Income redistribution within the life cycle versus between individuals: Empirical evidence using Swedish panel data

Anders Björklund
Swedish Institute for Social Research
Stockholm University
S-106 91 Stockholm
Sweden
email: anders@sofi.su.se

Mårten Palme
Stockholm School of Economics
Box 6501
S-113 83 Stockholm
Sweden
email: stmp@hhs.se

Working Paper Series in Economics and Finance No. 197

September 1997

Abstract:

The generalised entropy measure is applied to decompose overall income inequality over several years into one part showing inequality of long-run (permanent) income and one part showing variability of single individuals' incomes over time. By comparing these components of inequality for pre- and post-tax and benefit incomes, we get an estimate of how the welfare state affects two conceptually different components of income inequality. Using Swedish panel data covering 18 years, we find that income taxes primarily affect the distribution of long-run income. Although the main effect of benefits is on smoothing intertemporal income variability, we also find an equalising impact on long-run income of benefits. Income variability is highest among those with low long-run income and the equalising effect of taxes and transfers within the life cycle is also largest in this group.

JEL: D31, H23, H24.

Key words: Generalised entropy, Income inequality, Income mobility, Income taxes.

* A previous version of this paper was presented at the IARIW-conference in Lillehammer, August 18-24 1996, at Uppsala University, and at a workshop organised by the Danish Ministry of Finance. We thank Jonas Agell, Stephen Jenkins, Markus Jäntti, and Anders Klevmarken for useful comments. Björklund acknowledges financial support from the Swedish Council for Social Research (SFR) and Palme from the Swedish Council for Research in the Humanities and Social Sciences (HSFR).

1. Introduction

Most empirical analyses on income inequality have focused on the distribution of income measured over a single year. Not least the Luxembourg Income Study has spurred an impressive amount of comparative research on income distribution using annual data for a large number of countries.[1] One result that has emerged as almost a stylised fact from this literature is that the distribution of post-tax and benefit family income is more equal than the distribution of pre-tax and benefit income, i.e. taxes and benefits make the income distribution less unequal. Sweden, is no exception in this respect; rather the equalising impact of the Swedish ”welfare state” seems to be quite high by international standards.

However, an obvious limitation of studies of annual income inequality is that they blend, and attach equal weights to, two conceptually different sources of income inequality, namely (i) transitory variation of individual incomes over time and (ii) variation in long-run (or lifetime) incomes. In the public policy discussion one can commonly hear claims that the distribution of lifetime income is the most important one. Indeed, in a world of complete credit markets that enables the individual to perfectly smooth consumption, the only interesting income redistributions, from a social welfare point of view, would be those that take place between individuals with different ”permanent” or lifetime income. Due to several well known problems, markets that provide such opportunities will not always be available. Therefore, progressive income taxes and public benefits will to some extent serve as insurance against temporarily low incomes. In the famous Beveridge Report (Beveridge, 1942), which provided guidelines for post-war British welfare policy, the following text could be read:

”Abolition of want cannot be brought about merely by increasing production, without seeing to correct distribution of the product... Better distribution of purchasing power is required among wage earners themselves, as between times of earning and not earnings, and between times of heavy family responsibilities and light or no family responsibilities. Both social insurance and children’s allowances are primary methods of redistributing wealth.”

That also progressive income taxation can be considered as a social insurance has been suggested in the literature more recently (e.g. Varian, 1980). The idea is that the individual is

[1] See Atkinson et. al (1995) for comprehensive results from the Luxembourg Income Study.

exposed to exogenous shocks that affect his or her earnings capacity. Progressive income taxation might serve as welfare enhancing social insurance against such shocks. Luck is likely to vary over the life cycle and hence the progressive income tax will serve the purpose of equalising income and consumption over the life cycle. Maasoumi and Zandvakili (1986) and Bird (1995) analyse the individual welfare improvements brought about by income security.

Thus, the literature obviously offers arguments for why equalisation of *both* long-run (permanent) income *and* of income variability over time can improve social welfare and, therefore, be interesting to analyse empirically. However, from the discussion above, it is also obvious that these two types of income redistribution are conceptually quite different and it is not clear that equal weights should be attached to them in a policy evaluation. In order to gain a more thorough understanding of the income redistribution process in a welfare state it is therefore important to separate out these effects. In the welfare state debate, it has been claimed that several welfare state benefits ”only” equalises income between different phases of the life cycle and have no effect on the distribution of lifetime income.[2] Indeed, it is even possible that some benefits have regressive effects on lifetime income, so that there is a conflict between reducing the two types of inequality.

The family is another institution that affects income distribution. Provided that there is a less than perfect correlation between the income positions of the spouses, family formation will have an equalising effect on the income distribution. Several empirical studies have shown that this is in fact the case (see e.g. Lehrer and Nerlove, 1984, or, on Swedish data, Björklund, 1992). A natural extension of these studies is to examine to what extent pooling of economic resources within the family affects the distribution of long-run income and income variability over time for men and women.

The aim of this study is to assess to what extent income redistribution caused by the family, income taxes and welfare state benefits, reflect income redistribution between different phases of the individual’s life cycles of the same individuals, and to what extent it reflects income redistribution between individuals with different long-run income. Our technique is to apply an income inequality measure, the generalised entropy measure, that is decomposable between different population sub-groups. The "within-group" inequality component represents income variability over each individuals life cycle and the "between-group" component represents inequality of long-run income between different individuals. Income redistribution, caused by e.g. income taxes, is measured as the difference between the measured income inequality when we have and have not considered income taxes in the income concept. This technique is also applied to the analysis of income redistribution caused by the family and by welfare state benefits.

We also analyse the empirical relationship between income variability and long-run income. Is income variability higher or lower for those with low long-run income? Or is it independent of long-run income? Furthermore, we examine to what extent income redistribution between different phases of the same individual's life cycle differ between different quartiles of the distribution of long-run income.

