NBER WORKING PAPER SERIES

SOCIAL POSITION AND FAIRNESS VIEWS

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Working Paper 28099
http://www.nber.org/papers/w28099

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
November 2020

We thank Beatrice Ferrario, Leonardo D'Amico, Ida Maria Hartmann and Isabel Skak Olufsen for excellent research assistance. We are also grateful for comments at seminars and by particpants in the Deaton workshop on Attitudes Towards Inequality in October 2020. We thank Ingvild Almås, Richard Blundell, Ernst Fehr, Andreas Peichl, and Bertil Tunggoden for feedback and suggestions. The activities of CEBI are financed by the Danish National Research Foundation. The use of the data for this project complies with Danish legislation (persondataforordningen, forordning 2016/679 om persondatabeskyttelse.) and has been approved by the The Danish Data Protection Agency (file number 514-0018/2018-2000 at University of Copenhagen). The project includes a randomized information treatment and was preregistered in the AER RCT Registry (AEARCTR-0003923). The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 28099
November 2020
JEL No. D1,D63,D8,H20,H31

ABSTRACT

How well do people know their social position relative to others in society and how does their position shape their views on the fairness of unequal outcomes? We provide new answers to these long-standing questions by combining survey-elicited perceptions on income positions and fairness views for a large, representative sample of prime-age people in Denmark with administrative data on their actual income positions, income histories, life events, and reference groups. This enables us to compare the income and perceived income positions reported by the respondents (in the survey) to the actual numbers (obtained from their tax returns) and to study social positions relative to many reference groups. These groups are others from the same cohort, co-workers in the same firm or sector, former schoolmates, neighbors or people living in the same municipality, or people with same education levels. We also show how changes in social position affect fairness views by exploiting the past changes in social positions of respondents, quasi-experimental real-life events (unemployment, health shocks, or promotions) that shift social positions, as well as randomized information treatments that show people their actual social positions. Our three main findings are: First, people underestimate the degree of inequality by believing that others are closer to themselves than they really are, yet misperceptions are not that large. Second, fairness views on inequality covary strongly -- and more than political views -- with the current social positions of individuals. Multiple pieces of evidence point to a causal relationship. Third, people view inequality within their education group and within co-workers to be most unfair, but in these same dimensions people underestimate the degree of inequality most and lower-income people strongly overestimate their own positions.

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1 Introduction

People's relative positions in society can affect their views on a range of issues. A long standing literature on social status, economic decision-making, and subjective well-being shows that people care about their social position, consumption and income relative to others (Duesenberry, 1949; Easterlin, 1974, 1995; Blanchflower and Oswald, 2004). In theory, relative income and income positions are also important for fairness considerations and redistribution policy (Boskin and Sheshinski, 1978; Meltzer and Richard, 1981; Bénabou and Ok, 2001; Alesina and Angeletos, 2005). But how well do people actually know the income of peers in their social circles or reference groups and their own position relative to these peers? How do they view (un)fairness of inequality within different types of reference groups? Are they better or less informed about inequality and social position where it matters the most? And to what extent do their views on fairness of inequality depend on their own social position?

To answer these questions, we leverage a unique data combination, linking survey data on perceptions of social position and fairness views of a large, representative sample of prime-age people in Denmark to detailed administrative data on their true income positions, income histories, life events, and income distributions of several of their "reference" groups. These many distinct reference groups – in which we ask people to rank themselves – include people from the same cohort and of the same sex, living in the same municipality, having the same education level, or working in the same sector ("large reference groups"), as well as neighbors, co-workers in the same firm, family members, and former schoolmates ("small reference groups").

This link of survey and administrative data enables us to verify the correspondence between respondents' reported income (in the survey) and actual income (on their tax returns) and how well people rank themselves in these various reference groups. It also allows us to study the relationship between social position and fairness views and how changes in social position over the life course and changes due to shocks (unemployment, hospitalization, disability, or promotions) affect views on inequality, fairness, and policy. We also show how a randomized treatment informing individuals' of their true positions within reference groups shape these views. Our unique combination of subjective and objective information on individuals and our methodology have several advantages that we describe in our comparison to earlier work in Section 1.1.

Our results can be grouped into three main sets of findings. First, we show that respondents systematically believe the income levels of others are closer to their own income level than they really are, but, nevertheless, misperceptions are generally not large. Lower-income respondents tend to underestimate both the median income level and the 95th percentile level of their cohort, while higher-income respondents tend to overestimate these levels. Yet, at most income positions in the distribution, the average perception is within 5% of the actual median and within 10% of the actual 95th percentile.[1] The most striking misperception is that people at the very top of the distribution (above the 95th percentile) overestimate the 95th percentile by 50%. Thus, respondents who are themselves in the top of the distribution tend to believe that some other people in the cohort have much higher income than they actually have.

The literature normally focuses on the perception of the respondent's own position, but this may exaggerate how inaccurate people are. Consistent with the systematic misperceptions of the distribution, we find that lower-income respondents believe they are higher up in the distribution than they really are, while higher-income respondents believe they are ranked lower. These

[1] Around one half of all respondents correctly perceive the median income level in their cohort within a 10% error band, which is a high level of awareness when compared to 70% reporting their own income correctly within the same tolerance band.

systematic misperceptions of own position seem large at first glance, but they are in fact mainly due to a mean-reversion error pattern when asking about positions (which are bounded between 1 and 100). Indeed, people in the top of the distribution cannot overestimate their rank, while people in the bottom cannot underestimate it. This implies that perceived rank positions are not uniformly distributed like actual rank positions. By ranking the respondents by their perceived positions, thereby creating a uniform rank distribution of perceptions and removing the mechanical mean-reversion, we demonstrate that perceived and actual ranking line up almost perfectly. Put differently, people who are ranked lowest also perceive to be ranked lowest. We also find that respondents with higher levels of education, conditional on actual income position, are generally more knowledgeable about the distribution (i.e., its P50 and P95) and their own position within the distribution.

Second, fairness views on inequality strongly depend on the current social positions of individuals, with multiple pieces of evidence pointing to a causal relationship. Fairness views are more strongly correlated with current social positions than with historical social positions going back in time. By contrast, political attitudes are more strongly correlated with respondents' past social positions and even with the social position of their parents when they were growing up. The perceived role of effort versus luck for inequality is most strongly correlated with current position, but also somewhat with past positions.

Our quasi-experimental evidence looks at the effects of negative shocks (unemployment spells, hospitalization episodes, or disability) and positive shocks (promotions at work), conditional on a detailed array of individual-level controls, starting social position, and pre-existing (i.e., past) political views. It shows that the perceived fairness of inequality significantly declines with negative income shocks and increases with positive income shocks.[2]

In our experimental part, the information treatment informs half of the sample about their actual social position before eliciting their fairness views on inequality. The results show that those who overestimated their position change their fairness views and the effects of the information treatment is of the same magnitude as the original correlation, but of opposite sign. Thus, when we move people's perceived position by correcting their misperceptions, their fairness views move as well. In line with the overall correlation patterns, political views do not react much to the information treatment and do not react to most of the real-life shocks, while the perceptions on the role of effort vs luck respond more than political attitudes, but less so than fairness views.

Third, people view inequality within peers working in the same sector or with same education level as more unfair than inequality among peers of the same age, or same sex, or living in the same municipality. Yet, it is exactly for these reference groups that respondents generally underestimate the degree of inequality most and within which lower-income people strongly overestimate their own positions. More precisely, for all reference groups, respondents perceive quite accurately the median income level, but they systematically underestimate percentile 95 of their co-workers and of people with same education level. Lower-ranked individuals overestimate their social position, in particular within their education group and within their sector. For example, people at percentile 20 within co-workers perceive on average they are well above percentile 40, while people at percentile 20 within their municipality believe they are around percentile 30. This pattern also holds if we look at smaller groups, namely co-workers within firms instead of within sector and if we look at neighbors instead of people living in the same municipality.

In contrast to this major difference in fairness views across the reference groups, the differences

[2]Although this additional analysis is only meant to be suggestive, if we view these shocks as shifters of today's social position and use them as instruments, we find that the effects of social position on fairness views are of the same magnitude as the raw correlation between fairness and social position.

are less pronounced in perceptions on the role of effort versus luck for inequality within reference groups.

We also show that respondents perceive their social positions relative to former schoolmates surprisingly well; perceive their positions relative to siblings very well, but far from perfect; and have very little idea about the former social positions of their parents when they were in their prime-age. Finally, the conclusion that people tend to believe others are closer to themselves than they really are also applies when people make perceptions about positions within the different reference groups.

To sum up, on average, individuals seem well-aware of their social positions, and the positions are important for their fairness views on inequality. Moving up the social ladder makes people more tolerant of inequality, while moving down makes them less tolerant of inequality. By contrast, political views seem more stable. Respondents perceive inequality to be most unfair among people with same education level and working in the same sector. These are also the reference groups in which lower-income people overestimate their position the most and within which respondents in general underestimate inequality most.

1.1 Related Literature

One of our key contributions is to elicit and compare peoples' perceptions of social positions across a large set of reference groups that vary by domain, size and proximity and to show the relationship to fairness views of inequality within the reference groups. Related to our results on perceived position within co-workers in the same firm, recent papers have analyzed the impacts on satisfaction and effort of within-firm or within-employer wage differences (Card et al., 2012; Cullen and Perez-Truglia, 2018a,b; Baker et al., 2019).

Our second contribution is made possible by the unique combination of evidence using information on individual income histories back in time, randomized information treatments, and quasi-experimental shocks to social positions to establish the link between social position and fairness views. Key to our results is that we link survey information on peoples' perceptions and attitudes with their real-life outcomes from administrative records. A few recent studies have combined subjective information from surveys with objective information from administrative records (Almås et al., 2017; Kreiner et al., 2019; Andersen and Leth-Petersen, 2020; Epper et al., 2020). Karadja et al. (2017) also merge survey data and administrative data to check the reported income of respondents against actual income. We are able to go further by using the administrative data to obtain information on income histories, life events and reference groups of the respondents so as to be able to draw a more precise picture of what drives views on fairness.

