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A COMPARISON BETWEEN ACTUAL DISTRIBUTIONS OF ANNUAL AND LIFETIME INCOME: SWEDEN 1951–89

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This paper uses register data on tax assessed income from 1951 to 1989 for a representative sample of Swedish men in order to compare the distributions of annual income and "lifetime" income. It is found that the dispersion of lifetime income is around 35 to 40 percent lower than typical cross-sections of annual income. It is income up to around 30 years of age that mainly explains this discrepancy in the magnitude of dispersions. From the age of 30 until 65 years the correlations between annual and lifetime income are quite high and the dispersion of annual income is not very much higher than the dispersion of lifetime income. An analysis of the evolution of income mobility shows that there is a slight tendency to rising mobility over time. This finding implies that the common approach to study the development of income distribution by using only annual income can be misleading.

I. INTRODUCTION

Most analyses of income distribution have been based on *annual* income, i.e. the year has been the time unit. Therefore our views of the magnitude of income dispersion as well as its evolution over time have been formed by such information on annual income. Still, it is a general opinion among economists that the whole life is a more appropriate time unit and that the analysis should focus on *lifetime* income instead.

No doubt, it is lack of data that explains the predominance of annual data in income distribution analysis. However, over the past decades panel data have become available in several countries and many panels now cover periods of 10 to 20 years. Quite a few studies have used such data to estimate dynamic income functions and then simulated lifetime income distributions from these models. Lillard (1977) for the U.S.A., Layard (1977) for the U.K., and Blomquist (1981*a* and *b*) for Sweden typify such studies. Creedy (1991) contains a recent discussion and overview of this research approach.

On the other hand, there are very few studies of *actual* lifetime income distributions from *representative* samples. The purpose of this paper is to use a unique Swedish data set that covers total income at the level of the individual from 1951 to 1989. This period is so long that we take the liberty of calling income over this period lifetime income. The data stem from tax registers and the sample is representative for the whole Swedish population. Actually, it is the same basic

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data base that Blomquist used to estimate his simulation model. However, the register data back to 1951 were not available when he did his study.

We start in Section II by presenting this data source. In Section III we first contrast the distributions of annual and lifetime income in order to see how the magnitude of income dispersion is affected by the choice of time unit. We then proceed by examining what accounts for the observed differences. Section IV aims at investigating whether our views of the development of income distribution over time are affected by the choice of time unit. We present measures of income mobility and the evolution over time of income mobility. Finally, we summarize our findings in Section V.

II. The Data

Our data come from the Swedish Level of Living Survey (see Erikson and Åberg, 1987, for details). This survey started in 1968 with interviews of around 6,000 randomly selected individuals from the Swedish population from age 15 to 75 years. Later in 1974, 1981, and 1991, the same set of questions about the level of living were asked again. In these years immigrants and young people were added to the data set to make it representative for the whole population. The data from the interviews have been complemented with information from various registers. In particular data on total income before taxes ("sammanräknad nettoinkomst") are available for the sample from 1951 to 1989 with the exception for 1959, which for unknown reasons is missing. Hence we have income data for 38 years for this sample of individuals. Register information will be continuously collected in the future.

The income concept includes income from work (including taxable sickness benefits, unemployment benefits, parental leave payment etc.), pensions, income from own business, capital income, and realizations of capital gains. Deficits in any source of income are deducted. The data stem from tax assessments and therefore data exist for everyone who has paid income tax plus all who have filled in their income report to the tax authorities without having paid any taxes.

In general the quality and coverage of the data can be considered good. There are, however, two problems involved. First, persons with income below the tax exemption level are reported to have no income at all. The tax exemption level is very low, though, and since we only consider men up to 65 years of age, we believe that this measurement error is not only small in magnitude but also pertain to very few individuals. A second issue is the comparability over time. Except for some changes in the tax exemption levels (which are of minor importance for non-retired men) there was a change between 1973 and 1974 when a number of social benefits (most notably sickness benefits and unemployment benefits) became taxable. This change raised the level of income and reduced the dispersion, but still not in a very drastic way.[1] We will take this change into account in our analysis of income mobility in Section IV.

[1]The coefficient of variation for uncorrected income data for a sample of men (20 to 64 years of age) was 0.661, 0.657, 0.587, and 0.565 in 1972 to 1975. For 1975 it was possible to deduct unemployment and sickness benefits, which gave a coefficient of variation of 0.616 and a reduction of total income of 5 percent.