Our analysis requires longitudinal data, ideally for the whole life cycle. We have been able to construct a representative sample of Swedes that we can follow over 18 years, from 1974 to 1991. For this sample of individuals, we have information on family composition, income and taxes of both adults in the family, and their major welfare state benefits. Even though this data set does not cover a whole life cycle, it allows us to extend the previous analyses of inequality of annual income to a considerable extent. We can compute long-run income as the individual's average income over the whole period, as well as her (or his) income variability over the 18 years.

To sum up, the contribution of this study is that it suggests a technique for, and carries out an empirical analysis of, how income redistribution can be separated into one effect on the distribution of long-run income and one effect on intertemporal income variability of the same individual. However, it should also be stressed that the study has some limitations. The most obvious is that it relies on mechanical comparisons between income distributions where we have and have not included the income component we analyse the effect of. More specifically, we ignore behavioural effects as well as general equilibrium effects on prices in the economy,

---

[2] It has also been suggested that public benefit programmes designed for a single phase of the life cycle can be replaced by "personal savings accounts" by means of which families can handle the intertemporal allocation of income themselves. See e.g. Fölster(1996).

i.e. in our implicit counterfactual labour supply is inelastic to changes in taxes and benefits. Moreover, we do not cover the entire life cycle of each individual.

The paper proceeds as follows. Section 2 explains the methodology; the statistical technique as well as the income concepts. The data sources are described in section 3. The results are presented in section 4, and section 5 concludes and discusses the main findings.

2. Methodology

Decomposition of inequality

Following the discussion in the introduction, our goal is to distinguish between inequality of long-run income and individual intertemporal income variability. To achieve this goal, we suggest the use of the generalised entropy measure.[3] This measure is defined as

$$I_\gamma = \frac{1}{n}\sum_{i=1}^{n}\frac{\left[\left(\frac{y_i}{\bar{y}}\right)^\gamma - 1\right]}{\gamma(\gamma-1)},$$

where y_i is income of unit i, n is the number of units in the sample; $\bar{y}$ is sample mean income; and γ is a parameter for degree of "poverty aversion" chosen by the researcher. This inequality measure could be decomposed in order to measure to what extent the total inequality in the population could be attributed to different population sub-groups. This decomposition is defined as

$$I_\gamma = \sum_{r=1}^{R}\left[\frac{y_r}{\sum_{j=1}^{n} y_j}\right]^\gamma \left(\frac{n_r}{n}\right)^{1-\gamma} I_\gamma^r + I_\gamma^B,$$

[3] This measure have been used in several empirical studies, see e.g. Cowell (1984).

where r is an index for the R different population sub-groups; $\frac{y_r}{\sum_{j=1}^{n} y_j}$ is the share of total income attributed to a particular group r (i.e. y_r is total income of subgroup r); n_r is the number of individuals in group r; I_γ^r is the generalised entropy measure within group r; *and* I_γ^B is the generalised entropy measure for the distribution of group mean incomes.

In this study, we investigate income inequality and mobility for a sample of annual incomes over the time period 1974-1991 (18 years). In the framework outlined above, we interpret *each unit* (individual)[4] in the sample as "one group". Hence, what is usually measured as "within (demographic) group inequality" in studies where the generalised entropy measure is used (see e.g. Cowell, 1984) is in this study interpreted as "intertemporal variability" in income streams for each individual. Obviously we attach the same weight to each individual since each individual is one group (n_r = 1 for all r). What is usually interpreted as the "between group inequality component", I^B, is here interpreted as "long run inequality" or inequality of mean income over the period of 18 years. "Overall inequality" will in our framework be the inequality in the complete panel of data covering 18 years and all individuals of the sample to be analysed.

The parameter for poverty aversion, γ, has a meaningful interpretation in this framework. For the component measuring intertemporal variability, relatively high poverty aversion reflects high aversion to temporarily very low individual incomes. High poverty aversion for the component measuring long-term income inequality reflects high aversion to "lifetime" poverty.

Bird (1995) and Maasoumi & Zandvakili (1986) use additive individual utility functions in order to measure efficiency losses of high variability in individual annual income. This is an alternative approach. Because our ambition is to distinguish between inequality of long-run income on the one hand, and intertemporal variability on the other, we believe that the proposed approach is more informative.

[4] As explained below, we use the individual as the unit of analysis even though we also use the household as the unit of income.

We have chosen two alternative values of γ: 0 and 1. These measures are known as Theil-L and Theil inequality indices respectively. The former represents a higher aversion to poverty. This gives the following estimation formulas:[5]

$$I_1 = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\bar{y}}\log\left(\frac{y_i}{\bar{y}}\right),$$

$$I_0 = \frac{1}{n}\sum_{i=1}^{n}\log\left(\frac{\bar{y}}{y_i}\right).$$

Income concepts

Our basic income concept, which we call *market income,* consists of labour earnings as well as income from capital, capital gains, real estate and own business. Market income also includes a number of public benefits that are ”work related” in the sense that they are subject to income tax and that the magnitude of the benefits are determined by previous earnings. The most important benefits that are included in market income are sickness pay, unemployment compensation,[6] early retirement pensions, and parental leave payment.

We start by examining inequality of *individual market income*, i.e. the individual is used both as the unit of analysis and as the unit of income. In the next step we look at *household market income*. We add the income of the spouse (for those who have one), assume equal sharing of income among members of the household, but retain the individual as the unit of analysis. At this stage we must also take a stand on the issue of differences in needs that might exist between single and cohabiting persons, and between families with different number of children, i.e. make a choice of equivalence scales. In order to illustrate the role of children as determinants of income inequality among adults, we do two separate analyses with two different scales. One analysis applies a standard equivalence scale on all the members of the households, namely one or two adults plus the number of children below 18 years of age. We

[5] Formally, these two formulas are obtained from the limit of generalised entropy measure when $\gamma \rightarrow 0$ and $\gamma \rightarrow 1$ respectively (see e.g. Cowell, 1984).

use the simple square root scale; the equivalent number of adults in the household is equal to the square root of the number of persons in the household as defined above. Such an analysis implies that children are considered a financial burden for the adults. In a separate analysis we treat a child as a pure consumption good, i.e. children incur no costs to the adults of the household. In this analysis we only consider the economies of scale of the second adult of the household. We use the square root scale and hence divide total household income of two adults by 1.41 (the square root of 2.0) in order to arrive at the equivalent income of the individual that we use in our computations. By comparing the results from these two equivalence scales, we are able to shed light on the role of children in generating long run inequality as well as income variability over time.

