

Inequality Trends in the Swiss Income Distribution

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1. INTRODUCTION

In many countries income inequality increased during the 1980s. GOTTSCHALK and SMEEDING (1998) report the estimated change in income inequality between 1979 and 1995 for 17 countries. In 12 countries inequality increased by more than 0.5 % per year. Two countries experienced a very small increase in inequality (Israel and Canada) and in three countries inequality decreased slightly (Finland, Ireland, and Italy). Switzerland is among the 12 countries with a significant increase.¹ Unfortunately, there is no clear-cut story to explain the observed trends in income inequality. As GOTTSCHALK and SMEEDING point out there are considerable differences in the timing of the increase; in some countries the largest increase occurred in the early 80s (e.g. the USA) whereas in other countries the largest increase occurred in the early 90s (e.g. Germany). There also appears to be no clear relation between the trend over time and the overall level of inequality at the start of the period; inequality increased both in countries with high initial inequality (e.g. the USA) and countries with much smaller initial inequality (e.g. Sweden). Nor is there a consistent country group story, e.g. within Europe. These findings suggest that the causes of increasing inequality are to some extent country specific and should be analysed within each country.

JÄNTTI (1997) analyses the change in inequality during the 1980s in 5 countries and concludes that "The (inequality) changes are in part explained by an increased contribution of labour earnings. Earnings inequality among household heads increased over the time period in most countries, thus contributing more to overall inequality. . . . Despite changes in both transfer and tax policies that could be expected to increase inequality, taxes and transfers are responsible for a decreasing effect on income inequality. . . . Demographic shifts can at most be given a minor role in increasing inequality; for the most part they cannot be assigned any of the increase. The reasons for increased within-group inequality, or for the increased variation in household heads' earnings have not been revealed."

LEU, BURRI and PRIESTER (1997) find an increase in inequality of disposable household income in Switzerland between 1982 and 1992. However, they did not analyse po-

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1. The countries are the UK, Sweden, Denmark, the Netherlands, Australia, Japan, Taiwan, the USA, Switzerland, France, Germany, and Norway (in order of decreasing relative increase of the Gini coefficient).

tential causes for the observed increase. Some evidence is provided by BURRI (1998) who analysed poverty and income inequality among the elderly population (aged 60 and more) using the same data. He finds that for this population subgroup inequality in fact decreased between 1982 and 1992. This finding of course implies that the observed overall increase is due to an increase of income inequality in the younger population. This is confirmed in ZÜRCHER and GERFIN (1998).

The purpose of this paper is to identify causes of the increase of income inequality in Switzerland. We analyse the observed trends in income inequality using a decomposition approach proposed by JENKINS (1995). The decompositions are performed by a) population subgroups and b) income sources. The first decomposition determines to what extent demographic shifts were responsible for the change in inequality. To do this we break down the population by age, household size, number of earners in the household, nationality, and region of residence. The second decomposition determines the importance of changing inequality contributions of the individual components of household income such as labour earnings, wealth income and transfers. The income data, which were also used by all the above mentioned studies for Switzerland, are collected from tax files and other official sources and are very accurate and detailed.

The paper is organized as follows: section 2 introduces the decomposition methods. The data are described in section 3. The main part of this paper is Section 4 which presents the results of the decomposition analysis. Section 5 contains the main conclusions of the paper.

2. DECOMPOSITION OF INEQUALITY TRENDS

We consider two different decompositions of income inequality and inequality changes; the first relates to population subgroups, the second to income sources. Both decompositions are performed with inequality indices belonging to the Generalized Entropy (GE) family. It is well known that only the inequality indices belonging to the Generalized Entropy (GE) family have the property of being additively decomposable by population subgroups. An index is additively decomposable if it can be written as a weighted sum of the groups indices plus a between-group inequality term based on mean incomes and group sizes. We concentrate on two indices that are particularly well suited for our decomposition analysis. These are the I_0 index for the decomposition by population subgroups and the I_2 index for the decomposition by income sources. The I_2 index is half the squared coefficient of variation. These indices are defined as

$$I_\alpha = \frac{1}{n} \frac{1}{\alpha(\alpha-1)} \sum_{i=1}^n \left[\left(\frac{y_i}{\mu} \right)^\alpha - 1 \right], \quad \alpha \neq 0, 1$$

$$I_0 = \frac{1}{n} \sum_{i=1}^n \ln \frac{\mu}{y_i} \quad (1)$$

where n is population size, y_i is the income of person i , μ is the average income, and α is an inequality aversion parameter with lower values indicating a higher degree of inequality aversion. I_0 is the mean logarithmic deviation (MLD).

