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The Evolution of Income Inequality During the Rise of the Swedish Welfare State 1951 to 1973

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We analyse the change in family gross income inequality between 1951 and 1973. We use two new samples of the Swedish population from 1951 and 1956 containing tax register data, and compare the results with those obtained from the Swedish Level of Living survey from 1967 and 1973. Gini coefficients, four different Generalised entropy measures as well as decile group shares of total income are calculated. We also do two different decompositions: one between different demographic groups and one between the male and female component of family income. Finally, we examine to what extent zero family income records really reflect low economic welfare by using interview data from the 1968 Swedish Level of Living Survey. JEL-codes D3 I3 N3.

Thanks to numerous studies emerging from the Luxembourg income study (LIS), we now know that Sweden around 1980 and at least up until the early 1990s had one of the most equal distributions of income among industrialized countries (see e.g. Atkinson et al. 1995, Gottschalk & Smeeding 1997). However, when and how Sweden achieved its equal distribution of income is more of an open question. Is it a rather recent outcome of the growth of the welfare state during the 1960s and 1970s? Or is it a historical inheritance from rather long time ago? Although these questions have a great interest, both from a social science and a political point of view, our knowledge on these issues is restricted by the fact that most micro data sets do not go back very far in time.

The main Swedish micro data set with information on family income inequality, The

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Income Distribution Surveys provided by Statistics Sweden (the so called HINK data), provides consistent series of income inequality from 1975 and onwards.[1] The second main micro data set, the Swedish Level of Living Survey, is a panel data set where the interviews have been conducted in 1968, 1974, 1981 and 1991. As there is both register and survey information about participating individuals' (and their spouses') incomes in 1967, we have a fairly good picture of the income distribution by that time (see e.g. Gustafsson & Uusitalo, 1990, Jansson, 1990, Fritzell, 1991, or Björklund, Palme & Svensson, 1995).[2] All the studies that have used data from 1967 and onwards suggest that there is a sharp decline in income inequality until 1980, which seems to be a peak in income equality. Since then, income inequality seems to have increased, although the change has not been as marked as in the UK or the US.

We know much less on what happened to income inequality before 1967. This is unfortunate since the time period between the end of the Second World War and the end of the 1960s constitutes the rise of the Swedish welfare state. We know of two studies. The first one, Johansson (1999), finds a decreasing inequality in the distribution of family equivalent income between 1925 and 1958. The limitation of this study is that the sample is restricted to the City of Göteborg. This restricts the comparability with the time period we know very well of, i.e., the late 1960s.

The second study, Spånt (1979), provides a consistent series of *individual* market income before taxes and transfers, for both sexes and for men and women separately, for the period 1951–1976. The general pattern is that women's incomes have been equalized over the period, whereas inequality of men's incomes was quite stable. The data used by Spånt (1979) come from administrative records, which in turn stem from individual tax returns. This type of administrative information is available for Swedes born the 15th in each month.

In this study we exploit the data from the sample of Swedes born the 15th in a month one step further than Spånt (1979) was able to do. Within the Swedish Level of Living Survey project, a representative sample of Swedish citizens in 1951 and 1956 were obtained from this register. As there is also information about the income of the spouse of married persons, we are able to obtain a measure of family income.[3] That is, we can estimate inequality of family income, which we believe is a better measure of economic welfare than individual income. We are also able to assess the effect on family income inequality of increased female labor force participation, which to a large extent accrued during the time period covered by this study. More specifically, we use the years 1951, 1956, 1967 and 1973.

