



Income inequality and intragenerational income mobility in Sweden from 1983 to 2010: Following two birth cohorts

Birgitta Jansson¹

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Abstract

Sweden has been known for having one of the most equal income distributions in the world. However, in recent decades, Sweden has experienced increasing income inequality. An alternative way of measuring the development of inequality is to study and compare the income development within and between two birth cohorts according to gender and different positions of income distribution. The focus in this paper is to study how individual disposable personal income has changed by aging and at various positions of the income distribution, as well as the gender disposable income gap and intragenerational income mobility. Three positions of the income distribution were chosen: percentile 10; median; and percentile 99. Two cohorts, including all individuals born in 1948 and 1958, were tracked from 35 years of age to 53 years of age – with two 18-year overlapping periods, 1983–2000, and 1993–2010. The results show a complex and multifaceted image of the development of income inequality and mobility, within and between the two birth cohorts. Especially male low-income earners, born 1958, have been left behind. Income mobility differ according to gender where women have increased mobility in the bottom quintile and decreased in the top quintile, men experienced the opposite. When modelling mobility education have decreased to contribute to an upward mobility, especial for cohort born 1958. Taking all the results together, the development of increasing income inequality in Sweden is apparent.

Keywords Cohort study · Income inequality · Intragenerational income mobility · individual disposable personal income · Sweden

1 Introduction

Since 1980s, there has been growing income inequality in most high-income countries. This inequality is mainly explained as a consequence of income development among top income earners, as both their share of earned income and capital income has increased more than for other earners in the income distribution (Atkinson & Piketty, 2007, 2010;

✉ Birgitta Jansson
Birgitta.Jansson@socwork.gu.se

¹ Department of Social Work, University of Gothenburg, Sprängkullsgatan 23 – 25,
405 30 Göteborg, Sweden

Björklund et al., 2019; Piketty, 2014; Roine & Waldenström, 2015). As individuals often value their living standard through comparisons with their age peers as well as individuals from earlier generations of the same age, an alternative way of measuring the development of inequality is to study and compare the income development within and between two birth cohorts. By doing so, another picture of income inequality will be shown. In this paper, the development of income inequality and income mobility in Sweden, within and between two cohorts in their prime working active ages, is investigated. The two cohorts include all individuals living in Sweden born in 1948 and 1958, followed over a time span of 18 years. More precisely, they were tracked from 35 years of age to 53 years of age—with two 18-year overlapping periods, from 1983 to 2000, and from 1993 to 2010.

This study differs from other studies in two primary aspects: the income variable and the inclusion of all individuals in the two cohorts. The income variable is individuals' disposable personal income (DPI), that is, the individuals and their disposable personal income (DPI) are the analytic unit. The reason for this is to capture individuals' own economic standards regardless of their household status. A more conventional approach is to use the household as the income unit and the individual as the unit of analysis. Following such an approach, all household members' disposable income is merged, and an equivalent income is used that is defined as the disposable income of the household, adjusted for its expenditure needs (using an equivalence scale). A consequence of such an approach is that it is based on the assumption of equal sharing in the household. As is well recognised in the literature and in society at large, this can be problematic in various cases (e.g. Boschini & Gunnarsson, 2018; Lundberg & Pollak, 2008; Ponthieux, 2013). Therefore, using individual DPI results will show individuals' own income development and income mobility regardless of their household, and a new picture of income and gender inequality will emerge. To include all individuals in each birth cohort—whether they work full-time and full-year, have low or no labour force participation and have low wages and/or high transfers—also differs from other studies. I argue that by applying this infrequently used method, a new dimension of income inequality in Sweden will be explored. The strongest reason for using the variable individual DPI is that it is a more accurate measure of a person's standard of living than relative wages, as it also includes transfers and taxes. If, as in many other studies, I had focused on earned income or wage, I would not have been able to reveal and discuss changes in the general pattern of income inequality and income mobility, as individuals working full-time and full-year constitute a special group that is in many ways self-selected. For example, more women than men work part-time and in low-wage sectors, which could be a consequence of their own choices, but could also be a consequence of norms, attitudes, discrimination and demands from the labour market.

Thus, this study compares two birth cohorts at three different positions, percentile 10 (P10), median and percentile 99 (P99), in the income distribution regardless of whether they work full-time and full-year, have low or no labour force participation, have low wages and/or high transfers, and irrespective of their civil status. The reason for including all individuals in each cohort is to explore the DPI differences within and between the cohorts according to gender, as well to measure the gender gap at different positions in the income distribution. By doing so, the results will tell us how income inequality has developed at different income positions in the income distribution; whether there is a difference within as well as between the two cohorts; whether the development of income inequality is the same for men and women at the same income positions; and whether there is a difference in income mobility between men and women. The results will also reveal who has gained and who has been left behind over a time span of 18 years, as well as whether one

cohort is better off than the other and the extent to which the gender gap differs between different positions of the income distribution.

The aim of this article is twofold. First, it focuses on how DPI has developed for persons born in two particular years—1948 and 1958—by answering the following questions: how has DPI changed with age and at various positions of the income distribution? What differences between individuals in the two birth cohorts of the same age, gender and position in the income distribution can be observed? Second, this article focuses on income mobility within and between the two cohorts over a time span of 18 years by investigating the extent to which mobility is connected with the life cycle.

The rest of the paper is laid out as follows: in the next section, a theoretical framework is provided. Section 3 gives a short historical background of Swedish economic development during the time of the study. In Sect. 4, the data is presented, and some methodological issues are raised. Section 5 presents and discusses the results of income development and income inequality within and between the two cohorts. In Sect. 6, results from the analysis of intragenerational income mobility are presented and discussed. Finally, Sect. 7 concludes by summarising and discussing the findings.

2 Theoretical framework

Several recent studies have documented the growing income inequality (e.g. Bourguignon, 2018; OECD, 2011, 2017). In Sweden, as in many other countries, the Gini coefficient for disposable income has followed a U-shaped pattern, with declining inequality up to the beginning of the 1980s followed by an increasing inequality (e.g. Andersen, 2019). Another aspect of income inequality can be captured by calculating real income growth across the income distribution and comparing the development of the average annual growth in real disposable income by calculating decile p-ratios between different income positions. When doing so, the results show an increasing inequality across positions where the top decile has gained and the bottom decile has lost (e.g. Andersen, 2019; Björklund & Jäntti, 2011). Björklund and Jäntti (2013) compared two economic crisis in Sweden: the beginning of the 1990s and the Great Recession in the world economy (2008–09). Their results showed that the last economic recession did not have the same impact on income distribution in Sweden as it did in many other comparable countries. However, when comparing real income growth and income inequality, differences between the two periods were exposed. In the 1990s recession, the incomes at the lower end of the income distribution were growing no less rapidly than the middle and higher incomes. During the Great Recession years (2008–09), the incomes at the lower end (P10) experienced a clearer decline than those at the median and the P99 (Björklund & Jäntti, 2013). In this study, the results will show whether there is a similar development when following the two cohorts in active working ages.

