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Structural inequality: The case of Sweden

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ABSTRACT/RÉSUMÉ

Structural inequality – the case of Sweden

Structural trends not directly related to labour market functioning and redistribution have made a sizeable contribution to inequality and poverty in Sweden, but occupy only limited space in the income inequality debate. To fill this gap, we put a quarter of a century of rising inequality in Sweden in a new perspective by quantifying the effect of changing household composition, age structure, industry structure, educational attainment and immigration on inequality. The influence of structural changes on inequality is derived from micro-data from Statistics Sweden. We re-weigh subgroups of the population with certain characteristics by their population shares in 1987 to construct counterfactual income distributions for 2013 and derive inequality measures that we compare to their actual 2013 values. We find that almost half of the inequality increase between 1987 and 2013 can be mechanically ascribed to these factors.

JEL classification codes: D31; I24; I32; J11;J12; J14; J15; L16.

Keywords: Income distribution, poverty, demographics, structural trends, immigration, ageing, education, industry structure, household structure

Inégalités structurelles - le cas de la Suède

Des tendances structurelles non directement liées au fonctionnement du marché du travail et à la redistribution ont significativement contribué à l'inégalité et à la pauvreté en Suède, mais n'occupent qu'un espace limité dans le débat sur l'inégalité des revenus. Pour combler cette lacune, nous abordons un quart de siècle de croissance de l'inégalité en Suède selon une nouvelle perspective, en quantifiant l'effet de l'évolution de la composition des ménages, de la structure par âge, de la structure industrielle, du niveau d'éducation et de l'immigration sur l'inégalité. L'influence des changements structurels sur l'inégalité est dérivée de micro-données de l'institut statistique suédois. Nous re-pondérons les sous-groupes de la population présentant certaines caractéristiques par leurs parts de la population en 1987 pour construire des distributions de revenu contrefactuelles pour 2013 et dériver des mesures d'inégalité que nous comparons à leurs valeurs réelles de 2013. Nous constatons que près de la moitié de l'augmentation de l'inégalité entre 1987 et 2013 peut être mécaniquement attribuée à ces facteurs.

Classification JEL: D31; I24; I32; J11;J12; J14; J15; L16.

Mots-clés: Répartition des revenus, pauvreté, démographie, tendances structurelles, immigration, vieillissement, éducation, structure de l'industrie, structure des ménages

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STRUCTURAL INEQUALITY – THE CASE OF SWEDEN

By Per Olof Robling and Jon Kristian Pareliussen¹

“Equality is a utopia (...) that must be constantly redefined and constantly conquered anew.”

-Olof Palme, 30 July 1965.

Introduction

1. A long trend of falling income inequality in Sweden turned in the 1980s and the Gini coefficient of household disposable income is today the highest among the Nordics (Figure 1). The falling trend pre-dates the rise of the welfare state in the 1960s and 70s by several decades and drivers of equality have varied over time (OECD, 2017).

2. Rapidly rising inequality in Sweden from the end of the 1980s has been subject to some attention. The OECD pointed out in 2011 that despite still being among the nine most equal countries in the OECD, “the growth in inequality between 1985 and the late 2000s was the largest among all OECD countries, increasing by one third”. More concentrated capital incomes and hence a higher income share of top earners, as well as less generous benefits, were identified as main drivers (OECD, 2011). Benefits have fallen behind earned incomes because they were cut or frozen as a consequence of the 1990s crisis, and have since been uprated according to the CPI or on an *ad-hoc* basis. This is an important factor behind the increased difference in earnings between incomes in the lower part of the distribution and the median (ISF, 2014; OECD, 2017; Ministry of Finance, 2016).

3. The underlying causes of rising inequality are partly attributed to the reversal of unsustainable policies and trends. Low inequality in the 1980s and early 1990s was unprecedented in a historical perspective, partly driven by rapid public sector expansion in the previous decades, government direct interventions to keep ailing industries alive and unsustainable macroeconomic policies. These policies may have boosted employment in the short term but eroded competitiveness, which could only be restored through recurrent currency devaluations. In the late 1980s, a further employment boost came from rapid credit expansion and asset price increases, largely driven by the deregulation of the domestic credit market and a tax system that resulted in low or negative real after-tax interest rates in a high-inflation environment. Economic and financial imbalances culminated in the early 1990s economic crisis, with mass unemployment, a drop in the employment rate from 83% to 73% and rising inequality as a result. Market income inequality rose significantly, but taxes and transfers dampened the rise in household disposable income and consumption inequalities (Domeij and Flodén, 2010; OECD, 2017).

¹ Per Olof Robling is Economist at the Economic Affairs Department in the Swedish Ministry of Finance. Jon Kristian Pareliussen is Economist in the OECD Economics Department. The authors would like to thank Christophe André, Vincent Koen, and Mikkel Hermansen (all from the OECD Economics Department) warmly for invaluable comments and suggestions at various stages of the preparation of this paper.

Figure 1. Inequalities have been widening, but remain relatively low

1. Market income including capital income, but excluding capital gains.
2. The Gini index measures the extent to which the distribution of income deviates from a perfectly equal distribution. A Gini index of zero represents perfect equality and 100 represents perfect inequality. "Latest" refers to 2012 except for Canada (2011), Finland, Israel, Korea, the Netherlands, the United States (2013) and Hungary (2014).