2.1. Decomposition by population subgroups

Consider now a decomposition of the population in k exhaustive subgroups (e.g. age groups). The following definitions are useful for the decompositions:

μ_k : the mean income in group k

ν_k : the population share of group k

$\lambda_k = \mu_k / \mu$: group k 's mean income relative to the population mean income

$\theta_k = \nu_k \lambda_k$: group k 's share of total population income

$I_{\alpha k}$: Index in group k

The decomposition equations for the two GE indices are

$$I_2 = \sum_k \nu_k \lambda_k^2 I_{2k} + \frac{1}{2} \sum_k \nu_k (\lambda_k^2 - 1) \quad (2a)$$

$$I_0 = \sum_k \nu_k I_{0k} + \sum_k \nu_k \ln \left(\frac{1}{\lambda_k} \right) \quad (2b)$$

Total inequality equals the sum of two contributions: the within-group inequality (the weighted sum of the inequalities within each population subgroup) and the between-group inequality (inequality between groups if each person had it's group's mean income).

The I_0 index is particularly well suited for decomposing changes of income inequality because the weight of subgroup k is exactly its population share ν_k . MOOKHERJEE and SHORROCKS (1982) show that the change in I_0 between two years t and $t + 1$ can be written as

$$\begin{aligned} \Delta I_0 &= I_0(t+1) - I_0(t) \\ &= \sum_k \bar{\nu}_k \Delta I_{0k} + \sum_k \bar{I}_{0k} \Delta \nu_k - \sum_k \overline{\ln \lambda_k} \Delta \nu_k - \sum_k \bar{\nu}_k \Delta \ln \lambda_k \\ &\approx \sum_k \bar{\nu}_k \Delta I_{0k} + \sum_k \bar{I}_{0k} \Delta \nu_k + \sum_i (\bar{\lambda}_k - \overline{\ln \lambda_k}) \Delta \nu_k + \sum_k (\bar{\theta}_k - \bar{\nu}_k) \Delta \ln \mu_k \\ &\approx \quad A \quad + \quad B \quad + \quad C \quad + \quad D \end{aligned} \quad (3)$$

where Δ is the difference operator, and a bar over variables indicates the average of the

values at t and $t + 1$ (e.g. $\bar{\nu}_k = 1/2[\nu_k(t) + \nu_k(t + 1)]$).² The approximation has an easy interpretation and is very accurate. Overall inequality changes are decomposed into 'pure' inequality changes (term A), changes resulting from changes in the sizes of the different groups (terms B and C) and changes resulting from changes in the relative incomes of different groups (term D). Consider for example the distributional effect of a changing age composition of a population. This may affect the income distribution via (a) changes in the relative numbers of old and young and (b) changes in their relative incomes. Effect (a) will be picked up by the B and C terms in the decomposition. If B and C turn out to be large relative to ΔI_0 then effect (a) would be important. Effect (b) will be reflected in term D, and again its importance depends on the relative size of D. If term A is relatively large, then age changes have little explanatory power and 'pure' inequality changes dominate.

In the empirical results below we present proportionate changes which are obtained by dividing both sides of (3) by $I_0(t)$, i.e. $\% \Delta I_0 = \Delta I_0 / I_0(t)$.

2.2. Decomposition by income source

The decomposition of income inequality by income source has to take account of the correlation between total income and its components. In addition, given the regular incidence of zero income in some sources the inequality index used must be able to handle zeroes. The I_2 index defined above is one of the few additively decomposable indices that have this property.

The decomposition by income sources has first been analyzed by SHORROCKS (1982). Suppose we write inequality in a given year as the sum of factor contributions, where each contribution depends on the incomes from a given factor f

$$I = \sum_f S_f, \quad (4)$$

where S_f depends on incomes from source f . Factor f has a disequalizing effect if $S_f > 0$ and an equalizing effect if $S_f < 0$. Let

$$s_f = \frac{S_f}{I}, \quad (5)$$

then s_f is the proportional factor contribution to inequality and S_f is the absolute contribution. Functions that generate suitable values of s_f are called decomposition rules. SHORROCKS (1982) proves that the decomposition rule is independent of the choice of an inequality index. He suggests to formalize s_f as

2. The decomposition can be carried out with either $t, t + 1$ or any linear combination of both as weights for the Δ terms. In practice it seems to make hardly any difference which weight is used.

$$s_f = \frac{C_f}{\sigma^2} = \rho_f \frac{\sigma_f}{\sigma}, \quad (6)$$

where C_f is the covariance between component f and total income, ρ_f is the correlation between component f and total income, σ_f is the standard deviation of income source f and σ is the standard deviation of total income.

