Review of Income and Wealth
Series 40, Number 1, March 1994

# THE DEGREE AND PATTERN OF INCOME IMMOBILITY IN SWEDEN

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This paper studies immobility in the distribution of income using Swedish data. Tax data shows immobility in personal income to be a decreasing function of the length of the period over which it is studied and an increasing function of initial age. The results show immobility to be larger among males than among females. Based on a household income survey it is found that when the time period expands from one to two years, the Gini-coefficient of equivalent income per person decreases by five percent. A sample of males indicates that income immobility between generations in Sweden is low.

## 1. INTRODUCTION

From the point of view of income distribution, knowledge of income immobility is of fundamental interest. The size of income immobility tells how the reported inequality in the distribution of income is affected by expanding the accounting period. In the case of high immobility, much of the recorded inequality remains as the accounting period increases, otherwise it vanishes. Motives for policy intervention are stronger in the first case as compared to the second. Knowledge of income immobility helps to illustrate which alternative prevails. In addition, knowledge of income mobility is helpful in understanding the labour market and public sector transfer programs.

Official income distribution statistics typically refer to an accounting period of one year. What happens over a longer period? We will investigate this using data for Sweden. Three studies will be performed. First, we will investigate personal income for a period covering up to ten years. This will be done by using tax data for various cohorts of males and females. Second, we will use household data on family income to investigate immobility for the entire population over two years. Third, a longer period will be taken into consideration as we study the relation between income in one generation and the next. Those estimates refer to personal income and are based on a small sample of males. Finally, as a by-product of our investigation, we will map the development of cohort income in Sweden during the 1970s.

The paper is organized as follows. Section 2 addresses the conceptualization and measurement of income immobility. Section 3 describes the Swedish tax data used. The development of cohort income during the 1970s is shown in section 4. Results on personal income immobility are reported in Section 5. The results of immobility based on household income data are presented in Section 6 and those

*Note*: This is a revised version of a paper prepared for the 1992 General Conference of the IARIW, Flims, Switzerland, August 30–September 5. It is part of a research project financially supported by the Swedish Council for Social Research (SFR). I wish to thank Renato Aguilar, Mats Johansson and Mehi Mohammadi for helping me with the data work.

on intergenerational income immobility in section 7. Section 8 summarizes the findings.

## 2. Conceptualizing and Measuring Immobility

Income immobility can be conceptualized in different ways. To facilitate comparison with other studies we have applied some often used alternatives. By applying various alternatives it is possible to find out to what extent results are robust regarding the choice of immobility measure.

One measure is the coefficient of correlation. It takes values from $-1.0$ to $+1.0$. A value of 1.0 stands for complete immobility and 0.0 for complete mobility. Negative values mean that people in the lower part of the distribution during one period have a tendency to appear in the higher part during the next period.

The second measure is the immobility ratio obtained from cross-classifying income variables referring to different time periods. The ratio between the sums of the elements in the main diagonal and the sum of all elements defines the index used. Here we divide the income variables into quintals. Thus in the case of no relation between income variables for two periods, the expected value of the index is 0.20.

The third measure stems from a suggestion by Shorrocks (1980) and captures the distributional aspect of immobility. A ratio is formed between a given inequality index for income accounted over a long period and the mean of inequality for the various sub-periods. In case of total immobility the ratio takes a value of 1. The ratio is equal to zero when all individuals have the same income over the longer period. The reverse of the index gives a measure of the reduction in income inequality due to increasing the accounting period, as well as a measure of income mobility. This index can be computed for various inequality indexes. Here we have chosen the probably most commonly used: the Gini-coefficient.

The three measures capture different aspects of income immobility. The size of the correlation coefficient indicates how closely related the amounts of income during the two periods of measurement are. The immobility ratio shows closeness in the rank order of the distributions for two periods. Thus it captures the positional aspect of immobility. The Shorrocks measure indicates how much inequality remains when the accounting period increases.

The three measures can be applied to income defined in different manners and for different periods. One obvious alternative is personal income. Surveying the literature, Atkinson *et al.* (1988) concluded that earning immobility appears to be a decreasing function of the length of the period over which it is measured and an increasing function of the initial age of the cohort that is studied. Immobility seems to be very small for very long periods and/or at the beginning of working life. However, these statements might be questioned because of a lack of comparability between the studies surveyed. Attrition is a fundamental problem for many studies. The studies surveyed cover various years and countries and use different sources.

In our research we have used tax data for Sweden covering 1971–80 to study personal income immobility. A special feature of this source is very low attrition. Following different cohorts of males and females enables us to study variations

in immobility for personal income between cohorts and sexes. As our results refer to the same observation period for the same country using the same definitions and data-source, reported differences between cohorts can be assumed to be real.[1]

A second alternative for studying income immobility considers household income. It can be argued that from a welfare point of view family income *per se* is not the most interesting variable to observe as has been espoused by various authors [for example, Danziger and Taussig (1979), Duncan (1983), O'Higgins *et al.* (1985), Kakwani (1986) and Ringen (1991)]. Income for a given household should preferably be put in relation to the size of the household. Assuming household income is equally shared, one can argue that *individuals* should be the unit of analysis. The variable of interest is often labelled "equivalent disposable income per person."

Studying immobility in income based on households puts strong demands on data. Here one can not expect administrative sources to be helpful; we have to rely on surveys. The U.S. Panel of Income Dynamics at the University of Michigan has been a model for studies now existing in several countries.[2] For Sweden we use the Household Income Survey made by Statistics Sweden to expand the period under observation to two years.

An expansion of the period under observation comes from studying two generations. To what extent is income observed over several years in one generation related to income measured over several years in the former generation? The ability to answer this question is limited because of data requirements. Ideally, one would have a country-wide sample of adequate size in which income for both generations has been observed for several years. These requirements seem to have been best fulfilled, up to the present, by two panels in the U.S. [Behrman and Taumban (1990) and Solon (1992), and Zimmerman (1992)]. In our data for Sweden we have also been able to follow the second generation over several years during the 1970s. The limitation is that income for the first generation refers to only one year and that the sample is restricted to males located in Stockholm during the mid 1980s.

## 3. Data on Personal Income

Tax data is used for studying personal income for cohorts. Several institutional circumstances make tax data in Sweden a good source for studying income immobility. The tax basis is relatively broad as most public sector transfers such as pension payments, compensation for sickness and unemployment benefits are subject to income tax. The level of personal tax exemption is relatively low and as most people are in the labour force, they fill in tax returns. The tax authorities have information on everyone paying income taxes, as well as those who have

[1]The study by Björklund (1992) parallels our study on individual income immobility in Sweden since it also uses tax data. However, they differ both on which population they cover and years covered. This study covers both sexes as well as cohorts spanning 30 years, the oldest is born in 1913 and the youngest in 1943. Björklund's study is limited to males born between 1924 and 1936. While the present study covers a much broader population, the other observes individuals during considerably more years.