Source: OECD Income Distribution database; The World Wealth and Income database.

4. Product and labour markets were deregulated in the 1980s and 1990s and the breakdown of highly centralised wage bargaining contributed to higher inequalities, but probably also to a better functioning economy. Wage bargaining coordination was restored, but became considerably more flexible in the 1997 Agreement of Industry Development and Wage Formation, which has formed the basis for Swedish wage bargaining since. Wage inequality has hardly increased since year 2000 (Domeij and Flodén, 2010; Elvander, 2002; Lindbeck, 1997; OECD, 2017).

5. The factors mentioned above relate directly to wage formation, the employment level and the role of redistribution. These factors have been extensively analysed because of their indisputable relevance to inequality, and also because of their direct policy relevance. But Sweden has also experienced significant demographic and structural changes that are neither directly related to the labour market functioning nor

redistribution policies over the past few decades. Ageing and large cohorts of baby boomers have shifted the demographic structure, family structures have changed in the direction of more single-person and single parent households, educational attainment has increased and the industry structure has changed. Furthermore, migration has increased in volume and its composition has changed with a higher share of humanitarian and family reunion migrants. This paper expands on Robling (2015), to assess the contribution of these structural trends and shocks to rising inequalities in Sweden from 1987 to 2013. We present results for the Gini coefficient, relative poverty, defined as 60% of the median income, and the top 10% income share.

6. We find that about 70% of the change in the Gini coefficient of market income from 1987 to 2013 can be attributed to these structural factors. Redistributive policies dampened their effect considerably, but the mechanical effect of changing structural factors can nonetheless explain more than 40% of the increase in the Gini coefficient of disposable income, almost 40% of the increasing top income share and 45% of the increase in the relative poverty rate. Household structure had a major impact on all measures of inequality, poverty in particular. Ageing increased inequality as measured by the Gini, but reduced poverty. Changing industry structure increased both the Gini and the relative poverty rate, but probably relatively moderately in international comparison. Immigration had only a modest impact on the Gini coefficient, but a higher impact on poverty.

7. The rest of this paper is structured as follows: The second section contains a description of the dataset and descriptive statistics of the structural factors for Sweden and the OECD. The methodology is explained in the third section, and results are presented in the fourth section. Summary and conclusions are presented in the fifth and last section.

Data

8. We use data from the Survey of Household Finances (HEK), an annual survey conducted by Statistics Sweden (SCB, 2014). The target population for the survey consists of all households and individuals who were included in the population register in Sweden at some point during the survey year. The sample consists of household heads (highest earner) aged 18 and above and households are constructed around these individuals. The sampled individuals are interviewed by phone to collect household background information. Detailed register information on incomes, taxes and transfers, as well as other background characteristics is available for all individuals in the household. The sample size varies from 20,000 to 40,000 individuals each year. 1987 is the first year with complete data on all the structural factors we consider, and 2013 is the last available year of the survey. We therefore focus on changes in inequality between 1987 and 2013 in the main analysis. Focusing on this time span allows us to consider a wide range of factors during the era where most of the increase in inequality took place.

Households

9. Statistics Sweden has used two definitions of households in the survey since 1991. The old definition did not include children above the age of 18 still living with their parents. This artificially lowers the economic position of young adults living with their parents and artificially increases the economic position of their parents because they are considered separate households. Thus, inequality measured using the old definition is somewhat overstated; for instance, the Gini coefficient of disposable income in 2013 is 33.2 using the old definition, but only 30.1 with the new definition. For consistency we use the old definition during the entire period of study.

Income definitions

10. The distribution of equivalent disposable income is our main outcome of interest. Disposable income consists of total income from all market sources plus all transfers and less direct taxes. Individual disposable income is summed within households and the square root of household size is used as the equivalence scale. Equivalent market income is constructed in the same way, but using incomes before taxes and transfers. We refer to these income measures simply as disposable income and market income. All incomes are adjusted to reflect the price level in 2013.

Structural changes in Sweden compared to other OECD countries

11. Sweden has seen significant structural changes between 1987 and 2013. Changes in the population structure, including age profile, household types, educational attainment and migration status are summarised in Table 1. The population share of the young (18-24) has decreased, which reduces inequalities as the young have low incomes compared to the median. Their average income has almost been halved compared to the median and their dependence on transfers has increased. These trends are related to increasing educational attainments and hence postponed labour market entry. An increasing share of the old (64+) over the period is expected to increase inequality since their average incomes are significantly lower than the median. It should be noted, however, that this group now has higher employment and higher average incomes than in 1987.

12. Household structures have changed, with fewer couples and significantly more single persons without children. Single parents have increased strongly in percentage terms, but still constitute a fairly low share of households. Single headed households' incomes are significantly lower than the median, and their increasing population share should hence be expected to increase inequality. Couples have seen solid income increases, while single and lone parents' incomes have fallen over the period. Lone parents' employment fell back significantly, as did the benefit share of their income.

