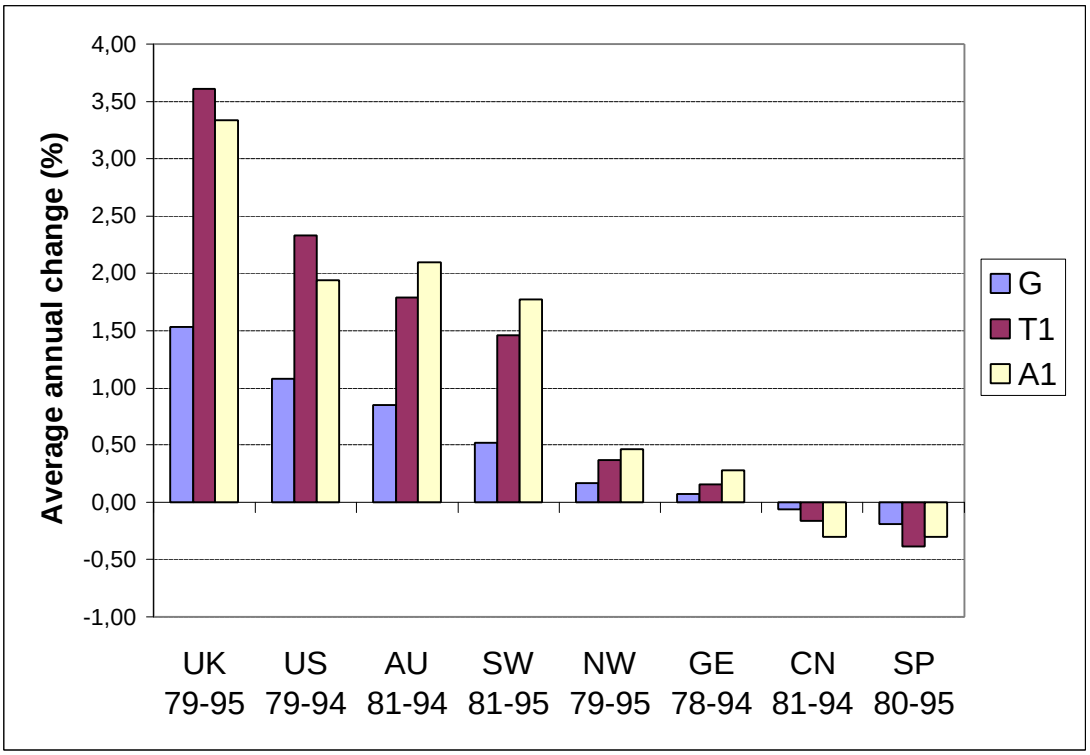
Note: (+) Unambiguous increase in welfare. (–) Unambiguous decrease in welfare. (0) No change in welfare (~) Ambiguous trend of welfare. **Source:** Own research using LIS microdata.

Table 2 shows the rates of real growth in average equivalent income in the different sub-periods for which there was information along with the rates of inequality variation according to the Atkinson index for *e*=1. Other inequality indices would alter the magnitude but not the direction of the changes, as can be seen in Tables A.1 to A.11 in the Annex and, less exhaustively, in Graph 1 below.

Inequality clearly rose in Sweden, Australia, the United States and, particularly so, in the United Kingdom. As various studies have clearly shown [17], the growth in wage inequality along with a decline in the re-distributive effects of the tax and benefits systems are the main factors behind this strong increase in differences among households in these countries. Inequality also increased, although more moderately, in Germany and Norway. Canada and Spain are the only two countries which showed a reduction, though slight, in inequality.

GRAPH 1

Trends in inequality in various countries



Data for the other three countries only covers a part of the period, so it is difficult to arrive at any general conclusions. France showed a reduction in inequality in the eighties, but no information is available for the nineties. There is no information on Belgium and Italy for the first sub-period, though in both cases the available data shows worse results for the nineties than for the mid-eighties.

As was seen above, from our view equivalent income is the variable which best approximates individual economic welfare. Thus, average equivalent income represents the efficiency component in the evaluation of welfare in our analysis. It is important to grasp that besides the degree of economic growth, other factors affect average equivalent income. The share of the GNP appropriated by families varies through the years and from country to country, giving rise to differences in GDP and Household Disposable Income growth rates. On the other hand, the size of households affects the economies of scales obtained by individuals who do not live alone. Thus, historical or geographical variations in family structure can also significantly affect levels and trends of equivalent income.

The data in Table 2 describes the differences in the behaviour of average income in the different sub-periods studied. Given that the economic cycle is not perfectly synchronised among the various countries and that the surveys' dates vary, growth data does not always refer to directly comparable economic periods. In general terms, however, real income growth was low in the early 1980's, high in the second half of the 1980's and low again in the first half of the 1990's.

Though all the countries show the effect of recessions to some extent, there are important differences in terms of theirs effects on income. Of the eight countries with data for the entire period, the United Kingdom experienced the largest growth of average income followed by Norway, Spain and the USA. All achieved average annual growth rates of over 1% (over 2% in the case of the UK). In Australia, Sweden and Germany income has grown at a slower rate of about 0,5%, while Canada shows the worst results with an average growth rate of 0.3 between 1981 and 1994.

[17] Gottschalk and Smeeding (1997) include a valuable revision of empirical evidence on this issue.

A joint examination of the data on average income and inequality permits an evaluation of the changes in welfare in those countries and periods in which the two indicators show concordant results. Nevertheless, a clear overall balance can only be reached in a few cases (Spain, Canada and France during the eighties). In the most countries, both inequality and average income increased from the early eighties until the mid-nineties. For this reason we can not draw firm conclusions on the evolution of welfare.

It is interesting to highlight that inequality evolved in opposing directions in different periods in many countries. In general, the second half of the eighties ended with distributive gains and increases in real income in contrast with the first half of the decade. France, Germany, Spain, Italy, Norway and, less markedly, Canada and the USA increased their levels of welfare in those years. The situation was quite distinct in the first half of the nineties. During these years, every country with available data, with the exception of Sweden, experienced an increase in inequality. In some cases, this increase has been linked to negative growth in income (Canada, Germany, Sweden and Italy)[18].

The lack of any clear correlation between changes in average income and inequality makes it difficult to forecast the evolution of welfare from isolated data on the rate of average income growth or inequality. At the same time, the necessity of disposing of measurements that would permit us to reach strong conclusions about social welfare trends under certain hypothesis becomes evident.

[18] Worsening income distribution in Germany between 1989 and 1994 can not be adequately understood without taking into account the economic and social costs linked to the reunification process. In strict terms we could say that they are two different countries; so, the data of the eighties and the nineties are not completely comparable.

4. The Distribution of Growth by Income Levels

A simple way to integrate the two dimensions of welfare considered in the previous section consists of analysing the real variations of the incomes in specific points of the distribution. This will allow us to know to what extent the diverse groups have benefited from the positive effects of economic growth. This question is decisive in a period in which the sharp increases in inequality occurring in many countries have put the old idea that "rising tides lift all boats" to the test.