[2]For a recent international comparison of mobility into and out of poverty based on such data, see Duncan *et al.* (1993).

filled in a tax return but do not pay any income tax at all. Therefore Swedish tax authorities have income data for almost all adults.

However, it should be noted that although data exists for almost everyone old enough to be employed, very low incomes are probably often measured with considerable error due to personal tax exemptions. As long as a person is reported to have an annual income below the personal exemption, there is limited incentive for the authorities to check the amounts

From a register of the population for those born on the 15th of each month kept by Statistics Sweden, it was possible to construct panels of income. For each cohort of males and females, born in 1913, 1918, 1923, 1928, 1933, 1938 and 1943, income information was put together beginning with 1971 for random samples of about 500 cases. The individuals were followed annually for ten years. Reasons for attrition were deaths and emigration. People who immigrated to Sweden during the observation period were not included in the data. As shown in an Appendix available from the author, the number of observations decrease only marginally during the decade under study.

However, the data situation for 1977 is problematic as the number of observations are systematically lower than at the end of the period. The unreasonable increase in number of cases in 1978 is small for all cohort males, but ranges up to 16 percent for the cohort females. A possible cause for this is that a number of persons with no taxable income for 1978 have been wrongly coded as missing in our data.

Although several income concepts are available for each year, there is little choice when constructing a variable for the entire period. By "income" we refer in the following to "gross income" (sammanräknad inkomst) which is the sum of income for various sources such as wages and salaries, pensions, business income, interests, capital gains and housing, but before subtracting general deductions (for example due to owner-occupied housing) and income tax. The recorded income variable is thus influenced by working hours, the wage rate and to a lesser extent by ownership of assets.

## 4. Mean and Inequality in Cohort Income

High economic growth during the 1960s slowed down at the beginning of the 1970s and at the end of the decade the GDP actually fell by a few percent. However, due to economic policy, unemployment rates continued to be low during the decade. Policy crises of a large public deficit and increased unemployment matured at the beginning of the 1980s, after the period under observation. Female labour force participation increased during the decade for (almost) all age-classes while the changes among men were much smaller. Wage dispersion decreased from the beginning to at least the middle of the decade and increases first occurred during the 1980s [See, for example, Hibbs (1990)].

In Figure 1 we show the mean real gross income for males and that corresponding for females is shown in Figure 2. (The actual numbers are available in an Appendix from the author.) No curves cross among females, meaning that at the same age subsequent cohorts have higher real mean incomes than older ones. The difference can be rather large. For example at age 50 "cohort 1928" had a

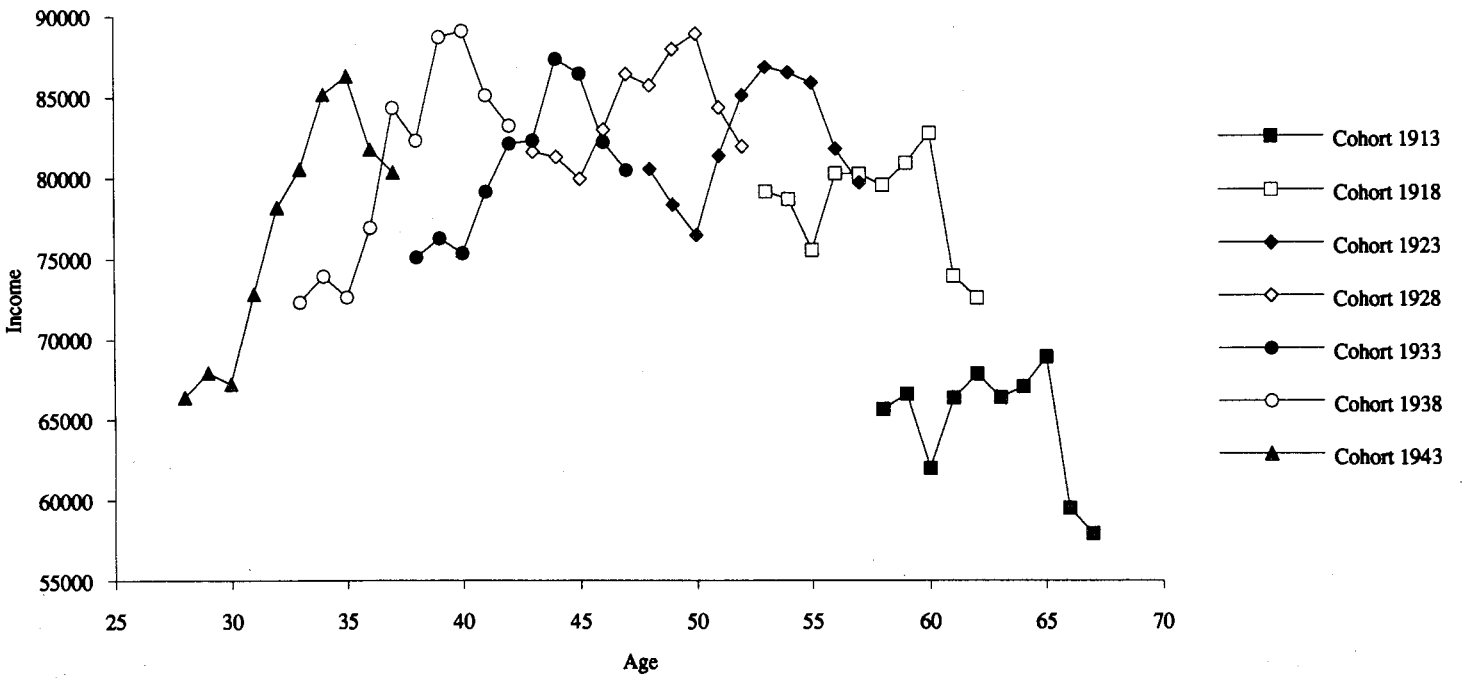


Figure 1. Mean Personal Income 1971–80 for Various Cohorts Male in Constant (1981) Prices