We are able to relate fairness views to the detailed past individual economic histories, going back up to 20 years, and to the experiences of specific shocks – both positive and negative. Related to the role of past history, Roth and Wohlfart (2018) and Giuliano and Spilimbergo (2014) have looked at the implications of living or growing up in different environments on taste for redistribution.

Our information experiment suggests that the strong correlation between misperceptions of social position and fairness reflects a causal relationship. Kuziemko et al. (2015) show respondents information on the actual distribution of income in the U.S. and where they rank based on self-reported income in the survey, but are unable to study how it relates to misperceptions. Cruces et al. (2013) find that those who overestimate their position tend to demand higher levels of redistribution when informed about their true position. Conversely, Karadja et al. (2017) show that those who underestimated their position demand less redistribution. Fehr et al. (2019) provide information about position in both the national and international distribution and find that only demand for

national redistribution decreases with national relative income. Perez-Truglia (2020) studies a natural experiment in Norway that made tax records easily accessible online and thus incomes visible to everyone. He finds that the transparency about income substantially increased the gap in happiness and life satisfaction between higher and lower income individuals, which is consistent with our findings that those who realize they are ranked lower perceive inequality as more unfair.

In contrast to most of the existing literature on people's perceived ranking, we find that people are well informed about social positions and we are able to show this for many different reference groups. Using face-to-face interviews in Argentina, Cruces et al. (2013) find a mean-reversion pattern, similar to the one presented in this paper, with a significant share of poorer households placing themselves higher up in the income distribution while richer households underestimate their rank. Using mail surveys in Sweden, Karadja et al. (2017) find that a majority of surveyed individuals misperceive their position in the income distribution and believe that they are poorer, relative to others, than they actually are. Fehr et al. (2019) find that German respondents are misinformed about their positions in both the global (i.e., worldwide) income distribution and in the national income distribution.

We believe the high accuracy of perceptions we detect is due to a number of methodological advances: We use a well-defined concept of income, by asking respondents in the survey about income as it appears on their last tax return and their corresponding perceptions about income positions. This allows us to distinguish misperceptions of social position from misreporting or misperception of own income. To make the elicitation procedure as precise as possible, we use video instructions with illustration of people on income ladders to explain the task and the concept of income positions, and a corresponding graphical interface where respondents report percentile levels (median, "P50", and 95th percentile, "P95"), and their own positions in the distribution. By eliciting peoples' perceptions of the income distribution (median and 95th percentile), we disentangle possible perceptions along those dimensions from misperceptions of one's position. We focus on people's position relative to peers of their cohort, which neutralizes large differences due to life cycle effects. This is arguably a better measure of social position and more relevant for fairness concerns than thinking about position relative to people of all ages at a given point in calendar time.[3] Our sample is an order of magnitude larger than existing studies, which implies that we can provide very precise evidence. Finally, but equally important, we demonstrate how large misperceptions arise when asking people about their own social position because of a mean-reversion error pattern in the elicitation and use a simple method to filter out this type of systematic errors.

Our paper is also related to empirical work documenting that people care about relative income and that their social positions shapes their well-being (Easterlin, 2001; Easterlin et al., 2010; Clark and Oswald, 1996). Luttmer (2005) shows that holding own income constant, self-reported happiness declines as one's neighbors' income increases. Ferrer-i Carbonell (2005) finds that one's income relative to that of a reference group is a determinant of happiness and well-being as important as own income using a large German panel.[4] Kuziemko et al. (2014) highlight the role for "last-place aversion," a particular form of relative position concerns whereby individuals particularly fear being ranked last. Charité et al. (2015) point out the importance of reference points, while we highlight

[3]This is important since income varies a lot over the life cycle. If we look at the overall income distribution, not by cohort, then small changes in the definition of the relevant reference/age group (adults, working population, total population including youth and retirees) have large effects on the percentiles of the distributions wherein people are asked to rank themselves.

[4]In the General Social Survey, McBride (2001) show that relative income effects matter in individual subjective well-being assessments, but less so at lower income levels. This echoes the findings in the US of Dynan and Ravina (2007) who show that relative concerns become an issue only after an individual has attained a certain rank in the income distribution.

the need to consider specific reference groups. Fisman et al. (2020) show that people care about inequality in a non-linear way relative to their own position, putting weight both on their nearest neighbors and on the top of the distribution.

The rest of the paper is organized as follows. Section 2 describes our survey, the administrative data, and our sample. Section 3 analyzes respondents' perceptions and misperceptions about the distributions of income and their own position in various reference groups. Section 4 studies the relationship between perceived social position and fairness views. Section 5 offers some concluding remarks.

2 Data Collection, Survey Design and Administrative Data

2.1 Survey Sample and Link to Administrative Data

Target Sample: Assisted by Statistics Denmark, we conducted a large-scale survey in February and March 2019 where we sent out survey invitations to a random sample of 50,100 Danish-born respondents with birth years from 1969 to 1973. Statistics Denmark randomly selected a representative sample from the five cohorts aged 45 to 49 at the time of the survey. At this age, people are well into their careers, no longer enrolled in formal education, but still quite far away from retirement. A large share of their lifetime permanent income is likely already realized. We excluded immigrants because we ask people about histories, schoolmates, and parental positions which are only available for Danish-born respondents.

Survey Method: Our survey method is original and leverages an official channel of communication of the Danish public authorities with citizens. The invitations were sent out through the secure website "Digital Post," normally used to receive and read mail from public authorities. Typical communications through this mailbox are from public institutions, such as the tax or health authorities, but also from private companies, for instance salary statements from employers or account statements from banks. 91.3% of the Danish population who are more than 15 years old are registered users of "Digital Post".[5] The use of this official channel of communication, together with the University of Copenhagen's stamp likely increased the credibility of our survey and experiment, and of the information provided to respondents, which sets this setting apart from lower-stakes survey environments.

To incentivize respondents, they were told that those who completed the full survey would be enrolled in a lottery for 100 gift cards with a value of 1,000 DKK (US$ 150) each to be used in more than 150 chains of stores in Denmark. The average time for completion of the survey was 33 minutes with a median time of 25 minutes (the full distribution of time spent on the survey can be seen in Appendix Figure A-1). Responses were linked by Statistics Denmark to the register data using social security number, which ensures a unique match. The relatively high incentives combined with the use of the official Digital Post channel are perhaps the reason we are able to sample extensively from the top of the Danish income distribution, a group that is typically very hard to reach with standard survey methods.

Testing for Selection into the Survey and Attrition: In our unique setting, thanks to the register data, we can analyze selection into the survey since we know all the same characteristics of those respondents who chose not to participate and who were sent an invitation, as well as those

[5] https://digst.dk/it-loesninger/digital-post/om-loesningen/tal-og-statistik-om-digital-post/

Table 1: Summary Statistics: Sample Compared to Population

	Analysis sample (1)	**Started survey** (2)	**Full population (excl. immigrants)** (3)	**Full population** (4)
Demographics				
Male	0.51	0.47	0.51	0.50
Age	47.0	47.0	47.0	47.0
Married	0.63	0.61	0.57	0.58
Immigrant	0.00	0.00	0.00	0.13
Descendant	0.00	0.00	0.01	0.00
Income Position				
Income position	64.2	59.6	53.3	50.5
Bottom 50%	0.29	0.36	0.46	0.50
Middle 40%	0.54	0.50	0.43	0.40
Top 10%	0.17	0.14	0.11	0.10
Education				
Primary education	0.08	0.10	0.16	0.17
Upper secondary edu.	0.06	0.06	0.05	0.06
Vocational education	0.31	0.34	0.39	0.38
Short cycle higher edu.	0.09	0.08	0.07	0.07
Bachelor programs	0.27	0.26	0.20	0.20
Masters programs	0.19	0.17	0.13	0.13
Socio Economic Status				
Self-employed	0.04	0.04	0.06	0.06
Employee	0.90	0.87	0.80	0.77
Unemployed	0.01	0.02	0.02	0.02
Not in work force	0.05	0.07	0.12	0.14
Private Sector	0.66	0.66	0.66	0.66
Regions				
Copenhagen	0.31	0.30	0.30	0.32
Sealand	0.16	0.16	0.16	0.15
Southern Denmark	0.21	0.21	0.21	0.21
Middle Jutland	0.23	0.23	0.23	0.22
North Jutland	0.09	0.09	0.10	0.10
Parents' Income				
Mother's income position	53.1	52.1	50.5	50.2
Father's income position	53.3	52.4	50.8	50.5
Observations	9415	13686	339231	389863

Notes: Full Population is the full Danish population born between 1969 and 1973. *Full population* (*excl. immigrants*) is the population our contact sample was drawn from. This sample was provided by Statistics Denmark and is the full population excluding immigrants. *Started survey* are the respondents who started the survey. *Analysis sample* are respondents who completed the survey and are used in the analysis. All variables are indicator variables, except for the income positions.

who were not sent an invitation. Table 1 shows summary statistics for our sample of people who received an invitation and completed the survey (column 1), and compares it to the characteristics of those who received an invitation to participate and started the survey, regardless of whether they completed it or not (column 2), the characteristics of the full Danish-born population in these cohorts, excluding non-Danish born people (column 3) and the full population in these cohorts, including immigrants (column 4). Our invitee group – people who received an invitation to participate, regardless of whether they did start the survey or not – is almost perfectly identical to the full Danish-born population excluding immigrants (column 3) in these cohorts, as should be the case given that they were randomly drawn from this group by Statistics Denmark (not shown here). The final analysis sample of respondents who completed the survey on average has somewhat higher income and education levels than the full target population in column 3, but is representative in terms of region of residence, age, and gender. Compared to other surveys, the top of the income distribution is very well-represented. People from the top five percent of the income distribution make up almost 8% of our analysis sample. For more detail on this, Figure A-2 shows the share of responses coming from each income percentile of the population.