When studying income mobility—in this case, intragenerational income mobility—it is dependent on available data and the possibility to create a panel in which individuals can be followed for a number of years. A great deal of empirical research has investigated income mobility by analysing longitudinal data (e.g. Haider & Solon, 2006; Jäntti & Jenkins, 2015; Jenkins, 2011). Mobility is commonly calculated through two different approaches: first, using absolute mobility, which is mobility relative to a real standard of well-being, such as

previous income¹; and second, using relative mobility, which reflects changes in individuals' or households' relative positions.²

Garnero et al. (2016) investigated the relationship between earnings inequality and intragenerational income mobility in 24 OECD countries. The results showed that 25 per cent of earnings inequality in a given year evened out over the life cycle as a result of income mobility. The findings indicated that intragenerational mobility did not have major implications for assessing the level of earnings inequality, meaning that countries with large inequalities at a certain point in time most often also tend to have inequalities in terms of lifetime earnings. Bönke et al. (2015) analysed the earnings histories (individual gross earnings) of 31 male birth cohorts in West Germany, born in 1938 to 1963. The results showed that within cohorts, the mobility in the distribution of yearly earnings was substantial at the beginning of the life cycle, decreased afterwards and virtually vanished after the age of 40. There was also a strong rise in intragenerational inequality in lifetime earnings. West German men born in the early 1960s were likely to experience about 80 per cent more lifetime inequality than their fathers. Burgess et al. (2003) examined the way in which long-term unemployment influences an individual's career and their later employment prospects. This study implied that the unemployment experiences of cohorts coming of age in poor labour markets conditions are more unequal within the cohort than those of luckier cohorts. The role of education was also investigated by Carr and Wiemers (2016), examining the trends in lifetime earnings mobility in the US since 1981. The findings showed a decline in mobility for both men and women and across the distribution of educational attainment since the early 1980s as inequality has increased. The effects of a 50-year career on four birth cohorts—men and women each including eight years—was studied by Tamborini et al. (2015). The results showed the impact of gender, as men earned more than women over their lifetimes and had better returns of education: the absolute rate of return for men was 43 per cent higher than that of women. Lastly, in a study using a longitudinal data set including every Norwegian man from 1967 to 2006 and focusing on cohorts born in 1942 to 1944, Aaberge and Mogstad (2015) investigated the so-called life cycle bias in an empirical analysis of income inequality that used current income variables as proxies for lifetime income. The study reached two broad conclusions: the life cycle bias was minimised when individuals' incomes were measured at the age of 34–35 and the inequality was much less than that suggested by cross-sectional estimates of inequality.

The results from the studies presented above imply that income inequality can be caused by many interlinked factors. The present investigation will show: if and to what extent earnings inequality has evened out over the life cycle; if inequality has developed differently in the two investigated cohorts and according to gender; and if different outcomes of income mobility can be explained by changes caused by the life cycle. Aaberge and Mogstad's (2015) study has confirmed that the choice of starting at age 35 minimises life cycle bias.

¹ In this study expressed in mobility matrices, see Tables 3 and 4.

² In this study expressed as predicted probabilities, see Figs. 6a and 6b.

3 The Swedish context

In 1983, the first year this study considers, Sweden had an almost equal income distribution: the Gini coefficient (adjusted disposable income) was 0.18, the unemployment rate was approximately two per cent, the real gross domestic product (GDP) growth rate was 1.9 per cent and women were continuing their march into the labour market (Fritzell et al., 2010). Sweden was in many ways a classic country with a full employment policy. Despite the increase in the female labour force participation rate, the working hours did not rise at the same pace: women worked for fewer hours and in general had less secure labour arrangements, with few women working full-time and full-year and most employed in the public sector, mainly in the care and health sectors (Regeringen Prop, 2012/13:1).

At the beginning of the 1990s, Sweden experienced a deep economic downturn with consequences for the labour force. The GDP growth was negative in 1991–1993, the unemployment rate increased to 9 per cent and time-limited employment arrangements increased, which led to more insecurity for individuals with weak positions in the labour market. To reduce unemployment and to prepare the labour force for the new demands on the labour market, the Social Democratic Government in 1997 implemented a programme called *Kunskapslyftet* (Knowledge Lift). The main goals of the programme were to reduce unemployment, develop adult education, reduce educational gaps and increase the conditions for economic growth (Albrecht et al., 2008; Skolverket, 2001). Since the end of the 1990s, the unemployment rate has fluctuated between 6 and 9 per cent (Swedish Statistics SCB, 2011). Between 1995 and 2004, the GDP growth rate was 2.6 per cent per annum, and Sweden had higher GDP growth rates than all the other European Union (EU) countries and the US (Regeringskansliet, 2006).

The income distribution also changed considerably during the study period, while the role of capital gains increased substantially and changes in the tax system favoured capital owners. With the Alliance Government³ in 2006, property tax was abolished (in 2007), and the tax rate for capital income has been 30 per cent since 1991, which is lower than the tax on labour (Skatteverket, 2010). The Gini coefficient (adjusted disposable income) increased to 0.297 in 2011 (Regeringen Prop, 2012/13:100, bilaga 2), and according to the OECD (2011), Sweden then had the fastest-growing inequality among the OECD countries.

In addition, the Swedish tax system changed several times during the study period. The reform at the beginning of the 1990s had many components and far-reaching consequences (Agell et al., 1998). A two-base system was introduced, meaning that capital income was taxed independently of work earnings using a proportional rate. The tax schedules for work earnings were simplified, and the progressivity for the highest brackets was initially reduced. Two so-called break points were introduced: income above these levels was subject to central government tax, while households with lower incomes only had to pay the proportional local tax (typically 30 to 35 per cent).⁴ Since 2007, with the Alliance Government, new changes in income tax have been introduced. An earned income tax credit was implemented in five steps between 2007 and 2014, which taxed earned income at a lower

³ The Alliance Government consisted of four cooperation parties: the Conservative Party (Moderaterna), the Liberal Party (Liberalerna), the Center Party (Centerpartiet) and the Christian Democratic Party (Kristdemokraterna).

⁴ Skatteverket (2010). In 2010, the first break point started for yearly incomes above 384 600 SEK, and the second breakpoint started for yearly incomes above 545 200 SEK.

rate than income from the major social insurance programmes, including unemployment, sickness and parental leave benefits, as well as old age pensions (Ferrarini et al., 2012).

As a welfare country following the dual-earner model with a universal social security system, most transfer payments received from the social insurance system in Sweden are based on the principal of compensation for income lost. The largest transfer systems are sickness insurance, parental leave, pensions and unemployment benefit. However, the compensation level of these types of insurance, since the beginning of the 1990s, has not kept up with the general income growth in recent decades, which has led to a real compensation rate below the original idea of the system (Bengtsson et al., 2014).