13. The foreign born share of the population roughly doubled and the composition of migration changed from 50% Nordic immigrants in 1987, to an overwhelming share of non-EU15 immigrants, a group with relatively low incomes, in 2013. These developments should hence be expected to raise inequality. The latter group also saw their relative incomes fall strongly from slightly below the median in 1987 to about 75% of the median in 2013. Nordic migrants' incomes also fell, but this is likely a cohort effect, as there is a positive correlation between being a Nordic migrant and belonging to the oldest cohorts in 2013. This cohort effect is also reflected in a high share of transfer income for this group.

14. Educational attainments have changed considerably. The population share with less than 9 years of schooling, a group with relatively low incomes, has fallen by more than two-thirds, which should be expected to lower inequalities. The shares with college- or research degrees have increased considerably, which should increase inequality, since these groups earn well above the median. However, educational attainment is also correlated with age and immigrant status. There are also relatively strong positive correlations between having low education and being a lone parent, a non-EU15 immigrant or belonging to the oldest cohorts in 2013. Higher education is positively correlated with belonging to couples and the younger cohorts and being a EU15 migrant. We should therefore expect that parts of the inequality effects from education are picked up by the other factors we study and *vice versa*.

Table 1. Population structure and outcomes

		Population share (in %)		Employment rate (in %)		Disposable income relative to median (in %)		Transfers as share of disposable income (in %)	
		1987	2013	1987 ¹	2013 ¹	1987 ¹	2013	1987 ¹	2013 ¹
Age	18-24	12.5	11.5	78.0	54.9	78.5	42.9	29.0	40.6
	25-64	64.0	63.6	87.2	85.5	113.5	115.3	32.6	27.3
	64+	23.4	24.9	5.1	12.8	76.1	84.4	116.5	110.6
Household types	Singles without children	36.0	41.8	55.9	55.1	77.5	69.0	58.1	56.0
	Lone parents	2.8	3.4	89.3	80.9	85.8	72.8	55.4	51.1
	Couples with children	25.9	22.6	93.1	90.0	112.1	117.8	25.8	22.7
Education	Couples without children	35.3	32.1	56.7	54.9	119.2	130.4	64.2	60.2
	< 9 years of schooling	39.0	11.4	40.6	18.2	86.4	68.1	78.4	100.6
	9 years of schooling	11.1	11.0	80.5	49.7	98.4	75.8	35.3	57.7
Place of birth	Short high school	27.2	22.5	83.5	62.2	104.5	101.7	37.5	54.3
	Long high school	9.2	21.9	78.9	76.9	109.4	97.4	34.5	34.7
	Some college	6.6	13.9	84.9	72.2	118.8	110.0	32.6	40.8
	College	6.4	18.3	92.7	80.1	133.0	130.1	26.2	32.8
	Research	0.4	0.9	100.0	78.6	163.0	175.0	13.9	30.6
	Sweden	91.2	83.8	66.6	65.1	100.1	103.8	51.5	49.1
	Nordic countries	4.4	3.0	74.0	46.8	103.2	92.5	49.4	68.0
	EU15	1.1	1.2	68.8	59.0	101.0	102.8	64.4	48.7
	Other countries	3.4	12.0	62.8	59.9	93.1	73.7	58.8	49.0

1. Displayed for information. These variables are not used in the decomposition exercise.

15. The industrial structure has also changed considerably. Table 2 shows the current industry of employment of the household head, disposable income relative to the median equalized disposable income. The shares of manufacturing and transportation and storage in employment have fallen, which should contribute to reducing inequalities, since already high incomes compared to the median have continued to increase in manufacturing, transport and storage. A rising employment share in relatively low-income accommodation and food services would be expected to contribute to increasing inequalities, as would the increasing shares of high-paying ICT, professional and financial services jobs. Wholesale and retail trade, health, education and social work have gained importance, but contributions to inequality should be limited, as incomes are only slightly above the median in these sectors. Transfers as a share of income have in general decreased and were more uniform across sectors in 2013 than in 1987.

16. All OECD countries have seen major structural changes since 1987, and changes mostly went in the same direction as in Sweden. Direct comparison between Sweden and other OECD countries over the same structural factors and time period as in the main analysis are not possible due to data limitations, but some qualitative reflections can nonetheless be made based on existing OECD indicators.

17. The high increases in single person and single parent households in Sweden from 1987 to 2013 can be partly attributed to fewer marriages and an increased number of divorces, even though the number of cohabiting unmarried couples has also increased in the last decades, likely more in Sweden and the other

Nordics than in the average OECD country (Kiernan, 2002). Changes in the rate of marriages net of divorces will only affect inequality gradually and with a significant lag as the share of single person and single parents increases. This ratio has fallen across the OECD since the 1960s, but has fallen more quickly in Sweden, and has been significantly lower than the OECD average for more than three decades from the 1970s to the mid-2000s, except for a spike induced by proposed changes to public widows' pensions in 1989 (Figure 2). This development has likely increased inequalities in Sweden compared to the OECD average. OECD (2011) also found household structure to be a more important factor behind increasing inequalities in Sweden than in most other countries.