Out of the 50,100 people invited from the population 13,686 clicked on the personal link in the invitation (column 2) and 10,089 completed the survey. After dropping respondents for whom reported birth year or sex do not match the register data (19), who spent less than ten minutes answering the survey (50), who reported monthly income instead of yearly or did not report their income in entire thousand DKK (343), had zero or negative income according to the register data or missing background register data (61) or who skipped one of our key questions (201), we have 9,415 respondents in total (column 1). The hit rate, i.e., the share of those invited to click on the survey is reasonably high when contacting a representative sample of new potential respondents that have never expressed a particular interest in taking surveys, and in contrast to online surveys that contact panels of respondents who have already signed up for participating in surveys.[6]

A completion rate of 74% (=10,089/13,686) may seem low at first sight, but it has a natural explanation. Our invitees are not people who have signed up to survey panels in order to take surveys as is the case in other settings. As explained above, potential respondents receive an invitation through the official Digital Post, which probably leads many to click on the survey link to figure out what this is about. Once people realize it is a research survey they are not obliged to answer and they have to report personal information some of them drop out. In regular survey settings where respondents have signed up to receive survey links, those not interested do not even click on the link to start with as there is no element of surprise for them. In our case this will appear as attrition, while in other settings, we will never get to see who did not click on the survey link to start with.

Table A-1 highlights which characteristics predict the drop out rate and at which point respondents drop out. Conditional on not being incluced in in the analysis sample, 20% dropout at the consent page or are screened out and 33% occur where respondents report their income. 78% of dropouts occur before the treatment with only 4% dropping out after the treatment. This means that attrition is not selectively driven by the treatment, as confirmed by the insignificant coefficient on treatment status. Men, non-married, higher-income and more educated respondents are less likely to drop out of the analysis.

[6]For comparison, a recent study in Denmark invited people by ordinary mail and obtained a response rate of 13% (Epper et al., 2020).

2.2 Survey Outline

The survey consists of eight blocks of questions and is available in full in Appendix A-2.1.

The *Consent block*, asks for consent to use the responses of the respondent in accordance with the General Data Protection Regulation of the European Union.

The *Background & Political Views block* contains questions on birth year, gender, educational level and sector of employment, which are later used to inform respondents about their positions relative to other people in the same large reference groups (see Table 2 for a definition of each reference group). We also ask about voting behavior and attitudes about economic policy in two ways:

"Which party did you vote for in the last general election (in 2015)? [10 parties; Other; Did not vote; Do not wish to answer]"

"How would you describe your attitude towards economic policy? [Very left-wing; Left-wing; Moderate; Right-wing; Very right-wing]"

The *Income block* asks about the income of the respondent in 2017 and includes wage income, self-employment income and taxable income transfers and benefits (see a screenshot of the exact formulation in Figure A-3). We ask separately about salary and fees, net income from self-employment, and unemployment benefits, pension benefits (disability) and other public transfers. The sum of the components appears on the screen. The breakdown of total income into smaller parts is done to help people report the correct income and to highlight that self-employment income and public transfers are included in total income. Respondents are informed that it is important to report the income correctly and that they can see the amounts on their annual tax statement (available online). We ask about income as it appears on the tax statement to base the analysis on a well-defined income concept where we know the true income from the register data. To avoid making the survey too complicated and time consuming, we exclude capital income, deductions and tax payments.[7] With a few exceptions, salaries, fees, UI benefits, pension benefits and public transfers are all third-party reported to the tax agency and prepopulated on the tax return, while self-employment income is self-reported. Tax evasion is in general low in Denmark and close to nil on third-party reported income components (Kleven et al., 2011).

The *Perceptions block*, elicits people's perceptions about the median (hereafter, P50), the 95th percentile (hereafter, P95) and their own position in the distribution of each of the five large reference groups. The block starts with a video that uses a ladder and 100 stick people to explain the different positions in the income distribution. It states, for instance, that the P50 is the income level for which 50% have a lower income and 50% have a higher income. The full script for and link to the video is in Appendix A-2.2. After this video, we elicit respondents' perception of the P50 and P95 incomes for their cohort (see figure A-5). We then ask the respondents to use a horizontal slider to indicate their perceived P50 and P95 income levels for their municipality, education group, gender group, and sector (see Figure A-6). Respondents are subsequently prompted to place themselves within each of the five large reference groups using a vertical slider next to the illustrative ladder that was also used in the explanatory video (see A-7). We also ask respondents about their parents'

[7] The average (median) of our narrow income concept relative to total income, as calculated by Statistics Denmark, across individuals in our sample is 96.0% (98.5%). Total income includes capital income, but not imputed value of housing and interest deductions. In Appendix figure A-4, we show that the income positions based on total income plotted against positions based on narrow income lies almost perfectly on a 45 degree line. That is also the case if we use the Statistics Denmark measuere of disposable income, which includes imputed value of housing, interest deductions and tax payments.

Table 2: Definition of Reference Groups

Reference group	Definition
Large reference groups	
Cohort	People born the same year
Gender	People born the same year with the same gender
Municipality	People born the same year currently living in the same municipality
Educational level	People born the same year with the same level of education: basic school, upper secondary education, vocational education and training, short cycle higher education, bachelor degree and master or PhD degree. We use the Danish DISCED education classification, which follows the international education classification ISCED.
Sector of work	People born the same year and working in the same sector: Construction, real estate, business services, finance and insurance, trade and transport, manufacturing, information and communication, culture, agriculture, public work. We use the Danish Sector Codes DB07, which is a sub-classification of the NACE classifications of the EU.
Small reference groups	
Schoolmates	People born the same year who went to the same school the year they turned 15
Co-workers	People working in the same workplace. We define a workplace as a single address entity, e.g. for a firm with multiple locations, each location is a separate workplace
Neighbors	For people living in an apartment, the neighbors are people from age 25 to 65 who live in the same stairwell. For people living in a house, the neighbors are people from age 25 to 65 who live on the same road

positions in the income distribution of all the parents of the other people in their cohort and to compare their own income to that of their sibling(s). For neighbors, co-workers, and former schoolmates, we first asked the respondent about the perceived number of individuals in these reference group (denoted by N) and then asked them to report their perceived income position on a horizontal slider going from 1 to N (see e.g. Figure A-8 for the co-workers question).

The *Treatment block* is presented for the treatment group at this point in the survey and for the control group at the very end of the survey (so that it does not affect any of their answers). Based on the respondents' earlier answers to the questions in the background and income blocks, we interactively calculate their true positions in each of the five large reference groups. The treatment reminds people which position they thought they were in, shows them their actual position and highlights how much higher or lower they are in the distribution compared to where they thought

they were. Figure 1 shows an English version of the treatment page for two fictitious respondents, one with a positive misperception of their own position within their cohort, and one with a negative one. Appendix Table A-2 shows that the treatment and control groups are balanced in terms of observable respondent characteristics.

The *Outcomes block*, asks about views on fairness of inequality within the cohort or within the (large) reference groups of the respondent, and also about the role of effort versus luck, political attitudes and a few other outcomes. The main questions are:

"Do you think that it is fair or unfair on a scale from 1 to 7 that there are differences in income among people born the same year as you within the following reference groups that you are a part of yourself?"

"Now, think about people born the same year as you within your reference groups (see below). Indicate on a scale from 1 to 7 for each reference group to what extent you think differences in income are caused by differences in peoples' efforts in life or caused by differences in luck?"

"Which party would you vote for if there was a general election today? [11 parties; Other; Do not wish to answer]"

The *Conclusion* block asks respondents how much attention they devoted to the survey and whether they thought it was left- or right-wing biased. 81% of respondents say they think the survey is neutral, 14% say the survey is left-wing biased and 5% say it's right-wing biased.

2.3 Response Quality

Figure 2 shows that the reported incomes in the survey match well with the actual incomes on tax returns. Figure 2a shows the distribution of the difference between reported and actual income. The average percentage difference is less than 0.5%, more than 25% of the respondents report an income that deviates less than 1% from their actual income and for 71% of the respondents the deviation is less than 10%.[8] We see a small spike at a reported income 8-9% below actual income. Respondents are asked to report their income including labour-market contribution,[9] which is 8% of income before taxes. A few respondents seem to report their income excluding the labour-market contribution. Figure 2b shows that across different levels of actual income both the average reported income and the median reported income within each bin are very close to the actual income.