To carry out the analysis we will consider a simplified version of the income distribution ($X^t=x_1^t, x_2^t,..., x_n^t$) in a year *t*:

$$X^{t}_{q_k} = (x^{t}_{q_1}, x^{t}_{q_2},..., x^{t}_{q_{k-1}})$$

where x^t_{qi} represents the upper limit of income in the ith group out of the *k* equally sized θ groups by which the distribution can be divided. The exclusion of the kth group in this simplified form is due to the atypical character of the extreme values of any empirical distribution, which makes it inadequate to take the highest income as a good representation of the economic situation of the most privileged group.

In the period *t+1* we will have a distribution of income ($X^{t+1}=x_1^{t+1}, x_2^{t+1},..., x_n^{t+1}$) that we can represent equally in a simplified form in terms of the initial distribution, through a vector [$X^{t+1}_q = (1+ l) X^t_q$]:

$$X^{t+1}_{q_k} = [\ (1+ l_1)x^{t}_{q_1}, (1+ l_2)x^{t}_{q_2},..., (1+ l_{k-1})x^{t}_{q_{k-1}}\ ]$$

where the l_i represents the growth rates of incomes at different points of the distribution. It is important to notice that the distribution X^{t+1}_q represents incomes

obtained in the time period *t+1* by individuals situated in this time, and not in time *t*, in the points of distribution considered[19].

It is easy to comprehend that the effects of the growth process on welfare fundamentally depends on the sign and structure of the vector (1+ *l*). If we accept the principle of monotonicity, which constitutes a basic property of any function of social welfare[20], welfare increases unequivocally if the following applies:

$$\lambda_i \geq 0, \qquad i = 1, 2, \ldots, k\text{-}1.$$
$$\lambda_j > 0 \qquad \text{for some } j \in (1, 2, \ldots, k\text{-}1).$$

This rule is closely related to the principle of Pareto optimality which stipulates that one situation A represents *unambiguously* greater welfare than another B if, and only if, nobody is worse off in A and at least someone is better off than in B.

The principle of transfers, of fundamental importance in the analysis of inequality, allows us to say something more. According to this principle, a specific increase in income contributes more to welfare if it benefits an *i* household that is poorer than a more prosperous one, *j*.

If we combine these two fundamental principles, it is possible to draw some conclusions. In the first place, given an overall increase in income in which nobody receives less income than before, a distribution of growth benefiting the poor represents a greater increase in welfare than a uniform distribution. Likewise, a uniform distribution of growth represents a greater increase in welfare than one benefiting the rich. Of course, it is not always possible to draw such clear conclusions when comparing overall growth rates of distinct magnitude and distributed differently by levels of income. In these situations it may be necessary to make value judgements on the relative importance of efficiency and equity gains.

[19] In other words, we are comparing two cross-sections of income distribution, where particular individuals can be situated at different positions in *t* and *t+1*. Incorporating mobility to the analysis is not possible as yet, due to the lack of comparable panel data.

[20] Although not universally accepted. As Cowell (1995) notes, if society consisted of a million paupers and a single disgustingly rich person, a change which rose the income of the rich individual while maintaining those of the paupers would generate an unambiguous increase in welfare.

Secondly, there is a possible trade-off between efficiency and equity in the evaluation of welfare whose terms depend on ethical assumptions about the degree of concavity of the income utility function. A *t+1* situation in which some incomes are greater and others smaller than in the initial *t* situation *could* represent an improvement in terms of welfare**,** even if average income fell. That would occur if the utility increases of those that improve their situation could compensate for the others' losses. In other words, an equality increase could offset the negative effect on welfare of a fall in average income. The opposite (a reduction in welfare) could apply for a process of growth that raised the incomes of richer households while diminishing those of the least privileged**.**

In this section we examine the implications of income growth on welfare using a simplified distribution which takes into account only three parameters:

$$w'(x) = f(\lambda_{1,} \lambda_{k/2,} \lambda_{k-1})$$

$w'(x)$ represents growth in welfare and l_1, $l_{k/2}$ *y* l_{k-1} are respectively the real growth of the upper limit of the first, the fifth and the ninth deciles of the equalised income distribution. This is a simplification used frequently when international comparisons are made as it enables us to analyse what happens at three representative points of the distribution in a simple way. From this point, we will refer to these households as the "poor", the "median" and the "rich" households.

An extreme criteria for evaluating the growth process from an ethical point of view would be to consider that aggregate welfare increases only if the situation of the least privileged group improved and, further, if the improvement took place at a rate faster than that of any other group. Specifically:

$$w'(x) > 0, \quad \Leftrightarrow \quad \begin{array}{l} l_1 > 0 \\ l_1 > l_{k/2,}\ l_{k-1} \end{array}$$

This implies a transformation of the monotonicity principle on a rawlsian basis, which could be interpreted as a heavily pro-poor evaluation criterion of welfare increases. The implicit value judgement of this criterion is that growth does not represent greater welfare if it does not manage to improve the absolute and relative standard of living of the least privileged.

The opposite extreme would of course be to consider that the distribution of growth is irrelevant. Thus, welfare would improve only when average income increases without taking into account the changes experienced by the different groups. This would imply a clear violation of the principle of transfers. In other words, it gives absolutely no importance to equity in the evaluation of welfare. The meaning that governments give to GDP growth data implies, in some cases, such extreme value judgements.

LIS micro-data allows the real growth of household incomes situated at the upper limits of the first, fifth and ninth deciles to be calculated for the years in which data is available[21]. As we have explained in section 2, individual household incomes have been scaled up in such a way so that total income in the surveys coincides with the value of the Household Disposable Income estimated from the National Accounts. This operation enables us to avoid temporal differences in the levels of underestimation which can bias our conclusions.

Table 3 shows the results obtained from the previous analysis. Although there are periods and countries in which the three types of households suffered reductions in their real income (the early eighties in Spain or the early nineties in Germany, Italy and Canada), all groups have experienced real improvements in their income levels between the early eighties and the mid-nineties. However, there are stunning differences regarding the way economic growth has benefited to the various income groups (Graph 2).

[21] To transform nominal income to real income, we have used the Deflactor for Consumer Expenditure from the series published by the OECD.