Table 2. Employment shares and outcomes

	Employment share (in %)		Disposable income relative to median (in %)		Transfers as % share of disposable income	
	1987	2013	1987 ¹	2013	1987 ¹	2013 ¹
Agriculture, forestry and fishing	4.8	2.0	84.97	106.1	34.25	49.0
Mining and quarrying	0.4	0.3	127.31	165.9	22.33	41.2
Manufacturing	25.1	14.0	115.36	135.2	23.66	10.1
Electricity, water, gas, steam, air conditioning supply and maintenance	1.1	1.3	129.72	150.1	17.86	14.0
Construction	8.3	7.5	116.57	132.0	21.79	14.2
Wholesale and retail trade; repair of motor vehicles	10.4	12.1	114.96	116.4	19.58	14.2
Transportation and storage	8.6	5.7	119.72	118.5	22.39	19.5
Accommodation and food service activities	1.9	3.7	92.87	81.8	28.72	17.9
Information communication and arts	2.2	5.4	110.90	140.5	26.00	17.9
Financial and insurance activities	2.4	1.8	127.22	171.8	17.27	14.2
Real estate, professional, scientific and technical activities	5.9	12.8	129.96	127.0	22.91	14.7
Public administration and defence; compulsory social security	4.3	3.5	127.45	137.9	19.01	19.4
Education, human health and social work activities	20.8	25.8	108.56	113.2	27.96	17.1
Domestic and other services	1.7	2.2	100.96	98.6	26.47	22.2
Activities of extraterritorial organisations and bodies	2.3	1.9	92.40	75.6	77.59	28.2

1. Displayed for information. These variables are not used in the decomposition exercise.

Figure 2. Trends in couple formation

Source: OECD Family Database (Extracted 27 June 2016).

18. Ageing will normally increase inequalities, since pensioners typically have lower earnings than workers. The strength of this relationship depends on the difference between pensions and earnings, which differs between countries. Children and youth living with their parents will lower equivalised income for all members of a family, and youth living on their own typically have lower incomes than prime-aged individuals. The effect of a higher share of youth is however not clear-cut, as children living in wealthy families will lower equivalised incomes in the higher end of the distribution. The old-age dependency ratio has increased in Sweden since 1987, but less so than in most OECD countries. On the other hand the youth dependency ratio has decreased less (Figure 3).

Figure 3. Dependency ratios

1. Youth dependency ratio is the ratio of youth (-20) to the working-age population (20-64). Old age dependency ratio is the ratio of old (65+) to the working-age population (20-64).

Source: OECD Population Statistics (Accessed 27 June 2016).

Figure 4. Manufacturing employment

As a share of total employment, change from 1985/1995-2009¹

1. 2008 for Luxembourg, Korea, France, Norway, Switzerland, Germany, Czech Republic and Hungary, 2007 for Iceland.

Source: OECD Structural Analysis (STAN) Database (Accessed 27 June 2016).

19. Educational attainment has changed considerably in Sweden, as in the rest of the OECD. Data from the OECD Education at a Glance database show that the population share with less than upper secondary education has fallen by approximately 12 percentage points from 1998 to 2013 in Sweden. This is in line with the OECD average. The share with tertiary education has increased with 9 and 13 percentage points in Sweden and the OECD, respectively. However, a data break from 2004 to 2005 lowers the share in Sweden by five percentage points, likely related to re-classification of short-cycle post-secondary education. There is hence little reason to expect education attainment to have had a higher influence on the income distribution in Sweden than in the OECD average.

20. The last structural factor we investigate is the changing volume and composition of migration. The 2014-2015 humanitarian immigration surge is not included in our dataset, but the share of non-EU migrants had already increased by 360% from 1987 to 2013. Cumulative net migration from 1987 to 2013 as a percentage of the 2013 population has been higher in Sweden than in most other OECD countries, even though several countries have seen even higher net migration per capita over the period (Figure 5). The composition of migrants to Sweden is however different from that of the other high-immigration countries, with a high share of humanitarian and family reunion immigrants who are less likely to integrate successfully in the labour market (Bussi and Pareliussen, 2015; OECD, 2015). High migration with an unfavourable composition would suggest that migration has affected inequalities more in Sweden than in most OECD countries. Robling (2015) finds that the direct effect of volume and composition of migration on inequality in Sweden is positive, but relatively modest.

Figure 5. Net migration 1987-2013

Cumulative share of total population 2013

Source: OECD Population and Vital Statistics Database (Accessed 27 June 2016).

Methodology

21. The traditional method of exploring how compositional changes in a society contribute to changes in income inequality is to apply additively decomposable inequality indices.² The drawbacks of

² Mookherjee and Shorrocks (1982) and Foster et al. (1984) show how the change in mean log deviation (MLD) and poverty can be decomposed into components that separate the compositional effects from changes within and between population groups. For other measures of inequality, this sort of decomposition is not straightforward.

this approach are that researchers are confined to a few inequality measures and that the analysis becomes difficult when the number of combinations of population characteristics is large (Jenkins and Van Kerm, 2009). DiNardo et al. (1996) propose a more general method in which an observation, or a group of observations, is re-weighted according to whether it is under- or over- represented in a counterfactual scenario. This allows the use of any summary measure of the income distribution and facilitates the analysis of multiple population characteristics. The methodology is well-suited to answers questions such as “What would the distribution of income in Sweden look like if the household structure had been the same as it was in 1987, but everything else was as it was in 2013?”. We construct such counterfactual income distributions for the structural factors discussed above. The distributions are constructed by using the data on incomes in 2013 and then re-weighting the sample for each factor to match the distribution of those factors in 1987. Summary measures for this distribution are then calculated using standard methods. Below we demonstrate more formally how the counterfactual distributions are constructed. For a more complete discussion see Fortin et al. (2011).