For a life-cycle analysis it is questionable whether it is relevant to include capital income in the income concept. If capital income represents the returns on own savings it is definitely a disadvantage to include it, because it would create a kind of double counting (cf. Blomquist, 1981*a*). On the other hand, if the capital is inherited it makes more sense to include it. Fortunately, capital income constitutes a very small fraction of total income so we believe that the results are not very sensitive to its inclusion.[2]

In the analysis we have restricted the sample in a number of ways. First, we only study men, which makes it possible to compare our results with those that Blomquist obtained. Second, we confine ourselves to those who were 15 to 27 years old in 1951, i.e. the cohorts of men born between 1924 and 1936. Third, we require that the individual responded in the 1968 survey *and* was living in Sweden in 1989.[3] As a consequence, we have excluded those who did not survive until 1989. Fourth, we exclude those who immigrated to Sweden after the age of 16. A remaining problem after these exclusions is that income received from abroad is not captured. However, after having excluded the immigrants in the way that we have done and having required that the sampled individuals lived in Sweden in both 1968 and 1989, we hope that this problem is of minor importance.

We have used the consumer price index when we computed the present value of real lifetime income.

III. Dispersion of Annual and Lifetime Income

Table 1 presents Gini coefficients and coefficients of variation for the present value of real total income from 1951 to 1989 (except for 1959) for the 13 cohorts of men born between 1924 and 1936. There is some variation between the cohorts which is probably due to a large extent to sampling variation since the samples for each cohort are small. Therefore it is more appropriate to consider the averages.[4] We can see that the Gini coefficients are around 0.2 and the coefficients of variation around 0.4 for all the three interest rates, 0, 3, and 6 percent.

It is interesting to note that the dispersions are not very sensitive to the choice of interest rate. Blomquist's simulation study produced dispersions that declined markedly with rising interest rate. One reason for this empirical pattern can be that real income declined for men in the mid 1970s and did not start to rise again until the mid 1980s and then only rose slowly. In this way income differentials late in the career will not contribute that much to dispersion of lifetime income.

We can now compare these measures of dispersion with those for cross-sections of individuals in a specific year, i.e. the type of information that is regularly published and forms the public's views on income distribution. Table 2 contains data on the same measures of dispersion for men in the same age brackets

[2]From 1975 to 1989, when separate information on capital income is available, its share of total income did not exceed 2.6 percent for men born between 1924 and 1936 who constitute the main sample of this study.

[3]The non-response rate in the 1968 survey was below ten percent. Those who did not respond that year but did so in the next survey in 1974 were also included in the sample. Therefore the non-response rate is very low in this study.

[4]An alternative would be to merge several cohorts but that would introduce some "between-cohort" variation that is irrelevant for our purposes.

TABLE 1

DISPERSION OF LIFETIME INCOME (1951–58, 1960–1989) FOR DIFFERENT COHORTS OF MEN

Cohort	n	r: 0%		r: 3%		r: 6%	
		Gini	C. of v.	Gini	C. of v.	Gini	C. of v.
b.-36	42	0.220	0.447	0.211	0.431	0.202	0.416
b.-35	35	0.146	0.272	0.144	0.265	0.146	0.267
b.-34	43	0.222	0.465	0.208	0.434	0.194	0.397
b.-33	40	0.179	0.326	0.169	0.308	0.160	0.294
b.-32	37	0.219	0.441	0.213	0.422	0.209	0.401
b.-31	50	0.159	0.289	0.159	0.287	0.160	0.289
b.-30	40	0.185	0.356	0.182	0.341	0.182	0.332
b.-29	48	0.240	0.481	0.250	0.487	0.243	0.495
b.-28	37	0.225	0.423	0.218	0.411	0.208	0.391
b.-27	36	0.235	0.431	0.232	0.438	0.229	0.431
b.-26	38	0.171	0.338	0.169	0.326	0.168	0.316
b.-25	44	0.188	0.387	0.194	0.408	0.200	0.429
b.-24	47	0.278	0.633	0.281	0.619	0.286	0.612
Average		0.205	0.407	0.218	0.398	0.199	0.390

Source: Own computations from Level of Living Surveys.