In defining household market income we also include one transfer designed for single parents, called the maintenance advance (*bidragsförskott*). In about half of all cases, the absent parent - in general the father - pays this amount to the custodial parent - in general the mother. In other cases, however, the custodial parent receives the amount as a public transfer.

In the next step we proceed to study the impact of taxes on the distribution of income. We do this by simply deducting taxes (of both spouses) from household market income as defined above. We confine ourselves to income taxes and do not treat wealth and property taxes. In the period 1974 - 1991, Swedish income taxes were changed a number of times. The most well known changes are the two ”tax-reforms” in 1983-85 and 1990-91. In these reforms the highest marginal taxes were markedly reduced, some generous deductions were eliminated or reduced, and benefits to families with children (see below) were raised.[7] However, even after the last tax reform, income taxation was progressive. Basically, the flat tax rate 30 percent was applied on all income for 80 percent of Swedish income earners and the rate 50 percent on the top of the income of the other 20 percent of income earners.

Then we proceed to analyse the impact of two central welfare state benefits for families with children. The first one is the universal child allowance (*barnbidrag*) that is paid directly to each mother of a child irrespective of her, or of her husband's, income and wealth. It is not

---

[6] All compensations to participants in labour market programmes are also subject to income tax and hence included in our measure of market income.

[7] Björklund, Palme and Svensson(1995) contains further information on these reforms as well as analyses of their impacts on income distribution.

taxable. The amount of this transfer was raised several times in nominal as well as in real terms during the time-period included in this analysis. There is a fixed amount that is paid for every child, but in 1982 a progressive amount was introduced that gave a larger amount for the third and each subsequent child. Both the general and the progressive part of the child allowance were considerably raised in 1991 as one part of the tax reform. Even though this transfer by tradition has been politically popular, it has been claimed in the public discussion during recent years that it is too general and could be replaced by more means tested programmes. Pressed by the budget deficit, the Swedish government decided to reduce the nominal amount of universal child allowance (effective January 1st 1996) for the first time ever, and a large part of the reduction was made on the progressive part.

The second benefit to families with children is the means tested housing allowance *(bostadsbidrag)*. Its primary purpose is to guarantee a descent quality of housing independent of the income of the family. The specific rules deciding the housing allowance have changed several times as well as the groups that are eligible; at times also some categories of retired and single persons have been eligible. In general, though, a certain fraction of the cost of housing for low income families has been covered by the programme.

We conduct these analyses of benefits by adding one benefit at a time to the previous income concept and examine the impact of each benefit on inequality of income.

3. The data source

Our basic data source is the Swedish Level of Living Survey.[8] This is a survey of a representative sample of individuals living in Sweden and aged 15 to 75 years. The first survey was done in 1968 with interviews of around 6000 individuals. Subsequent interviews were done in 1974, 1981 and 1991. At these later interviews the original sample was retained to make it a longitudinal data base, but youth and immigrants were added to the sample to make it representative for the whole population in these years as well.

Most of the information that we use does not stem from the interviews in the surveys, but from various public registers that have been merged with the information from the interviews.

For example, we define cohabitation status by means of register information on tax status. Those who live together and are either formally married or have (or have had) common children get tax status as cohabitants.[9] Unfortunately, some cohabiting persons will in this way be treated as single, namely those who live together with an adult person without being married or without having had common children.[10] Even though we regard this as shortcoming, it should not be too severe. Many of those who live together without being married or having had common children probably have merged not their economic resources as much as other cohabiting couples have, although such couples make some economies of scale by sharing capital goods.

In order to compute household size, we also need to know the number of children in the family of the individual in our data set. This variable is also obtained from public registers.[11] Our variable for the number of children covers children who are seventeen years of age or younger. As a consequence, those who are eighteen years old are treated as ”adults” (as individuals in our data set) even if they still live with their parents.

The variables market income and taxes are also obtained from register information.[12] The universal child allowance is imputed from the information on the number of children in the family, whereas the data on housing allowance are obtained from public registers. We do not have direct observations on the special transfer for single parents (advance maintenance) and

---

[8] See Erikson and Åberg (1987) for a detailed description of the Swedish Level of Living Survey.

[9] The formal Swedish concept is samtaxerad. Two persons get this tax status for a specific year if they (1) lived together at the beginning of the year and during most of the year and (2) were either formally married or had (or had had) common children born at the beginning of the year.

[10] The only way of getting complete information about cohabitation is to ask questions in a survey. This is for example done by Statistics Sweden in their Income Distribution Survey (*HINK*). In the Level of Living Survey, questions are asked about cohabitation status during ”most of the year” preceding the interview. For 1980 and 1990 we compared this broader definition of cohabitation with the more narrow one defined by tax status. For the young sample we found that at most 12 percent were counted as cohabitants in the survey but not by tax status; for the old sample the corresponding number was at most 4 percent. These discrepancies consist of (1) persons who lived together the whole year without being formally married and without having common children and (2) persons who moved together during the year and spent most of the year together.

[11] The exception is 1990 for which year we use interview data about the number of children.

