Income Inequality and Income Mobility in the Scandinavian Countries Compared to the United States [1]

Rolf Aaberge
Statistics Norway

Anders Björklund
Stockholm University

Markus Jäntti
Åbo Akademi University

Mårten Palme
Stockholm School of Economics

Peder J. Pedersen
Århus University

Nina Smith
Århus School of Business

Tom Wennemo
Statistics Norway

August 2002

Forthcoming in *Review of Income and Wealth*

[1]The authors thank two referees, Stephen P. Jenkins, Peter Gottschalk, Stephen E. Rhody and seminar participants at the University of Michigan, Syracuse University, Michigan State University, the University of Western Ontario and the European Association for Labour Economics for helpful comments. An earlier version was circulated as Discussion Paper no. 168 of Statistics Norway. This research was supported by the Nordic Council for Economic Research and in part by the Yrjö Jahnsson Foundation.

Corresponding author: Markus Jäntti, Åbo Akademi University, Department of Economics and Statistics, FIN 20500 Turku, Finland.

Abstract

This paper compares income inequality and income mobility in the Scandinavian countries and the United States during 1980-90. The results suggest that inequality is greater in the United States than in the Scandinavian countries and that this inequality ranking of countries remains unchanged when the accounting period of income is extended from one to eleven years. The pattern of mobility turns out to be remarkably similar, in the sense that the proportionate reduction in inequality from extending the accounting period of income is much the same. But we do find evidence of greater dispersion of first differences of relative earnings and income in the United States. Relative income changes are associated with changes in labor market and marital status in all four countries, but the magnitude of such changes are largest in the United States.

JEL Key Words: D31 Personal Income and Wealth Distribution

1 Introduction

International comparisons of income and earnings distributions suffered until fairly recently from a lack of sufficiently comparable cross-country data. Thanks to the efforts put into the Luxembourg Income Study (LIS), such comparisons have acquired much more credibility, because the researchers behind LIS have invested heavily in bridging gaps in comparability. Surveys using LIS data, such as Gottschalk and Smeeding (1997), find that the Nordic countries are among the countries with the lowest level of annual income inequality while the United States is among the countries with the highest. International comparisons of annual and hourly earnings inequality (see e.g. Freeman and Katz, 1995) are based on national data sets that have not been subject to the same kind of standardization as those in LIS, but yield similar results: the United States has high and the Nordic countries have low levels of inequality.

Many economists, however, question the appropriateness of examining the inequality of single-year incomes (and earnings) and would rather observe the inequality of permanent income. It has long been recognized that there could be high annual income inequality even if the inequality of permanent income is very low. The more individuals, or households, over time move up or down the income ladder, the more single-year inequality will deviate from the inequality of income measured over a longer period of time. If there are differences in income mobility across countries, single-year inequality rankings may yield a misleading picture of the long-term income inequality ranking. Therefore, it is interesting to study cross-country inequality rankings when the accounting period is extended.

There is not, however, complete agreement as to whether income mobility is good or bad (cf. Atkinson et al., 1992). Those who claim that income mobility is good have argued that it enhances both equity and efficiency, in that it provides economic incentives. Milton Friedman (1962) expressed this view in a passage in Capitalism and Freedom:

> A major problem in interpreting evidence on the distribution of income is the need to distinguish two basically different kinds of inequality; temporary, short-run differences in income, and differences in long-run income status. Consider two societies that have the same distribution of annual income. In one there is great mobility and change so that the position of particular families in the income hierarchy varies widely from year to year. In the other, there is great rigidity so that each family stays in the same position year after year. Clearly, in any meaningful sense, the second would be the more unequal society. The one kind of inequality is a sign of dynamic change, social mobility, equality of opportunity; the other of a status society. The confusion behind these two kinds of inequality is particularly important, precisely because competitive free-enterprise capitalism tends to substitute the one for the other.

This passage captures many of the arguments that have been raised in favor of income mobility. First, mobility is a sign of a dynamic and hence more flexible, or efficient, economy. Second, Friedman emphasizes that income mobility contributes to social mobility or equality of opportunity. No doubt, this is correct in the sense that the income history

of an individual will not be as important for the future income stream as it would otherwise be. Finally, high income mobility will, everything else being equal, make the distribution of lifetime income more equal. A counter argument is that lifetime income is not necessarily a complete measure of inequality. Income mobility often implies income instability for the individual and his/her household.[1] Further, if it is costly for the individual to transfer income from one period to another and with uncertainty about the future, the income received in a given period will also matter for the welfare of the individual. Amartya Sen concludes a discussion of the issue by saying that cross-section and lifetime inequality "supplement each other, reflecting two different aspects of it".[2]

For these reasons, it is important to compare income inequality across countries based also on longer time periods than one year and to compare also income mobility across countries. As the LIS has demonstrated, attaining comparability in a single year is a time-consuming and demanding task. Doing so for multi-year studies has only rarely been attempted.[3] Using longitudinal data sets from four countries – Denmark, Norway, Sweden and the United States – the present study explores the following questions:

1. What is the ordering of countries with respect to inequality of earnings and income, and does this ordering change when the accounting period is extended from one to several years?
2. What is the ordering of countries with respect to the mobility of earnings and income?
3. Which factors are associated with changes in relative income?

We study the mobility of individuals using three income concepts: individual earnings, family market income and family disposable income. Data are available for the 1980s. More complete data are available for the 1986–1990 period than for the longer time period, so separate analyses are made for the 1980-90 and for the years 1986 to 1990. To get some idea of what accounts for individual mobility, we explore the magnitude of changes in relative earnings (1980-90) and disposable income (1986-90) that are associated with shifts in labor market and marital status using regression techniques.

A comparison between these Scandinavian countries and the United States is, in our view, particularly relevant. Because previous studies of annual income (and earnings) inequality have placed the Scandinavian countries at the top in terms of equality and the United States at the bottom, evidence from these countries is ideal in order to determine whether there is a tradeoff between inequality of annual income and mobility. There are several reasons to believe that mobility in the Scandinavian countries differs from that in the United States. The macroeconomic background and the institutional settings differ between those four countries. Labor market trends and public policies regarding benefits and taxes influence the distribution of all three income concepts, both in any given cross-section and dynamically.

The unemployment experience of the four countries differed in many respects in the 1980s. Until the mid-1980s, unemployment rates high and followed similar time patterns in Denmark and the United States. Norway and Sweden

also had similar time patterns but low levels of unemployment. In the second period of our analysis, from 1986 to 1990, unemployment was increasing in Denmark and Norway but decreasing in Sweden and the United States. The distributional impact of unemployment depends on the dynamic structure of unemployment, on the importance of job tenure for earnings and on the coverage and replacement rates of income transfer schemes. Denmark stands out as the country having the highest level of long-term unemployment during the period. As job tenure effects are large in the United States (Topel, 1991), displaced workers will experience a significant reduction in post- compared to pre-unemployment wages. Job tenure effects are small in the Scandinavian countries (Westergård-Nielsen, 1996), so losses for displaced workers appeared more as the consequence of more unemployed people either leaving the labor force or being employed temporarily in labor market programs with a compensation lower than the pre-unemployment wage.

These observations may partly be explained by the much lower wage dispersion and the higher level of the minimum wage in the Scandinavian countries. This is reinforced by the much higher public sector share of employment in the Scandinavian countries, as the variance in the earnings distribution is smaller in the public than in the private sector, cf. Pedersen et al. (1990) and Zetterberg (1990). Thus, unemployment seems to induce some downward mobility in the income distribution, but since the earnings distribution is much more compressed in the Scandinavian countries, the effect is much smaller than in the United States.

Differences in the participation rate among married women are related to differences in the sectoral distribution of employment. Transition rates between employment and non-participation are lower for married women in the Scandinavian countries than in the United States OECD (1991). With married women predominantly working in the public sector – which is more resistant to cyclical shocks – the higher and more stable level of female participation in the Scandinavian countries tends to stabilize average market income per person in the household.

Finally, the impact from unemployment on disposable income is expected to differ between Scandinavia and the United States because of the differences in unemployment insurance and social welfare. The Scandinavian unemployment insurance systems are much more generous in terms of coverage, benefit duration and replacement rates. The risk of large income losses due to unemployment is small in the Scandinavian countries.

Gottschalk and Moffitt (1994) analyze a number of factors that might explain the increase in earnings instability found in recent U.S. studies. No single factor emerges as being the most important, but some of the factors they view as likely candidates for an explanation were present in the Scandinavian countries in the 1980s. This is the case with the decline in regulation, the disappearance (or decline in the extent) of administered prices and the general increase in competition. Another factor mentioned by them, the decline in unionization, clearly is irrelevant in the Scandinavian context.

The rest of the paper is structured as follows. We give in Section 2 precise definitions of income concepts, research

population and time periods. We also present the methods we use in Section 2. Section 3 contains the main results on inequality and mobility orderings as well as a number of sensitivity analyses. Section 4 presents our approach to exploring the correlates of income mobility. The main results are summarized and discussed in Section 5.

2 Data and methods

Data

There are a large number of specific choices to make in a study of this sort, in the making of which the need for similarity across countries has to be borne in mind. We must specify the time period(s) to cover, the relevant income receiving unit (individual, family or household) and the appropriate unit of analysis (individual, family or household, again). We must also decide on what income concepts to study, how to delimit and choose the populations to be researched, and, depending on what income and analysis units are chosen, we have to specify an (at least implicit) equivalence scale.