TABLE 2

DISPERSION OF ANNUAL INCOME FOR MEN IN DIFFERENT AGES, 1966, 1967, 1968 AND 1970

(Gini-coefficients and coefficients of variation within parenthesis)

Age	1966	1967	1968	1969	1970
16–53	0.359	0.389	0.396	0.380	—
	(0.696)	(0.747)	(0.753)	(0.737)	
17–54	0.340	0.372	0.374	0.379	0.354
	(0.665)	(0.723)	(0.715)	(0.737)	(0.685)
18–55	0.326	0.356	0.360	0.360	0.351
	(0.644)	(0.696)	(0.696)	(0.704)	(0.685)
19–56	0.314	0.344	0.346	0.350	0.338
	(0.637)	(0.700)	(0.673)	(0.695)	(0.661)
20–57	0.308	0.333	0.337	0.340	0.332
	(0.632)	(0.672)	(0.661)	(0.677)	(0.653)
21–58	0.299	0.325	0.326	0.330	0.320
	(0.621)	(0.667)	(0.652)	(0.661)	(0.634)
22–59	0.292	0.316	0.323	0.318	0.311
	(0.608)	(0.653)	(0.702)	(0.648)	(0.622)
23–60	0.291	0.312	0.319	0.320	0.305
	(0.606)	(0.647)	(0.697)	(0.759)	(0.622)
24–61	0.290	0.312	0.319	0.318	0.308
	(0.602)	(0.647)	(0.696)	(0.755)	(0.639)
25–62	0.292	0.312	0.320	0.318	0.308
	(0.609)	(0.646)	(0.697)	(0.756)	(0.640)
26–63	0.294	0.316	0.321	0.322	0.311
	(0.615)	(0.657)	(0.698)	(0.762)	(0.644)
27–64	0.300	0.320	0.327	0.324	0.316
	(0.624)	(0.662)	(0.712)	(0.765)	(0.652)
Average	0.309	0.334	0.339	0.338	0.323
	(0.630)	(0.676)	(0.696)	(0.721)	(0.649)

Source: Own computations from Level of Living Surveys. The sample sizes are approximately 2,000 individuals for each year.

as our cohorts were in during 1951 to 1989. We have computed these measures for the years 1966, 1967, 1968, 1969, and 1970, the years in the middle of the period for which we have longitudinal data. The sample is constrained by the same selection criteria as in the longitudinal analysis.

The dispersion is roughly 35 to 40 percent lower for lifetime income compared to cross-sections of annual income. This is a marked reduction. Actually, the magnitude of the reduction in dispersion is quite close to those reported by Blomquist. He simulated income for employed males from the age of 21 years to 75. The dispersion of the income concept that comes closest to ours was reduced by 48 to 49 percent when the time unit was changed from one year to 55 years.

Our next ambition is to see what accounts for the discrepancy between the dispersions of annual and lifetime income. For this purpose it is useful to follow the annual income of cohorts of individuals over the lifetime and look at the correlations between annual and lifetime income in various stages of the career. Figure 1 provides such information for the cohorts born 1925, 1928, 1931 and 1934. The most striking pattern in the figure is that the correlations are quite low—and in some cases even negative—up to around 25 years of age and are rather high after 35 years of age. In general the correlations are around 0.8 after the age of 35. One marked drop in the correlations for the cohort born 1925 around the age of 55 years does not change this general conclusion. Furthermore, this finding is also rather robust with respect to the choice of interest rate.

Additional insight into the life-cycle pattern of income is revealed by Figure 2 which shows how the dispersion of annual income evolves over the life-cycle for 12 different cohorts of men. Except for two single spikes in the data (the age of 39 for those born in 1934 and the age of 42 for those born in 1946) the most notable pattern is that income dispersion is much higher at younger age.[5] Actually, after the age of 30, the Gini coefficients are only slightly above 0.20, or more or less of the same magnitude as for lifetime income.

Hence, it seems as if it is income up to around 30 years of age that mainly accounts for the marked discrepancy between the dispersion of annual and lifetime income. From around 35 years of age up to 65 years the correlations between annual and lifetime income are high and the dispersions are more or less of the same magnitude. A practical piece of advice to those who find lifetime income more relevant, but only have annual data available, would therefore be to exclude the young from the analysis and focus only on the prime-aged.

The reasons for the different pattern for the young are not difficult to imagine. Variation in the length of schooling will produce large income variation up to around 25 years and also tends to make correlations between annual and lifetime income negative. High job mobility with several temporary jobs before getting a more permanent match with an employer probably also helps explain the data.

IV. The Evolution of Income Mobility

The evolution of income distribution over time is of great interest both from political and scientific points of views. The diverging experiences of Sweden, the

[5]A closer examination of the data has revealed that it is one single person per year with extremely high capital gains ("inkomst av tillfällig förvärvsverksamhet") that explains the spikes.