[12] For the years 1974 - 1990 the income concept was called *sammanräknad inkomst*. This concept disappeared when the tax system was changed in 1991, and for 1991 we instead use *förvärvsinkomst plus kapitalinkomst* as our measure of market income.

can therefore only impute the amount of it to all single parents according to the number of children.[13]

We do not have complete information on social assistance benefits over the whole period and therefore we cannot include this transfer in any of our income concepts. Neither do we have information about student loans and some other minor tax exempt benefits. The omission of social assistance benefits is not overly restrictive for our results. The expenditure on those benefits are comparatively low, only about one third of the expenditure on universal child allowances in the period that we cover.

We use two different samples. The first one - called the young sample - was 18-32 years old in 1974. The second one - called the old sample - was 33-47 years old in 1974. For both samples we require that the individuals were living in Sweden every year from 1974 to 1991.[14] Hence we also require that they survived the whole period of our analysis. The sizes of the two samples are 1,388 and 991 individuals respectively. Descriptive statistics of some of the most important variables of the two samples are presented in tables in the Appendix. All income variables in these tables as well as in our analysis have been deflated to the price level of 1980 by using the consumer price index.

These two samples cover different parts of the life cycle and consequently capture different types of intertemporal income variability. The young sample consists of quite many who in the beginning of the period were students with zero or very low income and later on entered the labour market. Hence, the (proportionate) growth of income is higher in the young sample than in the old one. The young sample also consists of quite many who change cohabiting status from living as a single person to becoming married or living with another adult as unmarried. The age limits of the sample also imply that quite many got their first child during the period that we cover. The second sample, on the other hand, covers the period in life when children typically leave their parents. The data in the tables in the Appendix confirm these demographic characteristics of the two samples.

---

[13] This procedure is subject to two errors. First, the transfer is tax-free but nonetheless we add it to market income before taxes. Second, we cannot deduct the payment of this transfer from the income of those absent parents who actually pay the amount themselves.

[14] We define living in Sweden by the Swedish concept *mantalsskrivning*.

4. Results

Individual versus family income

We display our results for the young sample in Table 1a, and for the old sample in Table 1b. We start by looking at the nature of inequality of individual market income in the two samples (rows 1 - 3 in the tables). Overall inequality is sensitive to the degree of poverty aversion (γ) and it appears clearly that this sensitivity can be attributed to the intertemporal variability of income. Intuitively this is not surprising: if a high weight is attached to temporarily low incomes, overall inequality will become high. In both samples and for both degrees of inequality aversion, we find that overall inequality of individual market income is much higher for women than for men. Both components of inequality contribute to this male-female differential, but the component capturing intertemporal variability is the most important one.

By comparing inequality of individual market income (rows 1-3) with inequality of household market income (rows 4-6), we can see how the cohabitation pattern affects for inequality of income. For all three cases - both sexes, men and women - we get more equal distributions when the household is used as the unit of income. This equalisation is most marked for women (rows 3 and 6). For the high degree of inequality aversion, in particular the intertemporal component for women is reduced. This is expected since women are likely to have low incomes when they are married (or are cohabiting) and can live out of the income of their husbands. It is also notable that incomes are equalised for men (rows 2 and 5) when household income rather than individual income is used, although the effect is mainly attributable to a more equal distribution of long-run income.

Next we compare rows 4 and 7 (both sexes only) in the tables to examine the consequences of considering children as a financial burden for their parents. For the old sample, overall inequality increases for both degrees of inequality aversion. Most of the increase comes from the intertemporal variation. For the young sample the effects on overall inequality are negligible with, by and large, counteracting effects on intertemporal variation (increase) and long run inequality (decrease).

Table 1a. Components of inequality, alternative income concepts. Young sample.

	$\gamma = 1$			$\gamma = 0$		
	overall inequality	intertemporal variability	long run inequality	overall inequality	intertemporal variability	long run inequality
1. Individual market income	0.1829	0.0731	0.1098	0.4133	0.2941	0.1192
2. Individual market income, men	0.1261	0.0545	0.0716	0.3164	0.2449	0.0715
3. Individual market income, women	0.1955	0.1040	0.0916	0.8294	0.7251	0.1044
4. Household market income (children no financial burden)	0.1211	0.0604	0.0607	0.2128	0.1501	0.0627
5. Household market income (children no financial burden), men	0.1190	0.0570	0.0620	0.2900	0.2251	0.0648
6. Household market income (children no financial burden), women	0.1230	0.0640	0.0590	0.2817	0.2215	0.0602
7. Household market income (children financial burden)	0.1225	0.0641	0.0584	0.2123	0.1509	0.0615

Table 1b. Components of inequality, alternative income concepts. Old sample.

	$\gamma = 1$			$\gamma = 0$		
	overall inequality	intertemporal variability	long run inequality	overall inequality	intertemporal variability	long run inequality
1. Individual market income	0.1957	0.0453	0.1504	0.7013	0.4938	0.2075
2. Individual market income, men	0.1170	0.0320	0.0850	0.2003	0.1192	0.0811
3. Individual market income, women	0.2176	0.0683	0.1493	1.0992	0.8543	0.2449
4. Household market income (children no financial burden)	0.1045	0.0300	0.0745	0.1562	0.0808	0.0754
5. Household market income (children no financial burden), men	0.1059	0.0344	0.0715	0.1600	0.0895	0.0705
6. Household market income (children no financial burden), women	0.1026	0.0256	0.0770	0.1520	0.0724	0.0797
7. Household market income (children financial burden)	0.1178	0.0411	0.0767	0.1688	0.0912	0.0776

Impacts of taxes and benefits

Tables 2a and 2b show the impact of taxes and benefits on the components of inequality. Rows 1-4 show results for the case when children are not considered a financial burden, and rows 5-8 for the case when they are. Further, we start by presenting inequality of household market income, then subtract taxes, then add universal child allowances, and finally add housing allowances. Thus, by comparing the results of row 1 with those of row 4, and row 5 with those of row 8, the combined income redistribution effect of income taxes and the two welfare state benefits can be studied. The results show that *overall* inequality is reduced between 20 and 35 percent depending on the sample, equivalence scale, and the degree of poverty aversion that is used. The proportionate reduction in inequality is consistently higher in the old sample, when children are considered a financial burden, and if γ is set to 0, whereas there is no consistent difference between the two samples.