We study the distribution of: (1) earnings of those who had strictly positive earnings in every year; (2) the market income of individuals over the time period and (3) the disposable income of individuals. We define earnings, (1), as the individuals' earnings plus work-related transfers, such as unemployment insurance, sick pay and part-time pensions. The restriction to positive earnings is quite standard in the earnings mobility literature (see e.g. Gottschalk and Moffitt, 1994). For (2) and (3), the income receiving unit is the family but the unit of analysis is the individual. Market income consists of factor incomes. Disposable income is: market income – taxes paid + non-work-related social transfers excluding social assistance and income in-kind. The exclusion of certain transfers is data-driven. Because we use the same sample to analyze market income and disposable income, we can use the first-order incidence method to examine the impact of taxes and transfers on income inequality and mobility.

We assign the market (disposable) income per adult member to the individuals we study, rather than (conventional) equivalent income (defined over all members in the household). For a married couple, we divide the sum of each spouse's market (disposable) income by two and assign the resulting number to each spouse. We define the "family" to consist of the head and the spouse, if they are married, and of only the individual in all other cases. We ignore income from other household members, adults and children alike. This means that we also ignore the income of the partner in a co-habiting couple. This choice is dictated by the need for comparability across countries. We are not always able to find out the structure of the household an individual lives in. For some countries, for some years, we do not know the number of children in the household, nor do we know the number of other adults. We have, therefore, settled for the somewhat unconventional solution, described above. To examine the sensitivity of our results to this choice we conduct also a more conventional analysis for three countries.

Negative disposable or market incomes are censored at zero in each year.[4] The proportions of zero and negative incomes (available from the authors on request) vary somewhat from country to country and by income concept, but are at the very largest below 5 percent. All incomes are expressed in 1990 prices in each country's own currency, using the consumer price indices. Since it is income inequality, rather than the level of living we are comparing, we have not used any method for converting domestic currencies into comparable units.

The most important difference to some common practices in our income definitions is that we gross count capital income instead of subtracting interest paid on loans. The data sources in the Scandinavian countries dictate that we include all work-related social transfers, most importantly unemployment benefits, in earnings. Public sector transfers that are not work-related, but either universal or means-tested, are included in disposable income.

We study two (overlapping) samples in two time periods, namely 1980 to 1990 (Sample 1) and 1986 to 1990 (Sample 2). The main reason to end the sample period as early as 1990 is that a major tax reform took place in Sweden in 1991, which changed markedly the definitions of earnings and other income variables (see Björklund et al., 1995). The samples that we study are as follows. In the first period we study individuals born between 1927 and 1951 (Sample 1). The youngest sample members are 29 in 1980 and the oldest are 63 in 1990. In the second period, we include persons born between 1927 and 1961, which makes the age range 25 to 63 (Sample 2; which thus includes all those who are in Sample 1 and those born between 1952-1961). These choices are primarily to enable the study of the working-age population. Also, we want to use consistent age groups within each of the two time periods. For all samples we only include those who lived in the country during the whole period.

Detailed data descriptions

The Danish data are based on the Longitudinal Data Base (LDB), which is a 5 per cent random sample of the Danish adult population, covering the years 1976-1990. It has been supplemented with additional observations (mainly from young generations) during the years in order to keep it representative of the population. The information in the sample is register based and stems from tax and income registers, unemployment insurance registers, educational registers etc. administered by the Statistics Denmark. Thus, the sample does not suffer from the traditional types of sample attrition. The master sample is described in greater detail in Westergård-Nielsen (1985). We use data from two sub-samples of the LDB. The analysis of earnings uses a random 1 per cent sample of the Danish population. As the earnings data include only those individuals who had positive wage income or unemployment payments in each of the years, the 1 per cent sample reduces to 11,734 individuals in these calculations. The household sample stems from a 0.5 per cent random sample of the Danish population.

The annual **earnings** (*lønindkomst*) and the unemployment payments (*arbejdsløshedsdagpenge*) are defined as the amounts registered by the tax authorities. The registration of earnings is based on the employers' pay-rolls.

Unfortunately, for confidentiality reasons, all income variables have been censored at 200,000 DKK for the years 1980-1981. As a consequence, income inequality for these years are underestimated. The income as self-employed or assisting spouse is not included in the wage income concept. Thus, wage income is not equal to "labor income". In the Danish data it is not possible to separate out labor income earned working as self-employed or as assisting spouse.

Household **market income** (*bruttoindkomst*) includes wage income, capital income (positive or negative), income as self-employed or assisting spouse, unemployment insurance payments and taxable public transfers (public pensions, public grants for students etc.). **Disposable income** is calculated as the market income of the family, net of income taxes, but including some non-taxable transfers. Income taxes are calculated by applying the Danish tax rules for each of the years on the variable taxable income (*skattepligtig indkomst*) which is included in the LDB. The public transfers included in the disposable income concept are child allowances (*børnetilskud* + *børnefamilieydelse*) and housing subsidies to renters (*boligsikring*). Until 1986, child allowances were means-tested against household income. Child allowances have been flat rate since 1987 and depend only on the number and the age of the children.

For Norway we use data from Statistics Norway's Income Distribution Survey (IDS) and Tax Assessment Files (TAF). These representative data sources are based on filled in and approved tax reports. The IDS provides detailed information about reported incomes, legal deductions, taxes paid and transfer payments received. The TAF contains income from labor and taxes. Our analyses are based on data from 2,047 persons in the IDS and 621804 persons in the TAF. The TAF covers years beginning in 1967 and the IDS covers the years 1986-1990, corresponding to our long and short periods.

The Norwegian **earnings** variable is *lönnsinntekt* – wage and salary income. **Market income** adds self-employment income and capital income to earnings, *markedsinntekt = lönnsinntekt + netto näringsinntekt (för fradrag for avskrivningar og fondsavsetninger) + brutto kapitalinntekt (för fradrag for geldsrenter og underskud i borettslag)*. **Disposable income** adds to market income all social transfers and deducts direct taxes, *disponibel inntekt = markedsinntekt + overföringer (ytelser fra folketrygden + tjenestepensjon + livrenter o.l. + bidrag o.l. + barnetrygd + bostötte + stipendier + försörgerfradrag) - skatt*.

All Swedish data are taken from the Level of Living Surveys, a 0.1 percent representative sample of the population (see Erikson and Åberg, 1987). All income variables that we use originate from tax-based registers, not interviews. The exact definition of **earnings** is *inkomst av tjänst* – income from labor. This income concept consists of wage and salary income paid by the employer. In addition, taxable work-related income transfers, such as unemployment insurance and sickness payments are included, as well as part-time pensions and maternity leave payment. The income that self-employed get from their business is not included.

Market income adds to earnings other sources of income. These are: (1) capital, (2) own business, (3) real estate and (4) farm income. The Swedish income concept is *sammanräknad inkomst* – total income – with the exception

that we exclude capital gains (*Inkomst av tillfällig förvärvsverksamhet*) to achieve comparability with the other countries. **Disposable income** is obtained by adding the income (market income) of both spouses. From this total factor income we subtract income taxes and add the largest non-taxable transfers, namely child allowances. We are unable to include the non-taxable housing allowance (*bostadsbidrag*) or social assistance (*socialbidrag*), which are fairly small compared to the child allowances.

The U.S. data are taken from the Panel Study of Income Dynamics (PSID) (Morgan et al., 1992). The PSID is a panel of households that was started in 1968 and consisted at that time of about 5000 households. The most complete information in the PSID, and the information that we use, is about the household head and the spouse. All information in the PSID is collected by interviews, mostly by telephone. Validation studies have found the income data in the PSID to be of quite high quality (see e.g. Bound and Krueger, 1991).

The U.S. data differ in some respects from those available for the other countries. The income data are based on interviews and (especially non-random) measurement error is likely to be more of an issue. Also, the concept of disposable income is less complete. For instance, the PSID only has information on federal, not on local or state, income taxes. We only use information about the head and the spouse, i.e., income from other household members is ignored. In calculating the various statistics, we use sample weights, the use of which yields population level statistics.

The PSID has complete information on **earnings** for heads and wives. We use the variables total labor income for each spouse separately. Unfortunately, this includes the estimated labor part of business income. Wages and salaries, a variable free of such estimated numbers, is not available for the wife. The estimated part of business income is likely to increase measurement error and thus leads us to overestimate mobility of earnings in the United States.

We use the PSID variable "total taxable income" of head and wife as our **market income**. **Disposable income** is arrived at by adding non-taxable transfers, such as e.g. Aid to Families with Dependent Children, to market income and by subtracting taxes from this. Only federal taxes are subtracted. Local and state taxes, however, are quite small relative to federal.

Measurement of income inequality and income mobility

In general, income inequality is expected to decrease when the accounting period is extended. The extent of inequality decline depends on the frequency of shifts in relative positions within the annual income distributions as well as on the magnitude of changes in annual relative incomes. In order to reflect this relationship between income mobility and income inequality, measures of income mobility should depend on the magnitude of the changes in annual incomes arising from shifts in the individuals' position over time. Conventional measures of mobility are based on transitions between deciles or quintiles and lack this property. They are less appropriate measures of income mobility, because even minor changes in annual incomes may result in frequent shifts between deciles or quintiles, suggesting a high

degree of mobility.