Decomposition by re-weighting

22. The distribution of income in period 1 (2013) can be expressed as the integral of the density of incomes conditional on some characteristics, X , of the population, over the distribution of X in period 1:

$$f_1(Y) = f_1(Y; t_X = 1) = \int_X f_1(Y | X) dF_1(X) \quad (1)$$

23. If the distribution of X is independent from the conditional distribution of income, then the hypothetical distribution of income that would have prevailed in period 1, if X had been distributed as in period 0 (1987), can be written as

$$f_1(Y; t_X = 0) = \int_X f_1(Y | X) dF_0(X) = \int_X f_1(Y | X) \frac{dF_0(X)}{dF_1(X)} dF_1(X) \quad (2)$$

24. The right hand side of (2) is identical to (1) except for the ratio $\frac{dF_0(X)}{dF_1(X)}$. Thus, multiplying the original income distribution in period 1 by the ratio of the distribution on X in period 0 and 1 result in an adjusted distribution that is the distribution of income in period 1 weighted by the distribution of X in period 0.

25. For any measure of inequality I , the contribution of characteristics X to the change in I is calculated as

$$\frac{I(f_1(Y)) - I(f_1(Y; t_X = 0))}{I(f_1(Y)) - I(f_0(Y))} \quad (3)$$

Limitations and interpretation

26. First, the assumption of invariant conditional distributions is not likely to hold exactly. There will be equilibrium effects of changes in characteristics of the population. For example, immigration can change the relative supply of skills in the labour market and therefore affect natives' wages. These indirect effects can vary in size depending on the factor but in the case of immigration they are likely to be small (Card, 2009). The problem of equilibrium effects is not unique to this study but is present in all

decomposition exercises regardless of technique. Therefore, as with other decompositions, the results should be interpreted as correlations, indicating directions for further research, rather than causal effects.

27. Second, the methodology outlined above only analyses one characteristic of the population at a time. We set out to investigate several factors, the relative magnitude of different factors and the joint impact of all factors considered. One way to proceed would be to simply repeat the procedure outlined above for all factors under consideration. The problem with this approach is that if the factors are not independent these estimates will contain interaction terms and the contribution of the factor will therefore be biased. In addition, summing these individual contributions will give a biased estimate of the joint contribution since these interaction terms are counted multiple times. Another approach would be to introduce the factors in a sequence. This would give an unbiased estimate of the joint contribution but the contribution of the individual factor would depend on the order in which the factors are introduced.

28. To resolve this issue, we follow the approach suggested by Shorrocks (2013), where the marginal contribution of the individual factor is its mean contribution from all possible orderings of the included factors. This procedure thus accounts for interdependence among the included factors and in addition has the desirable property that the individual contributions sum up to the joint contribution of all the included factors.

29. The factors analysed in this paper are chosen for not being directly related to the wage structure, employment and redistribution, and hence represent only a subset of possible factors to consider. Other studies including other factors answer different questions and can yield different results also on our chosen factors because of interaction terms. For example, a decomposition of factors affecting inequality carried out by the OECD decomposed inequality according to the dispersion of male earnings, male and female employment rates, assortative mating and household structure. Male earnings dispersion was found to be the main factor affecting inequalities in most countries analysed, including Sweden. The factors we study would indeed affect inequality partly through increased male earnings dispersion. Our results should hence not be interpreted as contradicting the OECD study or similar ones, but rather as complementing them with a different angle of study. The OECD decomposition, carried out with data from the Luxembourg Income Study with data points in the mid-1980s and the mid-2000s also found that household structure had a stronger impact on inequality in Sweden than in most other OECD countries. Furthermore, the results in that study were sensitive to the ordering of factors in the decomposition and household composition gained significantly in importance when decomposing the factors in reverse order (OECD, 2011).

30. A statistical artefact may lead to over-estimating inequality overall and the effect of household structure in particular. In Sweden, the most common arrangement after a separation is that children live an equal amount of time alternately with both parents. However, for statistical purposes children are registered in one parent's home, generally with their mother. This mechanically lowers equivalised incomes of single mothers and children with separated parents, and raise single fathers' incomes. Another shortcoming is that income taxed in other countries, in particular the income of those who live near the borders and work in neighbouring Nordic countries, is not completely captured in the Swedish statistics. This affects inference in many municipalities in southern Scania that also have a high immigrant population (Fiscal Policy Council, 2013).