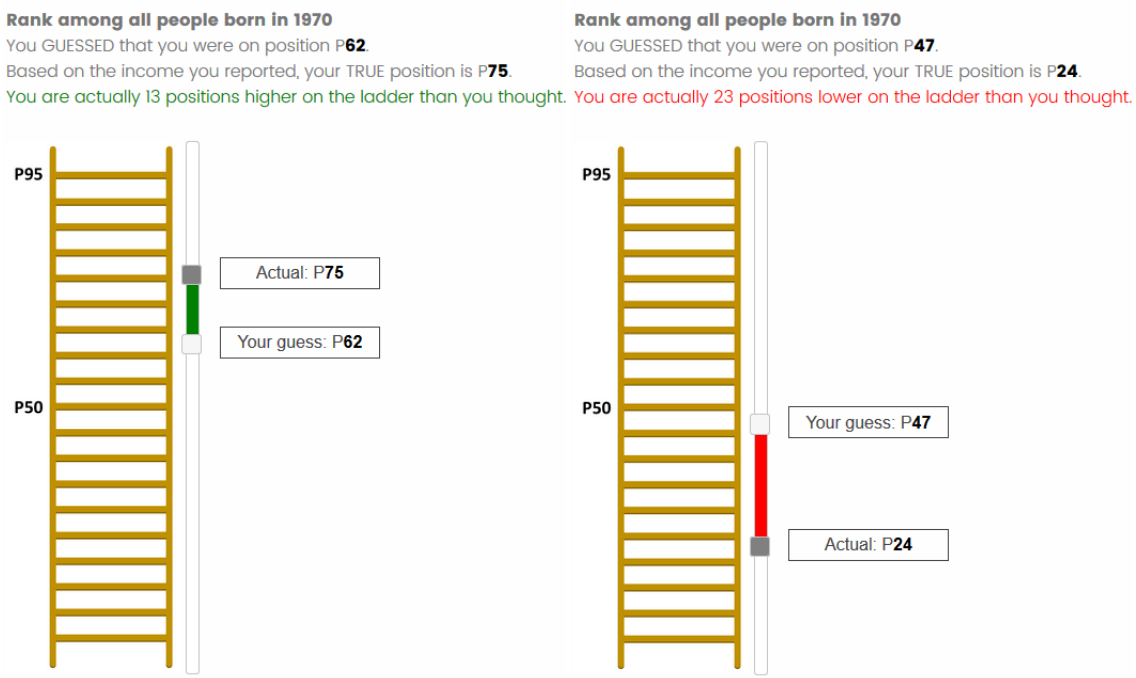
In the block with background questions, we ask about municipality of residence, educational level and industry sector where they work. In Appendix Table A-3, we see that 98% of the respondents report living in the correct municipality. Respondents are less precise when they report educational level and sector of work, with 74% and 72% matches between survey response and register data. For the education level dimension, 93% of the respondents with a bachelor or master program as their highest level of education according to the registers report the correct level of education. Almost half of the respondents who report an incorrect educational level have a vocational education and training program as their highest level of education. The majority of these respon-

[8]The correspondence between reported and actual income is even higher than in Karadja et al. (2017). For example, close to 40% deviate less than 2.5% in our case, which applies to less than 30% of the respondents in their study (Figure 1). They report that the mean perception of relative position is 16 percentiles away fom its actual value, which is 6 percentiles in our case.

[9]Danish gross tax paid by all employees to help finance labour-market expenses

Figure 1: Information Treatment

(a) Negative misperception (b) Positive misperception



Notes: The two panels show screenshots of the cohort treatment information provided to a respondent reported being born in 1970 and either had a negative or positive misperception of own position based the reported income.

dents report that their highest level of education is either upper secondary school or short cycle higher education. The explanation for the first group is that many consider upper secondary school as a higher level than vocational education, but according to the standard education classification this is not the case.[10] For the second group, the majority have an education within *Office, commercial and business service*, and therefore plausibly think they have a short cycle higher education, but according to the education classification these are also categorized as vocational educations.

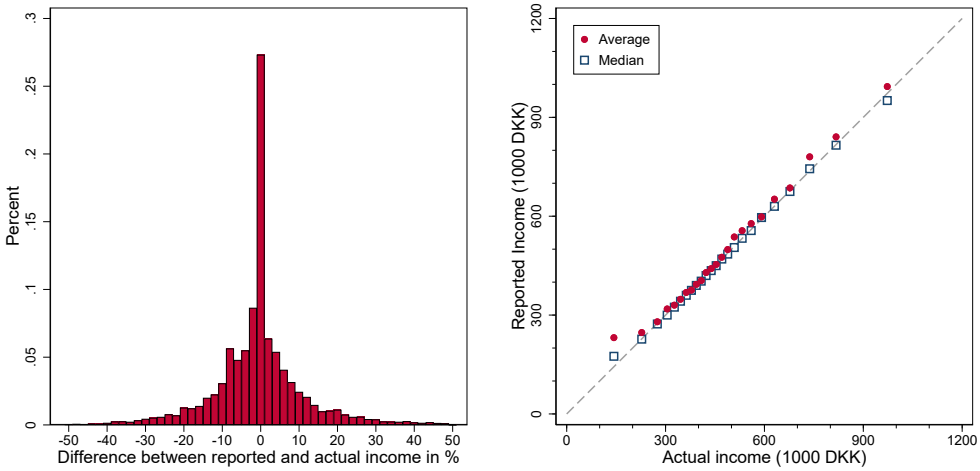
For the sector dimension, it is more understandable that some respondents have difficulties in knowing the correct sector. We use a standard classification of sectors and labelling of the sectors as described in Table 2. For a large, clearly defined sector such as *Public administration, education, health and social work activities*, 89% of respondents who work in that sector according to the register also report working in that sector. For a more vaguely defined sector such as *Business services*, only 29% of those who work in the sector according to the registers report working in the sector whereas for instance 17% report working in the related sector *Manufacturing*. Furthermore, as Table A-4 shows, respondents who recently changed jobs are more likely to report the wrong sector.

The results we present use the reference groups respondents believe they belong to. In the appendix, we show that the results are very similar if we instead use their actual reference groups or

[10] We use the Danish International Standard Classification of Education, which follows the international education classification ISCED.

Figure 2: Reported and Actual Income

(a) Relative difference (b) Correlation



Notes: The left panel shows a histogram of the relative difference between reported and actual income in %. The bin width is 2 and the plot is truncated at ±50. The right panel shows binned scatter plots of the average and median reported income against actual income, both in DKK. There is approximately the same number of respondents in each of the 25 bins.

only include respondents who perceive their reference group correctly, reflecting that the differences are not so big across the groups that are difficult to differentiate.

3 Perceptions and Misperceptions about Social Positions

In this section, we describe people's perceptions and misperceptions about the distribution of income in their cohort and in various reference groups and about their own position in these distributions.

3.1 Cohort Income Distribution

We start with people's perceptions of the income distribution of their cohort. Our approach of asking about cohort-level perceptions neutralizes life-cycle effects. This is both practically convenient and normatively interesting. Indeed, lifecycle patterns are likely to be considered more natural and harder to form fairness views on (e.g., how fair is it that someone at age 18 is poorer than someone at age 50?). The people in our cohort are at the peak of their career paths and income trajectories, with a lot of their permanent income already realized. Figure A-9 and Table A-5 in the Appendix highlight the pitfalls of asking about the full income distribution without specifying proper age limits. The median income by cohort varies drastically across different ages or by excluding or including some cohorts. The variation is naturally even starker when considering the P95 for different cohorts. If we also consider how various definitions of "income" are, it becomes clear that typically seen "misperceptions" by respondents could simply be the result of poorly specified questions combined with the large variability in the reality with some parameters (such as which age groups are included and how income is defined exactly). Instead, we ask respondents the most precise question possible so as to ensure they truly understand what they are being asked and so that inaccurate

responses can be interpreted as actual misperceptions, rather than misunderstandings or confusion about the question.

Perception of the cohort income distribution

Figure 3a plots people's misperceptions about the median income level (P50, red curve) and the percentile 95 income level (P95, blue curve) relative to the actual levels. For the median income level, prediction errors are symmetric around zero and bell shaped with 45% percent predicting correctly with a 10% or lower error and 75% being in a 25% error band. For comparison, the errors when people report their own income (black curve) are such that 70% (90%) percent report correctly within a 10% (25%) error band. Against this benchmark, people seem reasonably well aware of the median income level of others in their cohort. There is larger variance of the perceived P95 level than the P50 level and with a small majority of people underestimating its level.

Figure 3b plots the perceived median income level against the respondent's own position in the distribution. It reveals a systematic increasing relationship between the prediction errors and people's own position: higher-income people tend to over-perceive the median and lower-income people to under-perceive it. Yet, except for respondents in the very top and the very bottom of the distribution, the average prediction errors are within 5% of the median value.[11] Similarly, there is a weak positive relationship between the perceived P95 level and the position of the individuals. At most income levels from the bottom of the distribution up to percentile 95, the average perception error for the P95 is below 10%. By contrast, those in the very top of the distribution starkly overestimate the P95 by 50%. In the Appendix, Figure A-10 shows a similar patterns using the bin medians instead of the bin averages.

Perception of own position within the cohort

Figure 4 shows the correlation between actual rank within the cohort and perceived rank. Figure 4a shows average perceived position by actual position computed in three different ways, based on either actual income on the tax return this year, reported income in the survey or average income on the tax return over the last three years. The latter is to reduce the role of potential noise and large fluctuations in actual position. The relationships are almost identical, with the exception of the bottom of the distribution where the perceived current position is actually slightly closer to the current actual position than to the position based on the three-year average.

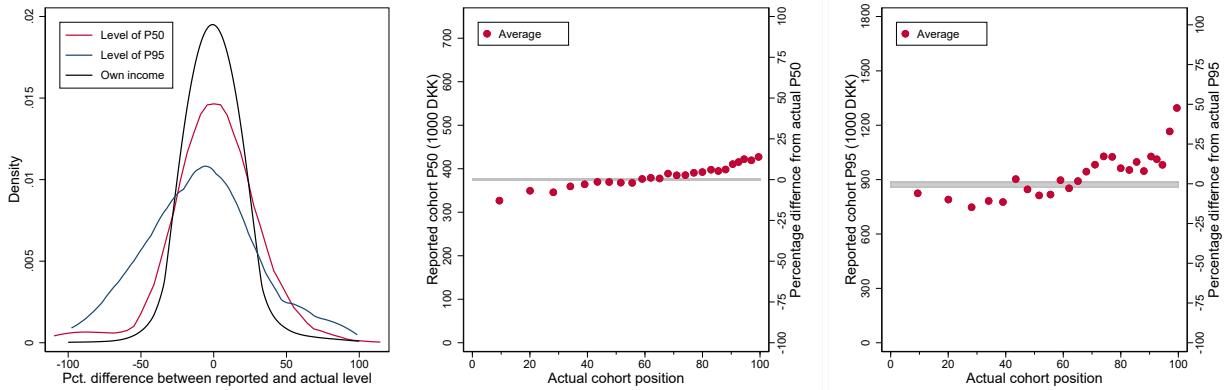
Figure 4b depicts three more moments of the perception distribution, by actual position: the median, the 25th percentile, and the 75th percentile. There is more variation in perceived position of people in the very bottom of the distribution relative to those at the very top. Unlike many other surveys, we are able to quite precisely study perception patterns at the top of the income distribution thanks to the ability to reach a lot of high-income respondents.