Shorrocks (1978) introduced as an alternative to the transition matrix approach a family of mobility measures that incorporates the close relationship between income mobility and income inequality. Mobility is measured as the relative reduction in the weighted average of single-year inequality when the accounting period is extended. The state of "no mobility" is defined to occur when *relative incomes* are constant over time. We define "no mobility" to occur if the annual *rankings* of all individuals are constant over time. With this definition, there could be no mobility even if relative incomes change over time. The advantage of this definition, over that originally proposed by Shorrocks (1978), is that it allows for a measure of income mobility based on the Gini coefficient.[5]

Consider a period of T years and let G and μ be the Gini coefficient and the mean of the T-year distribution of income. Furthermore, let G_t and μ_t be the Gini coefficient and the mean of the distribution of income in year t. To arrive at a measure of mobility, it appears useful to introduce the "natural" decomposition of the Gini coefficient (see Rao, 1969), from which the following inequality can be easily derived:

$$G \leq \sum_{t=1}^{T} \frac{\mu_t}{\mu} G_t, \tag{1}$$

with strict equality if and only if all individuals maintain their position within the distribution of annual income in all years. The T-year inequality is strictly less than the weighted average of the inequality within the separate years unless no individual position shifts take place (i.e., complete immobility). Thus, when individuals do change their annual rank positions, equation 1 suggests that M, defined by

$$M = 1 - \frac{G}{\sum_{t=1}^{T} \frac{\mu_t}{\mu} G_t}, \tag{2}$$

is an appropriate measure of mobility. M takes its minimum value zero if and only if there is no mobility. The maximum attainable value of one occurs when complete equality in the distribution of the T-year incomes arises from income mobility. The mobility index M provides guidance to the second of our questions, namely what is the ordering of countries with respect to income mobility.

Of course, this mobility index is analogous to the Shorrocks mobility indices. However, if income rankings are constant over, say, s consecutive years, but the relative incomes of some units change over time, the Gini-based index (2) registers no mobility, whereas the Shorrocks measures suggest income mobility has taken place.

The Shorrocks approach has previously been used by e.g., Björklund (1993) who used the coefficient of variation to define a measure of income mobility, while Aaberge and Wennemo (1993) and Gustafsson (1994) used the Gini coefficient as basis for measuring income mobility. Burkhauser and Poupore (1997) used both the Gini and the Theil index of inequality.

3 Income inequality and mobility

We start the presentation of our results by looking at inequality of annual incomes. Figure 1(a) shows the time-series of our Gini coefficient for earnings for Sample 1, Figure 1(c) the same information for market income, and Figure 1(e) the same information for disposable income (these data are also shown in Table A 9). Further, the time-series of inequality for earnings, market income and disposable income for Sample 2 are shown in Figure 1(b), 1(d) and 1(f) (see also Table A 10).

[Figure 1 about here.]

In both samples and with all three income concepts, the United States has much higher inequality than the Scandinavian countries. For earnings, the difference in the Ginis between United States and the Scandinavian countries exceeded 0.1 during the years 1980–1990 (Figure 1(a)). The differences are of comparable orders of magnitude for disposable income and market income.[6] There is also a marked trend in inequality of all income concepts.[7] Both of these findings are in line with earlier research and lend credibility to our choices of populations and income concepts; e.g., the discrepancy between the United States on one hand and Sweden and Norway on the other has been found in analyses of the LIS data (see e.g. Gottschalk and Smeeding, 1997). That inequality increased substantially in the United States throughout the 1980s is well established.

The differences between the Scandinavian countries are small compared to the differences between these countries and the United States. The largest inter-Scandinavian differences are found for market income in the last two years of Sample 2 when the differences between Sweden and Norway are .07. For no other income concept or sample does the difference exceed .05.

[Table 1 about here.]

By comparing the inequality of market and disposable income, we also get an estimate of the equalizing effect of taxes and child allowances, albeit under the assumption of no behavioral responses. Our results indicate that taxes and transfers in Norway and the United States lead to the by-far greatest reduction in inequality. The difference between the Gini coefficient of market and disposable income clusters around .07 for Norway and the United States in Sample 2. The difference in Sweden is around .04, whereas in Denmark the differences are smaller.[8] It should be be kept in mind, though, that a larger number of transfers are included in disposable income in Norway and in the United States than in the other two countries. Moreover, the U.S. transfers are in general means-tested and are therefore strongly redistributive as measured by the first-order incidence method.

[Table 2 about here.]

We continue with comparing single-year inequality with multi-year inequality, our Question 1. Panel A of Table 1 contains the numbers for Sample 1 and Panel B those for Sample 2. For Sample 1 the results are quite clear; inequality is highest in the United States for all income concepts and the differences against the Scandinavian countries are fairly large. There is, however, a slight tendency for the differences to be smaller when incomes are averaged over several years than in single-year inequality comparisons. For example, the difference in the Gini coefficients between the United States and Denmark of the eleven year average of disposable income is .10, but around .12 for annual disposable income. The differences between the Scandinavian countries are relatively small and their ordering depends on the income concept. The pattern for Sample 2 is similar in the sense that inequality is higher for the United States than for the Scandinavian countries.

An interesting finding is that the equalizing impacts of taxes and transfers, in the mechanical sense used above, are of similar magnitudes when the time period is extended from 1 to 5 or 11 years. This means that extending the accounting period does not deprive the "welfare state" of its equalizing effect.

Finally, we turn to the comparison of income mobility, our Question 2. The numbers in Panel A of Table 2 for the 1980–90 period suggest that mobility of earnings is lower in the United States than in the Scandinavian countries. By contrast, mobility of market and disposable income is higher in the United States than in Denmark. However, mobility in the distribution of market and disposable income in Sweden is higher than in the United States. Turning to Panel B of Table 2, we can see that the mobility indices, as expected, are lower for the 1986–90 period. The ordering of countries with respect to earnings mobility is different in this period, but the cross-country differences are very small.

It should noted that mobility ordering by market and disposable income is consistent across the two periods, in the sense that no ordering of countries in the 1980-90 analysis is changed in the 1986-90 period. E.g., Sweden is more mobile on market and disposable income than the United States, which in turn is more mobile on market and disposable income than Denmark. The estimated mobility indices for Sample 2 suggest that the United States has less mobility than Sweden and Norway, followed only by Denmark.

We are somewhat surprised to see that mobility in the distribution of disposable income is higher than in that of market income for all countries, except the United States, in both samples. We had expected that the "welfare state" in terms of taxes and transfers would smooth income over longer periods and thus reduce mobility even more for disposable income than for market income. In the light of these results, this does not appear to be the case. To understand this particular aspect of our results requires further study. One possible reason could be that we do not adjust incomes to reflect changes in, e.g., the number of children living in the household, a possibility we examine in our sensitivity analysis.

Sensitivity analyses

There is always a risk in a study of this type that the conclusions are sensitive to some specific choices. We have chosen to study whether the following issues, if handled differently, would lead us to draw different conclusions:

1. whether restricting the sample to only men, rather than both men and women would alter the pattern of earnings inequality and mobility;
2. whether the restriction to only treat married couples as families (and hence aggregate their income), rather than to similarly treat cohabiting couples, in combination with not using a traditional equivalence scale affects our results;
3. whether the inequality and mobility rankings of the United States is sensitive to the inclusion of racial minorities;
4. whether the treatment of unemployment benefits as part of earnings influences the extent of earnings inequality and mobility in the United States.

We deal with each of these questions in turn.

[Table 3 about here.]

There are larger inter-country differences in the patterns of female than in male labor force participation. These differences affect both inequality and mobility. Instead of attempting to control for different sources of mobility, we compare the mobility of male earnings in the four countries. This comparison is likely to be less sensitive to the interaction of inter-country differences in male and female labor markets, work-related public policies and our sample selection criteria.

In Table 3, we show the inequality and mobility indices of earnings estimated only for males. The ranking of countries by earnings inequality is similar to that found for the sample of all positive earners, except that the earnings of men are slightly more equal in Norway than in Sweden. The ordering of countries with respect to mobility is perhaps more interesting. It turns out that the mobility of male earnings in the United States is less than in Denmark and Norway in both time periods, while Sweden turns out to have slightly lower earnings mobility than the United States.

[Table 4 about here.]

We were surprised by the fact that the mobility of both market and disposable income were so high in the Scandinavian countries. One possible explanation could be that cohabitation without formal marriage is fairly common in the Scandinavian countries. Our choice to restrict the pooling of husband's and wife's income to legally married couples

and treat two cohabiting persons as forming two families would tend to overstate income inequality and mobility.[9] Also, our choice to assign one half of the market and disposable income of a couple to each spouse departs from conventional analyses, where equivalent income is defined in terms of the whole family.

In order to address these issues, we show in Table 4 for three of our countries – Norway, Sweden and the United States – long-run income inequality and mobility indices obtained when treating cohabiters as being married and dividing the family income variables by the square root of family size – a commonly used equivalence scale. The inequality of long-run income is always higher when we equivalize using the square root scale and treat cohabiters as married couples. The differences are substantial. For instance, in the 1980-1990 sample in the U.S. the long-run Gini was .334 compared to .305 in our main analysis (see Table 1). However, the ordering of countries is not affected by this change in methods. The mobility indices are estimated to be lower than in the main analysis (with the exception of Norway 1986–1990). However, the mobility ordering of countries is unaffected by this sensitivity check. Thus, cross-national differences in the prevalence of marriage and cohabiting and the choice of equivalence scale do not lead us to revise our main results.

[Table 5 about here.]

It is also possible that the results for the United States are driven by differences in population composition. In particular, the U.S. population is more heterogeneous than the populations of the Scandinavian countries, and racial minorities in the United States are economically disadvantaged. This heterogeneity may account for the observed higher inequality and lower mobility in the United States, but is difficult to control for.[10] However, we can examine whether the exclusion of racial minorities would alter our results. Specifically, we include in this sensitivity analysis only those individuals who in every sample year lived in a household with a white head.