TABLE 3
Growth of Real Incomes at Different Points in the Distribution

Country	**Period**	l_1	l_5	l_9
Australia	1981-85	-0.4	-0.2	-0.1
	1985-89	0.2	0.6	1.6
	1989-94	0.3	0.7	0.8
	1981-94	**0.0**	**0.4**	**0.8**
Belgium	1985-88	5.5	2.7	2.9
	1988-92	3.7	3.7	3.6
	1985-92	**4.8**	**3.5**	**3.5**
Canada	1981-87	1.6	0.7	0.8
	1987-91	0.4	0.3	0.2
	1991-94	-0.8	-0.8	-0.5
	1981-94	**0.7**	**0.2**	**0.3**
France	1979-84	0.3	-0.3	0.4
	1984-89	3.2	1.3	1.3
	1979-89	**1.8**	**0.5**	**0.8**
Germany	1978-83	0.0	-0.3	-0.9
	1984-89	2.4	2.0	1.8
	1989-94	-1.3	-0.7	-0.1
	1978-94	**0.6**	**0.7**	**0.3**
Italy	1986-91	4.2	4.0	2.6
	1991-95	-5.8	-2.3	-0.3
	1986-91	**-0.8**	**1.0**	**1.3**
Norway	1979-86	1.3	1.8	2.2
	1986-91	1.0	0.5	0.0
	1991-95	2.1	2.5	2.4
	1979-95	**1.5**	**1.7**	**1.6**
Spain	1980-85	-2.0	-1.1	-0.9
	1985-90	9.0	5.6	4.7
	1990-95	0.3	0.7	0.5
	1980-95	**2.1**	**1.7**	**1.4**
Sweden	1981-87	-1.1	0.5	0.6
	1987-92	2.3	1.6	2.7
	1992-95	-0.4	-1.5	-2.3
	1981-95	**0.2**	**0.5**	**0.7**
U. Kingdom	1979-86	0.8	0.7	1.9
	1986-91	-0.9	2.2	3.6
	1991-95	3.2	2.2	2.6
	1979-95	**0.9**	**1.6**	**3.0**
U. States	1979-86	-0.6	0.9	2.2
	1986-91	1.7	0.8	1.1
	1991-97	0.8	0.3	0.9
	1979-97	**0.5**	**0.7**	**1.6**

Source: Own research using LIS micro-data.

The experience of the United Kingdom is undoubtedly the most striking due to the inequality with which growth was shared out among households. The real position of British high-income families improved at a rate of two times greater than that of average-income households and more than three times that of low-income households. Australia, the United States and Sweden followed a similar pattern, although with significant differences in terms of size. In these countries, the fruits of economic growth were clearly shared out to benefit the rich. To some extent, the same can be said for Norway in the first half of the 1980's.

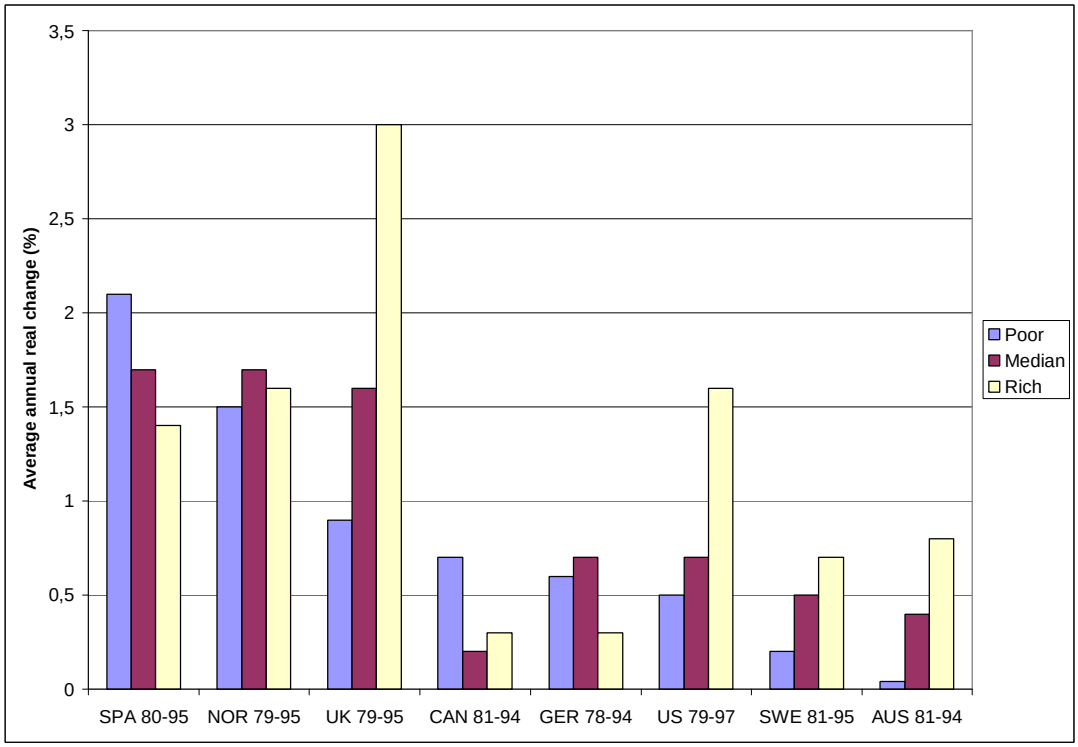
In general terms, it can be said that growth was shared out more equitably among the different income groups in continental Europe, Canada and Norway (from 1986 onwards). The income gains of low-income households were somewhat greater than those of median or high-income households. The available data for the early 1990's, however, points towards a certain inversion of this process. This is probably related to the economic crisis and the sharp rises in unemployment registered during these years.

Spain is the country for which the data covering 1980-1995 shows the most clearly redistributive pattern of growth. The real incomes of poor Spanish households increased at a rate higher than those of median and, more particularly, rich families. France and Germany experienced a similar process in the 1980's[22]. The trend, however, was modified in Germany after the start of the reunification process in 1989. Growth also had a pro-poor bias in Belgium during 1985-92, but the available information is insufficient to paint an overall picture for the period under study.

[22] Growth was biased towards *both* extremes of the distribution in France, although lower income households experienced higher improvements.

GRAPH 2

Distribution of Growth by Income Levels, 1980-95



If we concentrate our attention exclusively on the least privileged households, it is evident that economic growth has not favoured low-income families in the different countries in a similar fashion. The most significant improvements for these groups are observed in countries like Spain and Norway, which combine high income growth levels with better results in terms of inequality.

The United Kingdom and Canada obtained results which are slightly better than those of Germany and the United States, both of which occupy a modest ranking with an average growth rate of approximately 0.5% for poor households. Thus, the greater economic dynamism of the United Kingdom has partially counteracted the negative effect of inequality in the least privileged households, although they have not benefited from growth in the same proportion than median and rich English households. Poor Swedish and Australian households have had lower income gains than the other countries, due to the effect of growing inequality and low overall

income growth. In fact, poor Australian households in 1994 had approximately the same income levels than in 1981.

These results point out that the way in which growth is distributed among the different segments of the distribution scale is crucial to evaluate their consequences in terms of welfare and its capacity to reduce poverty. The differences that have been observed also underline the fact that an increase in average income does not always guarantee significant gains for low-income groups. Furthermore, the sharp differences in the income growth of low and high-income families in countries such as the United States or the United Kingdom have given rise to greater social inequalities. Such a process may bring about a risk of higher social polarisation and conflict which could have negative effects on a wider notion of social welfare.