The curves in the first two panels all have a horizontal, inverted S-shape whereby people below the median income level tend to overestimate their position, while people above the median underestimate their position. To some extent, such a pattern is mechanical because of a simple mean-reversion type logic: people at the highest position can only weakly underestimate their position, while people at the lowest position can only weakly overestimate their position. Put differently, perceived income ranks are not uniformly distributed, unlike actual income ranks (see Appendix Figure A-11). To filter out this mean-reversion mechanism, we ask: Are those ranked

[11] Equivalently, in terms of positions, an income level of 350,000 corresponds to a percentile position of 44-45 within the cohorts and an income level of 400,000 hovers around the 56th-57th position.

FIGURE 3: PERCEPTION OF P50 AND P95 INCOMES WITHIN COHORT BY OWN POSITION

(A) SIZE OF MISPERCEPTIONS (B) P50 MISPERCEPTION (C) P95 MISPERCEPTION



Notes: The left panel shows the distribution of the percentage difference between the reported and actual level of P50 and P95 and, for comparison, the percentage difference between the respondent's own income reported in the survey and the actual income on the tax return. The distributions of reported P50 and P95 have spikes due to heaping. Therefore, we smooth the graphs using epanechnikov kernels with a bandwidth of 15. The bin scatter diagram in the middle panel shows the perceived P50 reported in DKK (left scale) and the corresponding prediction error in percentage (right scale) by position of people in the within-cohort income distribution. The bin scatter in the right panel similarly shows the perceived P95. Both bin scatter figures have 25 bins and reported P50 and P95 are winsorized at the 5th and 95th percentile within each bin.

at position x with respect to actual income also ranked at position x with respect to perceived position? Figure 4c shows that this is the case with all points lying close to the 45 degree line. Thus, the systematic misperception of own position almost disappears. While we do this re-ranking within our sample, recall that our sample is representative of the population, except at the top, so these patterns can be interpreted as very close to the patterns we would obtain if we re-ranked within the full population. To summarize, respondents are quite accurate about their own position, with some inaccuracies arising from an almost mechanical mean-reversion due to the bounds in position.

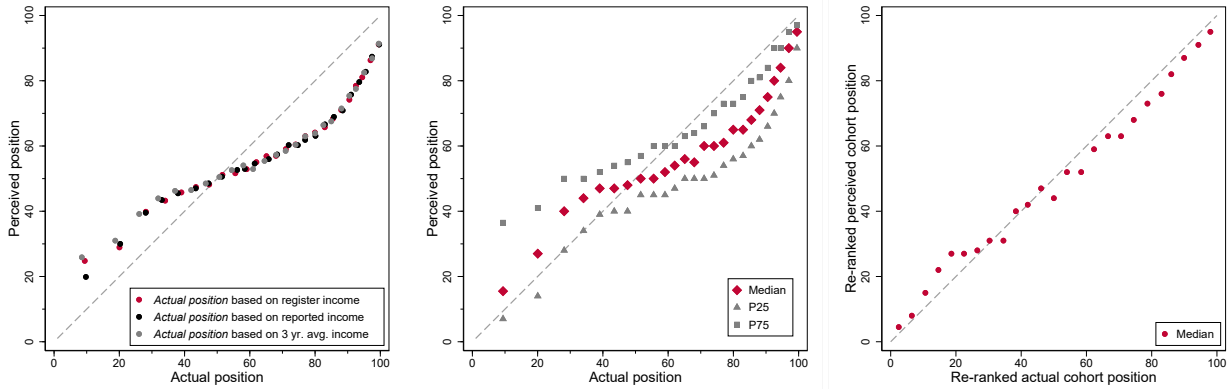
Which respondents are best informed about the income distribution and their own position?

In addition to actual cohort position, what are the characteristics that drive respondents' perceptions and misperceptions? Table 3 regresses measures of accuracy and inaccuracy of perceived position on respondents' gender, political affiliation, an indicator variable for residing in a large city, an indicator for working in the private sector (the omitted category is the public sector), employment status, and education level, also controlling for cohort and actual position fixed effects. The dependent variable in the first three columns is an indicator variable for whether the respondent is among the 20% of the sample with the largest misperception of their position; by contrast, in column 3, the dependent variable is whether the respondent is among the top 20% most accurate ones.[12] The results show that male respondents tend to be more accurate. More educated respon-

[12]The 20% most inaccurate misperceive their position by more than 22 percentiles, the P50 by more than 33%, and P95 by more than 66%. The 20% most accurate misperceive their position by less than 5 percentiles, the P50

Figure 4: Perceived Position Within Cohort

(a) Average (b) Median (c) Re-ranked



Notes: The left panel shows the average perceived position by actual position in the distribution. Actual position is either based on the actual income observed on the tax return, the income reported in the survey, or a three-year average of actual income. The middle panel shows the 25th, 50th and 75th percentile of perceived position by actual income position computed from the tax data. In the right panel, we re-rank both actual and reported position, such that they are uniformly distributed from 1 to 100 in our sample, and plot the median within each bin. There are 25 bins in each panel, with approximately the same number of respondents in each bin.

dents (with a bachelor, Master, or PhD) are significantly more likely to be accurate. For example, individuals with a Master or PhD degree are 10 percentage points more likely to be accurate on their own position and 15 percentage points less likely to be inaccurate compared to individuals with the lowest education level. Other personal characteristics do not appear to be systematically associated with misperceptions.

by less than 6%, and P95 by less than 10%.

Table 3: Accuracy of Perceived Position and P50 and P95 Incomes Within Cohort

	Top 20% most inaccurate			Top 20% most accurate		
	Position	P50	P95	Position	P50	P95
Male	-0.04***	-0.06***	-0.04***	0.04***	0.02	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Left-wing	-0.02*	0.00	0.03**	0.01	0.01	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Right-wing	-0.03**	-0.01	-0.00	0.03**	0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Living in city	-0.01	0.01	0.01	0.02*	0.00	-0.02*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Private sector	0.01	-0.00	-0.01	0.00	-0.00	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Not employed	-0.02	0.04	0.01	0.03	0.02	-0.04*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Educational level (Ref.: Primary)						
Upper secondary	-0.06**	-0.04	-0.00	0.01	-0.00	0.05*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Vocational	-0.03*	-0.03	-0.02	0.02	0.03	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Short cycle higher	-0.05*	-0.07***	-0.04	0.02	0.02	0.06**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Bachelor	-0.08***	-0.06***	-0.02	0.04*	0.03	0.04*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Master or PhD	-0.15***	-0.11***	-0.01	0.10***	0.06**	0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
N	9415	9415	9415	9415	9415	9415
R^2	0.084	0.031	0.024	0.077	0.035	0.029
Cohort FE	✓	✓	✓	✓	✓	✓
Actual position FE	✓	✓	✓	✓	✓	✓

Notes: The first 3 outcomes are indicator variables equal to 1 if the respondent is among the 20% of respondents with the largest misperceptions numerically. The last 3 outcomes are indicator variables equal to 1 if the respondent is among the 20% of respondents with the smallest misperception numerically. *Left-wing* and *Right-wing* are indicators that equal one if a respondent reported having either a very left-wing/left-wing or very right-wing/right-wing view on economic policy. *Living in city* is a dummy indicating if the respondent live in one of Denmark's four largest cities. *Private sector* equals one if a respondents works in the private sector and *Not employed* equals one if a respondent is unemployed or out of the workforce. The *Actual position FE* is fixed effects for all 100 positions in the income distribution. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.2 Distributions of Reference Groups

Large groups: education, sector, municipality, and gender groups

Figure 5a plots the perceived median income level of different reference groups against the actual medians. Each dot represents either a gender group, an education group, a sector, or a set of municipalities grouped into ten bins by median income. In general, the points are very close to the 45 degree line reflecting that people are well aware of the median income level of their various reference groups. The deviations from the 45 degree line are largest for some sectors, particularly for the two sectors with the highest median income levels, namely "Finance & Insurance" and "Information & communication" where respondents tend to underestimate the median.[13]

Figure 5b shows a similar graph for the perceived P95 level. Individuals are also well aware of this moment of the whole cohort distribution (black dot), the gender-specific distribution (red dots) and the municipality-specific distribution (blue dots). Note, however, that they systematically underestimate P95 of their education group and, in particular, underestimate P95 in the sector where the work (the green and purple dots are all below the 45 degree line). In this dimension, the respondents are not aware of the degree of inequality within their education groups and within their sectors.[14]

Recall that not all respondents reported their reference groups in accordance with the register data. This inaccuracy does not affect the misperception patterns described here as shown in Figure A-12 where the sample is restricted to individuals who reported all their reference groups as they are in the register data.

In Figure 6a, we plot the median income for men and women (horizontal lines) and the average perceived median among men and women of their gender group, by actual cohort position. Conditional on being at the same income position in their cohort, males (females) tend to correctly report a higher (lower) median income for their own gender group. In fact, the vertical distance between the reports of men and women at the same cohort position is very close to the actual difference between the median incomes. Yet, there is a systematic bias in perceptions: high-income men and women overestimate the median income level of their gender group, while lower-income ones underestimate it. This bias that tends to assume the median is closer to one's own position is similar to the one observed for the cohort median in Figure 3.