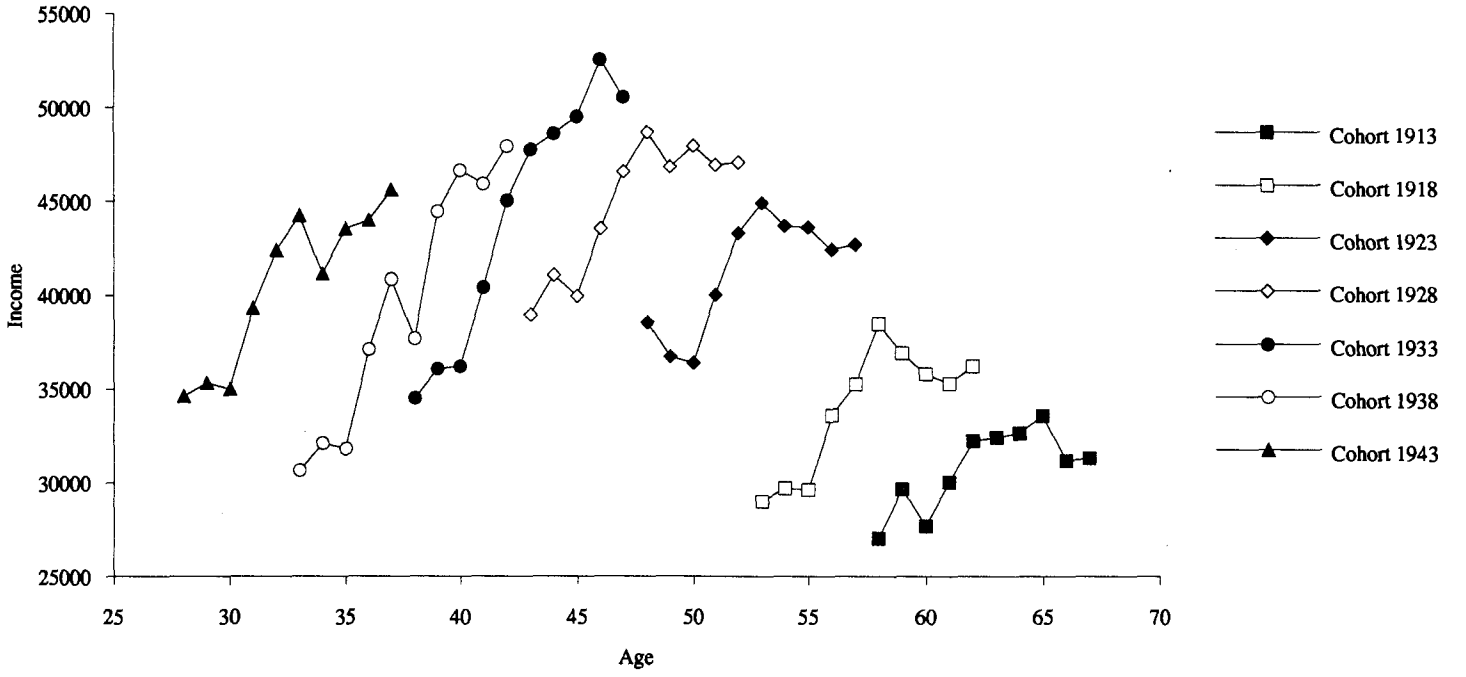


Figure 2. Mean Personal Income 1971–80 for Various Cohorts Female in Constant (1981) Prices

TABLE I

THE LOGARITHM OF MEAN COHORT INCOME AS FUNCTION OF AGE, TIME AND MACROECONOMIC INDICATORS

(*t*-statistics in parenthesis)

| Intercept | Age | $(Age)^2$ | Time | $(Time)^2$ | Unemployment | GDP | $R^2$ (adj) |
|---|---|---|---|---|---|---|---|
| Males ($n=70$) | | | | | | | |
| 10.783 | 0.0344 | −0.00696 | 0.004 | −0.0027 | | | 0.768 |
| (245.56) | (10.78) | (12.22) | (4.71) | (3.3) | | | |
| 11.134 | 0.0346 | −0.00070 | | | −0.143 | | 0.752 |
| (195.19) | (10.51) | (11.83) | | | (6.53) | | |
| 10.419 | 0.0349 | −0.00071 | | | | 0.004 | 0.737 |
| (118.69) | (10.28) | (11.64) | | | | (6.03) | |
| Females ($n=70$) | | | | | | | |
| 9.974 | 0.0368 | −0.00082 | 0.073 | −0.0030 | | | 0.824 |
| (159.44) | (8.10) | (10.10) | (5.57) | (2.60) | | | |
| 10.772 | 0.0370 | −0.00080 | | | −0.340 | | 0.691 |
| (103.46) | (6.16) | (7.47) | | | (8.54) | | |
| 8.811 | 0.0369 | −0.00082 | | | | 0.012 | 0.819 |
| (74.05) | (8.04) | (9.99) | | | | (13.09) | |

real income 32 percent higher than "cohort 1923." For all male cohorts real income decreased for the last two years of observation. This makes some curves for males cross, thus at the same age the younger cohort has a (somewhat) lower real income. This is in contrast to results for cohorts of employed males during the period from 1960 to 73 which were all found to have higher real mean income at the same age as the older cohort [Credy, Hart, Johansson and Klevmarken (1980)].

In order to further investigate the pattern, we can estimate regression models where the logarithm of real mean income is related to the variables Age, $(Age)^2$, Time, $(Time)^2$ alternatively the unemployment rate and a GDP index. The results are shown in Table 1. Across specifications, the estimated age-income profiles are similar for males and females. Mean income reaches a maximum at about 45 years among males and 42 years among females. The time effect is found to be positive at a decresing rate over the entire observation period for females. It is smaller among males for whom it is negative for the last two years under study. As an alternative to linking cohort income to time, it is possible to relate it to macroeconomic indicators in an expected way. According to the estimates, GDP increases cohort income and the unemployment rate decreases cohort income. These effects are found to be greater for females than for males.

Inequality measured by the Gini-coefficient is shown for males in Figure 3 and for females in Figure 4. Generally, inequality is larger among females which is understandable because of heterogeneity in the number of working hours. The curves show the experiences of the various cohorts from 1971 to 1980. Consequences of the measurement problems are quite visible in the figures as there is a large drop for male cohorts the fourth year (1974), and generally the estimate for the seventh year (1977) appears erratic.

The pattern of inequality in cohort income is summarized by estimated regression models using time and age as explanatory variables and two dummies for a year with measurement problems, see Table 2. The coefficients for a year with measurement problems have an expected negative sign and have a *t*-value larger