5. Inequality and absolute income levels: a cross-national comparison

In previous sections we have studied the changes in average income levels and inequality as well as the way economic growth has affected the different income groups in the countries considered. Consequently, we have some elements to evaluate the main trends of these countries concerning these variables. But we have not said anything as yet about the measurement of the comparative levels of welfare among those countries.

As is argued in the introduction, per capita income (PCI) comparisons do not offer a good perspective on the welfare differences among the different groups or countries. In countries with little inequality, where most of the population has levels of income near the average, the PCI may be an accurate index of general welfare. But if a great degree of inequality exists, average income will not be a good ratio to describe the standard of living of large groups of the population. As Tables A.12 and A.13 in the Annex clearly show, the countries considered in our study differ in the degrees of inequality, irrespective of the index chosen.

Comparing *absolute* income levels of households occupying the same *relative* ranking in different countries constitutes a first approach to the question. The interpretation in terms of welfare of the international income differences must

confront an additional difficulty related to the different levels of prices in each country. As we already have argued, one of the implicit assumptions of the use of income as a welfare indicator is that individuals face the same price vectors. Thus, two individuals with the same equivalent adult income have the same consumer capacity. This assumption is a simplification that could be accepted within a particular country[23], but not when different countries are involved.

Therefore, the comparison of the real incomes obtained by households located at different points of the income distribution scale requires the use of adjusted exchange rates to take price differences among the various countries into account. We have used the OECD purchasing power parities to such an end. As is well known, PPP's have certain limitations but their use has become common practice when comparisons are made in terms of real consumer capacity.

As in the previous section, we shall work with simplified income distributions, so that for country *j* we have:

$$X_j^{q_k} = \frac{1}{g_j}(x_j^{q_1}, x_j^{q_2}, ..., x_j^{q_{k-1}})$$

Where $x_j^{q_i}$ again represents the incomes of the upper limit of the i^{th} income group in the country *j*, but now adjusted by a g_j variable allowing us to compare incomes in terms of purchasing power.

We can also analyse welfare in a simplified form concentrating on the incomes at three separate points of the distribution:

$$v(x) = f(x^{\theta_1}, x^{q_{k/2}}, x^{q_{k-1}})$$

Welfare is now analysed with a cross-section perspective depending on absolute levels of income of the *poor, median* and *rich* households in each country.

[23] If regional differences in prices are not very high, which not always will apply.

According to any function of social welfare which fulfils the principle of monotonicity, the situation in a country *j* will be unequivocally preferable to that in a country *l* when all groups have higher income in *j* than in *l*.

Nevertheless, as in the case of temporal comparisons, the ranking in terms of welfare may be more difficult to establish when some groups have higher income in country *j* and others in country *k*. In this case, the diagnosis depends on the value judgements regarding the income marginal utility of the different groups**.** By the principle of transfers, a country *j* in which some incomes are greater and others less than in country *l could* have greater (lesser) welfare than *l*, even if average income is lower (higher). The justification is the same as in temporal comparisons.

If we consider that the situation of low-income groups is the best criteria to evaluate welfare in two different countries, it could be said that:

$$v_j(x) > v_l(x) \Leftrightarrow \frac{q_j^1}{g_j} > \frac{q_l^1}{g_l}$$

This implies restricting the admissible space of social welfare functions to those that are in accordance with Rawlsian *leximin*. According to such a principle, the welfare of the poorest is the only important element when we try to establish an overall evaluation of the achievements of a society. Although this represents an extreme value judgement, it permits us to centre the discussion on the situation of the least privileged in each country. Such a viewpoint is not considered in the usual PCI based rankings.

Table 4 provides information on the absolute income levels of poor, median and rich households in each country around 1995. The information is given both in US dollars using PPP's and in relation to the median household of the richest country of the sample (the United States) [24].

[24] For those countries lacking micro-data for 1995, we have used the data in the nearest available year. The data has been indexed to reflect 1995 prices using US deflactor of consumer expenditure after converting national values to US Dollars with the purchasing power parities.

TABLE 4
Income Levels of Poor, Median and Rich Household around 1995

Country	Household	US $, using PPP's	US Median = 100
Australia	x^{q_1}	8 437	31.1
	x^{q_5}	18 721	69.0
	x^{q_9}	36 431	134.3
Belgium	x^{q_1}	14 800	54.6
	x^{q_5}	25 173	92.8
	x^{q_9}	40 904	150.8
Canada	x^{q_1}	9 692	35.7
	x^{q_5}	20 460	75.4
	x^{q_9}	37 806	139.4
Germany	x^{q_1}	10 069	37.1
	x^{q_5}	18 053	66.6
	x^{q_9}	31 536	116.3
Italy	x^{q_1}	8 876	32.7
	x^{q_5}	21 255	78.4
	x^{q_9}	42 886	158.1
Norway	x^{q_1}	9 510	35.1
	x^{q_5}	17 123	63.1
	x^{q_9}	26 901	99.2
Spain	x^{q_1}	8 032	29.6
	x^{q_5}	16 495	60.8
	x^{q_9}	32 286	119.0
Sweden	x^{q_1}	8 674	32.0
	x^{q_5}	14 572	53.7
	x^{q_9}	22 687	83.6
U. Kingdom	x^{q_1}	7 914	29.2
	x^{q_5}	17 252	63.6
	x^{q_9}	36 161	133.1
U. States	x^{q_1}	9 828	36.2
	x^{q_5}	27 124	100.0
	x^{q_9}	58 294	214.9

Source: Own research using LIS data.

Looking at the absolute levels of income at the selected points of the distribution scale, no complete and unambiguous welfare ordering among countries emerges. Under the assumption that the three income levels that we consider sum-up perfectly the income distribution, Belgium would have greater welfare than Germany and Canada, but we can not clearly determine the ranking of the last two countries. In

a similar way, it would be impossible determine the position of Germany or Belgium with respect to the United States. A country like Norway is classified above Sweden and behind Belgium, Germany, Canada and the United States. However, it can not be compared to Spain, Italy, Australia or the United Kingdom. A conventional dominance chart would prove hard to draw in these circumstances.

Taking into account income levels of poor households, Belgium clearly stands out above the other countries due to a combination of high-income level with low level of inequality. Poor Belgian households have an annual income level equivalent to $14,800 which represents a consumer capacity at least 50% higher than other countries. Germany, the United States, Canada and Norway come next, with incomes close to $10,000. The negative effect of greater inequality on the standard of living of the least privileged is most clearly evident when the real incomes of poor households in Belgium and the United States —the two richest countries of the sample but with different distributive patterns— are compared.

Italy, Sweden and Australia form the third group, where households in the upper limit the first decile have incomes situated between $8,400 y $8,900. Lastly, poor households in Spain and the UK have incomes of around $8,000, approximately half that of a similar Belgian household.

To sum up, the higher average income of some of the most unequal countries does not completely offset the effect of higher levels of inequality in the poorest families' absolute incomes. If we were to follow Rawls and use these families' standard of living levels to measure overall welfare, Belgium and Germany would occupy the topmost rankings, while Spain and the UK would be situated in last place.