The era that we are able to examine coincides with the build-up of the Swedish welfare state. In his thorough exposition of the development of the Swedish welfare state, Olsson (1990) identifies three important changes during the period of our study. The immediate postwar period: the institutionalization of housing and employment programs

1. The Swedish data in the LIS project are taken from the HINK data.
2. The Swedish Level of Living Survey from 1967 is now a part of the LIS data set.
3. There is also information about the number of children and for some years also about taxes, so it is possible to extend the measurement of income inequality with these data. Björklund & Palme (1998) present preliminary results based on this information.

and the introduction of flat-rate benefits. The second half of the 1950s: the introduction of earnings-related benefits. The 1960s and early 1970s: the expansion of public services. Because most transfers were not taxable during the period and we exclude retired people from our sample, the growth of transfer payment cannot be a driving force in the data we analyse. More important could be the expansion of the public services, which sparked the labour force participation of women during the period. Public employment as a percent of the labour force, increased from 15.4 percent in 1950 to 29.2 percent in 1975 (Olsson, 1990, page 124). Nermo (1999) reports that women's labour force participation increased from around 32 percent in 1950 to 62 percent in 1975, even though the increase is somewhat lower if farmer's wives are counted as employed. Starting from a lower level, married women's labour participation increased more than for unmarried. See also Nyberg (1989, chapter 17).

We continue the paper with a description of the data sources and the definition of the measure of family income. We present results on the evolution of overall inequality in section 3. In Section 4 we discuss the quality of the income measure with special emphasis on those who report zero income. Section 5 offers two decomposition analyses and our main conclusions are given in Section 6.

Data and income concepts

Our basic sample is closely related to the Level of Living Surveys (see Erikson & Åberg, 1987). The first wave of these surveys was conducted in 1968 and the sample was representative for the Swedish population of individuals aged 15 to 75 years in 1967 – born between March 15 1893 and February 15 1953. The sample size was 6522, or one per thousand of the population. A large number of questions about various level of living components were asked to the respondents. Further, administrative data on income from various registers were merged to the data derived from the interviews. In 1974, 1981 and 1991, similar interviews were conducted and the first sample was complemented by youth and immigrants in order to make it representative for the whole population of individuals. Register data on income were continuously collected from 1967 onwards.

Register data on income have also been collected back in time to 1951, with the exception for 1959 that is missing because of changes in the administrative routines followed by the Statistics Sweden. When these historic data were merged to the sample of the Level of Living Survey, the latter sample was extended to get representative samples of the Swedish population also in 1950, 1956 and 1962. The principle followed in these extensions was the following: a random sample with the same sample fraction and the same age interval as in the Level of Living Surveys was drawn in 1950. This sample was complemented with youth and immigrants in 1956 and 1962 to make it representative for the whole population in these years too.

Those who remained in Sweden in 1967 were replaced by the sample of the Level of Living Survey; those who did not were kept in the sample. For this new sample, data from several registers were collected back to 1951. In addition to income, information about marital status, number of children, emigration and return-immigration and quite a few other variables were gathered from the available public registers. There is also information about the year of death for those who have died.

Thanks to this extended sample it is possible to construct representative cross sections of the Swedish population in 1950,

1956 and 1962.[4] By using the information on emigration, return immigration and deaths, it is possible to get quite representative cross-sections for the intervening years as well.

This rather sophisticated merging of data from several sources was made possible by the fact that the Level of Living Survey sample was originally drawn from the register of people born the 15th in each month. Until the late 1960s, this register was kept and updated by Statistics Sweden for research purposes. Therefore the register data could be merged to the Level of Living Surveys.

Table 1 shows sample sizes and the demographic characteristics of the samples we use. We confine ourselves to the age group 20-66 years old. Despite the panel property of the data, we treat the samples as four cross-sections.[5] The overall impression is that there are no marked shifts in the variables. The proportion that is married falls by a couple of percentage points during the 1970s. Increasing cohabitation without marriage could possibly explain this decline. Because we lack information about cohabitation and hence also the income of cohabiting persons, we have to treat persons who cohabited without being married as single.

The income concept for which data exist for this long period of time is, in Swedish, *sammanräknad nettoinkomst* (market income in the following). It is the sum of incomes from the main "sources of income" defined by the Swedish tax laws: income from work, from own business, from capital and from realizations of capital gains. Deficits in any of these sources of income are deducted. Up until 1973, most Swedish transfers were tax-free so these are not included in the income concept. Further, income taxes are not deducted.

Table 1.
Demographic characteristics of our samples.