In order to analyze inequality changes it is necessary to choose an inequality index. JENKINS (1995) derives the inequality change decomposition for the I_2 index. For I_2 , S_f can be written as

$$S_f = s_f I_2 = \rho_f \chi_f \sqrt{I_2 I_{2f}}, \quad (7)$$

where χ_f is factor f 's share of total income. Inequality change is then defined as

$$\Delta I_2 = I_2(t+1) - I_2(t) = \sum_f \Delta S_f = \sum_f \Delta(\rho_f \chi_f \sqrt{I_2 I_{2f}}) \quad (8)$$

Again we report proportionate inequality changes which are defined as

$$\% \Delta I_2 = \frac{\Delta I_2}{I_2(t)} = \sum_f s_f \% \Delta S_f. \quad (9)$$

An important issue which is not addressed in this paper is computing standard errors for the estimated inequality indices and inequality changes. In future work we plan to address this problem by bootstrap methods.

3. DATA

We analyse data for two years, 1982 and 1992. The 1982 data are taken from the Swiss Income and Wealth Survey, the 1992 data are taken from the Swiss National Poverty Study. In both cases the income data have been collected directly from the tax offices. They contain very detailed and accurate information on the incomes of every member of the households as they were filed for the income tax declarations. Both samples are stratified and need to be weighted to be representative. For the 1992 data in particular low income households were systematically oversampled. Detailed descriptions of the sampling designs are provided by LEU, BUHMANN and FREY (1986) and LEU, BURRI and PRIESTER (1997).

Our analysis is based on total disposable household income. This net income is the sum of the following parts:

- Labour earnings (household head and spouse)
- + Self-employment income (household head and spouse)
- + Realized wealth income (household)
- + Other income (household)
- + Transfers (household)
- Direct taxes (household)
- Social security contributions (household head and spouse).

The comparability of the incomes in the two data sources is hampered by several problems. One problem has to do with pension fund payments. Since 1985 pension fund membership has become compulsory. In 1982 payments to pension funds were voluntary and only about 56 % of the employees were in a pension fund. In 1992 this figure had increased to 90 %. Unfortunately, it is difficult to determine the distributional effect of this institutional change. There is a lower bound for earnings below which no pension fund contributions have to be made.

One minor problem regarding comparability concerns transfers and taxes. These have been collected much more comprehensively in 1992. But because there exists a very detailed breakdown by components it is possible to define both transfers and taxes almost identically to the ones available for 1982. A similar argument applies to self-employment income. In the 1982 data employment income is not broken down into labour earnings and self-employment earnings. The breakdown is done by using the employment variable which indicated whether the person is employed or self-employed. A combination of both labour and self-employment earnings is not possible. Appendix A contains a detailed description of the definition of the income components. All income figures for 1982 have been converted into 1992 CHF using the CPI deflator.

Finally, we had to choose the unit of analysis and the corresponding income. Following JENKINS (1995) the decomposition by subgroups is based on income distributions in which household incomes are adjusted to household size by an equivalence scale (equivalent income). We used the equivalence scale employed by the OECD (1995) which is simply the square root of household size. Furthermore, the subject of analysis is the individual.³ This is the common procedure in most studies which focus on the distribution of welfare.⁴ This approach allows us to compare our results with those in LEU, BURRI and PRIESTER (1997).

Unfortunately, most studies performing decompositions by income sources are based on unadjusted household incomes because welfare is not of particular interest for this type of analysis. This introduces an inconsistency between our two decomposition ana-

3. This implies that a household of size 4 is counted 4 times with each household member having the equivalent net income. In practice this is done by multiplying the household sampling weights by household size.
4. In these studies the ultimate goal is to analyse the distribution of individual welfare. The consensus is that this goal is better achieved by analysing the personal distribution of equivalent income as compared to the household unadjusted distribution.

lyses. To assess the importance of this inconsistency we performed some sensitivity analyses by redoing the subgroup decompositions using unadjusted household income. This has primarily an effect on the level of inequality but the results for relative changes are fairly robust.⁵

Sample sizes are relatively large. We have 6853 observations (households) for the year 1982 and 8649 observations for 1992. The number of individuals is 16054 in 1982 and 18773 in 1992.

A final issue is comparability in terms of business cycles. Both years are quite similar in this respect. Both represent the starting point for a period of recession with real GNP growth changing from positive values in the previous year to negative values (−0.9 % and −0.4 %, respectively).

4. RESULTS

Our empirical results are presented in several steps. First we display results for the overall income distribution. The second part presents the population subgroup decompositions while the third part contains the factor decompositions.