The previous ranking is different from that which comes from the mean income statistics usually published by international organisations. Given that we are dealing with the level of income of less privileged households and not of those at the average, the shape of the distribution represents an obvious reason. But there are other factors. The comparisons that have been made refer to equivalent income, which takes the economies of scale associated with family life into account. Countries where family units tend to be larger -as Italy and specially Spain- improve their relative

position when equivalent income is used instead of per capita income. The opposite is true in those countries with small households, among which Sweden clearly stands out. As a result, the quotient between equivalent income and per capita income fluctuates between a maximum of 1.9 in Spain and a minimum of 1.4 in Sweden.

Economies of scales are not considered in those comparisons based in income or GDP per capita. Their inclusion represents an obvious advantage in the analysis proposed above. But there are other elements which should also be taken into account. The most important refers to the differences in access to and quality of benefits in-kind such as health or education. These are types of public goods consumption different from directly appropriated household income that clearly have an influence on welfare. The inclusion of such concepts would probably raise measured welfare in countries like Sweden or Norway where most basic services are provided free of charge by the public sector. Taking this fact into account in future studies on this field would be of considerable interest.

6. Welfare estimates using abbreviated social functions

Some of the questions broached at the beginning of this paper were answered by the analysis undertaken in sections 3-5. However, it does not supply us with general criteria to classify the countries included in the study according to their aggregate levels of welfare, nor to compare the size of welfare gains throughout the period under study. Another way of studying the contributions of average income and the level of distributive equality to welfare in an integrated manner can be done by using abbreviated social welfare functions[25]. These consider average income and inequality exclusively when evaluating the level of welfare associated with a specific income distribution x. In this way:

$$W(x) \equiv \omega\,[m(x), I(x)]$$

where $m(x)$ is average income and $I(x)$ is an inequality index, as in previous sections.

This kind of abbreviated social welfare function has the advantage of providing a criterion for ordering income distributions according to their level of welfare. They only take into account simple and easily understood criteria such as average income and inequality. Their disadvantage is that it is necessary to set greater restrictions on the range of admissible social welfare functions. This means that the normative power of other criteria based on the unanimity of preferences must be given up[26]. Nonetheless, if the form of the abbreviated function has a convincing ethical grounding, it provides a very attractive tool to rank situations which other criteria could not clarify convincingly.

The recent literature has discussed the conditions that the general form proposed must have so that the results have a rational interpretation with regard to welfare.[27] The inequality index and the form of the chosen abbreviated function have a decisive influence. Many of the statistical indices frequently used in empirical work do not bring together all the desired properties in a measure ethically grounded on inequality. This is the case for average relative deviation, variance or even widely used indexes such as the Gini coefficient.

Among all the indices which gather together the minimum criteria required by inequality measurements, the Atkinson measures are specially suitable to forming part of the social welfare function given their explicit ethical grounding. The generic form of the index designed by Atkinson incorporates the concept of equally-distributed equivalent income. This concept represents the income level that, were it to be shared out equally among all the population, would provide the same level of welfare as the current distribution. Using this concept, it is possible to construct an index limited to between 0 and 1 in the following way:

$$I(x) = 1 - \frac{x_d}{m}$$

where x_d is equally distributed equivalent income and m represents the mean income of the distribution under study. It is easy to see that $I(x)$ measures the fraction of total

[25] Following the terminology introduced by Lambert (1993). Other authors, like Cowell (1999), refer to these abbreviations as reduced form social welfare functions.
[26] For example, ranking distributions with generalized Lorenz Curves.

income that could be sacrificed without losing out on welfare if the distribution were perfectly egalitarian.

Instead of adapting a measure used in other fields and later examining its implicit normative content, Atkinson defended the need of taking a determined social welfare function as a starting point in order to give his inequality index concrete form. By imposing a series of minimum restrictions on the form of the income utility, Atkinson obtained the expressions outlined below:

$$U_e(x) = a + b\frac{x^{1-e}}{1-e}, \qquad e > 0, \qquad e \neq 1$$

$$U_e(x) = a + b\ln x^{1-e}, \qquad e = 1$$

Where *a* and *b* are constants greater than zero and *e* represents an inequality aversion parameter which introduces different value judgements concerning the costs related to inequality. This expression gives rise to the whole family of Atkinson inequality indexes presented in section 2.

The explanation above readily suggests the possibility of using the concept of equally distributed income x_d as a measure of the level of social welfare associated to a specific distribution of income. Thus, the abbreviated social welfare function for the empirical analysis would be as follows:

$$W_e = m(1-I(x))$$

where $I(x) = A_e$. If we identify the expression in brackets with an equality index E(x), we can express the welfare index as the product of average income and an inequality index whose value depends on parameter *e*:

$$W_e = m\left[\frac{1}{n}\sum_{i=1}^{n}\left(\frac{x_i}{m}\right)^{1-e}\right]^{\frac{1}{1-e}}$$

[27] Dutta y Esteban (1992), Lambert (1993).

for $e > 0$, $e \neq 1$, and

$$W_e = m\left[\exp\left(\frac{1}{n}\sum_{i=1}^{n} Ln\left(\frac{x_i}{m}\right)\right)\right]$$

for $e = 1$.

Differentiating and making it equal to 0, we have that the trade-off relationship between average income and equality is equal to 1. Thus, a 1% increase in the level of equality makes a 1% reduction in average income possible without any alteration to the level of welfare.

The wide range of values that *e* can adopt allows us to explicitly deal with the possibility of including very different ethical and political judgements on the importance of both dimensions of social welfare.

The lower *e* is, the more neutral towards inequality is the social welfare function. $e \to 0$ would represent the extreme case in which equality is not given any weight at all. The income utility function approaches linearity, which means that a distribution X_i is preferred to another one X_j if, and only if, average income in X_i is greater than average income in X_j. When $e \to \infty$, we find ourselves at the opposite extreme. This situation supposes an infinite aversion to inequality and provides a criterion of evaluation which is similar to Rawls' *leximin***.** Positive and finite parameters *e* assign positive and increasingly important weightings to equality. Specifically, if we were to have two levels of income x_i y x_j such that $x_i=\lambda x_j$, $\lambda>1$, and assuming that the transfer will leave the initial order unchanged, the society in question would be prepared to give up λ^e monetary units of x_i to increase the income of x_i by one monetary unit.

a) Welfare levels

Table 5 shows the social welfare indexes for a group of inequality aversion parameters that range from e=0.5 to e=3. The indexes are expressed as a percentage of the average to facilitate comparisons. 1995 is taken to be the reference year because

it is the most recent date for which we can establish comparisons, with the sole exception of France[28]. The countries are ranked by average income (first column), which would represent the limit of the value of the welfare index should $e \to 0$. This permits us to easily identify the changes in ranking produced when different value judgements on the form of the social welfare function are introduced.