Results

31. We find that about 70% of the change in the Gini coefficient of market income from 1987 to 2013 can be attributed to the sum of changes in age structure, household composition, industry structure, immigration and education attainment. Age structure is the single factor contributing the most to the increase, while higher educational attainment has dampened market income inequalities strongly. The impact of structural factors is more profound in the lower than the higher end of the distribution; the

structural factors have mechanically contributed more than the total increase in the poverty rate and have consequently been partly offset by factors not included in this study. The information value of measuring relative poverty rates of market income is questionable, as transfers account for a large share of lower incomes, but we nonetheless include the measure in the table for completeness. The high equalising effect of education is mainly due to a strong reduction of people with zero market incomes as educational attainment has increased, since the medium- and high-educated are less likely to have zero market income. Household structure, with more singles and lone parents, contributes strongly to increased market income inequality, as does the age structure.

Table 3. Structural drivers of market income inequality¹

	Gini coefficient (in %)	60% of median poverty rate (in %)	Top decile income share (in %)
2013	53.4	36.8	34.8
1987	43.8	33.8	26.5
Change	9.6	3.0	8.3
% Structural contribution to change	68.9	146.9	59.0
Of which:			
Household structure	47.5	146.6	23.2
	[1.2]	[3.4]	[1.3]
Age composition	67.4	189.2	39.9
	[1.1]	[3.8]	[1.3]
Industry structure	16.8	28.6	16.3
	[2.1]	[4.8]	[2.8]
Immigration	9.0	23.7	4.6
	[1.0]	[2.6]	[1.1]
Education	-71.9	-241.2	-25.0
	[2.2]	[5.2]	[2.3]

1. Standard errors in parentheses.

Source: Authors' calculations, based on the Survey of household finances (HEK).

Table 4. Structural drivers of disposable income inequality¹

	Gini coefficient (in %)	60% of median poverty rate (in %)	Top decile income share (in %)
2013	33.2	19.3	26.0
1987	20.9	10.4	17.9
Change	12.3	8.9	8.0
% Structural contribution to change	43.1	45.0	39.2
Of which:			
Household structure	16.4	23.7	8.0
	[0.7]	[1.7]	[1.1]
Age composition	11.1	-2.5	10.4
	[0.8]	[1.3]	[1.2]
Industry structure	9.4	7.9	9.9
	[1.7]	[2.0]	[2.6]
Immigration	4.6	10.0	1.7
	[0.6]	[1.3]	[0.9]
Education	1.6	5.9	9.2
	[1.3]	[2.3]	[1.8]

1. Standard errors in parentheses.

Source: Authors' calculations, based on the Survey of household finances (HEK).

32. Redistributive policies have dampened the increase in the Gini coefficient after taxes and transfers caused by these factors considerably, but the mechanical effect of changing structural factors can nonetheless explain more than 40% of the increase in the Gini for disposable income. Household composition accounts for 16%, age for 11%, industry structure for 9% and immigration for 5%, respectively. The effect of education structure is slightly positive when taxes and transfers are taken into account. The same factors have mechanically caused about half of the increase in relative poverty, defined as earning less than 60% of the median disposable income. Household structure contributes 24%. The contribution from changing industry structure is relatively modest with 8%. Age increases the Gini coefficient and the share of top incomes modestly, but its impact on relative poverty is slightly negative, as transfers to pensioners are generally above the poverty line and the decreasing youth share likely contributes to reducing poverty. Education increases post-tax and transfer income inequality, notably in the top and bottom of the distribution, as a higher concentration of individuals with higher education and incomes increases top and median incomes and thus raises the poverty threshold. The reduction of the share of the low-qualified does not affect disposable incomes to the same extent as market incomes, since low-qualified individuals with zero market income are compensated by transfers. The size and composition of the immigrant population contribute 10% of the rise in relative poverty, but have only modest effect on top incomes and the Gini coefficient. It should, however, be noted that non-EU15 migrants are more likely to be young, single and low-qualified relative to the other groups.

Robustness checks

33. As a robustness check, and to investigate the interactions between structural factors and the widening of the earnings distribution and weakening redistribution that took place from 1987 to 2013, we do our analysis backwards and quantify how much higher inequality would have been in 1987 if the population structure had been as in 2013. The overall contribution to the increase in inequality is reduced, to 31% (Gini), 25% (relative poverty) and 27% (the top income share). Ageing has a sizeable impact on poverty, reflecting lower pensions compared to earnings in 1987. The poverty impact from migration is considerably reduced, but remains positive. Impacts of industry structure are negligible. Household structure remains the most important factor behind poverty and second only to ageing in explaining the Gini change. A lower overall impact when re-weighting population shares subject to the 1987 income distribution should be expected, since the distribution was considerably narrower at the time (Table A.1.1 in Appendix 1).