The results in Table 5 do not lend much support to the thesis that our results are driven by the inclusion of racial minorities. The inequality of all income variables is somewhat lower in both time periods than for the main analysis, but the differences are at most around .015. Inequality of all income variables in the United States is well above that in the Scandinavian countries. Income mobility among whites is slightly larger than for the whole population. The differences are small and in only one case, that of earnings in 1986–1990, is the ranking of the United States changed.

Recall that data sources in the Scandinavian countries do not allow us to separate unemployment benefits from earnings. The PSID does not record unemployment benefits as a separate variable for the spouse before 1985, at which point we do include it (it is included for the head throughout the sample period). Our U.S. earnings data differ in this respect from both what is customary in U.S. studies (which do not include unemployment benefits in earnings) and how we have defined earnings in the Scandinavian countries (which do include unemployment benefits in earnings). This naturally raises some questions about the sensitivity of the inequality and mobility of earnings in the United States.

We examine this issue by defining two earnings variables for the U.S. data, one which includes unemployment benefits and one which does not. Further, we estimate the inequality and mobility indices for both of these variables for the sample as defined "normally", i.e., including both men and women, and for the sample consisting solely of men. The results for annual inequality are shown in Figure 2 and for mobility and inequality of average income in Table 6.

[Figure 2 about here.]

Looking at Figure 2, we see that the inclusion of unemployment benefits has a negligible effect on the magnitude of earnings inequality in the United States. The series which include and exclude unemployment benefits appear to be closely related. This does not preclude that the inequality of average income and/or mobility would be affected by the discrepancy in the definition of earnings. As Table 6 shows, however, the sample definition matters much more than the treatment of unemployment benefits. The differences in the Gini coefficients of average income are in the third decimal and are small, and the differences in the mobility indices are negligible. Mobility, as measured by the Gini mobility index, appears to be lower for men than for men and women combined.

[Table 6 about here.]

Interpreting mobility indices

Interpreting the magnitudes of the estimated mobility, or inequality, indices is not easy. Are the differences between annual and long-run inequality indices small or large? To form some idea of what a particular level of mobility leads to, we compare inequality in the observed distribution with a hypothetical distribution that has no mobility but has the same level of inequality in each year. In order to keep this illustration of the effects of mobility brief and as the mobility estimates from different countries were fairly similar, we only present results on earnings over the period 1980–1990 in Norway.

Recall that by definition, there is no mobility if the annual rank ordering of each individual in the income distribution remains the same throughout the time period. Based on the actual Norwegian earnings distributions from 1980–1990, we construct the set of immobile distributions by assigning the lowest earnings in every year to the "poorest" individual (measured in terms of long-run earnings), the second lowest to the second "poorest", and so on. This procedure keeps the *distributions* of annual income unchanged, but it attaches the observed annual incomes to different individuals. Aggregating these hypothetical distributions over time leads to a distribution of over-time average income that is different from what is observed. By comparing the observed and hypothetical distribution of over-time average income we get an idea of the economic significance of the magnitude of estimated mobility.

We simplify the comparison by looking at the mean income of every income decile group in the two distributions. The hypothetical distribution of annual earnings over the 1980–1990 period is displayed in Table 7. The comparison of the observed and the hypothetical distribution of average annual earnings demonstrates that observed mobility in Norway during the 1980–1990 period had a substantial effect on the bottom decile but a modest effect on the remaining deciles. Compared to the hypothetical immobile distribution, the bottom decile gained 38 percent and the second decile gained almost 8 percent. The top decile lost 3.3 percent and the ninth decile 1.4 percent. The remaining deciles lost less than one percent. The Gini coefficient of the immobile hypothetical distribution was 7 percent higher than that of the observed distribution.

[Table 7 about here.]

Thus, when the mobility index takes values around or below 0.1, which is the case in our study, we tentatively conclude that income mobility among the adult population is quite low and has only modest effects on the overall distribution of income. However, income mobility can have large results at the tails of the distribution, in particular at the bottom. Rank changes at the bottom end of the distribution had a substantial impact on the mean income of the lowest decile group, suggesting that income mobility may be greater at the bottom of the distribution than elsewhere.

4 Relative income changes – micro level analyses

To better understand why countries with very different levels of inequality have such similar levels of inequality-reducing mobility, we take a closer look at the micro-level income changes in each country. In the above analysis, income rank changes equalize the multi-year distribution of income relative to that of annual income. The fact that the country differences in multi-year income inequality were only slightly less than in single-year inequality suggests that rank changes are not much more common in the United States. As U.S. income differences are greater, the changes in incomes for a given rank may be quite large. We therefore examine in this section changes in relative income within countries.

In order to keep things tractable, we examine two income definitions in two periods, namely *earnings* in 1980–90 and *disposable income* in 1986–90. In this analysis, we include unemployment benefits in earnings for all countries. We define a variable that measures the change in relative income for each individual between year $t-1$ and t, defined as

$$d_{i;t-1,t} = \frac{y_{i,t}}{y_t} - \frac{y_{i,t-1}}{y_{t-1}}, \quad i = 1, \ldots, n, \tag{3}$$

where $y_t = \sum_i y_{i,t}/n$ is average income in year t. Thus, the average of d equals by definition zero. The distribution of d, however, can and does vary between years and countries.

We summarize for each country the distribution by the 25th, 50th and 75th percentile of d in each year. The distribution of changes in relative earnings are shown to the left and that of disposable income to the right in Figure 3). Displaying individual income mobility in this way reveals some differences between the countries. The 25th percentile of the change in relative earnings is slightly lower and the 50th percentile a little higher in the United States than in Denmark and Sweden. The 75th percentile is clearly higher, suggesting the distribution of d is wider in the United States and that it has a fatter right-hand tail. The same pattern is present for the change in relative disposable income between 1986 and 1990.

[Figure 3 about here.]

To gain insight into the kind of states and events that are associated with changes in an individual's relative income, we estimate regression equations of the form:

$$d_{i;t-1,t} = \beta_0 + \beta_1 \text{age}_{it} + \beta_2 \text{age}_{it}^2 + Z_{i;t-1,t}\delta + u_i + \varepsilon_{i;t-1,t}, \tag{4}$$

where, in addition to controls for age and its square, the covariates $Z_{i;t-1,t}$ are indicators representing changes of marital status (married at $t-1$ and not married at t, not married $t-1$ and married at t, not married $t-1$ and not married at t) and analogously changes of employment state (employed or not employed).[11] Further, the individual specific constant u, which we treat as a random effect, captures the inter-temporal covariance of relative earnings or disposable income.[12] The regression coefficients δ have a simple interpretation in all countries, in that they measure the average change in relative income that is associated with the change in the status of an individual, such as divorce (married in $t-1$ to not married in t).

We estimate the parameters in equation 4 using the Generalized Estimating Equations [GEE] approach, a longitudinal extension of GLIM (Zeger and Liang, 1986). The GEE estimates are robust to misspecifications of the inter-temporal covariance structure of the errors. The purpose of the present exercise is to gain insight in what covariates are associated with large or small changes in relative income. While it is possible that a fixed-effect formulation would be useful, doing so would throw away information of this descriptive nature. It would, for instance, not be possible to compare the average changes in relative income between, say, those who are employed in both years with those who are unemployed in both years if a fixed effects formulation were to be used. Further, these processes may be very different for men and women, so rather than controlling for gender, we estimate separate regressions.[13] The results for earnings in 1980-1990 were quite similar to those we obtained for disposable income in 1986-1990. As Norway can only be included in the latter case, we present in Table 8 results for disposable income only.[14]

[Table 8 about here.]

Turning to the estimation results, we see that becoming unemployed is associated with negative relative income changes for males. The magnitude of this change is by far the largest for the U.S. For Norway and Sweden, the coefficient is insignificant. Ceasing to be unemployed is associated with an increase in income in Denmark and the U.S. Remaining out of employment is associated with an income decline in Denmark and little change in the others. Divorce is for U.S. males associated with little change in income, while marrying and remaining single are associated with declines. Divorce is associated with fairly large increases in the relative incomes of Norwegian and Swedish men while marrying is associated with large declines. In Denmark, effects are small and mostly insignificant, although marrying is associated with income increases.

Employment changes are for U.S. women associated with similar but smaller changes than for men. In Denmark, Norway and Sweden, changes in labor market status are for women associated with few significant changes in relative income. The marital status indicators are small and insignificant for Denmark. Divorce is associated with an income decline in Norway but an increase in the U.S. Marrying is, on the other hand, associated with increases in relative income in Norway and Sweden but with a decline in the U.S. There is little difference in changes in relative incomes between those who remain married and those who remain unmarried. Denmark is, again, an exception to this, although the coefficients are small (remaining married is positive for men but negative for women). In interpreting these results, however, we need to keep in mind that children are here treated as being costless. Including the costs of children would likely lead to quite different assessments of the costs of divorce. A detailed examination of this issue is, however, beyond the scope of the present paper.

Our regression analysis of changes in relative disposable income resembles the ones for the United States in Duncan and Morgan (1981) and for Sweden in Fritzell (1990). Duncan and Morgan regressed the annual growth rate from 1971 to 1978 of needs-adjusted family income on, *inter alia*, family and labor market events. Fritzell regressed the annual growth rate from 1973 to 1980 in needs-adjusted family income on similar events.[15] However, because Duncan and Morgan also included some attitudinal variables, the results are not comparable between the countries.

Our results for the United States are the same as in Duncan and Morgan regarding labor market events, but deviate somewhat regarding family events. Fritzell obtained stronger effects for labor market events than we do, and his results for family events deviate from ours. We note, though, that these two studies used information on the numbers of children to adjust for the needs of the family.