4.1. *Changes in the overall income distribution*

We first present results on the overall change in income inequality. At the bottom of Table 1 we show several estimated inequality indices for the distributions of net equivalent income in the years 1982 and 1992. The indices are the Gini coefficient and three GE indices (I_0 (MLD), I_1 , and I_2). The upper part of Table 1 shows the mean income of the 10 deciles and the ordinates of the Lorenz curve and the Generalized Lorenz curve.⁶ It is well known that distribution A Lorenz dominates distribution B if the (Generalized) Lorenz curve for A is never below the (Generalized) Lorenz curve for B (also known as second order stochastic dominance). First order stochastic dominance (or rank dominance) corresponds to all decile means of A being at least as large as those of B. Dominance tests can be performed by comparing the estimated ordinates. Using the estimated standard errors of the ordinates it is possible to test the significance of the differences (see BISHOP, CHAKRABORTI and THISTLE, 1994, for details).

All inequality indices indicate an increase in inequality. It is interesting that the percentage change in inequality decreases with increasing α . The GE indices are the more sensitive to variations in the upper part of the income distribution the larger is α . This

5. Of course inequality is higher in the unadjusted income distribution because equalisation compresses the distribution.
6. The Generalized Lorenz curve is obtained by multiplying each Lorenz ordinate with mean income. Hence the final Generalized Lorenz ordinate equals mean income.

suggests that the observed increase in inequality predominantly occurred in the lower part of the income distribution.

This conjecture is confirmed by the estimates of the Lorenz ordinates. While all Lorenz ordinates for 1992 are smaller than their 1982 counterparts the difference is only statistically different for the 3 lowest deciles. The 1982 income distribution Lorenz dominates the 1992 income distribution. The result is reversed when we consider the Generalized Lorenz (GL) curve. The GL ordinate of the top decile is equal to the mean income which is significantly larger in 1992. In effect it is sufficiently larger to make all GL ordinates larger for 1992 except in the bottom decile. However, this difference is not significant implying that the income distribution of 1992 is GL dominating. The comparison of the mean incomes of each decile reveals that in 1992 each decile's mean is larger,

Table 1: Overall Inequality and Stochastic Dominance Tests, Disposable Net Income

Decile	Lorenz Ordinates ^b		Generalized Lorenz Ordinates ^c		Rank Dominance ^{c, d}	
	1982	1992	1982	1992	1982	1992
Bottom	3.6	3.2	1.37	1.36	13.7	13.6
2.	9.2	8.7	3.54	3.69	21.7	23.3
3.	15.9	15.3	6.12	6.50	25.8	28.1
4.	23.4	22.9	9.04	9.72	29.2	32.1
5.	31.9	31.3	12.31	13.31	32.7	35.9
6.	41.4	40.7	15.97	17.28	36.6	39.8
7.	52.0	51.1	20.06	21.69	40.9	44.1
8.	63.9	62.8	24.67	26.68	46.1	49.8
9.	77.8	76.7	30.01	32.58	53.4	59.1
Top	100.0	100.0	38.58	42.48	85.7	99.0
Inequality Indices^a	1982	1992	% change			
Gini	268.9	282.5	5.1			
I_0	136.3	159.5	17.0			
I_1	65.7	73.6	12.0			
I_2	322.1	333.2	3.4			

Note: Own calculations using the Swiss Income and Wealth Survey (1982) and the Swiss Poverty Study Data (1992). All figures are computed using sampling weights. Income figures are in 1992 CHF. A significant difference at the 5 % level is denoted by bold print (in the 1992 columns). Standard errors are computed as proposed by Bishop et al. (1995). a) x 1000; b) x 100 c) in 1000 CHF; d) Columns contain mean income in decile.

again except for the bottom decile.⁷ The main conclusion from the results in Table 1 is that both inequality and mean income increased from 1982 to 1992. The increase in inequality occurred at the lower part of the income distribution. We now turn to the results of the decomposition analysis of the change in inequality.

4.2. Population Subgroup decomposition results

We consider the following variables to partition the population into subgroups: age of household head, household size, number of earners in the household, nationality, and region. The first three in particular are considered to be prime candidates in explaining changing inequality. Population statistics for Switzerland indicate that the population is getting older on average, household size is getting smaller, and the number of secondary earners is increasing. Table 2 displays the relative subgroup sizes, and mean incomes and inequality within each subgroup for both years. It is interesting that in all considered population subgroups mean income increased between 1982 and 1992, but the relative change varies between 1.3 % and 27.3 %.