TABLE 5
Average Income and Social Welfare Indexes around 1995
(OECD-10 =100)

Country	m	**W(e=0.5)**	**W(e=1)**	**W(e=1.5)**	**W(e=2)**	**W(e=3)**
United States	144	140	135	130	126	117
Belgium	121	124	128	131	136	146
Italy	108	106	104	102	99	95
Canada	105	106	106	107	108	111
Australia	99	98	97	94	91	77
U. Kingdom	92	90	89	88	87	87
Germany	91	93	94	96	99	103
Norway	86	88	91	93	96	103
Spain	84	84	84	83	83	84
Sweden	68	70	72	74	75	78
OECD-10 (US$)	100 (22 484)	100 (21 247)	100 (20 002)	100 (18 759)	100 (17 529)	100 (15 155)

As can be observed, when some importance is given to equality, although still slight (e=0.5), the resulting ranking is similar to the one obtained with average incomes. The only exception to this is the order between Germany and the United Kingdom, as well as that between Canada and Italy, which are now situated at the same ranking.

The ranking of each country with regard to the average varies when equality is given more weight in welfare. In some cases these changes are of little significance.

[28]For countries in which the data refer to 1994 (1992 in the case of Belgium), we have used a simulated distribution. For the inequality indices, we have applied average annual change rate obtained in the last

Sweden and Spain are the clearest examples of this. The position of other countries in the ranking, however, is very dependent on the value judgements on the form of the social welfare function. Germany and Norway, which are ranked seventh and eighth when measuring by average income, change ranking to fourth and fifth places respectively when using W(e=3). These two countries improve their positions as the value of e is increased given that for them inequality supposes a lower loss of efficiency than for other countries. In the opposite extreme, Australia quickly loses its ranking as from W(e=1).

The level of welfare is also reduced significantly in the United States when inequality is taken into account. The United States cedes first place to Belgium once all the indices greater than W(e=1.5) are considered. As the inequality aversion parameter is increased, the difference between Belgium and the United States is accentuated.

The changes in position produced when using different values for e make it difficult to obtain an overall ranking of the relative welfare levels of the countries considered in this study. Any other result would have been surprising given the various combinations of average income and inequality among the countries under study. Some general conclusions, however, can be drawn on the range of implicit value judgements in the e=[0.5, 3] interval, which includes a wide range of views on the costs of inequality.

Thus, we can affirm that Belgium and the United States both enjoy a higher level of welfare than all the other countries, although their ranking is not clearly determined (due to the interchange of rankings when $e \geq 1.5$). Canada would come in the third position. These three countries are better placed than all the others irrespective of the welfare indexes used. Within the rest of the countries only partial orderings are possible. Sweden enjoys a lower level of welfare than Spain and both countries have a worse position than the rest, with the exception of Australia, which cannot be compared. The United Kingdom is always ranked behind Germany and Italy, but no unanimity exists concerning the order among the last two countries.

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available period. For the average equivalent income we have assumed the same growth rate as observed

Norway has lesser welfare than Germany but its ranking with respect to Australia, Italy or the United Kingdom varies according to the index utilised.

b) Welfare trends

The second aspect of interest to complete the analysis is looking into how the welfare indexes have changed with the passage of time. In section 3 we looked at how average income increased in real terms in all the countries, barring Canada, between 1980 y 1995. We also saw that changes in inequality made it difficult to reach definitive conclusions about trends in welfare for a majority of countries. Do abbreviated social functions allow us to say something more?

Table 6 shows the average annual increase of three welfare indexes that cover the range of inequality aversion parameters considered. Welfare increased in the first half of the eighties in Canada, Norway and the United States, while it fell in Australia, Spain and France. During the same period it remained steady in Germany. In the United Kingdom and Sweden the diagnosis depends on the index used. The picture is clearer in the second half of the eighties. This period ended with welfare gains in all the countries considered. Spain and Italy obtained the best results in these years, particularly so when equality is given more weight.

The nineties produced less successful results. Of the nine countries for which we have data for the mid-nineties, only three (the United States, the United Kingdom and Norway) obtained unambiguous welfare gains. Sweden, Italy, Germany, Canada all registered welfare losses, as well as Australia and Spain with index W(e=3).

Norway and Spain are the two countries whose levels of welfare increased at the fastest rate between 1980 and 1995, as well as the United Kingdom when little weight is given to inequality. The United Kingdom and the United States experienced unambiguous gains in welfare, although at a lower rate when indexes more sensitive to changes in the distribution are used. Both Belgium and France obtained unequivocal improvements in the periods for which we have information. Italy,

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in the per capita Household Disposable Income (OECD data).

Sweden and Australia register net gains when indices with low parameters are used and net losses with higher parameters. This last country experienced the smallest welfare improvement along the period, irrespective of the index chosen.

TABLE 6
Annual Increase of the Welfare Index
Using Different Inequality Aversion Parameters

Country	***Period***	**W(*e*=0.5)**	**W(*e*=1.5)**	**W(*e*=3)**
AUS	1981-85	-0.16	-0.29	-0.45
	1985-89	1.13	0.89	0.48
	1989-94	0.15	-0.48	-3.31
	1981-94	**0.36**	**0.01**	**-1.27**
BEL	1985-88	2.99	2.93	2.83
	1988-92	3.49	3.43	3.25
	1985-92	**3.45**	**3.39**	**3.23**
CAN	1981-87	0.91	1.05	1.49
	1987-91	0.45	0.44	0.35
	1991-94	-0.80	-0.80	-0.66
	1981-94	**0.37**	**0.43**	**0.64**
FRA	1979-84	-0.33	-0.36	-0.42
	1984-89	1.82	2.87	10.24
	1979-89	**0.72**	**1.07**	**2.28**
GER	1978-83	-0.06	-0.05	0.06
	1984-89	2.00	2.02	1.91
	1989-94	-0.70	-0.94	-1.30
	1978-94	**0.61**	**0.57**	**0.44**
ITA	1986-91	3.24	3.46	3.74
	1991-95	-1.81	-3.09	-5.58
	1986-91	**0.87**	**0.31**	**-0.87**
NOR	1979-86	1.88	1.77	1.60
	1986-91	0.59	0.69	0.84
	1991-95	2.33	2.22	1.94
	1979-95	**1.71**	**1.66**	**1.56**
SPA	1980-85	-1.18	-1.67	-3.01
	1985-90	5.76	6.86	9.74
	1990-95	1.43	0.22	-0.36
	1980-95	**1.59**	**1.63**	**1.60**
SWE	1981-87	0.31	0.02	-0.71
	1987-92	2.18	2.15	2.30
	1992-95	-1.66	-1.65	-2.58
	1981-95	**0.52**	**0.39**	**-0.11**
UK	1979-86	1.08	0.63	-0.75
	1986-91	2.78	2.32	3.09
	1991-95	2.31	2.18	1.74
	1979-95	**2.11**	**1.67**	**1.06**
US	1979-86	1.25	0.76	0.28
	1986-91	0.90	0.98	1.27
	1991-97	1.29	1.10	0.82
	1979-97	**1.25**	**0.99**	**0.77**

Source: Own research using LIS micro-data.