4 Data and methods

The data used are register data⁵ from Statistics Sweden (SCB), including the total population registered as living in Sweden for each year from 1983 to 2010. The data were constructed as a panel and the possibility of following all the individuals living in Sweden for as long as 28 years. In this study, the calculation for each cohort was, for the first time, based on *all* the individuals in these cohorts and for a period of 18 years each. The data include many variables, of which a few have been chosen, mainly different income variables, year of birth, gender, civil status, level of education and country of birth.

Starting with the income variable, “disposable personal income—DPI” was calculated as the sum of the components earned income, self-employed income, nominal capital income and transfers, minus tax, (i.e. post-distributed and post-taxed income) calculated on a yearly basis and in fixed prices (2010). Examples of transfers is sickness insurance, parental insurance etc.; the nominal capital income derives from fiscal sources and include dividends, interest and rents. Because of the inclusion of transfers and nominal capital income, this variable was selected as it provides a better measurement of the actual well-being of the individual than using earned income/self-employed income before tax. A few individuals with zero income, possibly due to emigration, were excluded from the calculations.

As stated earlier, the focus in this study was on individuals’ DPI, that is, the individuals and their DPI are the analytic unit, and it includes all individuals in each birth cohort: all males and all females regardless of whether they work full-time and full-year, have low or no labour force participation and have low wages and/or high transfers.

Two balanced panels were used each consisted of all individuals in the two specific birth cohorts: individuals born 1948 and individuals born 1958. The first panel included all individuals living in Sweden 1983 and born in 1948 (followed from 1983 to 2000), and the second panel included all individuals living in Sweden 1993 and born in 1958 (followed from 1993 to 2010). No distinctions were made between whether they were born in Sweden or had immigrated to Sweden before their thirty-fifth birthday. New individuals migrating to Sweden after 1983 and 1993 born in these specific years (1948 and 1958) were not added to the panels, and if a person died or emigrated from Sweden, they disappeared from the data. Because of the use of register data, the attrition was small.

⁵ The data derive from different registered data, for example, tax files and the Register of the Total Population (RTB).

Table 1 Panel description

Cohort	Born 1948	Born 1958
1983–2000	x	
1993–2010		x
Total number of individuals	123,584	106,916
Number of Men	62,017	53,887
Number of Women	61,567	53,029

Source SCB data

These two cohorts were chosen to explore the individual DPI development and income mobility of individuals who were presumed to be established in the labour market. The findings in Aaberge and Mogstad's (2015) study supported the choice of entry age (35 years old). It can be argued that the choice of this starting age is too early for the women, as many of them then are at childbearing age, and therefore, a larger part of their income may derive from transfers (especially parental leave).⁶ As this study compares the intragenerational mobility within as well as between genders, the choice of the age of 35 years as the starting period for both sexes will make it possible to display the economic consequences for women of childbearing age.

In Table 1, above the number of individuals are shown. Two 18-year periods were chosen: from 1983 to 2000 and from 1993 to 2010. The periods overlap, and the results will tell us whether and how the income development and income mobility have changed over time depending on the starting year and birth cohort. The starting year 1983 was chosen for measurement issues: it is the first available in the data when a wide span of public transfers were recorded (e.g. social assistance). The ending year, 2010, was the last available year in the data.

As stated earlier, the aim of this study was twofold. First, the general income development for the two cohorts was investigated on a yearly basis (cross sectional). The interest here was to focus on the general trend in income development according to position and gender, as well as the development of the gender gap for these specific cohorts. The investigated positions in the income distribution were the median, the P10 and the P99. The reason for choosing the P99 instead of the ninetieth was to capture the development of the extremely high-income position, and the reason for choosing the P10 was to capture the development for the low-income position. Income inequality can be measured in different ways e.g. Atkinson's index and Theil's index, and researchers must always choose which method to use. This study was inspired by other studies (Andersen, 2019; Björklund & Jäntti, 2011; Nolan, 2020) which discuss the need to separately monitoring and analyse different positions in the income distribution, in this study the P10, the median, and the P99, to get an increased understanding of income inequality. This was examined by calculating the Gini coefficient, annual average growth rate and p-ratios across these three income positions. By doing so differences in the development of inequality within the income distribution was captured and analysed. The reason for dividing each cohort according to gender was to capture gender equality. As results show there were gender differences, a development that had not been revealed if men and women were analysed together.

⁶ In 2009, the father's share of parental leave was on average 23 per cent compared with 77 per cent for mothers, only a modest increase over the 1974 level (Duvander and Johansson 2012).

The second aim focus was on the intragenerational income mobility and changes in mobility when comparing the two periods, 1983–2000 and 1993–2010 (using the balanced panel). The reason for adding intragenerational mobility was to interlink the two different measurements of inequality (income inequality and mobility) as they, when analysed together, widens our understanding of the development of inequality and how these processes can be explained. Men and women in each cohort were measured separately to explore if the patterns of mobility differed according to gender. To visualise differences in intragenerational mobility within and between the two cohorts' mobility matrices were estimated.

The equation for the mobility matrix is when having specified m income range by one criterion, here quintiles, induced by a transformation $x \rightarrow y$ is defined as:

$$P(x, y) = [p_{rs}(x, y)] \in R_+^{m \times m}, \quad (1)$$

where $p_{rs}(x, y)$ is the proportion of individuals that from quintile r in the distribution x , have moved to quintile s in the second observation. By definition $\sum_{s=1}^m p_{rs}(x, y) = 1$ for all r .

The mobility matrices used showing the individuals position in terms of DPI quintiles at the beginning of each 18-years period and his/hers position at the end of each period (i.e. absolute mobility–mobility relative to a real standard of well-being here previous DPI).

To understand how relative income change is affected by changes in life cycle multinomial logit model was used for each 18-year period (i.e. relative mobility which reflects changes in the individuals' relative positions).

A multinomial logit investigate the determinants of downward and upward mobility for men and women in the two different cohorts at time t . It can be used when all the independent variables are case specific (Ricci, 2016). It specifies that

$$p_{ij} = \frac{\exp(x_i' \beta_j)}{\sum_{l=1}^m \exp(x_i' \beta_l)}, \quad j = 1, \dots, m \quad (2)$$

where x_i are the independent variables, and the intercept. This model ensures that $0 < p_{ij} < 1$ and $\sum_{i=1}^m p_{ij} = 1$. To ensure model identification β_j is set to zero for one of the categories (in this case immobile) and coefficient can be interpreted with respect to the base category. In this presentation the parameters are transformed to odds ratios, where the odds ratio of being a member of category j rather than alternative 1 is given by

$$\frac{\Pr(y_i = j)}{\Pr(y_i = 1)} = \exp(x_i' \beta_j) \quad (3)$$

where e^{β_j} gives the proportionate change in the relative risk of being ij rather than 1 when x_{ij} changes by one unit (Ricci, 2016). Observable characteristics such as level of education, civil status and country of birth enter the vector x_i and the relationship between characteristic and the dependent variable are thus studied. Specifically, I estimate the impact of several variables on the probability of moving downward or upward in DPI using immobility status in DPI as the reference category. I perform models obtaining results for each type of



Fig. 1 Development of Gini-coefficient (DPI), cohorts 1948 and 1958. *Note* Disposable personal income; the years for the 1948 cohort are 1983 to 2000, and for the 1958 cohort are from 1993 to 2010

transition, including remains or changes level of education, remains or changes civil status and, country of birth.⁷

The next step was predicting probabilities. Here I used Eq. (2) and (3) from above with β -values from the multinomial logits. Eleven different predictions (cases, described in Fig. 6a and 6b), for each gender separate, were made using differences in characteristics (x -value). Results are presented in Fig. 6a and 6b.