5 Discussion and concluding comments

Our results can be summarized briefly. Firstly, we find that the ordering of countries by inequality of annual income by and large remains unchanged when the accounting period is extended up to 11 years (1980-1990). United States

is by far the most unequal country even for this longer period. Secondly, no unequivocal ordering arises from the comparisons of income mobility between countries. For the shorter period (1986 to 1990), the United States comes third in the mobility ordering for both market and disposable income. In the longer period (Sample 1), the United States has higher mobility for earnings. Sweden seems to have the highest mobility when it comes to market and disposable income. Thirdly, changes in labor force and marital status are associated with substantially larger changes in relative income in the U.S. than in the Scandinavian countries.

It appears that in all the countries we study, there is quite little income mobility as measured by the reduction in inequality on extending the accounting period. This suggests that a lengthening of the accounting period of income will only have minor effects on inter-country differences in income inequality. The differences that arise within countries of lengthening the accounting period are modest compared to the magnitude of inter-country differences. The result that the United States, despite high cross-sectional inequality is not the country with the highest level of such income mobility is similar to the findings of Burkhauser and Poupore (1997) and Burkhauser et al. (1998). These conclude, using methods that are slightly different from ours, that Germany and the United States have "remarkably similar" mobility patterns over the period 1983 to 1988. This conclusion holds for both earnings and measures that are closer to disposable income. Further, in comparing mobility of family-size adjusted disposable income between Sweden and the United States, Fritzell (1990) found a remarkable similarity among between the two countries. He studied mobility in Sweden using mobility tables from 1973 to 1980 and compared his results with those obtained by Duncan and Morgan (1981) for the U.S: from 1971 to 1978. OECD (1996) compares earnings inequality and mobility in a larger set of countries. They find quite different results depending on what definition and measure of mobility is used. No unambiguous ordering arises from that study, either.

In order to gain insights into the mechanisms that underlie income mobility, we examined the distribution of first differences in earnings and disposable income relative to their annual averages. The distribution of these changes in relative earnings and income turn out to be more dispersed in the United States, implying greater changes in relative income from year to year than in the Scandinavian countries. Our approach to modeling the changes in relative income suggests that changes in unemployment and marital status are in the United States associated with fairly large changes in relative earnings and income. Changes in labor force status lead to similar but smaller shifts in relative income in the Scandinavian countries. The pattern of income shifts associated with changes in marital status is more variable, although such shifts are again largest in the United States. The framework we use is quite simple and should be thought of as indicative. Clearly, much can be learned from further modeling of the income process.

Our inquiry has also highlighted the data problems involved in comparative research like this. We regard improvements of the basic sources of income data as an important task for future work. The treatment of capital income should be improved and there is a need to obtain better data on other household members and their incomes. We are

also concerned about household definitions. In the Scandinavian countries, it has become increasingly common to live together without being married, or marry after a long period of non-marital cohabitation. Potentially, this might create spurious income mobility in our data. However, our sensitivity test suggests that this is not a major source of cross-country differences in mobility.

Another data quality issue is whether our comparisons are flawed by the fact that the Scandinavian income data stem from administrative records, primarily tax registers, whereas the U.S. data stem from interviews. If random measurement error is greater in the U.S. data than in the data from the Scandinavian countries, this would inflate the estimated income mobility in the United States compared to the Scandinavian countries. One possibility that we have not pursued would be to impose some model of measurement error on the Scandinavian data. The findings from the PSID validation studies (e.g. Bound and Krueger, 1991) could be used for such a purpose.

Another important goal for future research is to further examine the sources and causes of income mobility. To what extent is mobility explained by job displacements due to structural changes in the economy? To what extent do earnings vary over time because of variations in labor supply over the life-cycle? Studies that address these types of questions can help us decide what income mobility is "good" and what is "bad".

We should emphasize, however, what we believe is an important finding. High levels of income inequality are widely thought to reflect a high degree of income mobility and to thus be a sign of a dynamic economy. When we measure mobility in terms of inequality-reducing rank changes (the Shorrocks approach using the Gini index), we find no evidence of a *positive* relationship between inequality and mobility. This lack of a pattern is in itself an important result.

Mobility as measured by annual changes in relative income appears more widely dispersed in the United States. Extending the accounting period this greater mobility does not, however, bring about a greater proportionate reduction in annual inequality than in the Scandinavian countries. Understanding the mechanisms that link these two findings is an interesting challenge for future research.

References

Aaberge, Rolf and Tom Wennemo, Inntektsulikhet og inntektsmobilitet i Norge 1986–1990, Sociale og økonomiske studier 82, Statistisk Sentralbyrå, Oslo, 1993.

Atkinson, Anthony B, François Bourguignon, and Christian Morrisson, Empirical Studies of Earnings Mobility, Fundamentals in Pure and Applied Economics, Harwood Academic Publisher, Chur, 1992.

Björklund, Anders, "A Comparison Between Actual Distributions of Annual and Lifetime Income," Review of Income and Wealth, 39, 377–386, 1993.

Björklund, Anders and Richard Freeman, "Generating equality and eliminating poverty, the Swedish way," in Richard Freeman, ed., Welfare State in Transition, Chicago University Press, Chicago, 1997.

Björklund, Anders, Mårten Palme, and Ingemar Svensson, "Tax Reforms and Income Distribution: An Assessment Using Different Income Concepts," Swedish Economic Policy Review, 2, 229–265, 1995.

Bound, John and Alan B Krueger, "The Extent of Measurement Error in Longitudinal Earnings Data: Do Two Wrongs Make a Right?" Journal of Labor Economics, 9, 1–24, 1991.

Burkhauser, Richard and John G Poupore, "A Cross-National Comparison of Permanent Inequality in the United States and Germany," Review of Economics and Statistics, 79, 10–17, 1997.

Burkhauser, Richard V, Douglas Holtz-Eakin, and Stephen E Rhody, "Mobility and inequality in the 1980s: A cross-national comparison of the United States and Germany," in Stephen P Jenkins, Arie Kapteyn, and Bernard van Praag, eds., The distribution of welfare and household production, chapter 6, 111–175, Cambridge University Press, Cambridge, 1998.

Duncan, Greg J and James N Morgan, "Persistance and change in economic status and the role of changing family composition," in Martha S Hill, D H Hill, and James N Morgan, eds., Five Thousand American Families: Patterns of Economic Progress, volume 9, 1–44, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1981.

Economic Report of the President 1991, U.S. Government Printing Office, Washington, D.C., 1991.

Erikson, Robert and Rune Åberg, Welfare in Transition, Clarendon Press, Oxford, 1987.

Freeman, Richard and Lawrence Katz, eds., Differences and Changes in Wage Structures, Chicago University Press, Chicago, 1995.

Friedman, Milton, Capitalism and Freedom, Chicago University Press, Chicago, 1962.

Fritzell, Johan, "The dynamics of income distribution: economic mobility in Sweden in comparison with the United States," Social Science Research, 17–46, 1990.

Gardiner, Karen and John Hills, "Policy Implications of New Data on Income Mobility," Ecnonomic Journal, 109, 91–111, 1999.

Gottschalk, Peter and Robert Moffitt, "The Growth of Earnings Instability in the U.S. Labor Market," Brookings Papers on Economic Activity, 1994, 217–272, 1994.

Gottschalk, Peter and Timothy M Smeeding, "Cross-National Comparisons of Earnings and Income Inequality," Journal of Economic Literature, 32, 633–686, 1997.

Gustafsson, Björn, "The degree and pattern of income immobility in Sweden," The Review of Income and Wealth, 40, 67–86, 1994.

Krelle, Wilhelm and Anthony Shorrocks, eds., Personal Income Distribution, North-Holland, Amsterdam, 1978.

Morgan, James N., Greg J. Duncan, Martha S. Hill, and James Lepkowski, PANEL STUDY OF INCOME DYNAMICS, 1968-1989 [WAVES I-XXII], Survey Research Center, Ann Arbor, MI, 1992.

OECD, Employment Outlook, OECD, Paris, 1991.

—, "Earnings inequality, lowpaid employment and earnings mobility," in Employment Outlook, chapter 3, 59–99, OECD, Paris, 1996.

Pedersen, Peder J, J Beyer Schmidt-Sörensen, Nina Smith, and Niels Westergård-Nielsen, "Wage Differentials between the Public and the Private Sector," Journal of Public Economics, 41, 125–145, 1990.

Rao, V M, "Two decompositions of the concentration ratio," Journal of the Royal Statistical Society, Series A, 132, 418–425, 1969.

Sen, Amartya K, "Informational bases of alternative welfare approaches," Journal of Public Economics, 3, 387–403, 1974.

Shorrocks, Anthony, "Income inequality and income mobility," Journal of Economic Theory, 19, 376–393, 1978.

Topel, Robert, "Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority," Journal of Political Economy, 99, 145–176, 1991.

Westergård-Nielsen, Niels, “A Danish longitudinal database,” in G R Neumann and Nils Westergård-Nielsen, eds., Studies in labor market dynamics, Springer-Verlag, 1985.

Westergård-Nielsen, Niels, ed., Wage Differentials in the Nordic Countries, North-Holland, Amsterdam, 1996.

Yaari, Menahem, “A controversial proposal concerning inequality measurement,” Journal of Economic Theory, 44, 381–397, 1988.

Zeger, Scott L and Kung-Yee Liang, “Longitudinal Data analysis for discrete and continuous outcomes,” Biometrics, 42, 121–130, 1986.