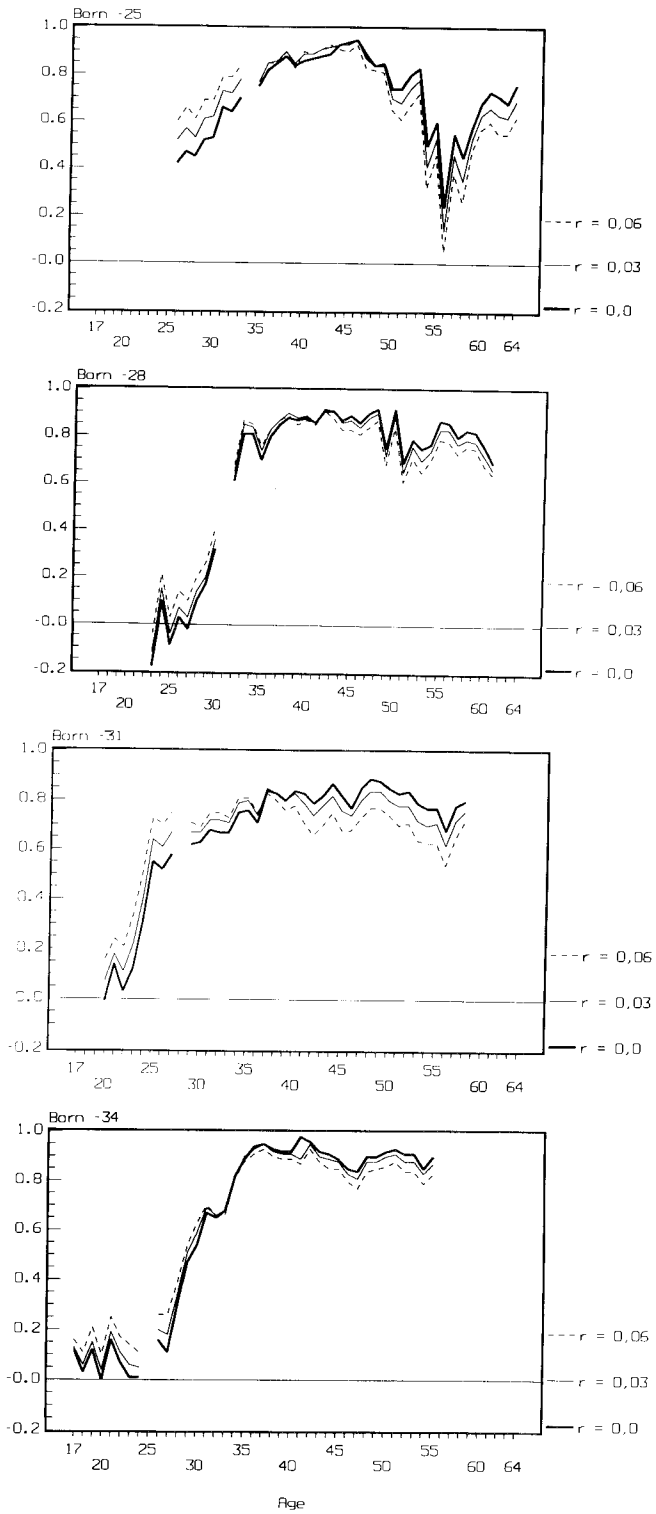

Figure 1. Correlations Between Annual Income and Lifetime Income for Four Cohorts of Men