The proportionate redistribution effects on long-run income are higher than the effects on overall inequality. Further, the redistribution of long-run income is somewhat higher when children are considered a financial burden and when γ equals 0. There are no consistent differences between the two samples. The proportionate effects on intertemporal variability are lower than the overall effects. These effects are very sensitive to the degree of poverty aversion chosen. For example, in the old sample when children are considered a financial burden, the inequality reduction is close to five percent when γ is set to 1, and almost 30 percent when it is set to 0. The explanation to this is that temporarily very low incomes are weighted more heavily if γ is set to 0. These incomes are to a larger extent affected by welfare state benefits.

We can also examine the separate effects of income taxes and welfare state benefits. By comparing rows 1 and 2 as well as rows 5 and 6, it can be seen that in all eight cases, post-tax income is more equally distributed than pre-tax income. Further, by focusing on the two components in the decomposition it can be seen that this redistribution primarily can be attributed to equalisation of long-run income inequality. For all eight cases long-run inequality is reduced by income taxes. The impact of income taxation on intertemporal variation is in all eight cases very small.[15]

[15] Using another technique and another income concept, Björklund, Palme and Svensson (1995) found an equalising impact of income taxes on both annual and long run income.

Adding the universal child allowance to the previous income concept, we find, not surprisingly, that overall inequality is reduced by this transfer in all our eight cases of analysis. The component showing intertemporal variation is uniformly reduced. This result is expected, at least when we consider children a financial burden, as the aim of child allowances is to give economic support in times of heavy family responsibilities, which is reflected in the equivalence scale. A more interesting finding, however, is that the impact on long run inequality goes in the same direction, i.e. that child allowances also equalise long-run income. Even though this impact is quite small, the reduction of long-run inequality takes place even when we consider a child as a pure consumption good.

The means tested housing allowance, finally, also reduces inequality in all cases. Although both components are reduced for both choices of γ, the magnitude of each component is very much dependent on the choice of poverty aversion: With high poverty aversion the bulk of the reduction is attributed to the intertemporal component, and otherwise to the component showing long-run inequality.

To sum up, income taxes are the most important component for redistribution of long-run income: Between 63 and 84 percent, depending on choice of sample, equivalence scale and poverty aversion, of the long-run income redistribution due to income taxes and welfare state benefits can be attributed to income taxes. Turning to the reduction in income variability, the picture is reversed: Most of the reduction in income variability can be attributed to welfare state benefits, although it is important to stress that our results suggest that these benefits also redistribute long-run income.[16]

[16] The magnitude of these results are likely to be affected by the order we chose to add benefits and deduct income taxes from household income. However, the observed difference between the effect of income taxes and welfare state benefits is so large that the qualitative result is unlikely to be affected by this choice.

Table 2a. The impact of taxes and benefits on components of inequality. Young sample.

	γ = 1 overall inequality	γ = 1 intertemporal variability	γ = 1 long run inequality	γ = 0 overall inequality	γ = 0 intertemporal variability	γ = 0 long run inequality
1. Household market income (children no financial burden)	0.1211	0.0604	0.0607	0.2128	0.1501	0.0627
2. Household market income - taxes (children no financial burden)	0.1041	0.0563	0.0478	0.1943	0.1450	0.0494
3. Household market income - taxes + univ. Child allowance (children no financial burden)	0.1008	0.0540	0.0468	0.1774	0.1289	0.0485
4. Household market income - taxes + univ. Child allowance + housing allowance (children no financial burden)	0.0967	0.0524	0.0443	0.1631	0.1175	0.0456
5. Household market income (children financial burden)	0.1225	0.0641	0.0584	0.2123	0.1509	0.0615
6. Household market income - taxes (children financial burden)	0.1032	0.0586	0.0446	0.1909	0.1441	0.0468
7. Household market income - taxes + univ. Child allowance (children financial burden)	0.0944	0.0539	0.0405	0.1675	0.1254	0.0421
8. Household market income - taxes + univ. Child allowance + housing allowance (children financial burden)	0.0891	0.0518	0.0373	0.1515	0.1132	0.0383

Table 2b. The impact of taxes and benefits on components of income inequality. Old sample.

	$\gamma = 1$			$\gamma = 0$		
	overall inequality	intertemporal variability	long run inequality	overall inequality	intertemporal variability	long run inequality
1. Household market income (children no financial burden)	0.1045	0.0300	0.0745	0.1562	0.0808	0.0754
2. Household market income - taxes (children no financial burden)	0.0855	0.0308	0.0547	0.1359	0.0810	0.0549
3. Household market income - taxes + univ. Child allowance (children no financial burden)	0.0824	0.0291	0.0533	0.1197	0.0662	0.0535
4. Household market income - taxes + univ. Child allowance + housing allowance (children no financial burden)	0.0796	0.0286	0.0510	0.1080	0.0574	0.0506
5. Household market income (children financial burden)	0.1178	0.0411	0.0767	0.1688	0.0912	0.0776
6. Household market income - taxes (children financial burden)	0.0969	0.0409	0.0561	0.1465	0.0902	0.0563
7. Household market income - taxes + univ. Child allowance (children financial burden)	0.0902	0.0370	0.0532	0.1258	0.0728	0.0530
8. Household market income - taxes + univ. Child allowance + housing allowance (children financial burden)	0.0867	0.0360	0.0507	0.1133	0.0633	0.0500

Accounting for trends

Income variability that can be foreseen is likely to be less costly for the individual. If an income decline can be planned for, it is easier for the individual, through access to credit markets, to smooth consumption. Consequently, assuming concave utility functions, the welfare loss will be less than it otherwise would have been. As we cannot observe whether or not the income variability can be foreseen by the individual, we are unable to take this into account. However, it is less likely that income mobility in the form of erratic variability, rather than a smooth trend, can be foreseen and planned for. Individual exogenous income chocks are more likely to appear as sharp deviations from a smooth trend, rather than as a declining trend over several years. Thus, one way of discriminating between different forms of income variability is to account for trends in the individual's income path.