Tether these two different types of measuring inequality and income mobility (cross sectional and panel) reveal if the patterns of income inequality and income mobility is the same for men and women at the same income positions in the income distribution. Results will show a new dimension of income inequality in Sweden.

5 Comparing disposable personal income development within and between two cohorts

The first aim was to study the development of income inequality. In Fig. 1, the development of the Gini coefficient over the two 18-year periods is displayed. The grey lines show the Gini coefficient for the whole cohorts and the black lines according to gender. As shown the trends differ and by dividing the samples into men and women, the development of income inequality between and within genders are captured.

As shown, the male cohort born in 1958 have experienced more inequality than those born 1948. This is probably a consequence of the economic downturn in the beginning of the 1990s, which led to increased unemployment and cuts in social insurance benefits. The women do not experience such an increased inequality. When comparing the two cohorts, the Gini is lower, although the gap is widening starting at age 46—probably a consequence

⁷ Estimates from the multinomial logits are available upon request.

Table 2 Average annual growth (per cent) in personal disposable income 1983—2000, 1993—2010, according to two cohorts and gender (fixed price 2010)

	P 10	Median	P 99
Cohort 1948			
Man	1.2	1.7	5.5
Woman	3.6	1.8	3.8
Cohort 1958			
Man	1.5	2.5	6.4
Woman	1.4	2.2	4.9

Source SCB data

of increased labour force participation in the cohort born in 1958. As shown in Fig. 1, inequality does not even out over the 18-year periods. When examine the average annual growth rate over each period for the three income positions, the different development of increasing inequality between men and women is shown. Starting with the cohort born 1948 and P10, a huge difference between the growth rate for men and women is exposed, as the rate for men was only 1.2 and for women was 3.6. This is explained by the increasing female labour force participation. Also large differences in growth rates in P99 when comparing genders are show.

When looking at the cohort born 1958, we do not find these large gender differences in P10, as women in this cohort had almost the same labour force participation as men. Still, there is a huge gender difference between growth rate in P99, a consequence of the so-called glass ceiling (Albrecht et al., 2003, 2015). An advantage with this alternative method of measuring inequality is shown when comparing these results with results from Nolan's study (2020). He reports annual the average growth rate in median equivalised household income for 26 countries and reports the Swedish growth rate, from 1983 to 2013, as 1.76 (and for working age households 1.75). Although there is a difference in time length between this study and Nolan's study, the results from Nolan's study are similar to the growth rates for the median, Table 2, especially the cohort born in 1948. By adding the two positions (P99 and P10), a broader picture of the development of income inequality is revealed.

Another way of demonstrating the development of inequality of the general DPI on a yearly basis is to calculate p-ratios, which express the difference, as a percentage, between two positions in the income distribution, for example DPI_{p99}/DPI_{p10} . Figures 2a and 2b, below, expose the p-ratios for P99, the median and P10. As shown in Fig. 2a, the p-ratios for men increased substantially between the cohorts, and the largest increase was seen for the p-ratio P99/P10. For the cohort born in 1948, the p-ratio developed from 3.5 at 35 years of age to 7.5 at 52 years of age; for the cohort born in 1958, it increased from 4.4 to 10.1. The minor increase for the p-ratio P50/P10 (1.6 to 1.7 and 1.8 to 2.2) indicates that median-income earners also improved their income from one cohort to another—however, not to the same extent as for the top-earner as the p-ratios P99/P50 increased from 2.2 to 4.3 and 2.4 to 4.7.

In Fig. 2b, the same p-ratios for women are shown (P99/P10). Here, we also found increases, but not to the same extent as for men (from 4.5 to 4.7 for the cohort born in 1948; from 3.3 to 6.0 for the cohort born in 1958). In addition, the p-ratio P99/P10 shows different developments when comparing the two cohorts. The p-ratio for the age cohort born in 1948 is U-shaped and is explained by the fact that in 1983, the year of the first observation, the female labour force participation in this age group was not as

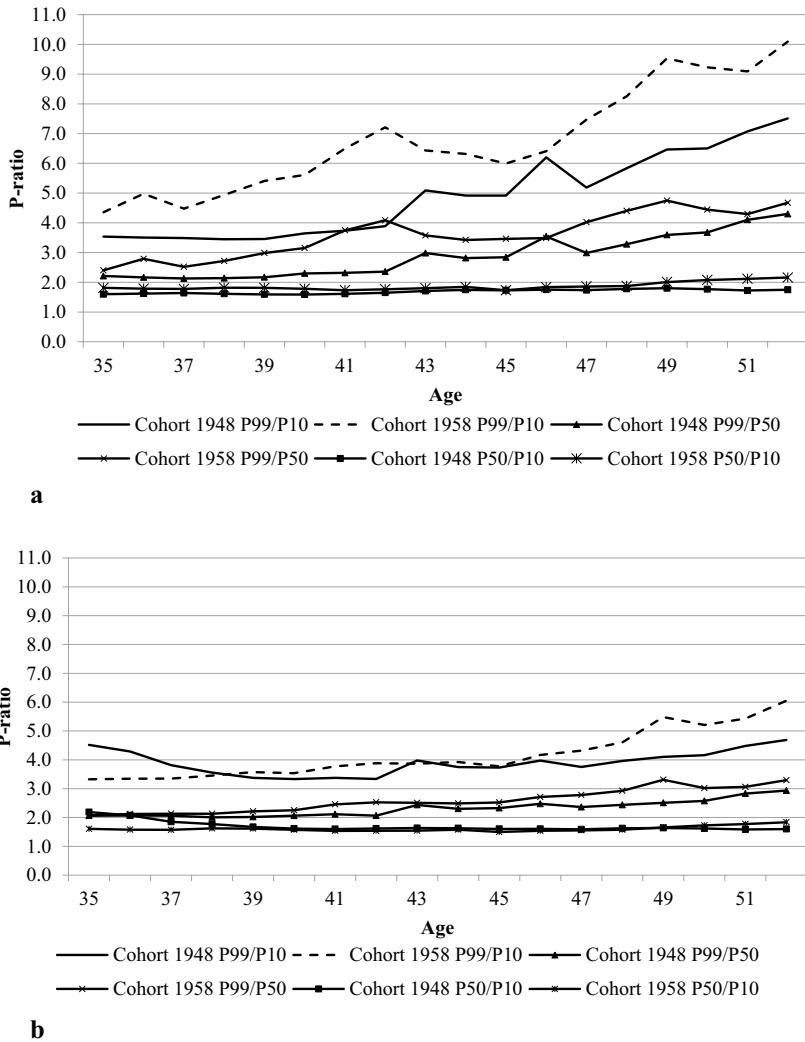


Fig. 2 **a** P-ratios for male cohort 1948 and 1958. Note the years for the 1948 cohort are from 1983 to 2000 and for the 1958 cohort are from 1993 to 2010. **Fig. 2 b** P-ratios for women born in 1948 and 1958. Note: the years for the 1948 cohort are from 1983 to 2000 and for the 1958 cohort are from 1993 to 2010