Year	Sample size	Women	Married	Age
1951	4512	0.498	0.695	41.3
1956	4525	0.497	0.716	42.1
1967	5200	0.498	0.717	42.4
1973	5378	0.498	0.672	42.0

The data on income stem from the tax return procedure that is compulsory in Sweden for all with an income above a rather low level. We come back to the issue of incomes below this level in section 4 where we discuss the quality of our series.

We have at our disposal this market-income variable for the individuals in the sample of the Level of Living Survey. For those who are married in a specific year, we also have the market income of the spouse in the same year. Unfortunately though, we have found out that income data of the spouse are erroneous for the years 1960–66; for these years income of the spouse is only available if the respondent has a positive income.

In 1974 a major reform of the social insurance system affected the definition of income. In principle, the content of this reform was that some major social insurance schemes – like the compulsory sickness insurance, the insurance for work-related accidents or illnesses and compensation during maternity leave – became more closely related to the income of the insured individual and also taxable.

We have not been able to compute the number of children in an accurate way, even though the data set contains some variables that inform about the presence of children in the household. For this reason, it is not useful to elaborate on the problems related to choice of equivalence scale. For a married person we have simply divided the couple's total income by the square root of two and assigned this income level to the sample individual.[6] The unit of analysis in the study is the individual, i.e., we measure inequality of individuals' family incomes. To do so has become the standard approach in applied research on income inequality.

Income inequality 1951 to 1973

We start by looking at inequality by using two summary measures, the Gini coefficient and the generalized entropy measure (GE), which are standard in the income inequality literature. The Gini coefficient can be defined as

$$G = \left(\frac{1}{2n^2\mu}\right)\sum_{i=1}^{n}\sum_{j=1}^{n}|y_i - y_j| \qquad (1)$$

where y_i and y_j are individual *i's* and *j's* income respectively, n the size of the population and μ mean income. The advantage of this definition in terms of a discrete distribution is that the Gini may be intuitively interpreted as one half of the relative mean difference (see Sen, 1973). The relative mean difference is the average of the absolute values of the differences between all income pairs as a share of the mean income. That is, if two individuals are picked randomly from the population, the Gini coefficient measures one half of the expected relative difference between their incomes.

To get an intuition on how the Gini aggregates different parts of the income distribution, it may be useful to study how different redistributions affect the size of the Gini. Equation (1) may be rewritten as

$$G = 1 + \left(\frac{1}{n}\right) - \left(\frac{2}{n^2\mu}\right)[y_1+2y_2+....+ny_n],$$
$$\text{for } y_1 \geq y_2 \geq ....\geq y_n. \qquad (2)$$

From this expression it is evident that if we take one unit of income from an individual ranked h and give it to an individual ranked k, where $h<k$ (i.e., h is richer than k), the Gini will decrease by $\frac{2(k-h)}{n^2\mu}$. That is, the size of the decrease will depend on the difference in rank between the two individuals, not the absolute income difference. This tells us that for a given absolute income difference, the maximum change of the Gini coefficient will take place where the density of the income distribution is highest. An interpretation of this result is that the Gini gives high weight to the income distribution around the mean income.

For two reasons we also use the generalized entropy measure. First, it is decomposable between population sub-groups as well as between different sources of income. We will return to this property in Section 5 below. Second, it enables us to give different weights to different parts of the income distribution.

Formally, it is defined as

$$GE(\alpha) = \frac{1}{\alpha(\alpha-1)}\frac{1}{n}\sum_{i=1}^{n}\left[1-\left(\frac{y_i}{\mu}\right)^{\alpha}\right] \qquad (3)$$

4. This work was done around 1980 by Robert Erikson in cooperation with Leif Andersson. We thank them for making this study feasible.
5. Björklund (1993) uses the panel property of the data to study inequality of individual market income for the whole period 1951 to 1989.
6. The square root scale is probably the most frequently used equivalence scale in empirical studies on income inequality, see e.g. Atkinson et al. (1995).

where y is income. The parameter α is chosen by the researcher. High values of α make the measure more sensitive to changes in the upper end of the income distribution. Conversely, low values of α gives high "aversion to poverty". We have chosen four alternative values, –1, 0, 1 and 2, which in declining order reflect aversion to poverty. By using different degrees of poverty aversion we are able to get a richer description on how the income distribution has changed over time than would have been possible if the description would have been restricted to only one income inequality measure.