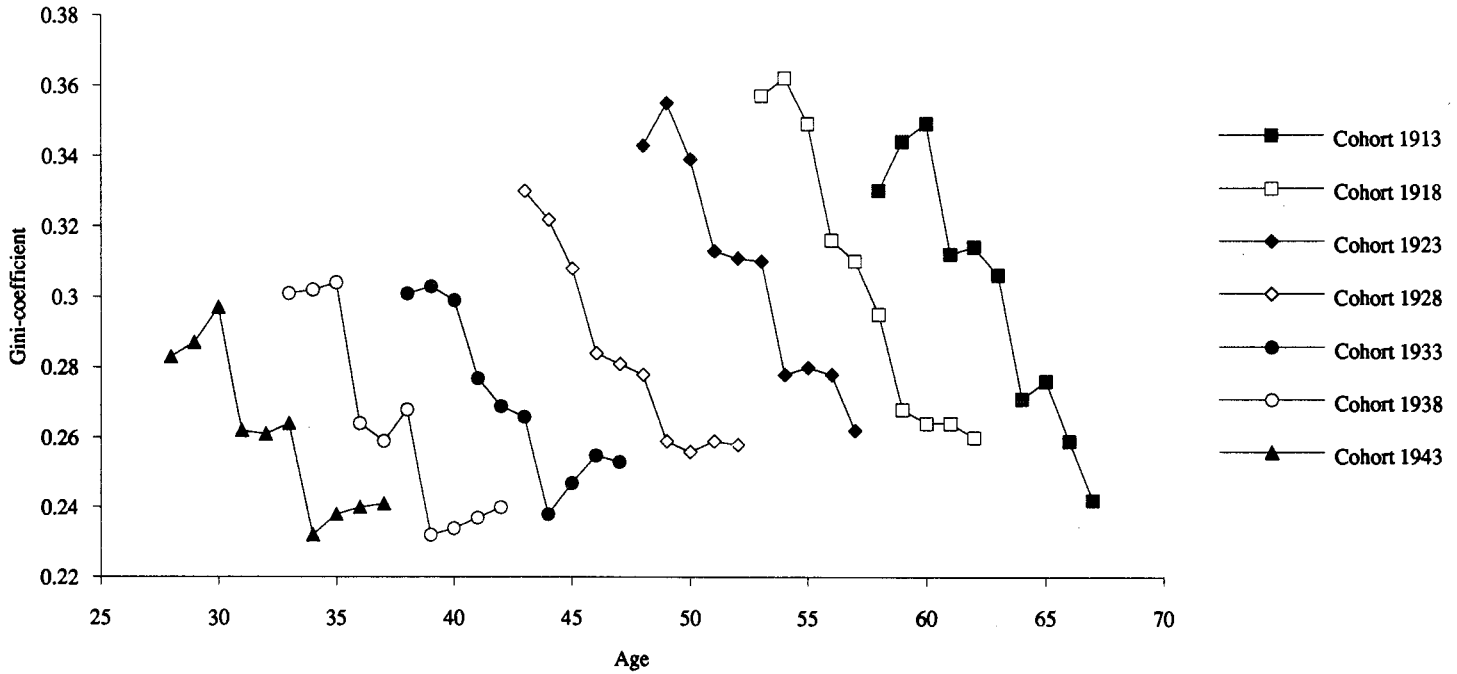


Figure 3. Gini-coefficient for Gross Income 1971–80 for Various Cohorts Male

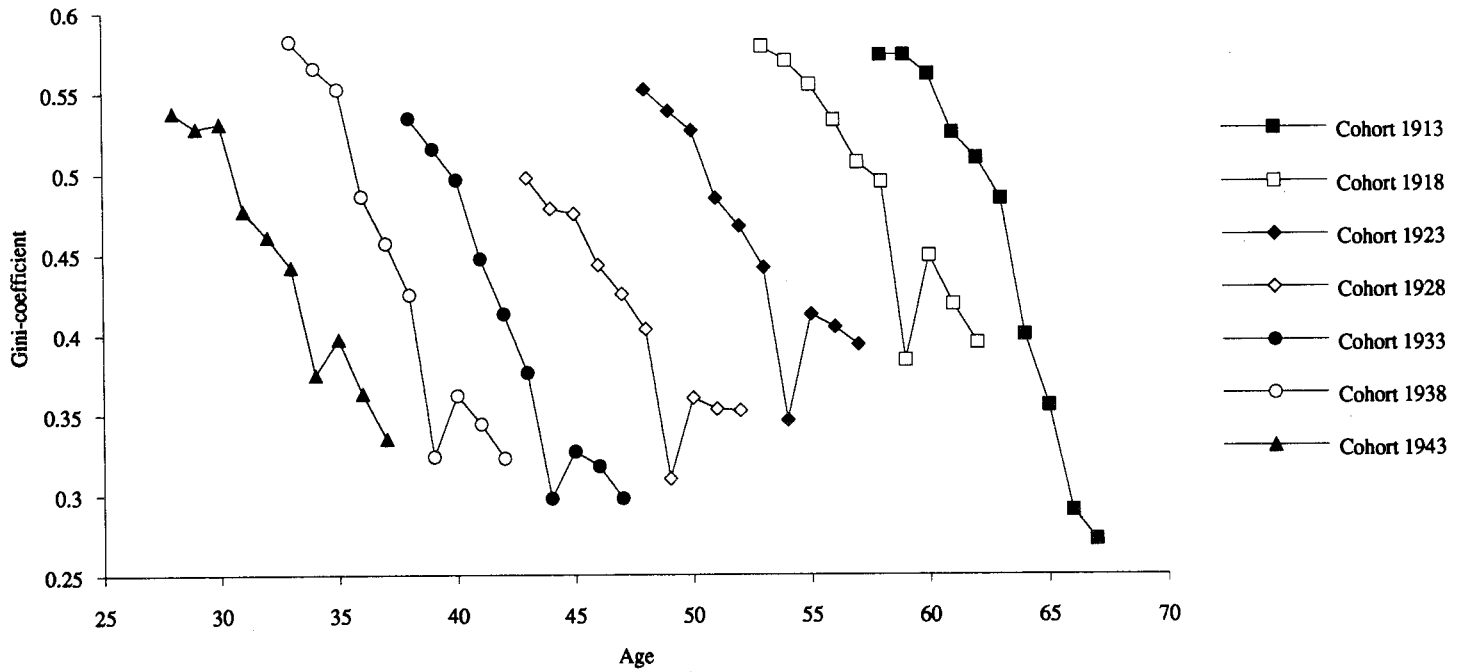


Figure 4. Gini-coefficient for Gross Income 1971–80 for Various Cohorts Female

TABLE 2

GINI-COEFFICIENTS FOR COHORT INCOME AS FUNCTION OF AGE, TIME AND DUMMY VARIABLES

(*t*-statistics in parenthesis)

| Intercept | Age | $(Age)^2$ | Time | D77 | D7173 | $R^2$ (adj) |
|---|---|---|---|---|---|---|
| Males ($n=70$) | | | | | | |
| 0.248 | 0.0045 | −0.00005 | −0.0084 | −0.017 | 0.018 | 0.90 |
| (23.87) | (6.39) | (4.05) | (11.03) | (3.78) | (3.86) | |
| Females ($n=70$) | | | | | | |
| 0.606 | −0.0031 | 0.00008 | −0.0259 | −0.062 | 0.0005 | 0.84 |
| (18.47) | (1.40) | (1.99) | (10.73) | (4.39) | (0.35) | |

*Note*: Variable D77 takes a value of 1 if year is 1977, for other years it is equal to 1. Variable D7173 takes a value of 1 in years 1971, 1972 and 1973, other years it is equal to zero.

than two in three out of four cases. For males the parameters mean that at a given point in time inequality increases with age up to about 45 years of age. This pattern can be obtained in Figure 3 by joining points at various cohort-curves having the same rank order. However, the estimates show a much larger negative effect of time than the positive effect of age making all cohort-curves downward-sloping. The estimates for females differ from the ones for males by not indicating a pronounced age-profile and also by possessing a much stronger negative time effect.