high as it was for the generation born in 1958. The differences in income between P99/P10 were higher during the ages 35 to 38, which are connected with childbearing, and these periods of lost income have stronger consequences for low-income earners than for high-income earners. After the age of 45 years, there was a real improvement of income for P99 females born in 1958, as the p-ratio shows. The p-ratio P50/P10 was for higher for the 1948 cohort in the 1980s, as fewer women participated at the labour market then (2.2 to 1.6), and for the 1958 cohort, there is almost no change in the p-ratio (1.6 to 1.8). The p-ratios P99/P50 do not show the same improvement of income for the

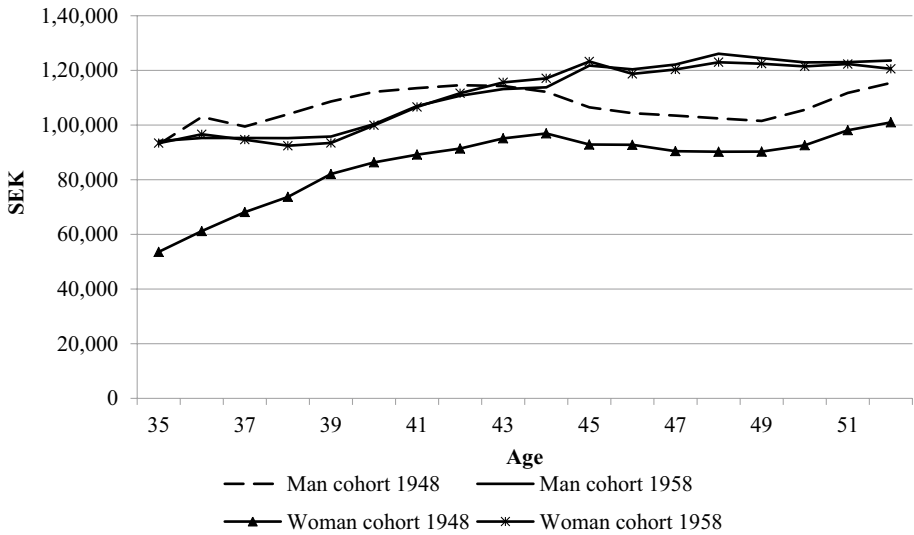


Fig. 3 DPI for individuals born in 1948 and 1958, P10, men and women, fixed price 2010, SEK. Note: the years for the 1948 cohort are from 1983 to 2000 and for the 1958 cohort are from 1993 to 2010

female top-earners as for male top-earners (2.1 to 2.9 and 2.1 to 3.3), which confirms the glass ceiling (Albrecht et al., 2003, 2015).

This increasing inequality, mainly due to the extreme development for top-income earners, is consistent with earlier research (Björklund & Jäntti, 2011; Roine & Waldenström, 2015). Now, we turn to investigating the development of inequality within the three positions according to gender starting at the bottom, P10.

5.1 In the bottom of the income distribution

As seen in Fig. 3, below, the development for men was strongly influenced by the economic crisis in the 1990s. Between the ages of 35 and 44 years, among men born in 1948, the incomes show a small increase as they grew older. This coincides with the years from 1983 to 1992. After the age of 45, their incomes decreased, as a result of which 1992 was the starting year for a deep economic recession in Sweden. For men born in 1958 and aged 35 in 1993, we found the results of increasing rates of unemployment and small income growth rates until the age of 44, as the economy in Sweden recovered (Björklund & Jäntti, 2013). Women in this group did not have the same development, as the 1958 birth cohort had a much better income development than the 1948 birth cohort. One explanation for this is the increasing labour force participation between the cohorts, whereby women born in 1958 in general had higher participation rates than women born in 1948, despite the economic crisis.

Turning to the DPI gender gap, visible in Fig. 3 by comparing the lines for women and men in the same cohort, results show that the gap vanished for the cohort born in 1958. This is a consequence of two things: the increasing female labour force participation and the poor income growth for men in this percentile (as also shown in Table 2). The male population in this percentile did not experience an increase in personal income, compared

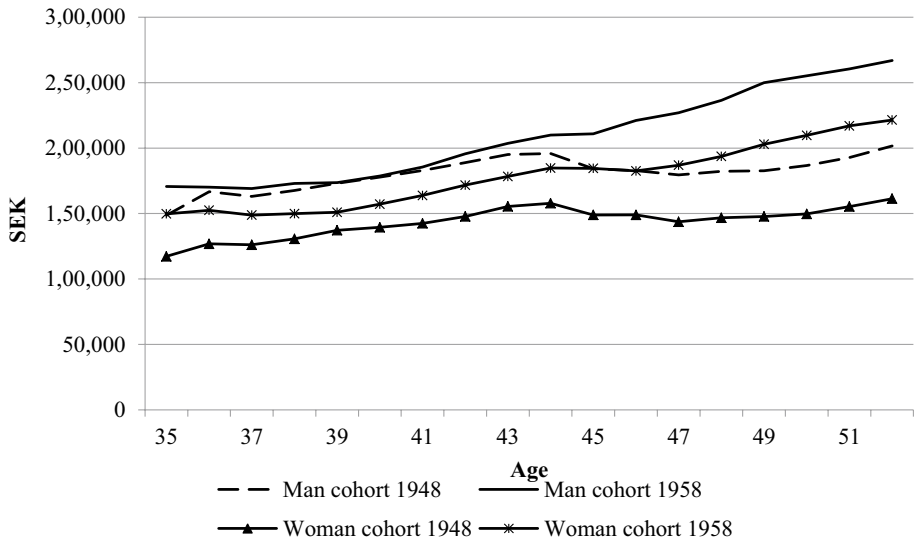


Fig. 4 DPI for individuals born in 1948 and 1958, median. Men and women, fixed price 2010, SEK. Note: the years for the 1948 cohort are from 1983 to 2000 and for the 1958 cohort are from 1993 to 2010

with women in the same percentile and/or men in higher percentiles, following the crisis years in the 1990s, and was thereby exposed to an increased risk of being more marginalised than its earlier counterpart (Burgess et al., 2003). The results show the masculinisation of low income and poverty: a man with a low income retained a low income and remained in poverty. These results are consistent with the results of the studies by Björklund and Jäntti (2013) and Boschini and Gunnarsson (2018).