Formally, *GE* (0) and *GE* (1) are defined as the limit values of *GE* (α) when α approaches zero and one and known as Theil-0 and Theil-1, i.e., *GE* (0), the mean logarithmic deviation, is defined as

$$GE(0) = \frac{1}{n}\sum_{i=1}^{n} \ln\left(\frac{\mu}{y_i}\right) \qquad (4)$$

and *GE* (1) is defined as

$$GE(1) = \frac{1}{n}\sum_{i=1}^{n} \frac{y_i}{\mu} \ln\left(\frac{y_i}{\mu}\right). \qquad (5)$$

GE(2) also is known as the squared Coefficient of variation,

$$CV^2 = \frac{Var(y)}{\mu^2}, \qquad (6)$$

i.e. the ratio between the variance of the income distribution and squared mean income.

The results are presented in Table 2. The Gini, *GE* (1) and CV^2 give a fairly similar picture of the evolution of income inequality for the period studied. The Gini falls from 0.384 in 1951 to 0.324 in 1973, which is a decrease by about 16 percent. The relative decrease of *GE* (1) and CV^2 is somewhat larger – about 30 and 40 percent respectively. The decrease of all three of these indices takes place in two steps. The first step between 1951 and 1956, and the second between 1967 and 1973. Each of these steps corresponds to about half of the decrease. The indices are fairly stable between 1956 and 1967.

Let us finally make some remarks on the precision of the Gini estimates. The asymptotic standard errors reported in the Table are obtained using the method of Cowell (1989). From these standard errors it can be seen that the precision is fairly high. Approximative 95 percent confidence intervals for the Gini are ±0.01. The changes between 1951 and 1956 as well as between 1967 and 1973 are both statistically significant.

Turning to the results of *GE* (–1) and *GE* (0) it can be seen that a dramatically different result emerges. The estimates of *GE* (0) are almost stable, while *GE* (–1) increases more than three times between 1956 and 1967. These results suggest that the income distribution has changed such that the very low income group have, as a group, decreased their relative incomes even more between these two points of time.

The ambiguous results reported in Table 2 suggest that we should take a look on how position of different parts of the income distribution have changed over time. One way of doing this is to look at the Lorenz curve. The Lorenz curve is obtained by ordering the income earners in ascending order. It then measures the accumulated share of total income corresponding to each successive proportion of the poorest individuals. If the Lorenz curve of one distribution is unambiguously inside (closer to the diagonal line of perfect income equality in a Lorenz diagram) than that of another, it is said to "Lorenz dominate" that distribution. Atkinson (1970) has shown that, for the same

Table 2.
Inequality of family income. Estimates of Gini-coefficient and generalized entropy measures 1951, 1956, 1967 and 1973

	1951	1956	1967	1973
Gini	0.3843	0.3540	0.3502	0.3235
	(0.0057)	(0.0055)	(0.0050)	(0.0042)
GE (–1)	224.76	256.41	863.03	863.74
	(11.07)	(14.83)	(38.55)	(47.86)
GE (0)	0.8225	0.6730	0.9170	0.6756
	(0.0361)	(0.0332)	(0.0393)	(0.0333)
GE (1)	0.2865	0.2430	0.2419	0.1983
	(0.0402)	(0.0418)	(0.1142)	(0.1007)
CV^2	0.3398	0.2877	0.2655	0.2036
	(0.0361)	(0.0362)	(0.0275)	(0.0184)

Note: The calculation of the income inequality measures were obtained using a STATA program provided by Stephen Jenkins, see Jenkins (1999). Assymptotic standard errors obtained by using the method of Cowell (1989).

Table 3.
Estimates of accumulated income shares for nine decile groups of family income 1951, 1956, 1967 and 1973.