Zetterberg, Johnny, Wage Growth and Mobility Between Private and Public Sectors in Sweden, Ph.D. thesis, Uppsala University, 1990.

Appendix

[Table 9 about here.]

[Table 10 about here.]

Notes

[1]Gardiner and Hills (1999) define different types of income trajectories using the first four waves of the British Household Panel. “Instable” trajectories account for at least 40–60 percent (depending on definition) of all cases.

[2]See his contribution to the stimulating discussion of the issue in Krelle and Shorrocks (1978).

[3]Fritzell (1990), Burkhauser and Poupore (1997), Burkhauser et al. (1998) and OECD (1996) are examples of cross-national longitudinal income distribution comparisons. We discuss their findings in the concluding section of this paper.

[4]Incomes are first added up in the family and then censored at zero if they are negative.

[5]See e.g. Sen (1974) and Yaari (1988) for a normative justification of using the Gini coefficient as a measure of income inequality.

[6]In judging whether these differences are “small” or “large”, the reader can use the property that the Gini coefficient equals half the expected income difference relative to the mean between two randomly drawn individuals in the population.

[7]In looking at the trend in earnings inequality in the United States, it should be recalled that our sample is different from commonly used samples. In particular, our sample differs from those in many other studies because we include both men and women (most study men and women separately) and we restrict the analysis to a balanced panel of those who had positive earnings in *every* sample year (rather than an unbalanced panel or series of cross-section).

[8]The differences we estimate for Sweden are only about one half as large as those estimated by Björklund et al. (1995). The most likely reason for this discrepancy is that they take the number of children into account when calculating equivalent income. In particular, the equalizing effect of child allowances is larger in doing so.

[9]Mobility would be higher both because transitory income shocks, if imperfectly correlated within couples, would tend to be smaller relative to permanent components of income and in as far as cohabiting couples marry during the observation period.

[10]See, however, Björklund and Freeman (1997) for an attempt to do that. In particular, the authors compared earnings inequality of Swedish males living in Sweden with that of U.S. males who in the Census report having Swedish ancestry. U.S. males of Swedish ancestry have more or less the same degree of inequality as other U.S. males. The authors conclude that population heterogeneity is unlikely to account for much of the difference in earnings inequality between the two countries.

[11]Marital status is defined as in the data in the previous sections. Employment status is in the Nordic countries defined by whether or not the individual has received unemployment benefits. In the United States, we use the survey answer on employment status. Thus, our definitions are slightly different and our results should be viewed with some caution.

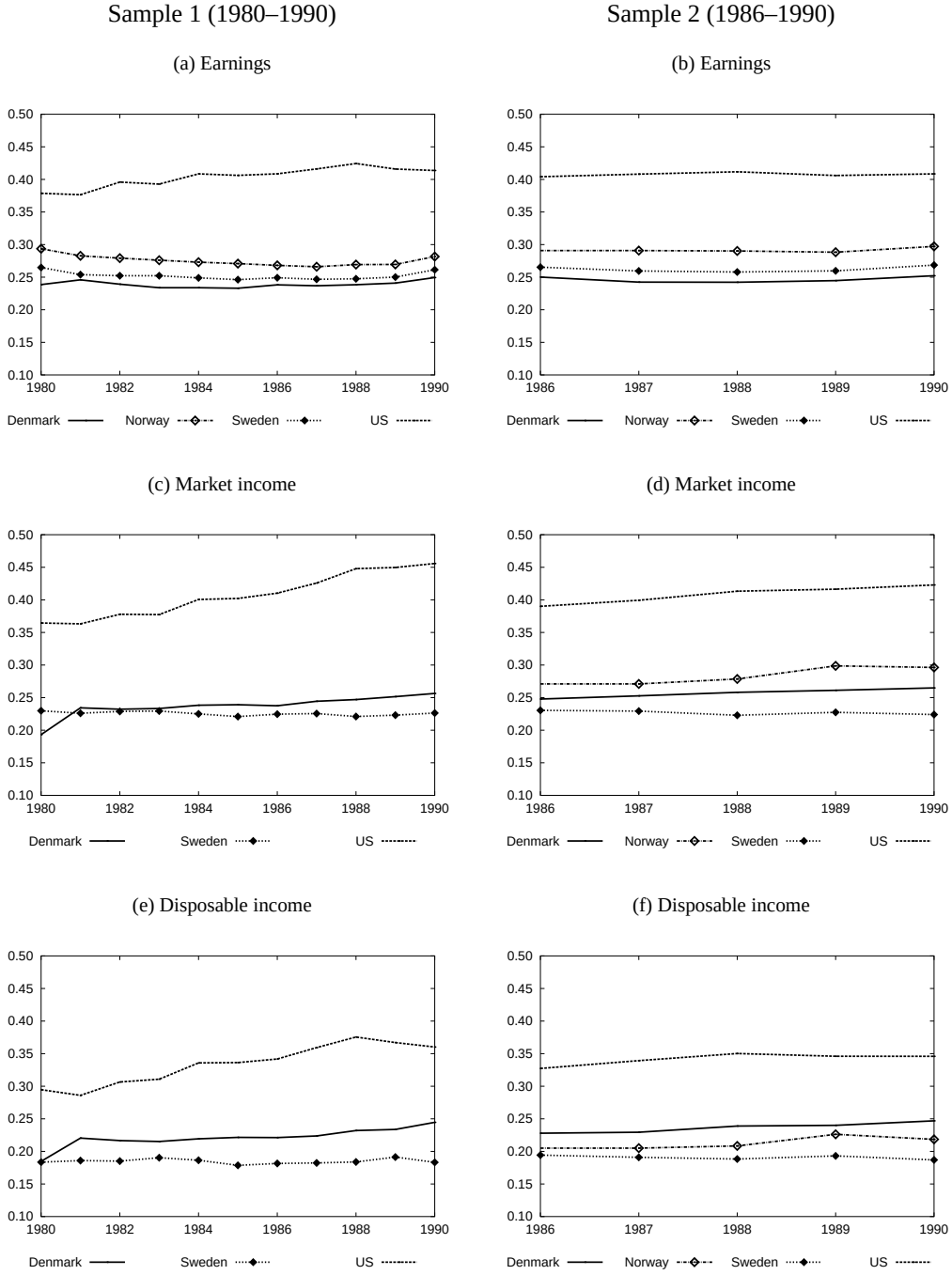
[12]Our estimated coefficients are robust w.r.t. to misspecifications of the inter-temporal covariance structure. See below.

[13]Standard F-test strongly reject that the coefficients for men and women are equal.

[14]Results for changes in relative earnings 1980–1990 can be obtained from the authors on request.

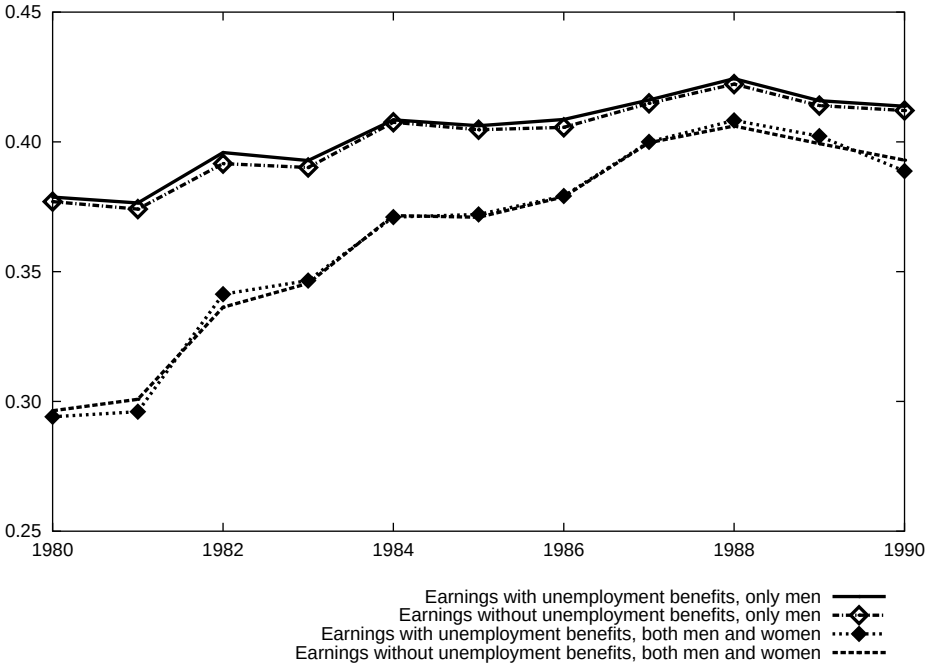
[15]Fritzell also estimated models for absolute income changes and changes in the percentile rank of income.

Figure 1 Gini coefficients for annual income, Sample 1 (1980–1990) and Sample 2 (1986–1990)



Source: Authors' calculations from Danish, Norwegian, Swedish and U.S. longitudinal data.
Note: See section 2 for details on sample and variable definitions.

Figure 2 The sensitivity of earnings inequality (Gini coefficients) to inclusion and exclusion of unemployment benefits – United States 1980–1990



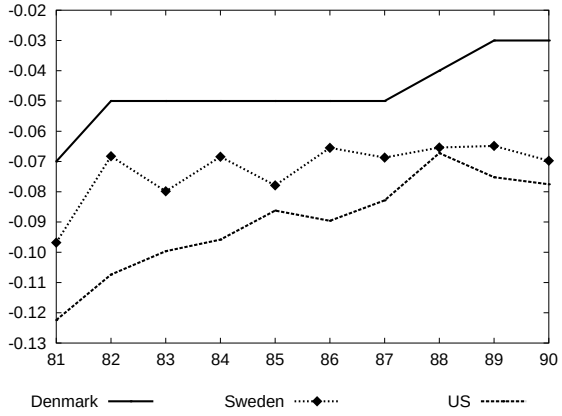
Source: Authors' calculations from PSID data files.
Note: See section 2 for sample definition. For the variable "Earnings with unemployment benefits", UB and workers compensation are available in only part of the sample years for the spouse. We include these in the earnings variable when possible.