5.2 In the middle of the income distribution

Turning to the middle of the income distribution, Fig. 4, below, shows the individual DPI according to gender.

Starting with the males aged 35–41, the proceeding cohort born in 1958 did not have a higher income than the earlier cohort born in 1948. This can be explained by the “bad” labour market for cohort born in 1958 during these ages, as these years correspond to the economic crisis in the 1990s. The gap between the two cohorts starting at the age of 44 years increased as they grew older as a consequence of the better economic growth in Sweden after the 1990s for the cohort born in 1958 and the poor economic growth for the cohort born in 1948, which experienced it after the age of 44 years. This development did not seem to happen for women. An explanation for this is that the economic crisis during the 1990s had a stronger impact on men than on women, and the reason for women not experiencing the same development was their increased labour force participation in the cohort born in 1958 compared with women born in 1948.

This was also apparent when investigating the DPI gender gap, visible in Fig. 4 by comparing the lines for women and men in the same cohort. There was an improvement for the cohort born in 1958, aged 35 to 45 years, as the gap decreased by almost ten per cent, but not as much as for the P10. Here, the explanation is also the general increased female

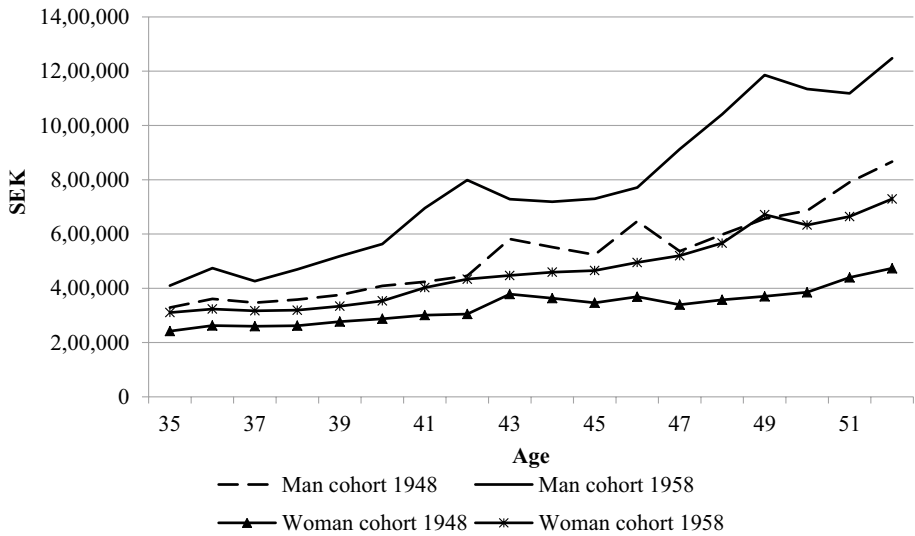


Fig. 5 DPI for individuals born in 1948 and 1958, P99, men and women, fixed price 2010, SEK. Note: the years for the 1948 cohort are from 1983 to 2000 and for the 1958 cohort are from 1993 to 2010

labour force participation, as well as the reforms of the parental leave and the introduction of “daddy” months, which divided the use of the insurance a little more equally between the parents (Duvander & Johansson, 2012). The widening gap starting at the age of 46 for that cohort to the same level as for the cohort born in 1948 is explained by the better income development for men at these ages, as a majority worked in the private sector, and women worked in the public sector with lower income growth (Tamborini et al., 2015).

5.3 At the top of the income distribution

In Fig. 5, which exposes the development for the very top, the P99, it is clearly visible that cohort born 1958 had a higher income than the cohort born in 1948. At 42 years of age, a man born in 1958 had a 1.8 higher income than a man born in 1948. For women, the increase was not as large, although it was substantial, as a woman aged 42 and born in 1958 had a 1.4 higher income than a woman born in 1948. The largest differences were observed at the age of 50 years.

Turning to the DPI gender gap in the P99, visible in Fig. 4, the results showed that it widened with age and increased between the ages of 38 and 43 years for the cohort born in 1958. The results also confirmed that the glass ceiling (Albrecht et al., 2003, 2015) was as hard to hit for both birth cohorts.

Summing up: By dividing into genders, a diversified picture of the development of inequality is revealed. Results show an increased inequality for men in cohort 1958 as low-income men are lagging. Women were not exposed to the economic crisis to the same extent as men, explained by their increasing labour force participation.

Up until now, we have investigated the development of inequality between and within the two cohorts according to three positions of the income distribution. We will now turn to the development of income mobility for the same cohorts, to investigate the causes for

upward or downward income mobility and the way in which it can explain the growing inequality.

6 The development of income mobility within and between the two cohorts

In this section, we turn to the second aim of this study: to investigate intragenerational mobility and the extent to which mobility is connected with the life cycle.

6.1 Mobility according to income development

To address the question of how income mobility has changed, transition matrices were used to explore the extent to which individuals remained in the same quintile from the first year of observation to the last year of observation. By dividing the panel into quintiles based on disposable personal income, immobility was measured for each 18-year period for each cohort. The Tables 3 and 4 is read in the following way: in Table 3 the number 40.6 in the bottom quintile show that 40.6 per cent of the men in the bottom quintile 1983 were in the same quintile 18-years later (2000). 20.1 per cent had moved to Q2, 16.9 per cent to Q3, 13.0 per cent to Q4 and finally 9.5 per cent to the top quintile. To start with an overall view, the movements in bold were first calculated (using the arithmetic mean) to determine the proportion of the sample, which did not change quintile positions (the immobility ratio). The results show, in Table 3 increasing immobility for men born in 1958 (immobility ratio 41.0) compared with men born in 1948 (immobility ratio 36.7). If there were no change in quintiles, i.e. no mobility the mean would be 100. If the mobility was totally random, i.e., if the individual's second quintile position was independent of the first, the mean would be 20.

As indicated in Table 3, the top quintile contains the largest share of immobile individuals. A majority of men in the top quintile were in the same quintile 18 years later. Among the individuals in the top quintile, born in 1948, 65.4 per cent were in the same quintile 18 years later. For the cohort born in 1958, there was increased mobility out of the top quintile—57.4 per cent—but the majority were still at the top 18 years later. In contrast, the bottom quintile revealed increasing immobility when comparing the cohorts: from 40.6 born in 1948 to 48.2 born in 1958. It was harder to change position in the income distribution, and the income that an individual earned at the age of 35 would largely predict his income at the age of 53. To sum up, there was slightly increased mobility in the top and decreased mobility at the bottom.