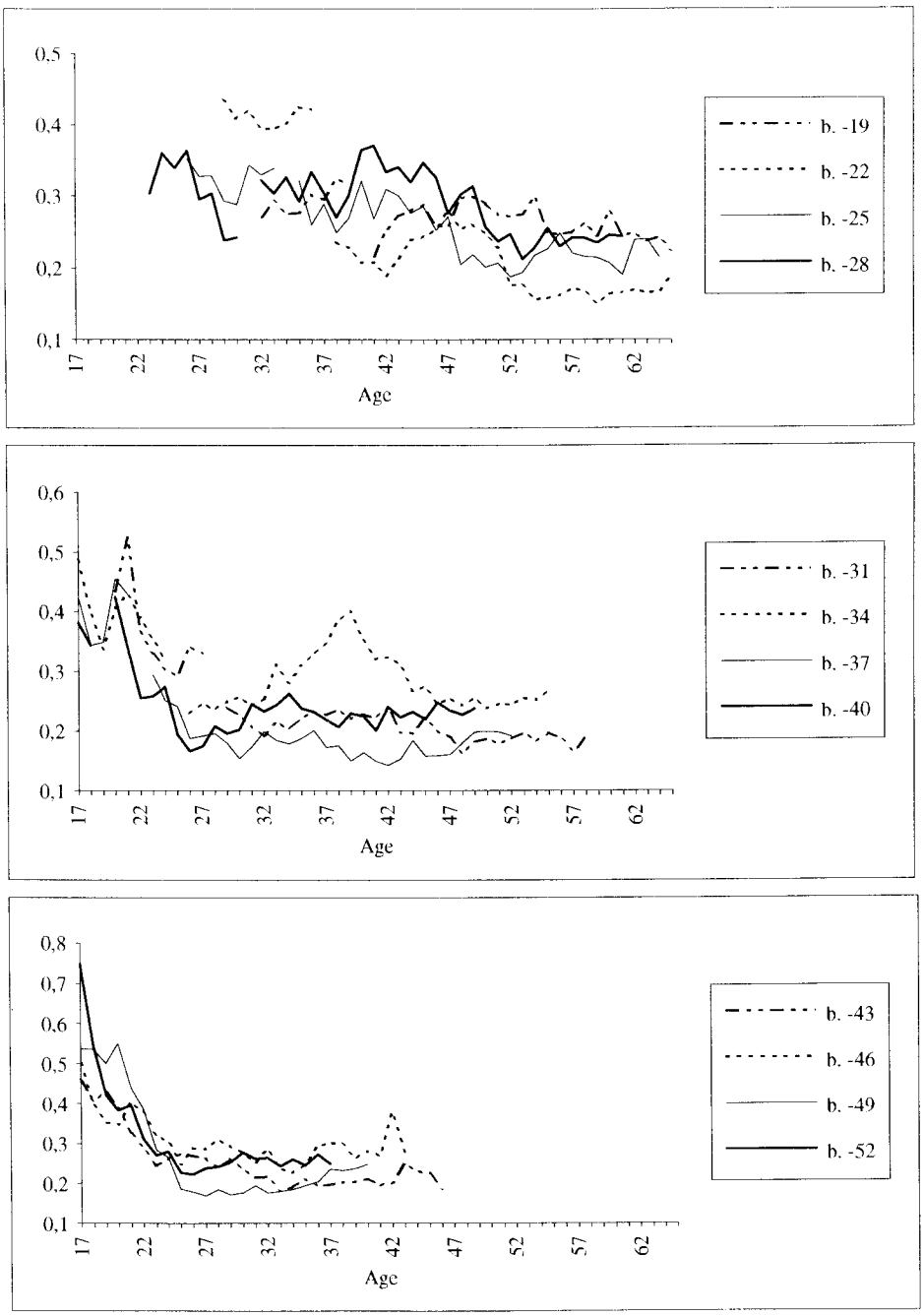

Figure 2. Dispersions of Annual Income Over the Life-cycle for Some Cohorts of Men, Gini Coefficients

U.K. and the U.S.A. during the 1980s have, for example, sparked both political discussion and scientific inquiry. It is a weakness, however, that this discussion and research almost entirely focus on annual income. There is a need for additional information that shed light on the implications for lifetime income. A convenient vehicle for this purpose is a measure of income mobility proposed by Shorrocks (1978). The notion behind this measure is that income are immobile or rigid if the relative positions of individuals are constant over time. If, on the other hand, individuals frequently change positions in the income structure from one year to another, there is high income mobility.

The formal definition of Shorrocks measure is:

$$M = 1 - \frac{I[Y(t_0, t_m)]}{\sum_{k=1}^{m} w_k I[Y(t_{k-1}, t_k)]} \tag{1}$$

where I is a measure of dispersion (here we use the squared coefficient of variation in our computations; $Y(t_0, t_m)$ equals income from the end of period t_0 until period t_m; w_k is the share of total income for the whole period that is received in period k; and $k = 1, \ldots, m$ denotes time periods.

Shorrocks has shown that for a wide class of inequality measures, the dispersion of income over many periods, i.e. the nominator on the right hand side, is less than or equal to the income-weighted average of dispersion for the single periods, i.e. the denominator on the right hand side. Therefore, M cannot be be negative. Furthermore, M becomes 1 if there is no dispersion in total income over many periods. This means that income differentials in single periods completely counteract each other to make total income during the many periods completely equal.