34. Our main results are derived with the square root equivalence scale, which means that equivalent income for each household member is calculated as the total household income divided by the square root of the number of household members. This is done to reflect economies of scale of consumption in larger households. However, several equivalence scales are in common use, and the choice of equivalence scale will affect the results in most studies of income inequality. We would in particular expect the influence of household composition to be sensitive to the chosen scale. To investigate the sensitivity of our results to the choice of equivalence scale, we run a robustness check where we divide household income on the number of persons in the household, without adjusting for economies of scale. This reduces the overall contribution of structural factors on inequality compared to our main results. It reduces the influence of household structure on the Gini coefficient and top incomes considerably, even though the contributions from changing household structure to the Gini coefficient and relative poverty remain considerable. Since many pensioners and youth are single, the negative impact of age on the Gini coefficient is reduced almost to zero, and the impact on the poverty rate is strongly negative. The poverty impact from immigration more than doubles, likely reflecting that immigrants are more likely to be in childbearing age and have higher fertility rates than natives on average (SCB, 2008). Analysing inequality without applying an equivalence scale implies that there are no economies of scale in consumption in larger households. This is an extreme and unrealistic assumption, and the deviations from our main results are fairly moderate when seen in this light (Table A.1.2 in Appendix 1).

35. A tax reform in 1990-1991 introduces a break in the series between 1991 and 1993. The reform lowered marginal tax rates but benefits were raised to offset the effect on inequality. However, the reform also included a broadening of the tax base by making more types of capital incomes and fringe benefits taxable. This new income definition increased inequality in 1993 as measured by the Gini coefficient by about 2 units.³ As a robustness check we redo the analysis with 1993 as starting year and the results are qualitatively similar (Table A.1.3 in Appendix 1).

Summary and conclusions

36. The influence of structural changes on inequality has been decomposed using micro-data from Statistics Sweden. Subgroups of the population with certain characteristics were re-weighted by their population shares in 1987 to construct counterfactual income distributions for 2013, and inequality measures were then derived and compared to their actual 2013 values.

37. About 70% of the change in the Gini coefficient of market incomes from 1987 to 2013 can be attributed to structural factors not directly related to employment, the wage distribution or taxes and transfers. Redistributive policies dampened the increase in inequality caused by these factors considerably, but the mechanical effect of changing structural factors can nonetheless explain more than 40% of the increase in the Gini coefficient of disposable incomes and about half of the increase in the relative poverty rate, defined as individuals living on less than 60% of the median disposable income (Figure 6).

38. Household composition accounts for 16% of the Gini increase and 24% of the increase in relative poverty, with an increasing share of singles and lone parents, who tend to have relatively low incomes. Marriage rates fell more steeply in Sweden than the OECD average from the 1960s, and household structure has been found to increase inequalities more in Sweden than in most other OECD countries (OECD, 2011).

39. Even though ageing is less marked in Sweden than in most other OECD countries, age accounts for 11% of the Gini increase when taxes and transfers are taken into account, as the population share of old cohorts with relatively low incomes increased. However, the contribution to relative poverty from ageing is slightly negative.

40. Immigration to Sweden has been high compared to other OECD countries, with a higher share of humanitarian and family reunion migrants. However, even with non-EU15 migrants increasing from 3% of the population in 1987 to 12% in 2013, migration only accounts for a relatively modest 5% share of the increase in the disposable income Gini coefficient. In contrast, it has a stronger effect on relative poverty, accounting for 10% of its increase.

41. Industry structure only accounts for 9% of the increase in the Gini coefficient and 8% of the increase in relative poverty since 1987, lending support to previous research suggesting that labour market polarisation caused by globalisation and skill-biased structural change is less important in Sweden than in many other countries, as jobs lost in middle-skilled occupations have to a large extent been replaced by high-skilled jobs (Goos *et al.*, 2009; Eurofound, 2014).

³ See Björklund *et al.* (1995) for more on the effect of the tax reform on inequality measures.

Figure 6. Structural change increased disposable income inequalities

Source: Authors' calculations, based on the Survey of household finances (HEK).

42. The effect of the education structure on the Gini coefficient is only slightly positive when taxes and transfers are taken into account, but more individuals with higher education and hence higher incomes raises the median income and accounts for 6% of the rise in relative poverty.

43. Various robustness checks qualitatively support our main findings, but they also illustrate that there is no one single answer to questions regarding inequality. Assumptions that all inequality researchers have to make, such as the choice of equivalence scale, time period and base year will inevitably affect the results. Furthermore we do not account for dynamic effects from changing the population structure. Therefore, as with other decompositions, our results should be interpreted as correlations, indicating directions for further research, rather than causal effects. However, we show that understanding these underlying trends, common to many countries, is vital to fully understand why inequality is on the rise. To date, however, with skill-biased structural change as a notable exception, such trends occupy only limited space in the income inequality debate.