Regarding age we find that the relative subgroup sizes did not change too much between 1982 and 1992, except for the age group 40–50. By far the largest increase of mean income occurred in subgroups aged 65 and above. Also noteworthy is the relatively large increase for the 40–50 year old subgroup. In comparison with the overall increase in inequality there is an overproportional increase for the age groups 20–50 and a notable decrease especially in the age group 65 and above. This corresponds to the results presented by BURRI (1998) that overall inequality decreased for the population aged 60 years and above.

The relative subgroup sizes for the different household types correspond to the observed trend towards smaller households. Somewhat surprisingly, mean incomes increased most for larger households (4 and more persons). Inequality also increased most for these household types, especially for the 4 person households. It should be noted, however, that these two groups started out with the lowest inequalities in 1982. The increase of inequality for the 4 person households is the largest increase for all subgroups considered in our analysis.

For the population subgroups defined by the number of income earners in the household we find the expected increase of the subgroup size with no income earners and two or more income earners. Inequality and its proportional increase is largest in the group with no income earners. This is somewhat puzzling since one would expect this group to consist mostly of retired persons for which we find a decrease in inequality. This finding is explained by the fact that a considerable fraction of the elderly have some earned income. This is illustrated in the following rows where the number of income earners by

7. It is easy to show that in the bottom decile the GL ordinate equals the mean income in the decile divided by ten.

Table 2: Subgroup sizes, mean incomes, and inequality

Population subgroup	Relative Group Size		Mean Group Income			Group Inequality (1000 I_0)		
	1982	1992	1982	1992	% change	1982	1992	% change
<i>Age</i>								
20–30	16.5	15.9	34.35	34.81	1.3	142.5	187.9	31.8
30–40	25.6	24.7	36.76	39.93	8.6	97.8	158.5	62.0
40–50	22.3	24.3	39.80	45.55	14.5	93.5	118.3	26.6
50–65	20.8	19.8	45.78	49.73	8.6	150.7	143.5	-4.8
65–80	9.1	8.2	36.56	42.85	17.2	201.0	183.7	-8.6
80 +	5.6	7.1	31.21	37.45	20.0	197.0	157.7	-19.9
<i>Household Size</i>								
1	24.7	26.5	35.54	38.80	9.2	176.9	193.4	9.3
2	25.9	26.2	46.54	49.07	5.5	162.2	158.3	-2.4
3	13.8	14.4	40.28	42.08	4.5	100.7	121.4	20.5
4	21.6	20.5	36.27	43.05	18.7	75.1	140.3	87.0
5+	14.0	12.4	31.13	35.96	15.5	80.4	121.5	51.2
<i>Number of Earners</i>								
0	14.4	18.0	29.23	34.82	19.1	191.0	232.8	21.9
1	60.3	51.2	38.15	40.62	6.5	129.6	150.1	15.8
2+	25.3	30.8	44.93	50.06	11.4	88.8	106.0	19.4
0, age 65	2.9	5.4	27.23	27.68	1.65	364.9	364.0	-0.2
1, age 65	57.3	49.0	37.74	40.20	6.53	124.7	147.8	18.6
2+, age 65	25.0	30.4	44.25	49.85	12.65	76.8	104.7	36.2
0, age >65	11.5	12.7	29.74	37.85	27.28	145.7	163.0	11.9
1+, age > 65	3.3	2.6	51.06	54.63	3.09	274.3	178.9	-34.8
<i>Nationality</i>								
Swiss	87.5	79.2	39.01	43.31	11.0	143.2	164.6	15.0
Foreigner	12.5	20.8	35.60	39.34	10.5	84.7	137.2	62.0
<i>Region</i>								
German speaking part	73.2	75.6	38.80	43.36	11.8	136.9	164.4	20.1
French speaking part	22.8	20.9	38.58	40.49	5.0	132.9	145.5	9.5
Italian speaking part	4.0	3.6	34.67	35.79	3.3	138.2	117.5	-15.0

Note: Income is equivalent net income. Own calculations using the Swiss Income and Wealth Survey (1982) and the Swiss Poverty Study Data (1992). All figures are computed using sampling weights. Income unit is the individual.

age is partitioned into two age groups.⁸ Obviously, the decrease of inequality in the older age group occurred within the group with income earners. At the same time it is the older age group with no income earners which is responsible for the observed increase within the overall group of households with no income earner.

For the breakdown by nationality we find that both the proportion of foreigners and particularly their income inequality has increased. Nevertheless, income inequality among foreigners remains below overall inequality. One reason for this is that only foreigners with a permanent permit (Type C) are included in the two data sets.

In the German speaking part of Switzerland both mean income and inequality are much larger than in the other parts of the country. The proportionate change is also largest in the German speaking part. In the Italian speaking part inequality actually decreased between 1982 and 1992.