The obvious problem with this approach is that the functional form of this trend has to be more or less arbitrary. From Mincer's (1974) pioneering work on the on-the-job-training hypothesis, and later also e.g. Lillard and Weiss (1979) or Hause (1980), we know that individual preference heterogeneity on the discount rate for how to value future income streams, may generate, disregarding all sorts of income chocks, heterogeneous earnings growth rates. Taking these results into account, we estimate separate quadratic trends for the income path of each individual in the sample, i.e.

$$y_{it} = \alpha_i + \beta_{1,i} t + \beta_{2,i} t^2 + \varepsilon_{it},$$

where i is a subindex for individual, t is a time trend, and ε is an i.i.d. error term.

In order to investigate if all individuals have a trend in their income paths, we performed an F-test of joint significance of the two coefficients that constitute the quadratic trend for each individual. Individuals for whom we could not detect a significant trend (at the 5 percent level), we simply use their mean income over their income path as predicted income.

To estimate if the family, income taxes, and welfare state benefits smooth income over the life cycle, we again use the generalised entropy measure. But instead of calculating the deviation from the sample mean, we use the predicted income $\hat{y}$, i.e.

$$I_{\gamma}^{i} = \frac{1}{t}\sum_{j=1}^{t}\frac{\left[\left(\frac{y_j}{\hat{y}}\right)^{\gamma} - 1\right]}{\gamma(\gamma-1)}$$, where t is the number of time-periods considered, i.e. here 18.

Table 3a and 3b show the results for the young and old samples respectively. We use the same values for the poverty aversion, 0 and 1, as in the preceding analysis. We also report the average R^2 for the entire sample. As a comparison, Table 3a and 3b also report some of the results from the preceding analysis under the heading “Raw income variability”. However, in order to save space, we do not report the results from all income concepts from the preceding analysis.

Let us first note a counter-intuitive result in Tables 3a and 3b. If γ is set to 1, i.e. when less weight is attached to the lower end of the distribution, detrended income variability is generally larger than raw income variability. This result is not what we would have expected. However, examining the data more carefully, we discovered that the number of outliers, larger than four times the predicted or the mean individual income, are somewhat larger when we control for an individual trend compared to “Raw” income variability. If we transform these outliers to four times the predicted or the mean individual income, the order of the estimates is reversed for all income concepts considered.

As can be seen in Table 3a and 3b, the most important results from the previous section are retained when we account for a smooth trend in individual income paths. Comparing the rows for “Household income (children financial burden)” with the row for “Disposable income (children financial burden)” it can be seen that income taxes and benefits reduce income variability even when we account for a trend. This result applies for both sub-samples and for both values of γ. For $\gamma = 0$, the magnitudes of the difference between the estimates for “Household market income” and “Disposable income” are about the same for “Raw income variability” and “Detrended income variability” in both sub-samples. The estimates of the variability measure decreases by about one third.

By comparing the rows for “Individual market income” and “Household market income”, it can be seen that also the conclusion that the family smooth out income paths is retained, except for the young sub-sample with $\gamma = 1$. Again, for $\gamma = 0$ the magnitude of the differences is about the same for the "Detrended" and "Raw" income variability measures.

Table 3a. Income variability when accounting for a quadratic trend. Young sample.

	$\gamma = 1$		$\gamma = 0$		
	Raw income variability	Detrended income variability	Raw income variability	Detrended income variability	Average R^2
1. Individual market income	0.0731	0.4611	0.2941	0.1925	0.5211
2. Household market income (children no financial burden)	0.0604	0.6424	0.1501	0.0975	0.5599
3. Household market income (children financial burden)	0.0641	0.4807	0.1509	0.1000	0.5435
4. Disposable income (children financial burden)	0.0518	0.2800	0.1132	0.0756	0.4858

Table 3b. Income variability when accounting for a quadratic trend. Old sample.

	$\gamma = 1$		$\gamma = 0$		
	Raw income variability	Detrended income variability	Raw income variability	Detrended income variability	Average R^2
1. Individual market income	0.0453	3.1026	0.4938	0.4139	0.2521
2. Household market income (children no financial burden)	0.0300	3.0852	0.0808	0.0615	0.3760
3. Household market income (children financial burden)	0.0411	2.7472	0.0912	0.0621	0.4617
4. Disposable income (children financial burden)	0.0360	2.4534	0.0633	0.0417	0.4016

Who suffer from income variability?

In a world of imperfect capital markets, and assuming concave utility functions, income variability represents a welfare loss for the individual. We would like to know if these welfare losses are larger among those with low than among those with high long-run income. For this purpose we have computed ordinary correlation coefficients between individual income variability and long-run income in our two samples and with the two measures of poverty aversion. In order to find out whether there are non-linearities in the relationships, we have also divided the distribution of long-run income into quartiles and computed average income variability in each quartile.

Tables 4a and 4b contain the results for the young and old sample respectively. We can see that the correlation for household market income before taxes and benefits is negative for all cases, i.e. individuals with relatively low long-run income also tend to have more income variability. Overall, the negative relationship is much stronger in the young than in the old sample. From the average income variability in the four quartiles we can see that the income variability is markedly highest in the first quartile, but does not consistently fall from the second to the fourth quartile. Hence, the relationship seems to be non linear.

Taxes and welfare state benefits seem to smooth out income fluctuations in all quartile groups. However, the magnitude of this income smoothing is largest in the lowest quartile. That is, individuals with relative low long-run income make the largest gain from income smoothing from income taxes and welfare state benefits.[17] Therefore, for disposable income, the negative relationship between long-run income and income variability is weaker, and for the old sample and low aversion towards poverty (γ=0) the correlation even turns positive.