REFERENCES

- Björklund, A., M. Palme, and I. Svensson (1995), “Tax reforms and income distribution: an assessment using different income concepts”, *Swedish Economic Policy Review*, 2.
- Bussi, M. and J. Pareliussen (2015), “Skills and labour market performance in Sweden”, *OECD Economics Department Working Papers*, No. 1233, OECD Publishing, Paris. <http://dx.doi.org/10.1787/5js0cqvnzx9v-en>.
- DiNardo, J., N. Fortin, and T. Lemieux (1996), “Labor market institutions and the distribution of wages, 1973-1992: A semiparametric approach”, *Econometrica*, 64.
- Domeij, D. and M. Flodén (2010), “Inequality trends in Sweden 1978–2004”, *Review of Economic Dynamics*.
- Elvander, N. (2002), “The new Swedish regime for collective bargaining and conflict resolution: a comparative perspective”, *European Journal of Industrial Relations*, Vol. 8, No. 2. doi:10.1177/095968010282005.
- Eurofound (2014), *Drivers of Recent Job Polarisation and Upgrading in Europe – European Jobs Monitor 2014*, European Foundation for the Improvement of Living and Working Conditions, Dublin.
- Fiscal Policy Council (2013), *Swedish Fiscal Policy 2013 – Fiscal Policy Council Report 2013*, Stockholm.
- Fortin, N., T. Lemieux and S. Firpo (2011), “Chapter 1 - Decomposition methods in economics”, in Ashenfelter, O., and D. Card (Red.), *Handbook of Labor Economics* (Vol. 4, Part A). Elsevier. doi:[http://dx.doi.org/10.1016/S0169-7218\(11\)00407-2](http://dx.doi.org/10.1016/S0169-7218(11)00407-2)
- Foster, J., J. Greer, and E. Thorbecke (1984), “A Class of Decomposable Poverty Measures”, *Econometrica*, 52(3).
- Goos, M., A. Manning and A. Salomons (2009), “Job polarization in Europe”, *American Economic Review*, No. 99:2, pp. 58-63.
- ISF (2014), “Utvecklingen av socialförsäkringsförmåner sedan 1990-talet” (The development of social insurance benefits since the 1990s), *Swedish Social Insurance Inspectorate Report*, 2014:4.
- Jenkins, S., and P. Van Kerm (2009). “The measurement of economic inequality”, in B. Wiemer Salverda, and T. Smeeding (Red.), *The Oxford Handbook of Economic Inequality*. Oxford, U, K: Oxford University Press.
- Kiernan, K. (2002), “Cohabitation in Western Europe: Trends, issues, and implications”, in A. Booth and A. Crouter(Eds.), *Just living together: Implication of cohabitation on families, children, and social policy* (pp. 3–31). Mahwah, NJ: Erlbaum.
- Lindbeck, A., (1997), “The Swedish experiment”, *Journal of Economic Literature* 35.
- Ministry of Finance (2016), *Fördelningspolitisk redogörelse* (Distribution policy report), Stockholm.

- Mookherjee, D., and A. Shorrocks (1982), “A decomposition analysis of the trend in UK income inequality. *The Economic Journal*, 92(368).
- OECD (2011), *Divided We Stand: Why Inequality Keeps Rising*, OECD Publishing, Paris. DOI: <http://dx.doi.org/10.1787/9789264119536-en>.
- OECD (2015), *OECD Economic Surveys: Sweden 2015*, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/eco_surveys-swe-2015-en.
- OECD (2017), *OECD Economic Surveys: Sweden 2017*, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/eco_surveys-swe-2017-en.
- Robling, P. (2015), “Immigration and income inequality in Sweden 1980 to 2011”, in Robling, P., *Essays on the origins of human capital, crime and income inequality*, Faculty of Social Sciences, Department of Economics, Stockholm University.
- SCB (2008), *Childbearing among native and foreign born*, Statistics Sweden demographic reports 2008:2
- SCB (2014), *Household's finances*, Available from: <http://www.scb.se/he0103-en>.
- Shorrocks, A. (2013), “Decomposition procedures for distributional analysis: a unified framework based on the Shapley value”, *The Journal of Economic Inequality*, 11(1). doi:10.1007/s10888-011-9214-z.

ANNEX 1. ROBUSTNESS CHECKS

Table A.1.1. Structural drivers of disposable income inequality, 1987 income distribution

	Gini coefficient (in %)	60% of median poverty rate (in %)	Top decile income share (in %)
2013	33.2	19.3	26.0
1987	20.9	10.4	17.9
Change	12.3	8.9	8.0
% Structural contribution to change	30.9	24.6	27.7
Of which:			
Household structure	9.5	1.8	8.3
Age composition	9.6	13.2	4.4
Industry structure	3.2	-1.9	5.5
Immigration	4.0	4.9	3.7
Education	4.5	6.7	5.9

Table A.1.2. Structural drivers of disposable income inequality, no equivalence scale

	Gini coefficient (in %)	60% of median poverty rate (in %)	Top decile income share (in %)
2013	33.7	16.7	26.4
1987	22.8	8.7	19.1
Change	11.0	8.0	7.3
% Structural contribution to change	30.7	36.0	30.4
Of which:			
Household structure	8.5	17.2	0.4
Age composition	1.0	-12.1	5.9
Industry structure	4.6	10.5	5.8
Immigration	6.7	21.6	2.6
Education	9.9	-1.1	15.6

Table A.1.3. Structural drivers of disposable income inequality (1993-2013)

	Gini coefficient (in %)	60% of median poverty rate (in %)	Top decile income share (in %)
2013	33.2	19.3	26.0
1993	24.0	10.8	20.0
Change	9.2	8.5	5.9
% Structural contribution to change	46.3	50.6	36.7
Of which:			
Household structure	18.4	21.9	8.7
Age composition	14.9	5.0	13.1
Industry structure	6.5	2.2	6.3
Immigration	4.7	10.1	1.8
Education	1.8	11.4	6.7

Source: Authors' calculations, based on the Survey of household finances (HEK).