Women were a little more mobile. As seen in Table 4 the immobility ratio was lower, and there was almost no difference between the two cohorts: 29.8 for women born in 1948 and 30.0 for women born in 1958. Regarding the immobility in the top quintile, the development was opposite to that for men. Of the women in the top quintile, born in 1948, 37.1 per cent were in the same quintile 18 years later. The immobility among women born in 1958, contrary to men, increased to 39.2 per cent who remained at the top 18 years later. In the bottom quintile, the opposite development is evident. For the first cohort, the immobility was 38.8 per cent, while for the second cohort, the immobility reduced to 35 per cent. Women's income mobility was opposite to that of men, as there was increased mobility at the bottom and decreased mobility at the top among women. This can be explained by increased labour force participation and

Table 3 Income mobility matrices, men, aged 35 years at first observation (fixed price 2010)

Man cohort 1948 Income position 2000						
	Bottom quintile	Second quintile	Third quintile	Fourth quintile	Top quintile	Sum quintile
Income position 1983 ($n = 62,017$)						
Bottom quintile	40.6	20.1	16.9	13.0	9.5	100
Second quintile	14.8	20.7	30.0	22.6	11.9	100
Third quintile	8.8	13.2	25.9	31.1	21.0	100
Fourth quintile	6.1	8.4	18.0	31.1	36.4	100
Top quintile	5.3	4.4	7.5	17.4	65.4	100
Immobility ratio			36.7			
<i>Man cohort 1958 Income position 2010</i>						
Income position 1993 ($n = 53,887$)						
Bottom quintile	48.2	23.3	12.8	9.2	6.5	100
Second quintile	23.8	34.5	23.0	12.7	6.0	100
Third quintile	12.4	24.6	31.7	21.7	9.6	100
Fourth quintile	8.6	13.7	23.9	33.3	20.5	100
Top quintile	6.1	5.8	8.8	22.9	57.4	100
Immobility ratio			41.0			

Source SCB data

Table 4 Income mobility matrices, women, aged 35 years at first observation (fixed price 2010)

Woman cohort 1948 Income position 2000						
	Bottom quintile	Second quintile	Third quintile	Fourth quintile	Top quintile	Sum quintile
Income position 1983 (n = 61,567)						
Bottom quintile	38.8	25.4	17.1	11.5	7.2	100
Second quintile	23.7	24.0	22.4	18.2	11.7	100
Third quintile	15.9	21.2	23.6	22.4	16.9	100
Fourth quintile	11.1	15.9	20.7	25.4	26.9	100
Top quintile	10.4	13.9	16.3	22.4	37.1	100
Immobility ratio			29.8			
Woman cohort 1958 Income position 2010						
Income position 1993 (n = 53,029)						
Bottom quintile	35.0	25.3	17.2	13.7	8.8	100
Second quintile	19.3	25.7	25.4	19.1	10.5	100
Third quintile	15.6	19.9	24.7	24.0	15.8	100
Fourth quintile	13.7	15.9	19.1	25.5	25.8	100
Top quintile	14.4	14.2	14.1	18.1	39.2	100
Immobility ratio			30.0			

Source SCB data

changed income source: the share of transfers decreases, and the share of earned income increases as women increase their working hours as the children get older.

Tables 3 and 4 also show considerable income mobility between the second, third and fourth quintiles for both genders. A relatively small change in income could result in an individual crossing a quintile border and being deemed as income mobile.

These mobility matrices have shown the absolute mobility—mobility relative to previous income. Now the interest is to examine the relative mobility, which reflects changes in an individual's relative position.

6.2 Mobility according to education, civil status and country of birth

To capture if and how the level of education, changes in levels of education, changes in civil status and country of birth affected income mobility, a multinomial logit model was used. In the model, persons were classified into three categories defined by the level of individual DPI during the last year of observation compared with the individual DPI during the first year of observation. “Downward mobility” was defined as less than 80 per cent, “relatively immobile” as between 80 per cent and 120 per cent and “upward mobility” as 120 per cent or more of the former income. These classifications captured any major changes in income while allowing various explanatory variables to affect increases and decreases differently. Three groups of explaining variables were included. The first group measured the individual's level of education and was constructed according to whether the individual had retained the same level of education or changed their level of education between the first and the last year of observation. Most individuals are supposed to have reached their highest educational level at the age of 35 years, but, as described in Sect. 3, during the 1990s, an educational programme, known as the “Knowledge Lift,” was directed to adults. Changes in civil status might also influence income mobility, but to what extent? To answer that question, the civil status at the first observation was compared with the civil status at the last observation. Finally, the third group of variables concerned the country of birth: this variable was included to indicate whether an individual's country of birth explains downward or upward mobility. The reference categories were: remain in secondary education; remain married; and born in Sweden.⁸

Figures 6a and 6b show the predicted probabilities of upward mobility, relative immobility and downward mobility for individuals with different combinations of characteristics.

As shown in Fig. 6a, for the men, the largest share stay in the same income, but when comparing the 1948 cohort with the 1958 cohort, the figure shows an increased mobility to higher income for all cases. Having a tertiary education pay off as 33 per cent in cohort 1948 and 47 per cent in cohort 1958 experienced an increased income (case 2). To change education level also pay off, to the highest extent if getting a tertiary education (case 5) but also from primary to secondary (case 4). To remain unmarried (case 7) or become divorced (case 8) does not improve income, as approximately four out of five are relatively immobile or experienced a downward income. For individuals born in a European country (case 10) or outside Europe (case 11), the mobility into a higher income has improved, especially for the 1958 cohort.

Turning to the development for women, Fig. 6b, also here the largest share is relatively immobile, but the same trend of increased income as was found for men is not shown.

⁸ Estimates from the multinomial logits are available upon request.