Figure 3 The distribution of changes in relative income – earnings 1980-1990 and disposable income 1986-1990

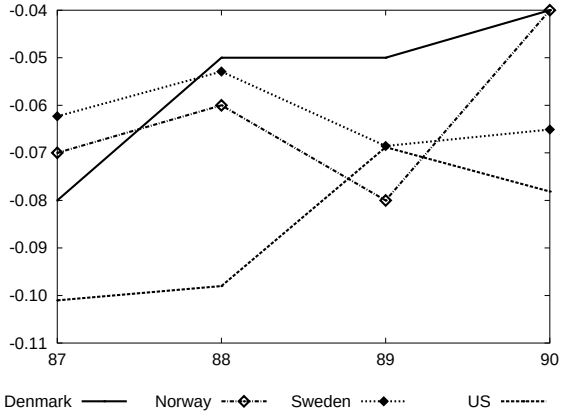
Sample 1 (1980–1990)
Earnings

Sample 2 (1986–1990)
Disposable income

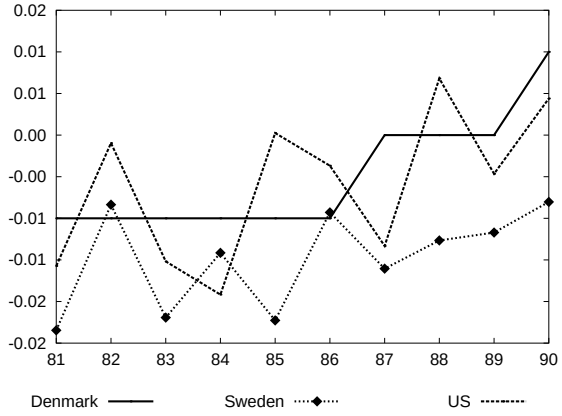
(a) 25. percentile



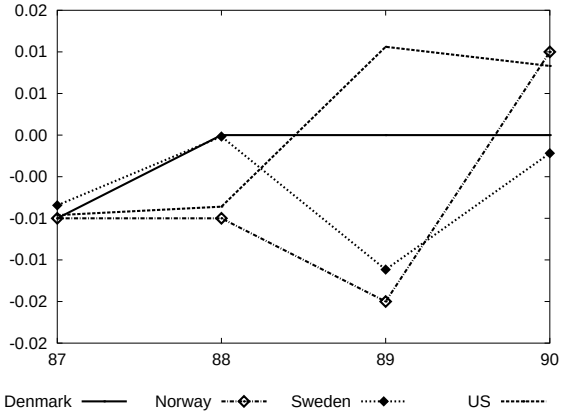
(b) 25. percentile



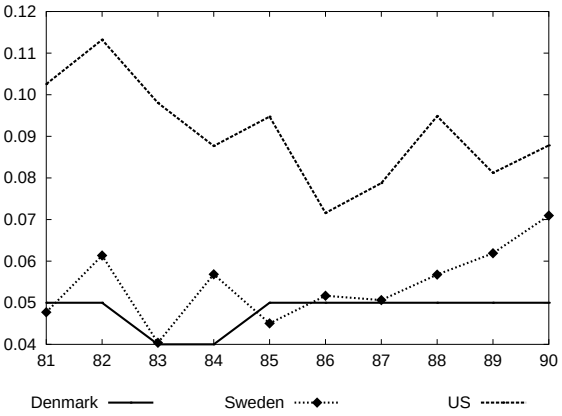
(c) 50. percentile



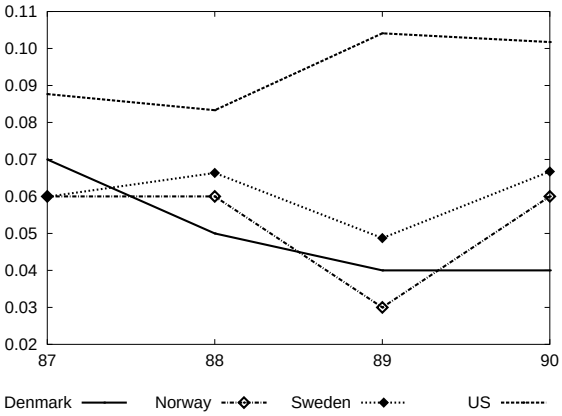
(d) 50. percentile



(e) 75. percentile



(f) 75. percentile



Source: Authors' calculations from Danish, Norwegian, Swedish and U.S. longitudinal data.
Note: Graphs show the 25th, 50th and 75th percentiles of the annual distributions of the change in relative earnings between $t-1$ and t in 1980-1990 (left column) and the change in relative disposable income between $t-1$ and t in 1986–1990 (right column). See equation 3 and text in section 2 for details on samples and variable definitions.

Table 1 Gini coefficients of over-time average income

Country	Earnings	Market income	Disposable income
		A. Sample 1 (1980–1990)	
Denmark	0.220	0.219	0.204
	(0.002)	(0.004)	(0.003)
Norway	0.256	n.a.	n.a.
	(0.000)		
Sweden	0.234	0.200	0.156
	(0.004)	(0.004)	(0.003)
United States	0.378	0.368	0.305
	(0.013)	(0.010)	(0.009)
		B. Sample 2 (1986–1990)	
Denmark	0.232	0.245	0.224
	(0.002)	(0.003)	(0.003)
Norway	0.278	0.263	0.197
	(0.000)	(0.007)	(0.006)
Sweden	0.250	0.211	0.172
	(0.004)	(0.004)	(0.003)
United States	0.389	0.383	0.321
	(0.010)	(0.007)	(0.007)

Source: Authors' calculations from Danish, Norwegian, Swedish and U.S. longitudinal data.
Note: Standard errors in parentheses. n.a. = not available. See section 2 for details on sample and variable definitions.

Table 2 Mobility indices

Country	Earnings	Market income	Disposable income
	A. Sample 1 (1980–1990)		
Denmark	0.080	0.076	0.078
Norway	0.069	n.a.	n.a.
Sweden	0.073	0.115	0.154
United States	0.065	0.097	0.092
	B. Sample 2 (1986–1990)		
Denmark	0.057	0.046	0.054
Norway	0.053	0.070	0.075
Sweden	0.045	0.071	0.097
United States	0.051	0.062	0.060

Source: Authors' calculations from Danish, Norwegian, Swedish and U.S. longitudinal data.
Note: Standard errors in parentheses. See section 2 for details on sample and variable definitions.

Table 3 Male earnings inequality and mobility

Country	Sample 1 (1980–1990)		Sample 2 (1986–1990)	
	Average Gini	Mobility	Average Gini	Mobility
Denmark	0.183	0.097	0.208	0.063
	(0.002)		(0.002)	
Norway	0.192	0.090	0.221	0.066
	(0.000)		(0.000)	
Sweden	0.200	0.078	0.250	0.045
	(0.005)		(0.004)	
United States	0.336	0.080	0.357	0.055
	(0.017)		(0.013)	

Source: Authors' calculations from Danish, Norwegian, Swedish and U.S. longitudinal data.
Note: Standard errors of Gini coefficients in parentheses. Samples include only men with positive earnings in sample period. See text for definition of earnings and other sample restrictions.

Table 4 Long-run income inequality and mobility treating cohabiters as married

Country	Market income		Disposable income	
	Average Gini	Mobility	Average Gini	Mobility
	A. Sample 1 (1980–90)			
Sweden	0.232	0.130	0.222	0.129
	(0.004)		(0.004)	
United States	0.392	0.096	0.334	0.086
	(0.010)		(0.010)	
	B. Sample 2 (1986–90)			
Norway	0.264	0.074	0.198	0.082
	(0.006)		(0.006)	
Sweden	0.251	0.063	0.216	0.068
	(0.004)		(0.003)	
United States	0.429	0.061	0.363	0.055
	(0.011)		(0.011)	

Source: Authors' calculations from country data files.
Note: For the main results, couples had to be legally married, and we divided family income by the number of adults. The numbers in this table stem from a sample where cohabiters are treated as being married and family income is divided by the square root of family size.

Table 5 Inequality of average income and mobility for households with white heads in the United States 1980–1990 and 1986–1990

Statistic	Earnings	Earnings of men	Market income	Disposable income
		A. Sample 1. (1980–1990)		
Gini	0.336	0.335	0.357	0.298
SE(Gini)	(0.015)	(0.018)	(0.011)	(0.010)
Mobility	0.112	0.080	0.103	0.096
		B. Sample 2. (1986–1990)		
Gini	0.358	0.353	0.368	0.311
SE(Gini)	(0.010)	(0.014)	(0.008)	(0.008)
Mobility	0.059	0.056	0.065	0.063

Source: Authors' calculations from PSID data files.
Note: Standard errors of Gini coefficients in parentheses. The sample only includes those persons who in every sample year lived in a household with a white head. Other restrictions as for main results (see section 2).