## 5. RESULTS ON INDIVIDUAL INCOME IMMOBILITY

For each cohort we have access to income data for ten years. Income for the first year can be compared to the annual income for each nine subsequent years. For the second year comparisons can be made to eight subsequent years and so on. In this manner 45 pair-wise comparisons are possible to make. For these 45 comparisons we have computed the three immobility indexes presented in section 2.

Various approaches to analysing the figures are possible. We chose to take averages for indexes computed for the same difference of time. Thus the numerical value for immobility between two subsequent years for a specific index and cohort is based on nine observations, while the numerical value for the index for the longest period is based on only one figure. Using this approach, short-term immobility is measured with precision. The disadvantage of the approach is that it does not make it possible to rigourously analyse the variation in short term immobility, for a fixed number of years for a cohort or between cohorts.

Is immobility as reported in Tables 3, 4 and 5 large or small? The answer depends to some extent on what one would have expected. The numerical values of the different indexes might give different impressions. Let us first look at immobility between two subsequent years. Here the coefficient of correlation ranges for the cohorts from 0.777 to 0.938 and the proportion immobile ranges from 68 to 80 percent. In both cases the lower figure justifies the opinion that immobility is

TABLE 3

IMMOBILITY IN PERSONAL INCOME FOR VARIOUS PERIODS AMONG MALE AND FEMALE COHORTS—THE CORRELATION COEFFICIENT

| Length of Period (Years) | Cohort | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1913 | 1918 | 1923 | 1928 | 1933 | 1938 | 1943 |
| Males | | | | | | | |
| 2 | 0.923 | 0.821 | 0.854 | 0.929 | 0.834 | 0.777 | 0.866 |
| 3 | 0.888 | 0.791 | 0.821 | 0.913 | 0.791 | 0.716 | 0.797 |
| 4 | 0.859 | 0.729 | 0.755 | 0.887 | 0.746 | 0.629 | 0.740 |
| 5 | 0.843 | 0.658 | 0.703 | 0.859 | 0.703 | 0.550 | 0.688 |
| 6 | 0.822 | 0.593 | 0.695 | 0.838 | 0.659 | 0.666 | 0.644 |
| 7 | 0.880 | 0.535 | 0.721 | 0.816 | 0.620 | 0.596 | 0.597 |
| 8 | 0.770 | 0.502 | 0.742 | 0.804 | 0.585 | 0.587 | 0.566 |
| 9 | 0.762 | 0.491 | 0.678 | 0.795 | 0.599 | 0.524 | 0.528 |
| 10 | 0.757 | 0.477 | 0.720 | 0.778 | 0.567 | 0.496 | 0.495 |
| Females | | | | | | | |
| 2 | 0.819 | 0.823 | 0.938 | 0.918 | 0.787 | 0.895 | 0.888 |
| 3 | 0.809 | 0.712 | 0.881 | 0.853 | 0.760 | 0.817 | 0.795 |
| 4 | 0.753 | 0.698 | 0.828 | 0.784 | 0.695 | 0.755 | 0.713 |
| 5 | 0.706 | 0.642 | 0.775 | 0.710 | 0.630 | 0.694 | 0.644 |
| 6 | 0.677 | 0.590 | 0.724 | 0.646 | 0.559 | 0.639 | 0.587 |
| 7 | 0.626 | 0.568 | 0.662 | 0.571 | 0.490 | 0.583 | 0.515 |
| 8 | 0.639 | 0.567 | 0.641 | 0.558 | 0.439 | 0.563 | 0.485 |
| 9 | 0.620 | 0.539 | 0.619 | 0.541 | 0.380 | 0.562 | 0.462 |
| 10 | 0.675 | 0.537 | 0.589 | 0.520 | 0.527 | 0.539 | 0.413 |

TABLE 4

IMMOBILITY IN PERSONAL INCOME FOR VARIOUS PERIODS AMONG MALE AND FEMALE COHORTS—IMMOBILITY-RATIOS

| Length of Period (Years) | Cohort | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1913 | 1918 | 1923 | 1928 | 1933 | 1938 | 1943 |
| Males | | | | | | | |
| 2 | 0.703 | 0.735 | 0.751 | 0.749 | 0.725 | 0.714 | 0.687 |
| 3 | 0.607 | 0.660 | 0.690 | 0.688 | 0.647 | 0.633 | 0.602 |
| 4 | 0.559 | 0.613 | 0.649 | 0.648 | 0.598 | 0.584 | 0.552 |
| 5 | 0.503 | 0.580 | 0.605 | 0.610 | 0.564 | 0.544 | 0.511 |
| 6 | 0.473 | 0.546 | 0.578 | 0.590 | 0.531 | 0.524 | 0.481 |
| 7 | 0.457 | 0.500 | 0.554 | 0.566 | 0.505 | 0.495 | 0.452 |
| 8 | 0.442 | 0.480 | 0.534 | 0.559 | 0.496 | 0.492 | 0.432 |
| 9 | 0.437 | 0.471 | 0.514 | 0.555 | 0.491 | 0.475 | 0.417 |
| 10 | 0.447 | 0.493 | 0.502 | 0.506 | 0.484 | 0.448 | 0.403 |
| Females | | | | | | | |
| 2 | 0.756 | 0.797 | 0.779 | 0.776 | 0.725 | 0.723 | 0.687 |
| 3 | 0.626 | 0.708 | 0.696 | 0.684 | 0.647 | 0.619 | 0.581 |
| 4 | 0.560 | 0.628 | 0.638 | 0.617 | 0.598 | 0.548 | 0.514 |
| 5 | 0.515 | 0.567 | 0.581 | 0.562 | 0.564 | 0.501 | 0.460 |
| 6 | 0.478 | 0.527 | 0.546 | 0.516 | 0.513 | 0.467 | 0.423 |
| 7 | 0.449 | 0.483 | 0.511 | 0.477 | 0.505 | 0.418 | 0.371 |
| 8 | 0.435 | 0.443 | 0.480 | 0.463 | 0.496 | 0.401 | 0.350 |
| 9 | 0.437 | 0.426 | 0.465 | 0.439 | 0.491 | 0.390 | 0.344 |
| 10 | 0.422 | 0.393 | 0.434 | 0.424 | 0.484 | 0.381 | 0.345 |