[17] These results, which can be obtained from the authors upon request, prevail also when we account for a quadratic trend using the same method as in the preceding analysis.

Table 4a. Correlation coefficients (ρ) between income variability and long-run income, and average income variability in each quartile of the distribution of long-run income. Young sample.

	$\gamma = 1$					$\gamma = 0$				
	ρ	1st qu.	2nd qu.	3rd qu.	4th qu.	ρ	1st qu.	2nd qu.	3rd qu.	4th qu.
1.Individual market income	-0.394 (-15.97)	0.213	0.072	0.041	0.054	-0.391 (-15.84)	0.805	0.190	0.086	0.096
2. Household market income (children no financial burden)	-0.250 (-9.6)	0.104	0.053	0.053	0.051	-0.280 (-10.9)	0.318	0.099	0.110	0.079
3. Household market income (children financial burden)	-0.259 (-10.0)	0.103	0.060	0.053	0.058	-0.282 (-11.0)	0.298	0.116	0.102	0.088
4. Disposable income (children financial burden)	-0.213 (-8.1)	0.078	0.049	0.041	0.049	-0.250 (-9.6)	0.219	0.094	0.073	0.068

Note: Disposable income equals household market income + universal child allowances + housing allowances - taxes. T-ratios within parenthesis.

Table 4b. Correlation coefficients (ρ) between income variability and long-run income, and average income variability in each quartile of the distribution of long-run income. Old sample.

	$\gamma = 1$					$\gamma = 0$				
	ρ	1st qu.	2nd qu.	3rd qu.	4th qu.	ρ	1st qu.	2nd qu.	3rd qu.	4th qu.
1. Individual market income	-0.362 (-12.22)	0.174	0.047	0.016	0.033	-0.394 (-13.48)	1.781	0.116	0.030	0.053
2. Household market income (children no financial burden)	-0.050 (-1.6)	0.050	0.022	0.016	0.037	-0.168 (-5.4)	0.239	0.028	0.024	0.033
3. Household market income (children financial burden)	-0.031 (-1.0)	0.061	0.032	0.028	0.048	-0.157 (-5.0)	0.246	0.041	0.037	0.042
4. Disposable income (children financial burden)	0.094 (3.0)	0.044	0.025	0.025	0.048	-0.097 (-3.1)	0.149	0.030	0.033	0.041

Note: Disposable income equals household market income + universal child allowances + housing allowances - taxes. T-ratios within parenthesis.

5. Conclusions and discussion

By means of an 18 years long panel we have extended the traditional analysis of annual inequality and distinguished between (i) individual income variability over time and (ii) inequality of long-run (18 years) income. As in the traditional analysis, we found that household income is more equally distributed than individual income (assuming equal sharing of income within the household). For women this equalising effect of the household could be mainly attributed to income variability over time, whereas for men the main effect showed up in long-run income. Treating children as a financial burden for their parents raises mainly intertemporal variation of income.

Turning to taxes and benefits, we found that the main equalising impact of income taxes is on long-run income rather than on intertemporal variation of income. Our analyses of one universal and one means tested transfer program for families with children showed, not surprisingly, that both programmes reduce individual income variability. We found it more striking, though, that even the universal programme had an equalising impact on long-run income and this impact was robust to a number of alternative assumptions about the cost of having children and the degree of ”poverty aversion”. This transfer is often classified as ”only” redistributing income over the life cycle rather than redistributing lifetime income. Our results therefore imply that there is no conflict between the goals of equalising long-run income and reducing income variability. Instead the two goals reinforce each other. The main conclusions about the effect of income taxes and welfare state benefits on income variability were retained when we controlled for a smooth trend in individual income.

In our analysis of the pre-tax and benefit relationship between long-run income and income variability, we found that income variability is unambiguously highest in the lowest quartile of the distribution of long-run income. In some cases income variability is higher in the top quartile of long-run income than in the second and third quartiles, so the relationship is not linear. Furthermore, we found that the proportionate impact of taxes and benefits on income variability is, in general, highest in the lowest quartile of the distribution of long-run income. These findings help us understand why there is no conflict between the goals of equalising long-run income and income variability.

References

Atkinson, Anthony B., Tim Smeeding and Lee Rainwater, 1995, ”Income Distribution in the OECD countries: the Evidence from the Luxembourg Income Study”, *Social Policy Studies*, OECD, Paris.

Beverage, William, 1942, *Social Insurance and Allied Services*, Macmillan, New York.

Bird, Edward, 1995, ”An Exploratory Comparison of Income Risk in Germany and the United States”, *Review of Income and Wealth,* 41, 405-426.

Björklund, Anders, 1992, "Rising female labour force participation and the distribution of family income - the Swedish experience", *Acta Sociologica*, Vol. 35, No. 4, pp 299-310.

Björklund, Anders, Mårten Palme and Ingemar Svensson, 1995, ”Tax Reforms and Income Distribution: an Assessment Using Different Income Concepts”, *Swedish Economic Policy Review*, Vol. 2, No. 2, pp. 229-266.

Cowell, Frank, 1984, ”The Structure of American Income Inequality”, *Review of Income and Wealth*, 30, 351-375.

Erikson, Robert and Rune Åberg, 1987, *Welfare in Transition - Living Conditions in Sweden 1968 - 1981,* Oxford Clarendon Press, Oxford.

Fölster, Stefan, 1996, ”Social Insurance Based on Personal Savings Accounts: A Possible Reform Strategy for Overburdened Welfare States?”, IUI Working Paper 454, The Industrial Institute for Social and Economic Research, Stockholm.

Hause, John C., 1980, “The fine structure of earnings and the on-the-job training hypothesis”, *Econometrica*, 48, 1013-1029.