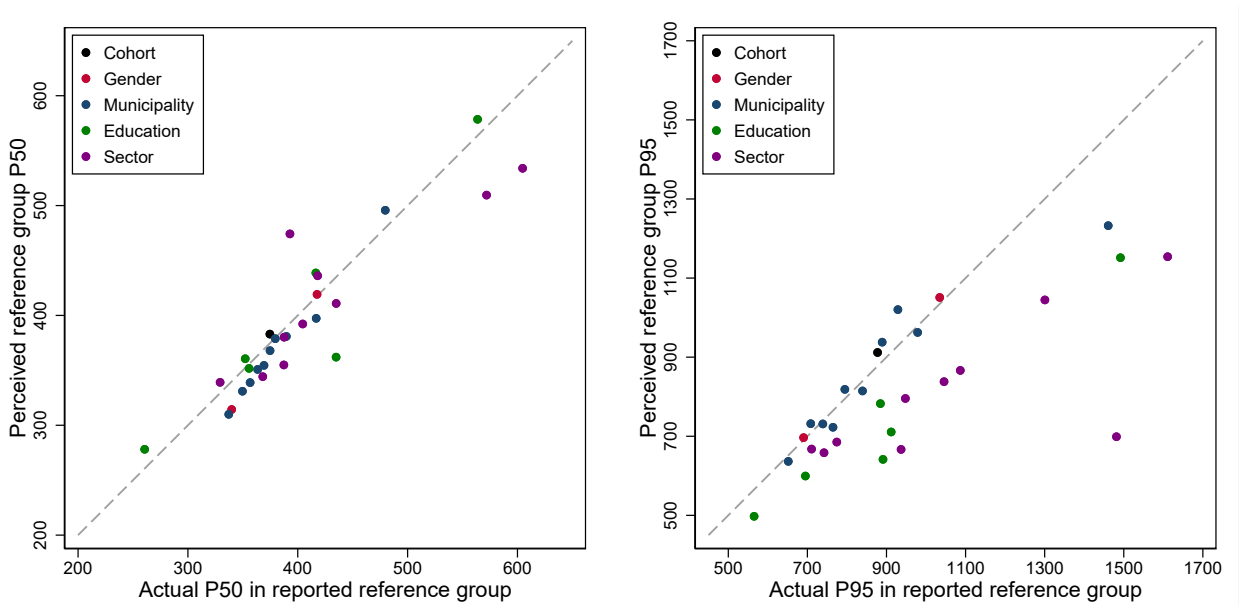
In Figure 6b, we split respondents into two roughly equally-sized groups, depending on whether they live in a low income or high income municipality. At each cohort position, we then plot the average perceived median income of their municipality for respondents at different positions. We repeat the same procedure for education groups and sectors (Figures 6c-d). For all reference groups at all income levels, we observe that people belonging to a high income group consistently report a higher P50 for their group than people belonging to the corresponding low-income group. For municipality and education reference groups, the differences in perceptions between low-income and high-income groups (vertical differences between the blue and red dots) tend to be somewhat smaller than the actual differences (difference between the red and blue lines), while for the sector reference group we observe a significant compression of perceptions. This reflects to a large extent that people with low and middle income working in high-income sectors tend to significantly underestimate the

[13] The latter sector covers a wide range of industries, from computer programming to the publication of newspapers. It does not include advertising or marketing.

[14] The outlier in the lower-right corner is the sector "Agriculture, forestry and fishing." This is a small sector in Denmark measured by the number of employed people in the sector and we only have 80 respondents in our sample that work in this sector. Furthermore, it is a sector with large income inequality: the P50 income level is the lowest of the ten sectors, yet it has the second highest P95 income level.

Figure 5: Perceived P50 and P95 Incomes for Gender, Municipality, Education and Sector (Large Reference Groups)

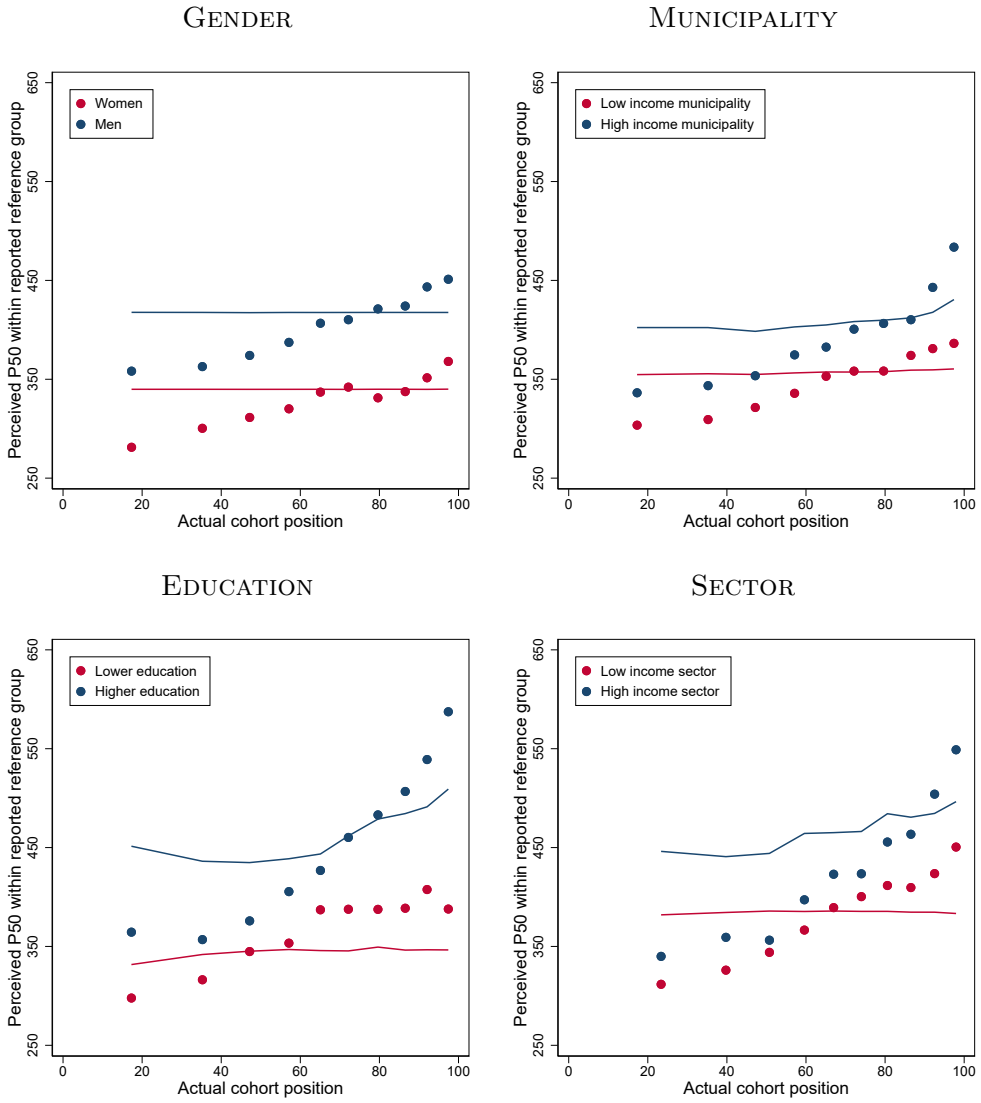
(a) P50 (b) P95



Notes: For gender, we show one scatter for men and one for women. For municipality we divide the respondents into 10 similar sized groups based on the actual municipality P50 and P95 income and plot one scatter for each group. For education and sector we show one scatter for each educational level or sector. The scatters show the means of the reported P50 or P95 winsorized at the 5th and 95th percentile within the group.

median of the sector. In the Appendix, Figure A-13 shows that these patterns are robust to restricting the sample to respondents whose reported reference group matches the group in the register data.

Figure 6: Perceived P50 Incomes for Gender, Municipality, Education and Sector (Large Reference Groups)



Notes: The solid lines indicate the actual average P50 for each group within the bin. The high/low income split for municipality is based on the median of within cohort in sample actual municipality P50 income. This is also the case for sector. For education, *Higher education* is short cycle higher education, bachelor programs and master programs.

Figure 7 shows respondents' actual position for each large reference group (top panels) and perceived position (bottom panels) as a function of their actual positions within the cohort. We split respondents into high-income reference groups (blue dots) and low-income reference groups (red dots), which both represent roughly half of the sample. This is reminiscent of Figure 6, which focuses on the median of the reference group, while the current figure focuses on the individual's own position. The top, left panel shows that males' position in the cohort is higher than their position in the distribution of males, while the females' position is lower than their position in the distribution of females. The panel below shows females perceived position in the female distribution

and males perceived position in the male distribution as a function of their overall position within the cohort. These relationships have the by-now familiar inverted S-shapes because of the mean-reversion logic described earlier. The diagram shows that the differences in the perceptions of males and females about their positions in the respective reference groups (as captured by the vertical distance between the red and blue dots) are smaller than the actual differences. For the other reference groups, we see a similar pattern. The differences in perceptions between high- and low-income groups are most compressed for education and sector in line with the result for the perceived median. Appendix Figure A-14 shows similar patterns when we restrict the sample to respondents whose reported groups match the actual group. In general, the differences in perceptions are more compressed when looking at own position compared to the median, which can be explained by the mean-reversion effect of misperceptions that moves perceptions of own position towards the mean.

Figure 8a plots respondents' average perceptions of their own position within each reference group as a function of their actual position within that group. To better compare the different reference group positions, we show local linear polynomials for each group in the same plot.[15] Figure 8b recasts this information in a different way, by plotting respondents misperception of their reference group positions for given overall position in the cohort. People in the lower part of the income distribution tend to overestimate their position within all reference groups and vice versa for high-income people. Especially within sector or education groups, the relation between actual and perceived position is quite weak. At all income levels, people tend to be most optimistic about their position within their education group and their sector. In particular, people with income below the median level in the cohort greatly overestimate their position within the sector where they work. This is in line with our previous findings that people in general tend to underestimate the inequality in their sector (as reflected by a negative misperception of P95), and that particularly people in the lower part of the distribution significantly understate the median income level of their sector.