TABLE 5

IMMOBILITY IN PERSONAL INCOME FOR VARIOUS PERIODS AMONG MALE AND FEMALE COHORTS

(Shorrocks index based on Gini-coefficients)

| Length of Period (Years) | Cohort | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1913 | 1918 | 1923 | 1928 | 1933 | 1938 | 1943 |
| Males | | | | | | | |
| 2 | 0.953 | 0.954 | 0.966 | 0.966 | 0.958 | 0.951 | 0.949 |
| 3 | 0.918 | 0.917 | 0.950 | 0.939 | 0.926 | 0.913 | 0.913 |
| 4 | 0.891 | 0.878 | 0.909 | 0.911 | 0.891 | 0.872 | 0.874 |
| 5 | 0.854 | 0.838 | 0.879 | 0.882 | 0.852 | 0.828 | 0.834 |
| 6 | 0.832 | 0.804 | 0.859 | 0.862 | 0.825 | 0.800 | 0.810 |
| 7 | 0.807 | 0.771 | 0.834 | 0.837 | 0.795 | 0.762 | 0.779 |
| 8 | 0.787 | 0.744 | 0.811 | 0.810 | 0.773 | 0.730 | 0.755 |
| 9 | 0.792 | 0.735 | 0.802 | 0.793 | 0.767 | 0.726 | 0.759 |
| 10 | 0.800 | 0.738 | 0.813 | 0.782 | 0.766 | 0.721 | 0.758 |
| Females | | | | | | | |
| 2 | 0.939 | 0.945 | 0.948 | 0.950 | 0.939 | 0.933 | 0.935 |
| 3 | 0.881 | 0.892 | 0.897 | 0.900 | 0.882 | 0.872 | 0.878 |
| 4 | 0.834 | 0.839 | 0.840 | 0.844 | 0.821 | 0.809 | 0.824 |
| 5 | 0.792 | 0.780 | 0.777 | 0.781 | 0.753 | 0.740 | 0.769 |
| 6 | 0.762 | 0.744 | 0.734 | 0.743 | 0.708 | 0.694 | 0.728 |
| 7 | 0.728 | 0.698 | 0.691 | 0.701 | 0.664 | 0.648 | 0.684 |
| 8 | 0.707 | 0.679 | 0.670 | 0.680 | 0.635 | 0.617 | 0.654 |
| 9 | 0.696 | 0.664 | 0.660 | 0.669 | 0.621 | 0.604 | 0.643 |
| 10 | 0.689 | 0.654 | 0.649 | 0.655 | 0.606 | 0.590 | 0.628 |

low. On the other hand the Shorrocks index shows that by expanding the accounting period from one to two years, not less than between 93.3 and 96.6 percent of inequality remains.

In several cohorts, income measured a decade apart is rather weakly related. The extreme is the youngest female cohort where the coefficient of correlation is only 0.41. This means that in a regression analysis, income for the first year can only explain 17 percent of variation in income for the later year. For this cohort, only one out of three people is in the main diagonal of the matrix made for income ten years apart and as much as about two-fifths of inequality disappears when the accounting period expands from one to ten years. At the other extreme in some cohort males, only one-fifth of inequality disappears when expanding the accounting period from one to ten years.

How do our results relate to the results of others? The tendency for immobility to increase with age up to the general retirement age is also present in another study using tax data for Sweden, Björklund (1992). That study shows very high immobility among people under 25 years and one should remember that they are not covered in our study. When relating annual income to income computed over almost four decades, Björklund (1992) finds a rather weak relationship between the two income variables for the youngest. However, for those over 35 this relation is fairly strong.

Compared to life-time income, our ten-year period can be expected to show more immobility. This is also the case when compared to Blomqvist (1980) who simulated life-time income for a cohort of employed males born around 1945. His

results showed the life-time Gini-coefficient to be 40 to 50 percent lower than for annual income. We observed a ten-year period for approximately the same cohort and found a reduction in inequality of about half the size (24 percent). However, our results show less immobility when compared to other studies using income variables separated by the same number of years. This is understandable since these authors restricted their samples. Fritzell (1993) whose study roughly covered the same period, restricted his sample to males born between 1924–43 and who were wage earners in 1973 as well as in 1981. Shorrocks (1980) restricted his sample for the U.S. from 1967–75 to those having positive income from labour for all the years studied.

How about variation in immobility between cohorts? We have used regression models to analyse the figures reported in Tables 3–5. The right-hand side variables are time, time squared, sex and initial age, alternatively cohort. Results of estimates for the first specification are shown in Table 6.

TABLE 6

IMMOBILITY FOR PERSONAL INCOME AMONG MALES AND FEMALES POLLED AS FUNCTION OF TIME, AGE AND SEX
($n=126$; $t$-statistics in parenthesis)

| Immobility Measure | The Correlation-Coefficient | Immobility Ratio | Shorrocks Index |
|---|---|---|---|
| Intercept | 0.842 | 0.813 | 0.993 |
| | (17.31) | (31.82) | (57.77) |
| Time | −0.083 | −0.094 | −0.072 |
| | (5.76) | (12.46) | (14.11) |
| $(\text{Time})^2$ | 0.0035 | 0.0048 | 0.0032 |
| | (3.02) | (7.78) | (7.70) |
| AGE | 0.0034 | 0.0016 | 0.0012 |
| | (4.95) | (4.30) | (4.74) |
| MALE | 0.0539 | 0.0279 | 0.0843 |
| | (3.94) | (3.87) | (17.38) |
| $R^2$ (adj) | 0.655 | 0.851 | 0.925 |

*Note*: Time defined as in Tables 3–5.

The structure of the results are the same for all immobility measures. Immobility decreases over time. However, the coefficients for the squared time variable are positive and have a high degree of significance. Immobility thus decreases over time at a decreasing pace. The age effect is positive. Male cohorts are found to have significantly higher immobility than female cohorts.

In order to further investigate the pattern of immobility we ran separate models for males and females and used dummies for cohorts instead of a single age variable (see Table 7). As expected from the previous estimates the effects of time are larger for females than for males, although the difference is small for the immobility ratio. It appears that the relation between age and immobility is somewhat complex. Most estimates indicate lower immobility among the younger cohorts.

The pattern of immobility is not identical for all three measures. This is most obvious for cohort 1918 males as well as females which aged from 53 to 62 years during the period of observation. According to the correlation coefficient and the

TABLE 7

IMMOBILITY FOR PERSONAL INCOME AMONG MALES AND FEMALES COHORTS AS FUNCTION OF TIME AND COHORT
(*t*-statistics in parenthesis)