Table 6 The sensitivity of average earnings inequality and mobility to definition of earnings variable and sample in the United States 1980–1990

Statistic	Earnings without unemployment benefits – both men and women	Earnings with unemployment benefits – both men and women	Earnings without unemployment benefits – only men	Earnings with unemployment benefits – only men
Average Gini	0.342	0.340	0.336	0.335
Mobility	0.109	0.108	0.080	0.080

Source: Authors' calculations from PSID data files.
Note: See section 2 for sample definition. For the variable "Earnings with unemployment benefits", UB and workers compensation are available in only part of the sample years for the spouse. We include these in the earnings variable when possible.

Table 7 Observed and hypothetical sum of earnings by decile groups over the 1980–1990 period for Norway

Decile group	Overall earnings 1980–1990		
	Observed	Hypothetical	Difference
1	5659	4105	-37.9
2	10285	9529	-7.9
3	13526	13322	-1.5
4	16277	16385	0.7
5	18253	18370	0.6
6	20018	20146	0.6
7	21928	22103	0.8
8	24323	24554	0.9
9	27882	28287	1.4
10	38946	40296	3.3
All	19710	19710	0.0

Source: Authors' calculations from the Norwegian TAF files.
Note: The sum of the lowest actual annual earnings in each year defines the lowest earnings in the hypothetical hypothetical distribution, the sum of the second lowest earnings the second lowest hypothetical earnings and so on.

Table 8 Regression results – first difference in relative disposable income 1986-1990, men and women

Covariate in $t-1$	t	Denmark	Norway	Sweden	U. S.	Denmark	Norway	Sweden	U. S.
			Men				Women		
Intercept		0.131	0.239	0.128	0.005	0.145	0.200	0.151	0.029
		(0.012)	(0.113)	(0.036)	(0.061)	(0.013)	(0.118)	(0.038)	(0.042)
Age		–0.005	–0.100	–0.005	0.003	–0.006	–0.099	–0.005	0.001
		(0.001)	(0.060)	(0.002)	(0.004)	(0.001)	(0.053)	(0.002)	(0.003)
Age^2		0.000	0.010	0.000	0.000	0.000	0.010	0.000	0.000
		(0.000)	(0.069)	(0.000)	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)
Employment									
$t-1$	t								
Employed	Employed								
Employed	Not employed	–0.037	–0.076	–0.008	–0.174	–0.016	0.016	0.012	–0.137
		(0.008)	(0.071)	(0.019)	(0.029)	(0.007)	(0.069)	(0.018)	(0.036)
Not employed	Employed	0.016	0.060	–0.027	0.091	–0.005	0.014	–0.037	0.037
		(0.005)	(0.065)	(0.018)	(0.020)	(0.007)	(0.058)	(0.017)	(0.020)
Not employed	Not employed	–0.018	–0.001	0.019	0.014	–0.006	0.034	0.006	–0.013
		(0.003)	(0.052)	(0.012)	(0.018)	(0.003)	(0.045)	(0.011)	(0.012)
Marital status									
$t-1$	t								
Married	Married								
Married	Not married	–0.001	0.380	0.333	0.056	–0.003	–0.184	0.107	0.100
		(0.023)	(0.072)	(0.028)	(0.040)	(0.022)	(0.067)	(0.063)	(0.035)
Not married	Married	0.032	–0.343	–0.202	–0.080	0.028	0.190	0.157	–0.075
		(0.015)	(0.055)	(0.016)	(0.029)	(0.015)	(0.061)	(0.018)	(0.029)
Not married	Not married	–0.004	0.003	0.002	–0.035	0.005	–0.004	–0.003	0.004
		(0.002)	(0.015)	(0.004)	(0.009)	(0.002)	(0.014)	(0.004)	(0.007)

Source: Authors' calculations from Danish, Norwegian, Swedish and U.S. longitudinal data.
Note: Dependent variable is the annual change in relative disposable income (see equation 3) between $t-1$ and t. Parameters have been estimated using GEE.

Table 9 Gini coefficients of annual income, Sample 1 (1980–1990)

Country	Year	Earnings		Market income		Disposable income	
		Gini	SE(Gini)	Gini	SE(Gini)	Gini	SE(Gini)
Denmark	1980	0.239	(0.002)	0.193	(0.003)	0.185	(0.003)
	1981	0.246	(0.002)	0.234	(0.004)	0.220	(0.004)
	1982	0.239	(0.002)	0.232	(0.004)	0.217	(0.004)
	1983	0.234	(0.002)	0.233	(0.004)	0.215	(0.004)
	1984	0.234	(0.002)	0.238	(0.004)	0.219	(0.004)
	1985	0.233	(0.002)	0.239	(0.004)	0.221	(0.004)
	1986	0.238	(0.002)	0.237	(0.004)	0.221	(0.004)
	1987	0.237	(0.002)	0.244	(0.004)	0.224	(0.004)
	1988	0.238	(0.002)	0.247	(0.004)	0.232	(0.004)
	1989	0.241	(0.002)	0.251	(0.004)	0.234	(0.004)
	1990	0.249	(0.002)	0.256	(0.004)	0.245	(0.005)
	N	11734		3336		3336	
Norway	1980	0.294	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	1981	0.283	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	1982	0.279	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	1983	0.276	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	1984	0.273	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	1985	0.271	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	1986	0.268	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	1987	0.266	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	1988	0.269	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	1989	0.270	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	1990	0.282	(0.000)	n.a.	(n.a.)	n.a.	(n.a.)
	N	705597		0		0	
Sweden	1980	0.265	(0.005)	0.230	(0.004)	0.183	(0.004)
	1981	0.254	(0.004)	0.226	(0.005)	0.186	(0.005)
	1982	0.252	(0.004)	0.229	(0.004)	0.185	(0.004)
	1983	0.252	(0.004)	0.229	(0.004)	0.190	(0.003)
	1984	0.249	(0.004)	0.225	(0.004)	0.186	(0.003)
	1985	0.246	(0.004)	0.221	(0.004)	0.179	(0.003)
	1986	0.249	(0.004)	0.225	(0.004)	0.181	(0.003)
	1987	0.247	(0.005)	0.225	(0.005)	0.182	(0.003)
	1988	0.247	(0.004)	0.221	(0.004)	0.184	(0.003)
	1989	0.250	(0.004)	0.223	(0.004)	0.191	(0.004)
	1990	0.261	(0.005)	0.226	(0.005)	0.183	(0.003)
	N	2834		3228		0	
United States	1980	0.379	(0.008)	0.364	(0.012)	0.295	(0.011)
	1981	0.376	(0.008)	0.363	(0.008)	0.286	(0.007)
	1982	0.396	(0.012)	0.378	(0.008)	0.306	(0.007)
	1983	0.393	(0.013)	0.377	(0.009)	0.311	(0.008)
	1984	0.408	(0.015)	0.401	(0.012)	0.336	(0.012)
	1985	0.406	(0.013)	0.402	(0.010)	0.336	(0.009)
	1986	0.409	(0.016)	0.410	(0.010)	0.342	(0.010)
	1987	0.416	(0.020)	0.426	(0.015)	0.359	(0.016)
	1988	0.424	(0.021)	0.448	(0.015)	0.375	(0.016)
	1989	0.416	(0.018)	0.450	(0.012)	0.367	(0.011)
	1990	0.414	(0.012)	0.456	(0.009)	0.360	(0.008)
	N	1939		3119		3119	

Source: Authors' calculations from Danish, Norwegian, Swedish and U.S. longitudinal data.
Note: Standard errors in parentheses. n.a. = not available. See section 2 for details on sample and variable definitions.

Table 10 Gini coefficients of annual income, Sample 2 (1986–1990)

Country	Year	Earnings		Market income		Disposable income	
		Gini	SE(Gini)	Gini	SE(Gini)	Gini	SE(Gini)
Denmark	1986	0.250	(0.002)	0.248	(0.004)	0.228	(0.003)
	1987	0.242	(0.002)	0.253	(0.004)	0.229	(0.003)
	1988	0.242	(0.002)	0.258	(0.004)	0.239	(0.003)
	1989	0.245	(0.002)	0.261	(0.004)	0.240	(0.003)
	1990	0.252	(0.002)	0.265	(0.003)	0.247	(0.004)
	N	16811		5455		5455	
Norway	1986	0.302	(0.000)	0.269	(0.006)	0.209	(0.006)
	1987	0.291	(0.000)	0.271	(0.006)	0.205	(0.005)
	1988	0.290	(0.000)	0.279	(0.006)	0.208	(0.006)
	1989	0.288	(0.000)	0.299	(0.012)	0.226	(0.011)
	1990	0.297	(0.000)	0.296	(0.008)	0.218	(0.008)
	N	1307540		2047		2047	
Sweden	1986	0.265	(0.004)	0.230	(0.004)	0.194	(0.003)
	1987	0.260	(0.004)	0.229	(0.004)	0.191	(0.003)
	1988	0.258	(0.004)	0.223	(0.004)	0.188	(0.003)
	1989	0.260	(0.004)	0.227	(0.005)	0.193	(0.004)
	1990	0.269	(0.004)	0.224	(0.004)	0.187	(0.003)
	N	3606		3828		3828	
United States	1986	0.404	(0.009)	0.390	(0.007)	0.327	(0.006)
	1987	0.408	(0.012)	0.399	(0.009)	0.339	(0.010)
	1988	0.412	(0.012)	0.413	(0.009)	0.350	(0.010)
	1989	0.406	(0.010)	0.416	(0.008)	0.346	(0.007)
	1990	0.408	(0.007)	0.423	(0.006)	0.346	(0.005)
	N	5483		6712		6712	

Source: Authors' calculations from Danish, Norwegian, Swedish and U.S. longitudinal data.
Note: Standard errors in parentheses. n.a. = not available. See section 2 for details on sample and variable definitions.