	1951	1956	1967	1973
1st decile	0.0025	0.0065	0.0028	0.0092
	(0.0003)	(0.0006)	(0.0004)	(0.0007)
2nd decile	0.0324	0.0425	0.0418	0.0509
	(0.0016)	(0.0019)	(0.0018)	(0.0020)
3rd decile	0.0871	0.1013	0.1021	0.1139
	(0.0032)	(0.0035)	(0.0034)	(0.0036)
4th decile	0.1591	0.1760	0.1775	0.1912
	(0.0051)	(0.0050)	(0.0050)	(0.0048)
5th decile	0.2448	0.2634	0.2650	0.2802
	(0.0063)	(0.0065)	(0.0061)	(0.0060)
6th decile	0.3402	0.3617	0.3641	0.3809
	(0.0079)	(0.0081)	(0.0076)	(0.0071)
7th decile	0.4500	0.4717	0.4758	0.4941
	(0.0091)	(0.0090)	(0.0084)	(0.0081)
8th decile	0.5761	0.5980	0.6030	0.6224
	(0.0105)	(0.0100)	(0.0089)	(0.0086)
9th decile	0.7298	0.7482	0.7533	0.7722
	(0.0112)	(0.0102)	(0.0095)	(0.0086)

Note: Bootstrapped standard errors.

mean income, if one distribution Lorenz dominates another it is also preferred using all strictly concave social welfare functions.

Table 3 presents nine observations on the Lorenz curves for the four years. The nine observations corresponds to the accumulated income share of each of the first nine decile groups. These are crude Lorenz curves in the sense that they do not tell us anything about the bottom and the top of the distributions. The numbers in the table tell us that the income distribution of 1973 really "Lorenz dominates" the distribution of 1951. This result in combination with the ones in Table 2 suggest that we have to be concerned about the incomes in the lowest decile of the distribution to conclude otherwise than that inequality has declined.

Poverty and zero income records

In the previous Section we concluded that the ambiguity of the results, in particular the overall change in income inequality between 1951 and 1973, can be referred to the position of the individuals in the first decile group. In this Section we address the issue if economic welfare of very low income earners can be measured with the kind of data we use, i.e., administrative tax register data, which are originally not collected in order to measure differences in economic welfare.

Most individuals in the first decile, for all years included in this study, have such low income that it is inconceivable that it can finance their annual consumption on it. Table 4 shows that more than half of the first decile group have zero income records. Formally, this means that they have taxable income below the income tax threshold, which is also reported in Table 4.

Following Johansson (1972) there are at least five categories of income earners who may have a very low income in tax register data without being poor.

- *Earners of income are not liable for income tax.* As is described in Section 2, at the time when the data used in this study were collected, neither social aid nor social insurance (such as income from e.g. the Unemployment insurance or the Sickness insurance) were included in taxable income. Also retired people, who did not receive pension in addition of the Basic State Pension were liable for income tax. Although we have restricted the sample to individuals aged below 67, the mandatory retirement age in Sweden by the time of the study, there may be individuals in the sample with Disability Pension, or those who have claimed Old-age Pension before the mandatory retirement age.

- *Farmers and some other self-employed.* It is well known that it is hard to measure incomes of farmers and other self-employed. For farmers, a large share of their income is in the form of consumption of products that are produced on the farm. This can of course not be measured by the tax authorities. Self-employed are also able to keep some of their income within their company, which will increase their wealth, but will not be recorded as income. In particular, when small businesses are winded up, it is common, as several tax rules interact, that the owner gets a zero net taxable income.

- *Students.* Students have, unless they do not have income from extra work, in general no income. However, studies can be regarded as accumulation of human capital. This can of course be seen as an increase in their wealth and a form of income, although it will not be recorded as taxable income.

- *Seamen.* By the time of the surveys, the income of seamen, were not recorded as taxable income.

- *Workers in the informal sector.* By definition, incomes from the informal sector of the economy is not recorded as income. For the time of our data, there are to our knowledge no estimates of the size of the informal sector.

Table 4.
Number of persons with zero income records and income threshold for tax assessments.