Thus, the analysis we have undertaken shows that the sign and magnitude of the changes in welfare depends, at times crucially, on the value judgements about the relative importance of economic growth and equality when evaluating social welfare.

This conclusion can appear to be unsatisfactory to those accustomed to employing simple and easily accessible indexes, such as income per capita, to measure the achievements of the various socio-economic models. Nonetheless, it is important to admit that such indicators contain very restrictive implicit value judgements on the form of the social welfare function. The advantage of the approach proposed in this paper is that it makes the value judgements behind such indicators explicit as well as clarifies the ethical principals behind affirmations on the comparative welfare of countries.

7. Conclusions

A number of factors have contributed to placing international comparisons in the foreground of attention. These include recent changes in the relationship between economic growth and inequality, the interest arising from matters related to real convergence in the European Union and the intense debate on the varying social consequences of the way the United States and Europe have organised their labour markets and socio-economic systems. All of the above have aroused a demand for more analyses and welfare indicators. This interest has produced the need to look for adequate tools to measure and interpret levels of social welfare.

We have aimed to provide some criteria to empirically investigate this question and offer a battery of results in this paper. Four principal aspects have characterised the analysis we have carried out. Firstly, we examined the average income and inequality trends in eleven OECD countries and discussed their possible implications in terms of social welfare. The results obtained using a variety of sources underline the absence of any direct relationship between the behaviour of both these variables. Thus, it is difficult to draw a clear balance of welfare trends. The more general pattern for the period 1980-95 was a rise in real average income combined

with an increase in inequality. Spain and Canada are the only countries where inequality was lower at the mid-nineties than at the early eighties.

Secondly, we have analysed the growth in household income situated at different points of the distribution scale in a number of OECD countries. The results obtained point towards the idea that growth has not favoured all the groups in these countries in the same manner. The United Kingdom stands out for being the country in which income growth was distributed more unequally. Other countries like Australia, Sweden or the United States followed a similar pattern. Although real income grew at the three points of the distribution chosen to summarise changes, inequality increases clearly contributed to reduce the positive welfare effects of economic growth in these countries.

As a consequence, households located in the lower end of the distribution have not necessarily registered the greatest gains in the countries with the highest growth of mean income. Some countries that have simultaneously registered high or medium growth rates with a reduction or a slight increase of inequality show better results. If we were to evaluate welfare gains based on the situation of the least privileged households, Spain and Norway would have experienced the greatest progress, while Sweden and Australia would be situated in the last places.

In order to complement the above-mentioned analyses, we have also attempted to establish absolute welfare comparisons. As a first approximation, these have been carried out by assessing the real differences that exist among income groups in different countries. The results point out the difficulty of outlining a clear ranking without assuming specific value judgements on the importance of income differences at both extremes of the distribution.

If we take into account incomes of the households situated on the top limit of the first decile, some unambiguous results emerge. A higher average income does not necessarily produce a better situation for poorer households. Germany and, specially, Belgium show the best situation on these grounds. At the other extreme, poor British and Spanish households have incomes of approximately half than that of a similar Belgian household.

It has been necessary to use abbreviated social welfare functions in order to obtain more robust conclusions about the welfare differences for the countries considered. These functions take into account average income and inequality as the only relevant components. We have defined welfare indices based on the Atkinson measure of inequality to make these abbreviated functions operative. These indices make the different ethical and political value judgements explicit by means of the value of the inequality aversion parameter chosen to calculate the Atkinson index.

The results with LIS data allow us to conclude that Belgium, Canada and the United States had the greatest level of welfare around 1995. Sweden and Spain occupied the worst position, with the exception of Australia, which can not be compared to the former. Germany, Italy, Norway and the United Kingdom formed the group of intermediate levels of welfare, together with Australia when lower inequality aversion parameters are used. Although some partial orderings are possible within each group, no unanimous and complete ranking exists for the range or inequality aversion parameters considered.

We have also used abbreviated social functions to examine changes in welfare in greater detail. Spain and Norway have experienced the greatest gains in welfare, together with the United Kingdom when little weight is given to inequality. Belgium, France, Canada and United States also have obtained welfare gains in the periods under study. The evidence for Australia, Italy and Sweden depends on the index used. They both register losses in welfare when inequality is given more importance.

Although the question of which range of inequality aversion parameters should be chosen to evaluate welfare is open to debate, the indices we have used allow the discussion to be carried out empirically. We believe they have clear advantages over the measures traditionally used to rank countries according to their aggregate economic indicators. Therefore, the joint analysis on growth and income distribution should constitute an important tool to calculate changes in social welfare and estimate the overall impact of governmental policies.

ANNEX

TABLE A.1. CHANGES OF INEQUALITY IN AUSTRALIA

I(x)	*1981-85*	*1985-89*	*1989-94*	*1981-94*
G	0.65	0.86	0.92	0.85
T_0	1.26	1.90	2.89	2.26
T_1	1.35	1.83	1.79	1.79
$A_{0.5}$	1.28	1.81	2.18	1.92
A_1	1.19	1.78	2.69	2.10
$A_{1.5}$	1.11	1.76	3.41	2.37
A_2	1.02	1.73	4.42	2.76
A_3	0.86	1.64	7.35	3.90
A_4	0.75	1.53	9.88	4.87

TABLE A.2. CHANGES OF INEQUALITY IN BELGIUM

I(x)	*1985-88*	*1988-92*	*1985-92*
G	0.33	0.06	0.18
T_0	1.13	0.42	0.73
T_1	0.74	0.11	0.38
$A_{0.5}$	0.75	0.25	0.47
A_1	0.76	0.40	0.56
$A_{1.5}$	0.78	0.55	0.66
A_2	0.79	0.70	0.75
A_3	0.82	0.99	0.93
A_4	0.83	1.23	1.08

TABLE A.3. CHANGES OF INEQUALITY IN CANADA

I(x)	*1981-87*	*1987-91*	*1991-94*	*1981-94*
G	-0.18	-0.06	0.18	-0.06
T_0	-0.76	-0.02	0.14	-0.32
T1	-0.39	-0.11	0.27	-0.16
$A_{0.5}$	-0.55	-0.07	0.21	-0.23
A_1	-0.72	-0.01	0.14	-0.30
$A_{1.5}$	-0.88	0.04	0.04	-0.38
A_2	-1.03	0.11	-0.08	-0.46
A_3	-1.26	0.24	-0.32	-0.58
A_4	-1.37	0.36	-0.54	-0.65

TABLE A.4. CHANGES OF INEQUALITY IN FRANCE

I(x)	*1979-84*	*1984-89*	*1979-89*
G	0.16	-1.01	-0.43
T_0	0.25	-4.17	-1.99
T_1	0.26	-2.40	-1.08
$A_{0.5}$	0.26	-3.09	-1.44
A_1	0.24	-3.97	-1.89
$A_{1.5}$	0.23	-5.08	-2.45
A_2	0.23	-6.38	-3.11
A_3	0.30	-8.79	-4.31
A_4	0.46	-9.58	-4.67