Table 3 shows the results of computing eq. (2b) for the 5 variables. Within-group inequality is the weighted sum of the subgroups' inequality using the respective population shares as weights. Between-group inequality is the inequality between the subgroups computed under the assumption that each member of a given subgroup has the mean income of that subgroup. Table 3 displays a very clear picture. In all cases within-group inequality is by far the greater part of total inequality. The proportion of within-group inequality ranges from 99.8 % to 93.3 %. Only for the household size decomposition one can see a noticeable change in the proportions between 1982 and 1992 (93.3 % vs 96.5 %).

The results of the decomposition of inequality trends (eq. 3) are displayed in Table 4. Recall that in this exercise the total proportionate change of inequality is decomposed into 4 parts (terms A, B, C, and D). Essentially terms B and C capture how much of the overall change is explained by changes in the population shares and term D captures the contribution of changes in the subgroup mean incomes. Term A can be seen as the residual that measures pure inequality changes. As before, the results provide a clear picture. For all decompositions term A has the largest contribution to the overall proportionate change in inequality. The most interesting decomposition is again by household size. In this case A is larger than the overall change. This is compensated by changes in subgroup mean incomes which had a relatively strong equalizing effect (D). Similarly the decomposition by nationality yields a large value for A which is corrected downwards by an equalizing effect of the changing population shares (B).

The main result of these decompositions by population subgroups is that changes in subgroup population shares and incomes can only explain a small fraction of the observed change in inequality. Almost all of the inequality change occurred within the population subgroups. For the subgroups we found some interesting differences in their change of inequality, particularly for the age and household size subgroups. Similar results have also been obtained by JENKINS (1995) and JÄNTTI (1997).

8. The older age group with positive number of earners could not be separated into one and two earners because the groups would have been too small.

Table 3: Within-Group and Between-Group Inequality, 1982 and 1992

Population Sub-groups	Year	Aggregate Inequality	1000 I_0	
			Within-group Inequality (in % of Total)	Between-group Inequality (in % of Total)
Age	1982	136.3	130.3 (95.6)	6.0 (4.4)
	1992	159.6	152.5 (95.5)	7.2 (4.5)
Household Size	1982	136.3	127.1 (93.3)	9.2 (6.7)
	1992	159.6	154.1 (96.5)	5.6 (3.5)
Number of Earners	1982	136.3	128.1 (94.0)	8.2 (6.0)
	1992	159.6	151.4 (94.8)	8.2 (5.2)
Nationality	1982	136.3	135.8 (99.7)	0.4 (0.3)
	1992	159.6	158.9 (99.5)	0.7 (0.5)
Region	1982	136.3	136.0 (99.8)	0.3 (0.2)
	1992	159.6	158.7 (99.4)	0.9 (0.6)

Note: Income is equivalent net income. Own calculations using the Swiss Income and Wealth Survey (1982) and the Swiss Poverty Study Data (1992). All figures are computed using sampling weights. Income unit is the individual.

Table 4: Subgroup Decomposition of Change in Inequality, 1982 and 1992

Population Subgroups	% change in aggregate Inequality (% ΔI_0)	% change in I_0 accounted for by change in			
		Within-group Inequality (Term A)	Population shares (Term B)	Population shares (Term C)	Subgroup mean incomes (Term D)
Age	17.14	16.86	-0.57	0.00	0.86
Household Size	17.14	18.55	1.25	-0.12	-2.54
Number of Earners	17.14	16.90	0.20	1.22	-1.17
Nationality	17.14	19.52	-2.59	0.18	0.04
Region	17.14	16.43	0.23	-0.04	0.51

Note: Income is equivalent net income. Own calculations using the Swiss Income and Wealth Survey (1982) and the Swiss Poverty Study Data (1992). All figures are computed using sampling weights. Income unit is the individual.

4.3. Income factor decomposition results

The results of the decomposition by income factors are displayed in Table 5. We consider eight sources of net income: labour earnings of the household head, self-employment income of the household head, labour income (employed and self-employed) of the spouse⁹, household wealth income, other household income, household transfers, and household taxes. We present the factor shares, factor correlations with total income, factor inequalities, proportionate and absolute factor contributions to total inequality, and the proportionate change in factor contributions. The last figure is relevant for identifying which factors played the most important role in the observed increase in total inequality.

The factor shares of both components of the labour earnings of the household head decreased while the share of spouse's labour earnings increased. The sharp decline in the share of self-employment earnings is somewhat puzzling. It can in part be explained by the data problems described in Section 3. The shares of wealth income and especially transfers increased as expected. At first sight it seems surprising that the share of taxes decreased but this finding is confirmed by official tax statistics.