	1951	1956	1967	1973
Sample size	4 512	4 245	5 200	5 378
Number of zero family incomes	377	280	457	307
Share, zero family incomes	0.084	0.062	0.088	0.057
Share, men with zero individual income	0.061	0.053	0.090	0.059
Share, women with zero individual income	0.598	0.540	0.389	0.225
Income tax threshold, SEK	600	200	2 400	4 500
Income tax threshold, 1973 SEK (CPI deflator)	1 472	2 478	3 117	4 500

The 1968 Level of Living Survey contains, in addition to the tax register data, extensive information on living conditions for each individual in the sample obtained from personal interviews. From these data it can be seen that 23.0 percent of the zero income earners and 3.7 percent of the non-zero income earners (279 individuals) are students. We excluded them and made some further analyses of the zero income earners.

The 1968 survey also contains self-reported data for 1967 on the same income concept as we use in this study. Following the discussion above, it is not surprising that the resemblance between these data and the tax register data is poor in lower income intervals. Table 5 shows average self-reported family income as well as the share of zero self-reported zero income among zero and non-zero tax record income earners respectively.

From Table 5 it can be seen that there is a surprisingly small share of income earners, less than one third in all age groups, who have also self-reported zero income. Comparing the zero and non-zero income groups, it can be seen that there is a difference between the two groups: at least two times as large share of the income earners in the zero income group have zero self-reported income and the average income is higher in all age groups. However, keeping in mind the large difference between the two groups in the income measure from the tax registers, the difference is surprisingly small.

The 1968 survey also contains information on whether or not the individual has access to 2 000 SEK (about 1200 US$ deflated by CPI in 1999 currency). As can be seen in Table 6, as many as 64.5 percent of the zero income sample are able to do that.

Finally, we compare consumption between the zero and non-zero income group in 1967. Again, the pattern is that the consumption level is higher in the non-zero income group, although the level of consumption is relatively high among some

Table 5.
Average self-reported family income and share of self-reported zero incomes by zero or non-zero taxed family income, 1967.

Age-group	Average self-reported income		Share self-reported zero income	
	Zero taxed incomes	Non-zero taxed incomes	Zero taxed incomes	Non-zero taxed incomes
–25	12 043	23 222	0.180	0.074
26–35	12 598	30 640	0.333	0.083
36–45	32 449	32 812	0.264	0.113
46–55	18 169	35 179	0.262	0.113
55–66	10 709	28 592	0.231	0.120

individuals in the zero income earner group: one fourth of them own a car; more than 8 percent own a summer house; and almost 20 percent did a holiday journey during 1967.

To sum up, it is not evident, although it is possible, that the individual living in a household with zero household income is poor in the sense that we usually see it. Evidently, the type of data we use in this study is not ideal for studying poverty. This, in turn, means that the income inequality measures that attach high weight to the lower end of the income distribution should be interpreted with great caution.

Decomposition analyses

An additional advantage with the generalized entropy inequality measures is that they are decomposable, i.e., overall inequality can be decomposed into components that in turn have a useful interpretation. This property can be used to examine the results obtained above in more detail. First, we are able to see whether the results have been driven by changes in the demographic composition of the population we study. Second, we can check whether the results above are sensitive with respect to the choice of equivalence scale. Third, it enables us to analyse what consequences the rising labour force participation of married women during the rise of the welfare state had for inequality of family income. We do one decomposition analysis by subgroups and one by income sources.

Table 6.
Consumption for persons with zero and non-zero taxed family income, 1967.

	Zero incomes	Non-zero incomes
Has access to 2 000 SEK	0.645	0.871
Owns a car	0.256	0.602
Owns a boat	0.077	0.145
Owns a summerhouse	0.082	0.203
Holiday journey during 1967	0.193	0.361
Holiday journey abroad during 1967	0.079	0.212

Decomposition by demographic groups

In Table 7 we present decompositions of the four GE measures by three subgroups: married persons, single men and single women. From these results it can be seen that irrespective of degree of poverty aversion, the evolution of overall inequality primarily reflects how inequality has evolved for the three groups, the within component. The alternative possibility would be that changes between the subgroups or the changing weights attached to them would be the driving force. For no case, the component that represents inequality between the groups is quantitatively important. This finding does, however, not rule out the possibility that with another classification a significant part of the change in inequality would have been attributable to the between component.