| Immobility Measure | The Correlation-Coefficient | Immobility Ratio | Shorrocks Index |
|---|---|---|---|
| Males ($n=63$) | | | |
| Intercept | 1.084 | 0.815 | 1.071 |
| | (33.93) | (84.12) | (114.56) |
| TIME | −0.059 | −0.080 | −0.054 |
| | (5.38) | (24.10) | (17.09) |
| $(TIME)^2$ | 0.0024 | 0.0041 | 0.0024 |
| | (2.65) | (15.32) | (9.33) |
| Cohort 1913 | — | — | — |
| Cohort 1918 | −0.212 | 0.050 | −0.028 |
| | (10.86) | (8.45) | (4.96) |
| Cohort 1923 | −0.091 | 0.083 | 0.021 |
| | (4.64) | (14.07) | (3.68) |
| Cohort 1928 | 0.013 | 0.094 | 0.016 |
| | (0.66) | (15.83) | (2.88) |
| Cohort 1933 | −0.156 | 0.046 | −0.009 |
| | (7.97) | (7.76) | (1.58) |
| Cohort 1938 | −0.218 | 0.031 | −0.037 |
| | (11.18) | (5.28) | (6.44) |
| Cohort 1943 | −0.176 | −0.010 | −0.023 |
| | (9.01) | (1.71) | (3.95) |
| $R^2$ | 0.89 | 0.98 | 0.97 |
| Females ($n=63$) | | | |
| Intercept | 1.102 | 0.919 | 1.130 |
| | (38.70) | (61.79) | (118.01) |
| TIME | −0.100 | −0.105 | −0.086 |
| | (10.31) | (20.78) | (26.47) |
| $(TIME)^2$ | 0.005 | 0.005 | 0.004 |
| | (5.94) | (13.13) | (14.82) |
| Cohort 1913 | — | — | — |
| Cohort 1918 | −0.072 | 0.033 | −0.015 |
| | (4.14) | (3.60) | (2.53) |
| Cohort 1923 | 0.037 | 0.050 | −0.018 |
| | (2.13) | (5.53) | (3.08) |
| Cohort 1928 | −0.025 | 0.031 | −0.012 |
| | (1.43) | (3.43) | (2.00) |
| Cohort 1933 | −0.117 | 0.038 | 0.044 |
| | (6.76) | (4.22) | (7.58) |
| Cohort 1938 | −0.031 | −0.026 | −0.058 |
| | (1.77) | (2.81) | (9.90) |
| Cohort 1943 | −0.091 | −0.067 | −0.032 |
| | (5.26) | (7.38) | (5.42) |
| $R^2$ | 0.92 | 0.97 | 0.99 |

*Note*: Time as defined in Tables 3–5.

Shorroks index, immobility was lower than for several other cohorts. However, according to the immobility ratio immobility was relatively high. Thus it seems as if people approaching retirement are having rather stabile positions in the income distribution. However, at the same time the size of income seems to fluctuate considerably.

The results vindicate conclusions by Atkinson *et al.* (1988) drawn on earnings: Immobility is a decreasing function of the length of the period over which it is studied and an increasing function of initial age. However, our results give further insights. The pace by which immobility decreases over time is not constant but decreasing. Immobility does not seem to decrease continuously with age. Immobility is larger among males than among females. The choice of immobility measure seems to be quite important when studying cohorts approaching the general retirement age, but less critical when studying younger cohorts.

## 6. Immobility in Equivalent Disposable Income Per Person

An overall view of the distribution of economic well-being is given by studying equivalent disposable income per person. We are interested in the distribution defined over the entire population. Taken separately, the fact that a more heterogeneous population is observed than in the preceding section leads one to expect lesser immobility. However, we are also now considering a variable that incorporates effects of income taxes (and some additional transfers) which might increase recorded immobility. Differences in results compared to immobility for personal income can also be caused by the fact that in several families there are two wage earners.

The variable equivalent disposable income per person is obtained from data on disposable income and an equivalence scale.[3] Assuming disposable income in a family is equally shared, individuals are used at the unit of analysis. Data comes from the household income surveys of 1980 and 1981 in which we follow about 5,000 households. In this survey, information on personal income comes from tax returns. Figures for transfers not subject to income tax and income tax information is collected from various registers kept by public authorities. Equivalent disposable income among individuals is more equally distributed than the personal income for cohorts analyzed above. Based on the earlier applied definition of disposable income by Statistics Sweden, the Gini-coefficient was estimated to 0.212.[4]

TABLE 8

Mobility Matrix for Equivalent Disposable Income per Person 1980–81

| | | 1981 | | | | | |
|---|---|---|---|---|---|---|---|
| Quintile | | 1 | 2 | 3 | 4 | 5 | Sum |
| | 1 | 0.718 | 0.198 | 0.054 | 0.016 | 0.014 | 1.000 |
| | 2 | 0.199 | 0.562 | 0.195 | 0.028 | 0.017 | 1.001 |
| 1980 | 3 | 0.051 | 0.204 | 0.502 | 0.211 | 0.032 | 1.000 |
| | 4 | 0.015 | 0.027 | 0.212 | 0.591 | 0.155 | 1.000 |
| | 5 | 0.006 | 0.007 | 0.039 | 0.162 | 0.786 | 1.000 |

Results in the form of a mobility matrix are presented in Table 8. Only a small proportion of individuals move more than one quintile. The immobility

[3]The scale value for a family depends on number of adults, ages and number of children, and also on the family's location, see Gustafsson (1984).

[4]Using the new definition of disposable income and a marginally different equivalence scale the Gini-coefficient for 1980 was estimated to 0.199 by Gustafsson and Uusitalo (1990).

ratio is 63.2 percent which is lower than for personal income for two subsequent years for all cohorts (see Table 4). The Shorrocks index assumes a value of 0.948 which is somewhat lower than for personal income among all cohort males, but somewhat higher than for most cohorts females.

How do our results agree with those of others? Comparisons can be made with immobility over a longer period where mobility can be supposed to be larger. The Level of Living Survey at the Institute of Social Research, Stockholm has a design different from the Household Income Survey. In the first-mentioned study one can compare equivalent disposable income per person for the years 1973 and 1980. From this Fritzell (1990) found an immobility ratio for quintiles of 40.1 percent. This is also considerably lower than our results in Table 4 for personal income and the same number of years between the measures. Fritzell's results are remarkably close to the 39.8 reported by Duncan and Morgan (1973) for the U.S. between 1971 and 1978, that is the same number of years between the measures.

## 7. Intergenerational Immobility

Surprisingly little is known on intergenerational income immobility. The opinion that immobility is low by Becker and Tomes (1986) was based on a dozen studies. However, those results might be questioned for methodological reasons [Jenkins (1987), Solon (1989)]. Estimates are based on a single year's income for the child and the parent respectively. These might not be typical for lifetime earnings which might produce large biases. Samples are often not random. Recent attempts to take the above-mentioned aspects into consideration are made by Behrman and Taubman (1990), Solon (1992) and Zimmerman (1992). Common to those studies is that intergenerational immobility appears much larger than in earlier studies for the U.S.

Our sample was chosen in the middle of the 1950s to represent boys living in the capital city of Stockholm at that time and born during the period 1939 to 1946 [Jonsson and Kälvesten (1964), Gustafsson (1979)]. We have access to data on parental income in 1955 when the second generation was 9 to 16 years of age. For the second generation we have data on personal income for 1971 to 1980 defined and measured as in section 3 (although these cases are not a subset of the cohort data base).

There are two reasons why our estimates might be biased downwards as measures of the intergenerational immobility in permanent income for the whole of Sweden. Income for the first generation is observed during only one year. (However, this can be corrected for by using results reported in Section 5.) On top of this comes the fact that our sample is more homogeneous than the entire Swedish population, as all investigated were residing in Stockholm during the middle of the 1950s.

Of the original 222 respondents from 1955, 214 were alive and residing in Sweden in 1971. During the following years further attrition occurred. The fact that income of a father was not recorded (most often because no father was present) further reduced the sample. At maximum we could use 195 observations of income in both generations, and when it was required that income data was recorded for all years, the sample size dropped to 183 observations. Admittedly

this is a small sample, but it is not much smaller than samples used in recent U.S. studies [Solon (1992), Zimmerman (1992)].