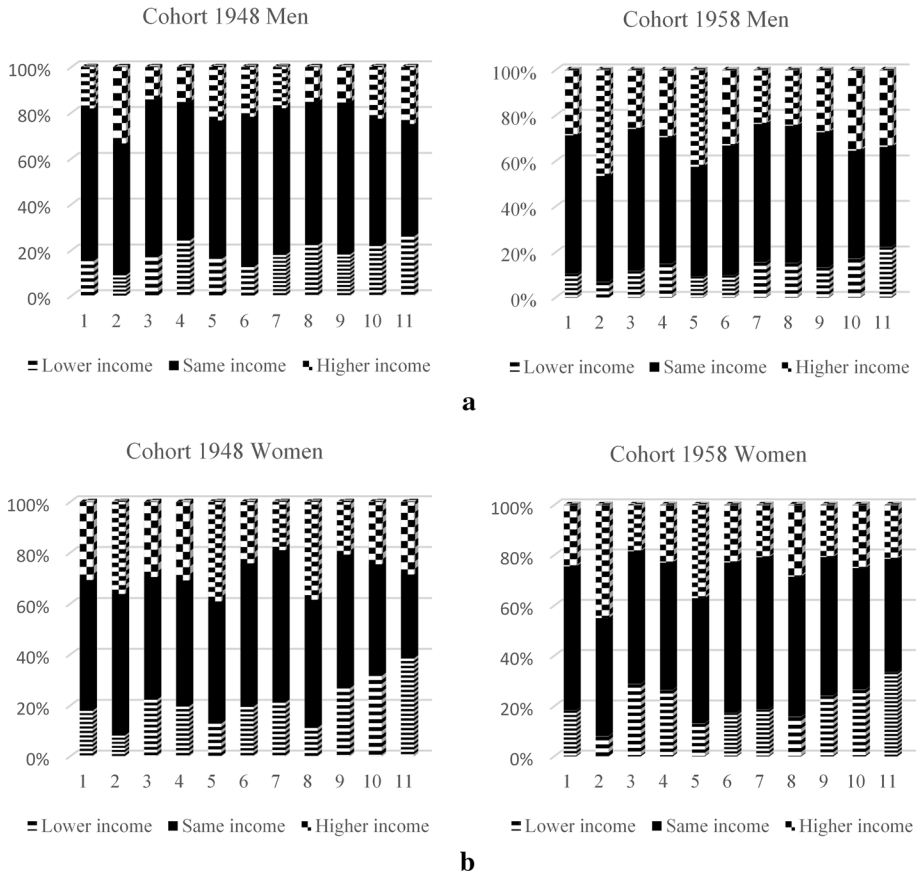


Fig. 6 **a** Predicted mobility transition probabilities. Cohorts 1948 and 1958, men. Characteristics: Case 1. Man, secondary education, married, born in Sweden. Case 2. as 1. Except tertiary educated. Case 3. as 1. Except primary educated. Case 4. as 1. Except change educational level from primary to secondary. Case 5. as 1. Except change educational level from secondary to tertiary. Case 6. as 1. Except change civil status from unmarried to married. Case 7. as 1. Except civil status unmarried. Case 8. as 1. Except change civil status from married to divorced. Case 9. as 1. Except born in the Nordic countries. Case 10. as 1. Except born in Europe except the Nordic countries. Case 11. as 1. Except born outside Europe. **Fig. 6 b** Predicted mobility transition probabilities. Cohorts 1948 and 1958, women. Characteristics: Case 1. Woman, secondary education, married, born in Sweden. Case 2. as 1. Except tertiary educated. Case 3. as 1. Except primary educated. Case 4. as 1. Except change educational level from primary to secondary. Case 5. as 1. Except change educational level from secondary to tertiary. Case 6. as 1. Except change civil status from unmarried to married. Case 7. as 1. Except civil status unmarried. Case 8. as 1. Except change civil status from married to divorced. Case 9. as 1. Except born in the Nordic countries. Case 10. as 1. Except born in Europe except the Nordic countries. Case 11. as 1. Except born outside Europe

Education does not pay off except for women having a tertiary education (case 2), as 36 per cent in the 1948 cohort and 45 per cent in the 1958 cohort experienced an increased income. There is no change in the pay off for a changed education level to a tertiary education (case 5) when comparing the 1948 cohort and the 1958 cohort. To change education

from primary to secondary (case 4) does not improve mobility for the 1958 cohort to the same extent as for the 1948 cohort and as for men (Fig. 6a). Women who remain unmarried (case 7) have the same consequences as for men, as four out of five are relatively immobile or experience a downward income. To become a divorced woman (case 8) has other consequences than for men, especially for the 1948 cohort, where two out of five experience upward mobility. Of women among the 1958 cohort, three out of ten experience an upward mobility as divorced women. The decreasing upward mobility of divorcing for the 1958 cohort is a consequence of their higher labour market attachment already as married. Finally, when comparing the outcome for immigrants (case 10 and case 11), the results do not show an increased upward mobility. These women are trapped in low incomes.

7 Conclusion and discussion

The picture that arises when using this alternative method is a more complex and multifaceted image of the development of income inequality within and between the two birth cohorts studied here. The different development according to position in the income distribution is clear when comparing genders, especially when investigating the gender DPI gap. As shown, the gender gap has more or less vanished within the P10 cohort born 1958. This is because of men belonging to P10 have not experienced the same income development as men in other positions in the income distribution, as well as increased female labour force participation and thereby increased income for women in the same percentile. This is a strong indication that male low-income earners have been left behind, a development that also became visible when calculating and comparing p-ratios and annual average growth rate. The DPI gender gap for the two other positions in the income distribution does not show a similar development. On the contrary, it is widening with age—mostly for P99, where the glass ceiling remained. Income mobility also differs between genders, as there was increased mobility at the bottom quintile and decreased mobility at the top quintile among women, in contrast to men.

A diversified picture of the development of inequality is also shown within genders. Starting with women, the Gini coefficient increased at age 46—probably a consequence of increased labour force participation in the cohort born in 1958 after childbearing. There is also a substantially increased inequality expressed as p-ratios for P99/P10 when comparing women in the 1958 cohort with the 1948 cohort. Looking at intragenerational mobility, there are no major differences between the two birth cohorts, although a small change of increased mobility in the bottom quintile can be observed for cohort born in 1958 (35.0) compared with the cohort born in 1948 (38.0). In the top quintile, an increased immobility is reported for the 1958 cohort (39.2) compared with the 1948 cohort (37.1).

For men, the development is a bit different. The cohort born in 1958 experienced more inequality, expressed as a Gini coefficient, than the male 1948 cohort, probably because of the economic downturn in the beginning of the 1990s, which lead to increased unemployment and cuts in social insurance benefits. There is also a substantially increased inequality for P99/P10 for the 1958 cohort compared with the 1948 cohort. The patterns of mobility between the two cohorts of men are different to women. There is increasing immobility in the bottom quintile (from 40.6 born in 1948 to 48.2 born in 1958) and decreasing immobility at the top quintile, from 65.4 per cent for the 1948 cohort to 57.4 per cent for the 1958 cohort.

When modelling income mobility, it is somewhat difficult to draw general conclusions. The predicted probabilities of the 11 cases showed that levels of education have decreased to contribute to an upward mobility for the 1958 cohort. To have a higher education still pay off, but to the change level of education, does not give the same reward as for the 1948 cohort. The results also showed that changes in civil status in particular had an impact on mobility, indicating that changes in the life cycle are crucial for individuals' income mobility. Taking all the results together, the development of increasing income inequality in Sweden is apparent.

This study has shown the need for using alternative methods when investigating the development of income inequality in a country. Deepening the description according to gender, cohorts and different income distribution positions contributes to a fuller understanding of the consequences of inequality for individuals. This can lead to accurate policy decisions for politicians aiming to reduce inequality.

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Data availability The dataset used for this study is based on linked data retrieved from Statistics Sweden. Sharing of the data is restricted by Swedish data protection laws, according to which administrative data is made available for specific research projects. Thus, the data used for this study cannot be shared with other researchers.

Declaration

Conflicts of interest The author(s) declares there is no conflict of interest.

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