Table 5: Decompositions by Income Sources, 1982 and 1992

	Year	Household disposable income	Head		Spouse		Household		
			Labour Earnings	Self-employment Income	Labour Income	Wealth Income	Other Market Income	Transfers	Taxes
Factor shares	1982	100	71.6	13.3	7.5	9.8	0.6	15.2	-18.0
	1992	100	68.3	8.3	9.0	11.2	0.7	18.6	-16.0
Factor correlations	1982	1.00	0.46	0.36	0.31	0.68	0.04	-0.02	-0.86
	1992	1.00	0.56	0.24	0.28	0.69	0.45	0.02	-0.82
Factor inequalities (x 1000)	1982	300.1	523.2	8621.6	4286.1	35804	42250	1894.2	3066.2
	1992	418.8	664.4	14356	3442.4	35688	89914	1583.2	4504.8
Proportionate factor contribution	1982	100	43.4	25.5	8.9	71.9	0.3	-0.9	-49.0
	1992	100	48.2	11.5	7.1	70.9	4.5	0.8	-43.0
Absolute factor contribution	1982	0.30	0.13	0.08	0.03	0.22	0.00	-0.00	-0.15
	1992	0.42	0.20	0.05	0.03	0.30	0.02	0.00	-0.18
% change in factor contribution		38.9	23.6	-9.5	1.0	26.5	5.5	2.0	-10.7

Note: Own calculations using the Swiss Income and Wealth Survey (1982) and the Swiss Poverty Study Data (1992). All figures are computed using sampling weights. Income is not equalised.

9. Unfortunately, it is not possible to separate spouse's labour earnings into employed and self-employed in the 1982 data.

Factor inequalities increased for all factors but spouse's labour earnings and transfers. The largest inequality indices are found for other income and wealth income while household head's labour earnings are distributed most equally. The proportionate factor contribution to total inequality is largest for wealth income (roughly 70 %) and household head's labour earnings and taxes (43–48 %). Recall that the factor contributions are a function of the factor share, the factor correlation, and the factor inequality. This explains why household head's employment has a large factor contribution despite having the smallest factor inequality.

The ultimate results of the factor decomposition of the inequality change are displayed in the bottom row of Table 5. The proportionate change of total inequality (+38.9 %) is decomposed into the individual contributions of the factors (eq. 9). Four factors emerge as the driving forces: labour and self-employment earnings of the household head, wealth income and taxes. Labour earnings and wealth income had the largest disequalizing effect. A strong equalizing effect is found for self-employment income and taxes. All other factors had only marginal effects on the change of inequality.

The strong disequalizing effects of labour earnings and wealth income are not surprising. They usually are among the prime suspects when income inequality increases. There was a large increase in the inequality of labour income in many countries in the 1980s. An equalizing effect of taxes on the income distribution is to be expected. The strong equalizing effect of self-employment income is harder to explain. There are some data problems but sensitivity analyses suggest that these do not drive the result. They rather seem to be caused by some extremely large values for self-employment income in the 1982 data. The maximum in 1982 is four times larger than the maximum in 1992.¹⁰ The I_2 inequality index is rather sensitive with respect to high incomes. Preliminary experiments using bootstrap methods to determine standard errors suggest that the standard errors of the figures for self-employment income are rather large. By contrast, these standard errors appear to be small for labour earnings.

We performed the same decomposition analysis using the subsample of persons below age 60. In general, the increase in inequality is larger in this sample. The main results with respect to inequality changes are robust however: we observe exactly the same pattern of the proportionate factor contributions to the overall increase of inequality.

To summarize the results of the factor decomposition analysis we conclude that we can identify two income factors that had strong disequalizing effects on the overall income distribution. These are labour earnings of the household head and wealth income. A strong equalizing effect is found for self-employment income and taxes but there is reason to believe that the first of these effects is not estimated very precisely.

10. Of course this could also be the result of the previously mentioned data problem.

5. CONCLUSIONS

In this paper we analysed the observed increase in income inequality in Switzerland between 1982 and 1992. We employed decomposition methods to identify possible causes for this increase. The inequality change was decomposed by population subgroups and income factors. We found that population subgroups cannot explain the observed trend in inequality. The decomposition by income factors revealed that two factors appear to be important for the change. These are the household head's labour earnings and the household's wealth income.

The finding that labour earnings are a main source for an increase in total income inequality is not surprising. In many countries labour earnings inequality increased considerably during the 1980s. This is translated into rising overall income inequality because labour earnings are the most important income factor. Therefore, in work in progress we analyse the changes in the earnings structure by econometric methods.