According to the tax data, 65 percent of the second generation were living in the city of Stockholm in 1971 and the percentage fell to 53 during the period of observation. A considerable number of the second generation were found not very far from Stockholm. Only 15 percent in 1971 and 20 percent in 1980 resided outside the county of Stockholm (Stockholms län).

Comparisons to the national cohorts of approximately the same age (cohorts 1938 and 1943) show differences. Mean income as well as inequality are higher. The most notable difference is a much lower immobility in the sample. For example the correlation coefficient for two subsequent years is as low as 0.46 and expanding the accounting period from one to two years decreases inequality measured by the Gini-coefficient by 16 percent. Expanding the accounting period from one to ten years reduces the Gini-coefficient by as much as 54 percent while among cohort 1943 the reduction was only 24 percent.[5]

A number of analyses were made. Immobility ratios for quintiles were computed. In different regression models the relation between log income of the two generations was investigated. For example, in addition to taking the log of gross income as a dependent variable only the log of work income was used. In other specifications age variables were introduced among the right-hand side variables. Common to all results was a rather weak association between income for the two generations.

Table 9 summarizes the findings. The immobility ratios are all close to 0.20 which is what is expected if income of the two generations are independent. The regression models tell much the same story when income in the second generation is measured during one year only. In only two out of ten cases is a coefficient of the father's income found having a $t$-statistic larger than 2.

However, when summarizing income for the second generation over more years, the estimates show a higher degree of statistical significance. The coefficient is stable at 0.14 when more years of observation are included. Since income of fathers is observed for only one year, the estimated coefficient should be adjusted upwards. The adjustment factor is the ratio between the variance of annual income to the variance of permanent income. The results of Gini-coefficients estimated for one to respectively ten years of the 1970s (Section 5) suggests an adjustment-factors ranging from 1.2 to 1.4. Applying the lower alternative leads to a "true" coefficient of 0.17 while the higher alternative gives a "true" coefficient of 0.20.

Our result gains in credibility by comparison to the ones from another similar, independent study for Sweden by Björklund and Jäntti (1993). In their study, data comes from the entire country. The income of fathers and sons refers to approximately the same life-stages as in our study, although the two generations were observed approximately one decade later. Since the income of fathers in their data is predicted and not observed, their estimator is upward inconsistent. Their estimates cluster around 0.25, which is surprisingly similar to our adjusted one.

[5]Mean income, Gini-coefficients and immobility measured for the sample is reported in an Appendix available from the author.

TABLE 9

THE RELATION BETWEEN INCOME OF SONS AND FATHERS
(*t*-statistics in parenthesis)

| Log (Income of Sons) Year | Immobility Ratio (Number of Observations) | Regression model ($n=183$) | | |
|---|---|---|---|---|
| | | Intercept | Ln (Father Income) | $R^2$ |
| 1971 | 0.200 | 0.440 | 1.00 | 0.009 |
| | (195) | (0.06) | (1.27) | |
| 1972 | 0.205 | 8.558 | 0.16 | 0.000 |
| | (195) | (1.50) | (0.25) | |
| 1973 | 0.193 | 1.466 | 0.98 | 0.012 |
| | (192) | (0.26) | (1.50) | |
| 1974 | 0.195 | 1.950 | 1.01 | 0.034 |
| | (190) | (0.56) | (2.52) | |
| 1975 | 0.211 | 9.318 | 0.17 | 0.001 |
| | (190) | (2.62) | (0.42) | |
| 1976 | 0.221 | 6.092 | 0.56 | 0.003 |
| | (190) | (3.10) | (1.57) | |
| 1977 | 0.223 | 4.18 | 0.76 | 0.022 |
| | (188) | (1.30) | (2.11) | |
| 1978 | 0.222 | 5.786 | 0.56 | 0.008 |
| | (189) | (1.45) | (1.23) | |
| 1979 | 0.200 | 9.518 | 0.19 | 0.004 |
| | (190) | (5.01) | (0.88) | |
| 1980 | 0.266 | 10.226 | 0.11 | 0.009 |
| | (188) | (13.04) | (1.26) | |
| 1979–1980 | 0.250 | 10.785 | 0.14 | 0.019 |
| | (188) | (16.34) | (1.86) | |
| 1978–1980 | 0.242 | 11.175 | 0.14 | 0.022 |
| | (186) | (18.93) | (2.03) | |
| 1977–1980 | 0.265 | 11.445 | 0.14 | 0.023 |
| | (185) | (19.53) | (2.07) | |
| 1971–1980 | 0.190 | 12.318 | 0.14 | 0.024 |
| | (184) | (21.84) | (2.12) | |

The two independent estimates of immobility in lifelong income in Sweden indicates a much more mobile society than the U.S. where the intergenerational correlation is reported to be in the order of 0.4 [Solon (1992), Zimmerman (1992)] or over 0.5 [Behrman and Taubman (1990)]. Sweden also appears more mobile in comparison to England. Atkinson *et al.* (1983) reported results from a sample of males where the first generation and their income were observed in the town of York in 1950 and income of the second was observed during a few years in the middle of the 1970s. Using similar regression models for earnings as in Table 9, coefficients of about 0.4 were found.

## 8. CONCLUSION

In this paper we have studied income immobility in Sweden during the 1970s primarily using tax data. An advantage of the data is low attrition because adults can most often be traced successfully. A disadvantage is that recorded income might change when the tax code and its implementation changes. The data on cohort income showed increased real personal income each year under study for females, but decreased at the end of the period for males. Inequality measured

by the Gini-coefficient in cohort income decreased strongly during the period under study among females.

Immobility in personal income for seven cohort males and females was investigated using various measures of immobility. Most conclusions were robust regarding the immobility measure, but there was also an exception. The findings vindicate some main conclusions drawn by Atkinson *et al.* (1988) who surveyed earlier studies. Immobility was found to be a decreasing function of the length of the period over which it is studied and an increasing function of initial age. Some additional insights were also attained such as: 1. The pace by which immobility decreases over time is not constant but decreases. 2. Immobility does not seem to decrease continuously with age. 3. Immobility is larger among males than among females.

Using the Household Income Survey, immobility in equivalent disposable income per person was studied for a 2-year period. When the time period was expanded from one to two years, the Gini-coefficient decreased by 5 percent. Nevertheless, mobility between various positions in the distribution was found to be substantial. When making a matrix of quintiles, somewhat more than one-third of the individuals were found to be outside the main diagonal.

Inter-generational income mobility has not been studied much. We used a sample of males originally residing in the city of Stockholm during the mid-1950s when the income information for the first generation was gathered. Income information for the second generation refers to 1971–1980. When income for the second generation was measured for more than one year, a positive relation to the income of the first generation was found; however, the relation was rather weak. It appears that income immobility between generations in Sweden is considerably lower than in the U.S. and in England.

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