Lehrer, Evelyn and Marc Nerlove, 1981, “The Impact of Female Work on Family Income Distribution in the United States: Black-White Differentials”, *Review of Income and Wealth*, 27 (4) 423-431.

Lillard, Lee A. and Yoram Weiss, 1979, “Components of variation in panel earnings data: American scientists 1960-70”, *Econometrica*, 47, 437-454.

Maasoumi, Esfandiar and Sourushe Zandvakili, 1986, ”A Class of Generalized Measures of Mobility with Applications”, *Economics Letters*, 22, pp.97-102.

Mincer, Jacob, 1962, “On the job training: Cost, returns and some implications”, *Journal of Political Economy*, 70, 50-79.

Varian, Hal, 1980, ”Redistributive Taxation as Social Insurance”, *Journal of Public Economics,* 14, pp. 49-68.

Table A1. Sample characteristics of the young sample, 18-32 years old in 1974, n = 1388. Coefficients of variation within parenthesis.

Year	Individual market income, 1000 SEK	Household market income of both spouses, 1000 SEK	Fraction of cohabitants	Fraction of lone parents	# of children	Disposable income, 1000 SEK
1974	44.2	46.6	0.460	0.056	0.69	34.7
	(0.78)	(0.63)				(0.57)
1975	50.2	52.1	0.492	0.038	0.73	37.5
	(0.68)	(0.56)				(0.47)
1976	54.2	56.1	0.543	0.039	0.82	40.0
	(0.65)	(0.56)				(0.45)
1977	56.3	57.7	0.569	0.045	0.93	41.5
	(0.59)	(0.48)				(0.39)
1978	58.2	58.5	0.597	0.050	1.01	41.0
	(0.60)	(0.49)				(0.39)
1979	60.1	60.1	0.610	0.053	1.08	42.4
	(0.61)	(0.46)				(0.42)
1980	60.5	62.2	0.646	0.059	1.15	44.9
	(0.62)	(0.43)				(0.38)
1981	60.2	61.4	0.658	0.055	1.22	45.2
	(0.71)	(0.46)				(0.49)
1982	59.9	58.2	0.670	0.071	1.34	42.6
	(0.64)	(0.47)				(0.44)
1983	59.2	62.3	0.686	0.070	1.35	46.3
	(0.56)	(0.45)				(0.45)
1984	60.9	62.2	0.697	0.076	1.35	45.9
	(0.53)	(0.40)				(0.34)
1985	63.3	64.9	0.699	0.079	1.34	48.1
	(0.53)	(0.41)				(0.34)
1986	67.0	68.6	0.697	0.079	1.33	49.5
	(0.61)	(0.45)				(0.37)
1987	71.0	73.5	0.713	0.072	1.25	51.5
	(0.58)	(0.44)				(0.34)
1988	74.2	77.3	0.717	0.066	1.20	53.5
	(0.56)	(0.43)				(0.33)
1989	79.2	83.5	0.728	0.064	1.16	56.9
	(0.66)	(0.47)				(0.39)
1990	81.7	84.7	0.741	0.071	1.26	57.9
	(0.56)	(0.49)				(0.37)
1991	80.5	84.8	0.737	0.058	1.14	60.9
	(0.64)	(0.51)				(0.42)

Note: All zero incomes (and a few negative ones) have been transformed to 1 SEK. For household and disposable income the square root equivalence scale is applied for all members of the household including the children.

Table A2. Sample characteristics of the old sample, 33-47 years old in 1974, n = 991.Coefficients of variation within parenthesis.

Year	Individual market income, 1000 SEK	Household market income of both spouses, 1000 SEK	Fraction of cohabitants	Fraction of lone parents	# of children	Disposable income,1000 SEK
1974	59.2	63.0	0.846	0.039	1.53	46.0
	(0.71)	(0.53)				(0.46)
1975	64.2	68.1	0.836	0.047	1.48	48.0
	(0.71)	(0.48)				(0.40)
1976	65.5	70.4	0.831	0.046	1.42	48.5
	(0.66)	(0.48)				(0.38)
1977	66.2	72.6	0.825	0.046	1.30	49.9
	(0.64)	(0.47)				(0.37)
1978	66.2	72.6	0.814	0.053	1.21	48.5
	(0.61)	(0.45)				(0.35)
1979	67.6	75.5	0.803	0.058	1.10	50.0
	(0.61)	(0.46)				(0.37)
1980	66.9	75.7	0.798	0.054	0.97	51.3
	(0.58)	(0.44)				(0.36)
1981	66.4	76.5	0.788	0.047	0.85	51.9
	(0.79)	(0.56)				(0.59)
1982	64.8	75.6	0.783	0.042	0.75	50.9
	(0.58)	(0.45)				(0.39)
1983	64.8	78.6	0.781	0.031	0.64	52.6
	(0.75)	(0.50)				(0.45)
1984	64.2	79.1	0.771	0.026	0.52	53.3
	(0.57)	(0.44)				(0.36)
1985	66.2	82.6	0.773	0.021	0.42	55.8
	(0.58)	(0.43)				(0.36)
1986	68.3	85.7	0.770	0.015	0.35	56.5
	(0.57)	(0.43)				(0.36)
1987	71.1	90.5	0.769	0.010	0.29	58.5
	(0.54)	(0.49)				(0.36)
1988	72.1	91.4	0.765	0.009	0.24	58.8
	(0.55)	(0.44)				(0.35)
1989	76.0	96.5	0.759	0.009	0.19	62.1
	(0.60)	(0.48)				(0.37)
1990	75.6	95.8	0.761	0.010	0.15	62.7
	(0.54)	(0.43)				(0.36)
1991	77.5	99.6	0.759	0.005	0.12	69.9
	(1.44)	(1.39)				(1.36)

Note: All zero incomes (and a few negative ones) have been transformed to 1 SEK. For household and disposable income the square root equivalence scale is applied for all members of the household including the children.