When we look at what happened to inequality within the three groups, we find a clear pattern for GE(1) and CV^2. This is that the three groups basically change in the same way over time. For higher degrees of poverty aversion, GE(–1) and GE(0), the pattern is more mixed. For GE(–1), inequality among married persons peaked in 1967 and fell in 1973, whereas inequality for single men and for single women increased in every year. The results for GE(0) show that inequality for the subgroups follow overall inequality somewhat more closely, but the same accordance as for $GE(1)$ and CV^2 cannot be found.

As mentioned above, comparisons of inequality within groups are not sensitive to the choice of equivalence scale, which always has an element of arbitrariness. Differences in equivalence scales are reflected in the between group component. The conclusion for each

Table 7.
Decomposition of the generalized entropy measure by demographic groups.

	1951	1956	1967	1973
$GE(-1)$ *All*	224.76	256.41	863.03	863.74
$GE(-1)$ *Within*	224.74	256.38	863.00	863.71
$GE(-1)$ *Between*	0.02	0.03	0.03	0.03
Married	149.48	122.86	447.45	229.06
Singled, males	276.15	440.99	1412.98	1542.55
Singled, females	337.82	423.72	1364.15	1608.23
$GE(0)$ *All*	0.8225	0.6730	0.9170	0.6756
$GE(0)$ *Within*	0.8016	0.6499	0.8930	0.6518
$GE(0)$ *Between*	0.0209	0.0231	0.0240	0.0238
Married	0.5506	0.3753	0.4952	0.2591
Singled, males	1.1245	1.1929	1.8132	1.3167
Singled, females	1.6439	1.5043	2.0011	1.6215
$GE(1)$ *All*	0.2865	0.2430	0.2419	0.1983
$GE(1)$ *Within*	0.2676	0.2224	0.2201	0.1764
$GE(1)$ *Between*	0.0189	0.0206	0.0218	0.0219
Married	0.2333	0.1931	0.1852	0.1427
Singled, males	0.3455	0.3067	0.3401	0.2587
Singled, females	0.4462	0.3866	0.3994	0.3255
CV^2_{All}	0.3399	0.2878	0.2656	0.2036
CV^2_{Within}	0.3225	0.2691	0.2455	0.1832
$CV^2_{Between}$	0.0173	0.0186	0.0201	0.0204
Married	0.3065	0.2513	0.2238	0.1630
Singled, males	0.4002	0.2891	0.2811	0.2135
Singled, females	0.4519	0.3514	0.3770	0.2990

sub-group are for GE(1) and CV^2 robust with respect to choice of equivalence scale.

Decomposition by income source

For the sub-sample of married couples, we are able to distinguish between two different sources of income: the income obtained by the man and the women respectively in each household. Inequality among married persons is of special interest, partly because most children belong to such families during this period of time, and partly because married persons represent 70 percent of the adult population (see Table 1). $GE(2)$, the squared coefficient of variation (CV^2), is decomposable by source of income The decomposition can be written as follows:

$$CV^2 = a^2\, CV_M^2 + (1-a)^2\, CV_W^2 + 2a(1-a)\,\rho\, CV_M\, CV_W \qquad (7)$$

where CV_M^2 and CV_W^2 are the squared coefficient of variation for the male and female income components of family income respectively, a denotes men's share of total family income, and ρ denotes the correlation coefficient between the spouses incomes.[7]

Table 8 presents the results of this decomposition. The upper part of Table 9 shows the estimated component of the decomposition, i.e., CV^2 for the male and female income components respectively, the shares of the overall income, and the estimates of ρ. The lower part of the Table gives the three components of the decomposition. Finally, the estimates of CV^2 for total household income are shown.

A careful examination of the results in Table 9 gives at least two interesting results. First, the estimates of CV_M^2 show that the distribution of the male income component have been substantially equalized between 1951 and 1973. The decomposition shows that this component, together with the share of male income, contributes to about 87 percent of the over all measured income equalization over this time period. Second, the increased rate of female labor force participation, which to a large extent was driven by rise of the welfare state through the expansion of the public sector, also contributed to the equalization of incomes. It is interesting to note that this result follows despite the fact that the correlation between husband's and wife's incomes is positive.[8] This result is also obtained by Björklund (1992), who covered the period 1967 to 1980 and in most studies from other countries. However, the importance of this change is less prominent in the overall equalization of the income distribution compared to the change in the distribution of male incomes.