One may wonder to what extent people report very similar positions for all reference groups. If they do not really know, they may be tempted to simply state the same perceived position across the groups. Appendix Figure A-16 shows this not to be the case. For each perceived position in the overall cohort distribution, we observe a lot of variation in perceived positions in the reference groups.

Small groups: co-workers, schoolmates, neighbors and family

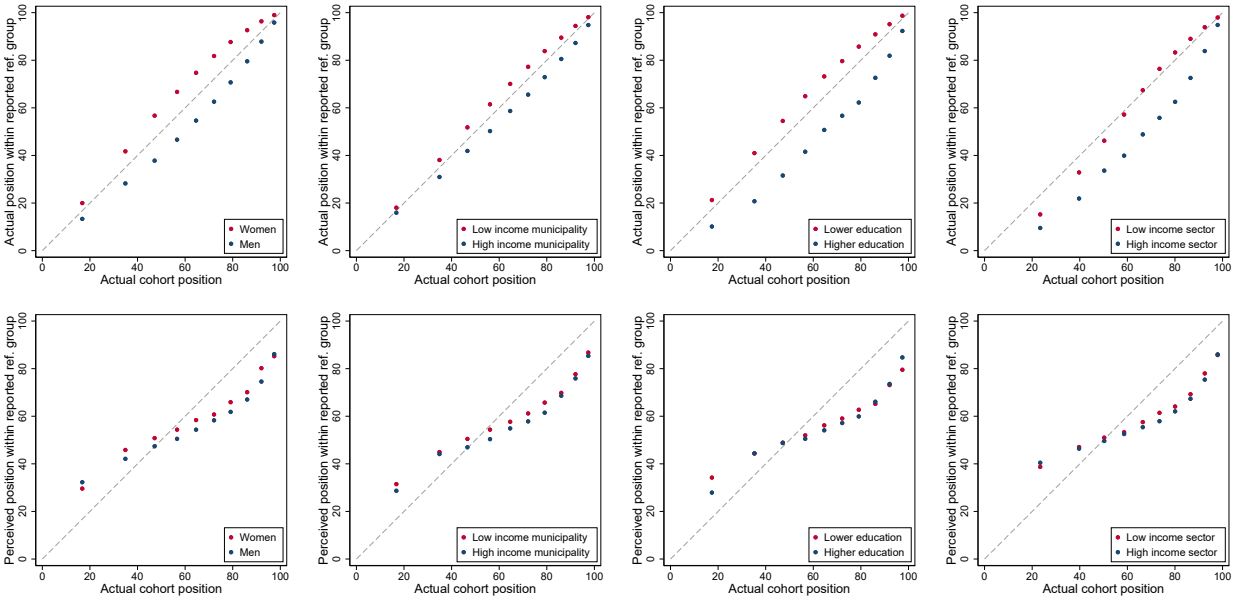
In this section, we look at perceptions related to smaller reference groups that are perhaps easier to relate to and closer to a respondent's daily life. Figure 9 shows how people rank themselves among co-workers at the same workplace, among neighbors living on the same road (if living in a house) or stairwell (if living in an apartment), and among former schoolmates.[16] Recall from Section 2 that for each group, we first asked the respondent about the perceived number of individuals in the group (N) and then asked them to report their perceived income position (X) on a horizontal slider going from 1 to N. Finally, to construct Figure 9, we compute the perceived percentile rank as X/N*100 and the actual percentile rank using the true X and N from the register data.

[15] See Appendix Figure A-15 that shows that the pattern is the same if we restrict the sample to those who reported each group correctly or respondents who reported *all* groups correctly.

[16] For the small reference groups, it does not make sense to ask about moments of the distribution such as P50 and P95 as we did for the large reference groups. The small size of the groups prevents us also from running information treatments informing people about their true positions within these reference groups, which would be against the Danish rules of conduct.

Figure 7: Correlation between Actual Cohort Position and Actual versus Perceived Position within Reference Groups

(a) Gender (b) Municipality (c) Education (d) Sector



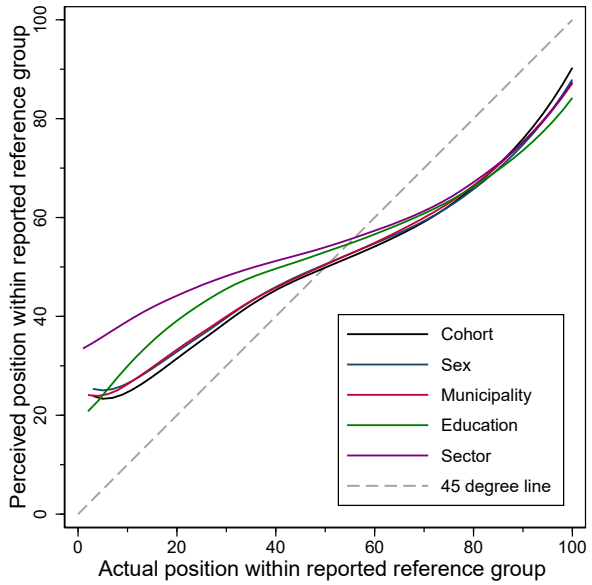
Notes: The top panels plot *actual* reference group positions by actual cohort positions, while the bottom panels plot *perceived* reference group positions by actual cohort positions. The high/low income split for municipality is based on the median of within cohort in sample actual municipality P50 income. This is also the case for sector. For education, *Higher education* is short cycle higher education, bachelor programs and master programs.

The graph of the perceived position among co-workers at the same workplace in Figure 9a is very similar to the result for perceived position among co-workers in the same sector in Figure 8. In both cases, people who are in the bottom of the distribution at percentile 20 believe on average they are above percentile 40. At the upper part of the distribution people underestimate their positions, but the misperceptions are smaller than in the bottom. The graph of the perceived position among neighbors in Figure 9b is similar, but with smaller misperceptions at the lower part of the distribution. Actually, this graph is very similar to the graph for municipalities in Figure 8, which aligns with the conclusion that misperceptions at the bottom are larger when comparing yourself to co-workers than when comparing to people living in your area. The graph of the perceived position among schoolmates in Figure 9c has the same shape as the other graphs. The most notable conclusion from this graph is probably that people tend to make smaller errors when ranking themselves among their former schoolmates in adolescent than among their current co-workers.

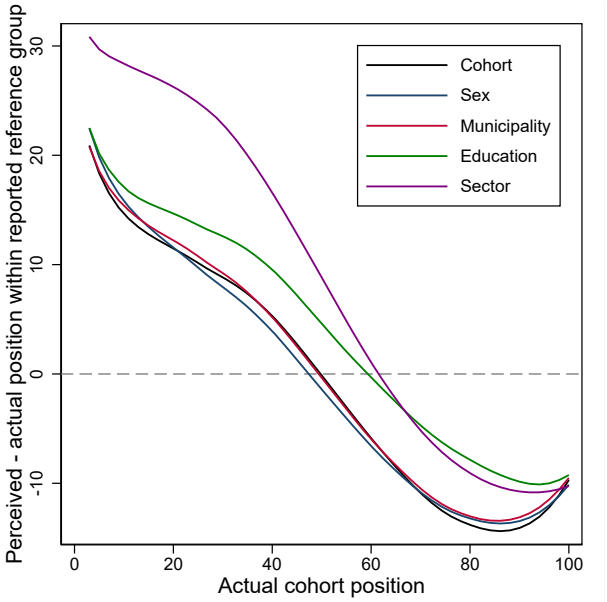
A deviation between perceived and actual rank could reflect that people misperceive the number of people belonging to their refererence group rather than their own position within the group. In Appendix Figures A-17a, A-17b and A-17c, we show that respondents are well aware of the size of their reference groups except for a smaller group of respondents who have more than one hundred neighbors, which they underestimate. Appendix Figure A-18 shows that we obtain similar results if we restrict the analysis to respondents whose reported number of people in the small reference group matches the number observed in the register data (±10%) or use bin medians instead of bin

Figure 8: Perceived and Actual Position for Cohort, Gender, Municipality, Education and Sector

(a) Within reference group



(b) Within cohort



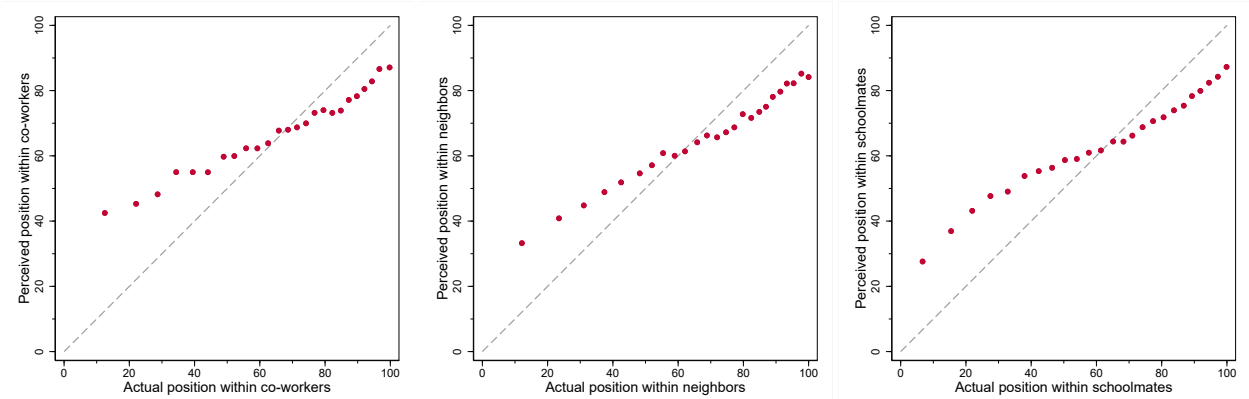
Notes: The local linear polynomials have a bandwidth of 10.

averages. In addition, Appendix Figure A-18 also shows similar patterns for co-workers and for neighbors if we split the respondents into people working in small firms versus large firms and into those living in apartments versus houses.