We will now use Shorrocks measure to look at the evolution of income mobility in Sweden. Given the nature of the data, it is natural to divide the period 1951 to 1989 into periods of 8 years and compute measures of income mobility for these periods. We will look at the following time periods: 1951–58, 1960–67, 1966–73, 1974–1981 and 1982–89. We want to have a break between 1973 and 1974, to take into account that in the latter year some transfers like sickness pay and unemployment benefits became part of tax assessed income.

The results in Table 3 show first of all that income mobility falls with age. This is hardly surprising in light of the information in the previous section. Our basic issue, however, is whether income mobility has changed over time for given age groups and in that case in which direction. The pattern is somewhat erratic which precludes strong statements, but if there is any tendency in the data it is in the direction of higher income mobility over time. In particular, the age groups 25–30 years and 31–40 years seem to have experienced higher income mobility over time. It is also interesting to note that income mobility seems to have been slightly higher during the period 1982–89 than 1974–81. For men the increases in income mobility for the age groups 20–24, 31–40 and 51–58 years are considerably higher than the declines for the age groups 16–19, 25–30 and 41–50 years. Even for women the tendencies to higher income mobility dominate for these two time periods.

TABLE 3

THE EVOLUTION OF INCOME MOBILITY FOR VARIOUS AGE GROUPS
(Shorrocks measure)

Period	Age at the Start of the Period					
	16–19	20–24	25–30	31–40	41–50	51–58
			Men			
1951–58	0.46	0.33	0.14	0.12	—	—
1960–67	0.45	0.43	0.28	0.13	0.09	0.11
1966–73	0.47	0.39	0.29	0.19	0.16	0.16
1974–81	0.59	0.39	0.38	0.23	0.18	0.14
1982–89	0.58	0.47	0.37	0.28	0.17	0.19
			Women			
1974–81	0.59	0.38	0.25	0.21	0.18	0.13
1982–89	0.46	0.48	0.35	0.25	0.17	0.14

Source: Own computations from Level of Living Surveys (LNU).

Note: The figures are averages of mobility measures for various age cohorts. In 1974 some transfers became included in tax assessed income.

The implication of rising income mobility is that the dispersion of income over longer periods has decreased (or increased at a lower rate) relative to the dispersion of single years. This is useful additional information when the distributional consequences of the 1980s are considered.

It is natural to compare the results in this section with those of Gustafsson (1992). He studied income mobility for seven cohorts of Swedes (born between 1913 and 1943) over the period 1971–1980. He used an income concept that is very close to the one in this study, but had the Gini coefficient as the basic inequality measure instead of the squared coefficient of variation.[6] Using Shorrocks measure of income mobility, he investigated how sensitive the measure is to the length of the period. He found that mobility increased from around 0.05 for two years to around 0.25 for ten years; the reduction was rather quick from two to five years and stabilized thereafter. For the period of eight years his numbers ranged from 0.19 to 0.27, which is quite close to those in this study. The age pattern was mainly the same, even though he obtained somewhat higher mobility for the cohorts born 1913 and 1918 than for those aged 51–58 years in our Table 3.

V. SUMMARY

In this study we have been able to use longitudinal data on total income from 1951 to 1989 (with exception for 1959) for a representative sample of Swedish men. That is, we have data for 38 years. Our three most important findings were:

(i) According to the Gini coefficient and the coefficient of variation, the dispersion of income during 38 years is around 35–40 percent lower than

[6]Gustafsson used total income *before* deductions of deficits in certain sources of income ("sammanräknad inkomst") whereas this study is based on total income *after* such deductions ("sammanräknad nettoinkomst"). The correlation between these income measures was around 0.95 during the 1970s and the differences in mean and coefficient of variation were small.

for cross-sections of annual income. This result is in conformity with those obtained in a simulation study of Sweden. On the other hand, our results are not sensitive to the choice of interest rate, whereas the simulation results were.

(ii) It is mainly the young that accounts for the discrepancy in dispersion between lifetime and annual income. After 35 years of age, the correlation between annual income and lifetime income is quite high and the dispersion of annual income is of approximately the same magnitude as lifetime income.

(iii) There is a slight tendency to higher income mobility in Sweden over the period that we have studied. Therefore the evolution of lifetime income distribution is probably more favourable than the evolution of annual income.

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