TABLE A.5. CHANGES OF INEQUALITY IN GERMANY

I(x)	*1978-83*	*1984-89*	*1989-94*	*1978-94*
G	0.13	-0.44	1.52	0.07
T_0	0.03	-0.61	3.34	0.29
T_1	0.19	-0.79	3.38	0.16
$A_{0.5}$	0.11	-0.70	3.29	0.21
A_1	0.03	-0.59	3.20	0.28
$A_{1.5}$	-0.07	-0.45	3.11	0.35
A_2	-0.19	-0.27	3.03	0.42
A_3	-0.43	0.19	2.83	0.58
A_4	-0.68	0.75	2.57	0.72

TABLE A.6. CHANGES OF INEQUALITY IN ITALY

I(x)	*1986-91*	*1991-95*	*1986-95*
G	-0.88	4.15	1.27
T_0	-1.69	11.11	3.58
T_1	-1.82	9.72	2.92
$A_{0.5}$	-1.71	9.96	3.10
A_1	-1.60	10.29	3.31
$A_{1.5}$	-1.50	10.66	3.55
A_2	-1.40	11.04	3.79
A_3	-1.23	11.56	4.13
A_4	-1.11	11.49	4.21

TABLE A.7. CHANGES OF INEQUALITY IN NORWAY

I(x)	*1979-86*	*1986-91*	*1991-95*	*1979-95*
G	0.77	-0.78	0.37	0.17
T_0	1.61	-1.51	1.14	0.47
T_1	1.60	-1.55	0.81	0.37
$A_{0.5}$	1.58	-1.51	0.95	0.41
A_1	1.56	-1.47	1.10	0.46
$A_{1.5}$	1.53	-1.42	1.26	0.50
A_2	1.49	-1.37	1.42	0.55
A_3	1.38	-1.25	1.75	0.62
A_4	1.21	-1.11	2.06	0.68

TABLE A.8. CHANGES OF INEQUALITY IN SPAIN

I(x)	*1980-85*	*1985-90*	*1990-95*	*1980-95*
G	1.09	-1.90	0.35	-0.19
T_0	3.11	-4.46	1.19	-0.32
T_1	2.54	-3.91	0.81	-0.38
$A_{0.5}$	2.70	-4.05	0.95	-0.34
A_1	2.92	-4.23	1.13	-0.30
$A_{1.5}$	3.20	-4.44	1.32	-0.25
A_2	3.52	-4.67	1.53	-0.20
A_3	4.21	-5.09	1.93	-0.07
A_4	4.77	-5.35	2.27	0.07

TABLE A.9. CHANGES OF INEQUALITY IN SWEDEN

I(x)	*1981-87*	*1987-92*	*1992-95*	*1981-95*
G	1.51	0.86	-1.89	0.52
T_0	4.29	1.02	-1.66	1.83
T_1	3.52	1.63	-2.67	1.46
$A_{0.5}$	3.82	1.31	-2.24	1.58
A_1	4.15	0.99	-1.61	1.77
$A_{1.5}$	4.54	0.66	-0.74	2.04
A_2	4.96	0.34	0.39	2.40
A_3	5.85	-0.25	3.35	3.35
A_4	6.56	-0.68	6.22	4.27

TABLE A.10. CHANGES OF INEQUALITY IN THE U. KINGDOM

I(x)	*1979-86*	*1986-91*	*1991-95*	*1979-95*
G	1.56	2.12	0.37	1.53
T_0	3.82	4.08	0.82	3.60
T_1	3.50	4.39	0.98	3.61
$A_{0.5}$	3.51	4.18	0.84	3.48
A_1	3.60	3.80	0.76	3.34
$A_{1.5}$	3.80	3.20	0.74	3.20
A_2	4.17	2.34	0.79	3.06
A_3	5.60	-0.05	1.10	2.82
A_4	7.67	-2.57	1.63	2.66

TABLE A.11. CHANGES OF INEQUALITY IN THE U. STATES

I(x)	*1979-86*	*1986-91*	*1991-94*	*1994-97*	*1979-97*
G	1.56	0.06	1.47	-0.02	0.90
T_0	3.19	-0.18	2.95	-0.36	1.69
T_1	3.25	0.06	3.19	0.22	1.99
$A_{0.5}$	3.12	-0.05	2.94	-0.09	1.77
A_1	2.93	-0.17	2.70	-0.33	1.55
$A_{1.5}$	2.68	-0.28	2.47	-0.50	1.33
A_2	2.37	-0.38	2.27	-0.56	1.12
A_3	1.68	-0.46	1.95	-0.47	0.77
A_4	1.07	-0.42	1.72	-0.23	0.55

TABLE A.12. INEQUALITY INDICES AROUND 1990

I(x)	*NW*	*BE*	*SW*	*GE*	*FR*	*IT*	*CN*	*SP*	*AU*	*UK*	*US*
G	0.195	0.202	0.199	0.210	0.243	0.256	0.252	0.267	0.270	0.294	0.306
T_0	0.062	0.065	0.067	0.072	0.097	0.107	0.107	0.117	0.122	0.142	0.165
T_1	0.060	0.063	0.063	0.070	0.094	0.102	0.100	0.113	0.114	0.135	0.148
$A_{0.5}$	0.030	0.032	0.032	0.035	0.047	0.051	0.050	0.056	0.057	0.067	0.075
A_1	0.060	0.063	0.065	0.070	0.093	0.101	0.101	0.110	0.115	0.132	0.152
$A_{1.5}$	0.091	0.095	0.099	0.104	0.138	0.150	0.152	0.162	0.171	0.194	0.228
A_2	0.121	0.125	0.135	0.138	0.182	0.197	0.202	0.212	0.226	0.250	0.301
A_3	0.180	0.184	0.210	0.205	0.266	0.281	0.296	0.301	0.325	0.345	0.429
A_4	0.234	0.237	0.288	0.269	0.345	0.351	0.377	0.375	0.409	0.416	0.524

TABLE A.13. INEQUALITY RANKING AROUND 1990

I(x)	*NW*	*BE*	*SW*	*GE*	*FR*	*IT*	*CN*	*SP*	*AU*	*UK*	*US*
G	1	3	2	4	5	7	6	8	9	10	11
T_0	1	2	3	4	5	6	7	8	9	10	11
T_1	1	2	3	4	5	7	6	8	9	10	11
$A_{0.5}$	1	2	3	4	5	7	6	8	9	10	11
A_1	1	2	3	4	5	6	7	8	9	10	11
$A_{1.5}$	1	2	3	4	5	6	7	8	9	10	11
A_2	1	2	3	4	5	6	7	8	9	10	11
A_3	1	2	4	3	5	6	7	8	9	10	11
A_4	1	2	4	3	5	6	8	7	9	10	11

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