APPENDIX A: DISPOSABLE HOUSEHOLD INCOME

Labour earnings	Earned labour income of the household head and spouse after social security contributions.
+ Self-employment income	Income from self-employment of the household head and spouse after social security contributions.
+ Realised property income	Imputed income from home ownership and other wealth income of the household, incl. income from assets, lottery wins, capital income from self-employment, income from real estate, income from nondistributed inheritances, 1/15 capital payments from pension and disability funds, 1/15 gains from liquidations. Household level.
+ Other income	Other income components of the household including income from royalties and patents.
+ Transfers	Old age and invalidity social security pensions, rents from pension funds, means-tested benefits (supplementary payments for old age and invalidity), unemployment benefits, sickness benefits, alimony payments. Household level.
- Direct Taxes	Regional, cantonal and federal income taxes, church taxes of household head and spouse.
= Household Disposable Income	

REFERENCES

- BISHOP, J.A., S. CHAKRABORTI, and P.D. THISTLE (1994), "Relative Inequality, Absolute Inequality, and Welfare: Large sample Tests for partial orders", *Bulletin of Economic Research*, 46, 41–57.
- BURRI, ST. (1998), *Methodische Aspekte der Armutsforschung*, Bern.
- GOTTSCALK, P. and T. SMEEDING (1998), "Empirical Evidence on Income Inequality in Industrialized Countries", *mimeo*.
- JÄNTTI, M. (1997), "Inequality in Five Countries in the 1980s: The Role of Demographic Shifts, Markets and Government Policies", *Economica*, 64, 415–440.
- JENKINS, ST. P. (1995), "Accounting for Inequality Trends: Decomposition Analyses for the UK, 1971–86", *Economica*, 63, 29–63.
- LEU, R.E., B. BUHMANN, and R.L. FREY (1986), "Die personelle Einkommens- und Vermögensverteilung in der Schweiz 1982", *Swiss Journal of Economics and Statistics*, 122, 111–142.
- LEU, R.E., ST. BURRI, and T. PRIESTER (1997), *Lebensqualität und Armut in der Schweiz*, Bern.
- MOOKHERJEE, D. and A. SHORROCKS (1982), "A Decomposition Analysis of the Trend in UK Income Inequality", *Economic Journal*, 92, 886–902.
- OECD (1995), *Income Distribution in OECD Countries*. Social Policy Studies No. 18.
- SHORROCKS, A. (1982), "Inequality Decompositions by Factor Components", *Econometrica*, 50, 193–211.
- ZÜRCHER, B. and M. GERFIN (1998), *Income Inequality, Income Mobility, and the Life Cycle*, Diskussionschriften des Volkswirtschaftlichen Instituts der Universität Bern, 98–03.

SUMMARY

As in many countries income inequality in Switzerland has increased between the early 1980s and the early 1990s. This paper applies decomposition methods in order to identify potential causes for this increase. The decomposition is performed by a) population subgroups and b) income sources. Our results indicate that demographic shifts can only account for a minor fraction of the overall change. The decomposition by income sources provides a clearer picture. The main contributing factors to the increase in overall inequality are the household head's labour earnings and household wealth income.

ZUSAMMENFASSUNG

Wie in vielen Ländern hat die Ungleichheit der Einkommen in der Schweiz zwischen den frühen 80er Jahren und anfangs 90er Jahre zugenommen. In diesem Artikel werden

Zerlegungsmethoden angewendet, um potentielle Ursachen für diesen Anstieg zu identifizieren. Dabei wird die Zerlegung a) nach Bevölkerungsgruppen und b) nach Einkommenskomponenten durchgeführt. Unsere Resultate deuten darauf hin, dass Veränderungen der demographischen Struktur in der Bevölkerung nur einen kleinen Teil der gesamten Veränderung erklären können. Die Zerlegung nach Einkommenskomponenten liefert hingegen ein deutlicheres Bild. Das unselbständige Erwerbseinkommen des Haushaltvorstandes und das Vermögenseinkommen des Haushalts sind hauptsächlich für die Zunahme der Einkommensungleichheit insgesamt verantwortlich.

RESUME

Comme dans beaucoup d'autres pays, l'inégalité des revenus en Suisse a augmenté entre le début des années '80 et le début des années '90. Cet article applique des méthodes de décomposition afin d'identifier des causes potentielles de cette augmentation. La décomposition est réalisée a) par sous-groupes de population et b) par sources de revenu. Nos résultats indiquent que les changements de structure démographique ne peuvent expliquer qu'une fraction mineure du changement total. La décomposition par sources de revenu fournit une image plus claire. Le revenu de la tête du ménage et le revenu de fortune du ménage sont les principaux responsables de l'augmentation de l'inégalité totale.