Conclusions

We have used new data to make inference about the evolution of family income inequality in Sweden from 1951 to 1973, a period when the Swedish welfare state was established. If we confine the analysis to the results from the estimates of the Gini coefficient, $GE(1)$ and CV^2, i.e., the income inequality measures that attach less weight to the lower end of the income distribution compared to $GE(-1)$ and $GE(0)$, we get a fairly uniform picture of how the income distribution changed over the time period considered in this study.

Family income before taxes became more equally distributed from 1951 to 1973. The Gini coefficient fell from 0.38 to 0.32. Spånt (1979) has previously shown that inequality of individual income before taxes declined over this period. Our results show that his results also hold for family income of individuals. This reduction in income inequality is quite general and can be found both among married persons and among single women and single men. This result implies some robustness of the results with respect to the arbitrary choice of equivalence scale.

Among married persons inequality of family income fell more, absolutely and relatively, than inequality of husband's incomes. This suggests that the entrance of married women in the labour force not only equalized incomes between men and women, but also reduced family income inequality. We believe that the growth of married women's labour force participation during this period was reinforced by the growth of the welfare state, most notably by the rise in public service employment. Hence, we are inclined to conclude that the growth of the welfare state contributed to falling family income inequality over the period 1951 to 1973, although the decomposition analysis of the CV^2 measure shows that the main source of the equalization was the change in the distribution of male incomes.

7. The technique has been frequently used in the literature that covers more recent periods of time. See Björklund (1992) for a Swedish study covering the period 1967-1980 and for references to several studies of other countries.
8. At first sight, it may seem intuitive that a positive correlation is a sufficient condition for rising female income to raise measured family income inequality. However, the scale invariance of these measures implies that not even a correlation equal to one is sufficient. In that case, rising female income would imply a proportionate increase in family incomes and changes of family income inequality. In order for rising female income to raise measured family income inequality, female income inequality must exceed male inequality. See Björklund (1992) and references there.

Table 8.
Decomposition of the squared coefficient of variation by income source. Within the group of married couples.

	1951	1956	1967	1973
CV^2_{Men}	0.3067	0.2826	0.2635	0.2093
	(0.0428)	(0.0494)	(0.0377)	(0.0309)
CV^2_{Women}	3.5896	2.2162	1.1283	0.5739
	(0.3253)	(0.2342)	(0.0825)	(0.0383)
$\mu_{Men}/\mu_{All} = a$	0.9026	0.8806	0.8165	0.7728
$\mu_{Women}/\mu_{All} = 1-a$	0.0974	0.1194	0.1835	0.2272
$\rho\,(Y_{Men}, Y_{Women})$	0.1222	0.0031	0.0621	0.0690
$a^2 CV_M^2$	0.2499	0.2191	0.1757	0.1250
$(1-a)^2 CV_W^2$	0.0341	0.0316	0.0380	0.0296
$2a(1-a)\,\rho CV_M CV_W$	0.0225	0.0005	0.0101	0.0084
CV^2	0.3065	0.2513	0.2238	0.1630
	(0.0377)	(0.0398)	(0.0297)	(0.0200)

Note: Assymptotic standard errors obtained by using the method of Cowell (1989).

This study also illustrate the limitations of the data that are used here. First, the quality of income data in the lower end of the distribution is very low because the data are based on public registers, which in turn are based on tax assessments. Therefore we believe that inequality measures that attach great weight to low incomes are not very reliable used in this context. Overall, we are not able to analyse changes in the poverty rates from these data. Second, the estimated standard errors of the inequality measures are not that high, despite sample sizes in the order of 4500 persons. The standard error of the popular Gini coefficient is only around 0.005. So it is the quality of the basic data rather than sample sizes that hinder us from making more detailed inference about the evolution of inequality during this period.

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