Figure 10 shows results for family members. Figures 10a and 10b show the perceived positions of parents of the respondents, when the respondents were fifteen years old, as a function of the true position in the ranking of parents of children from the same cohort. The line is close to flat for the ranking of fathers in panel 10a, except for fathers who were ranked in the top 25%, indicating that respondents have little idea about the historical income positions of their fathers. The same goes for mothers, where respondents starkly underestimate the ranking of mothers, including at the very top. Figure 10c shows the share of respondents who report having income higher than their siblings, as a function of their actual cohort position and split by whether they actually do have higher income than their sibling or not. In general, respondents are well aware whether they are making more or less than their siblings. The share of those who report making more and who in fact make less is very small, except for respondents who are ranked close to the top of their cohort. On the other hand, information is far from perfect even among siblings and, in line with evidence above, misperceptions correlate systematically with the respondent's cohort position. People who are higher ranked than their siblings are less aware of this if they have a low cohort rank, and people who are lower ranked than their siblings are more likely to wrongly believe they are higher ranked if they belong to the upper part of the cohort distribution.

Figure 9: Perceived Position Within Co-workers, Neighbors and Schoolmates (Small Reference Groups)

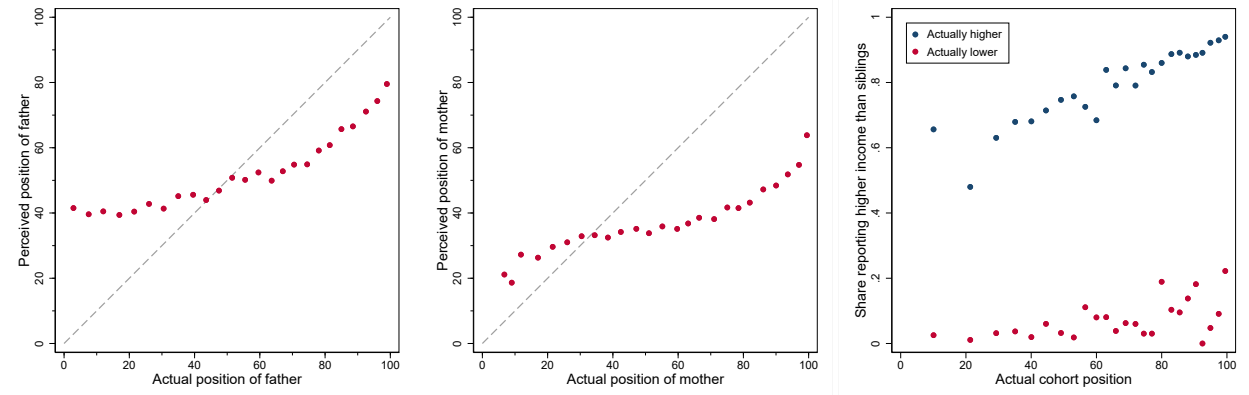
(a) Co-workers (b) Neighbors (c) Schoolmates



Notes: There are 25 bins in each panel. They are of equal size, except the top bin for co-workers and neighbors, which have more observations.

Figure 10: Perceived Position of Family Members

(a) Father (b) Mother (c) Siblings



Notes: We asked about the respondents' perceived position of father's or mother's position when the respondent was 15 years old relative to parent's of other children from the same cohort as the respondent. We asked men about their father's position and we asked women about their mother's position. The right panel only includes responses from people reporting the correct number of siblings. *Actually higher* means that a respondent's income is at least 25 pct. higher than the siblings' mean income. *Actually lower* means that a respondent's income is more than 25 pct. below the siblings' mean income.

4 Relationship Between Social Positions and Fairness Views

This section analyses the relationship between social position and views on fairness. We approach this question in four ways. First, we study the simple, contemporaneous correlation between position and fairness views across people. We then show how fairness views relate to changes in social position over the history of a respondent, and to changes in position caused by major life events such as unemployment, health shocks, disability, and promotions. Finally, we analyze how fairness views are causally affected by changes in (mis)perceived social position induced by the information treatment.

For brevity in the main part of the paper, we only focus on three key outcomes: perceptions of fairness of inequality for all the large reference groups, the belief that effort matters more than luck for differences in income, and whether the respondent would vote for a right-wing party. Other outcomes are in the Appendix.

4.1 Correlations

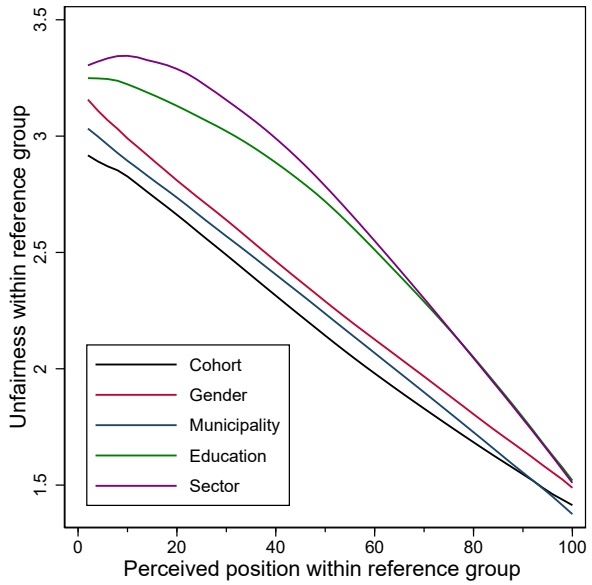
How do the perceived or actual rankings within the various reference groups correlate with views on fairness? Figure 11a shows, first, that those who believe they are ranked higher in the cohort find inequality within the cohort to be less unfair and, similarly, those ranked higher within each reference group systematically find differences in income within that group to be less unfair. Second, unfairness of inequality within cohort, sex and municipality show very similar levels and patterns by position. But compared to these groups, income inequalities within education and sector are considered considerably more unfair at all positions in the distribution. In addition, the slope is steeper for these groups, showing a stronger relation of fairness views with actual position. The same pattern holds if we instead plotted fairness views against actual (rather than perceived) position in each reference group or actual position in the cohort on the x-axis (see Appendix Figure A-19a that also shows the distribution of fairness views by reference group). This makes sense in light of the findings in Section 3 that perceptions of position are in general in line with actual positions.

Figure 11b shows that those positioned higher within the different reference groups also tend to believe that high positions in the reference groups are the result of effort rather than luck. In this dimension, there is no major difference between reference groups either on the level or the slope.[17]

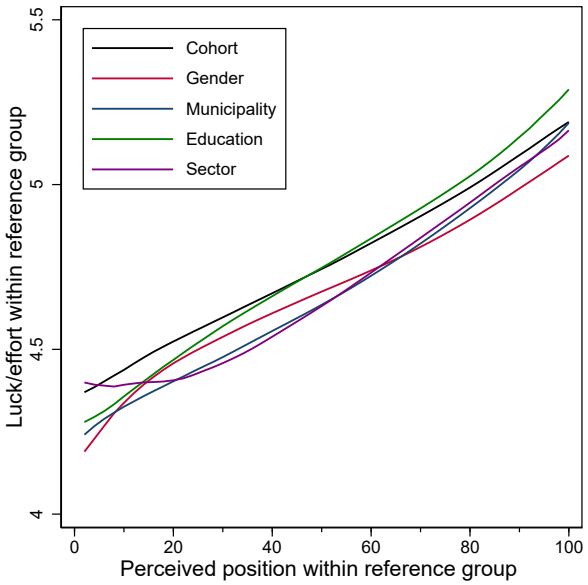
[17] See the distribution of luck vs. effort views by reference group in Figure A-19b.

Figure 11: View on Fairness and Effort vs. Luck by Position Within Cohort, Gender, Municipality, Education and Sector

(a) Fairness



(b) Effort vs. Luck



Notes: The figures are only based on the control group respondents. The bandwidth for the local linear polynomials is 20.

Table 4: Correlation Between Actual Position and Misperception and Fairness, Luck vs. Effort and Political View

	More unfair					More	Right-
	Cohort	Gender	Mun.	Edu.	Sector	effort	wing
Panel A: No controls							
Position	-1.18***	-1.13***	-1.27***	-1.36***	-1.42***	0.81***	0.91***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Misperception	-0.38***	-0.60***	-0.48***	-0.38***	-0.86***	0.43***	0.45***
	(0.10)	(0.09)	(0.09)	(0.08)	(0.09)	(0.10)	(0.10)
Panel B: With controls							
Position	-1.09***	-1.01***	-1.09***	-1.03***	-1.19***	0.92***	0.86***
	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)	(0.09)	(0.09)
Misperception	-0.40***	-0.41***	-0.42***	-0.30***	-0.61***	0.46***	0.44***
	(0.10)	(0.10)	(0.09)	(0.09)	(0.09)	(0.10)	(0.10)
N	4690	4690	4690	4690	4450	4690	4690
Outcome mean	(2.01)	(2.16)	(2.09)	(2.54)	(2.53)	(4.81)	(3.01)
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.01)

Notes: In the table, we only use control group respondents. All outcomes are z-scores. *Position* denotes the actual position within the reference group from percentile 1 to 100 divided by 100. A coefficient of 1 means that going from the bottom of the distribution to the top increases the outcome by one standard deviation. Similarly, *Misperception* is the difference between perceived and actual position within the reference group divided by 100. For *More effort* and *Right-wing*, we use cohort position and misperception. *Controls* includes cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects. *Outcome mean* is the mean of the non-standardized outcome variable and *Outcome std. err.* is the standard error of the estimated mean. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4 confirms the graphical analysis in Figure 11 without controls (Panel A) and with controls (Panel B), showing also political views in the last column.[18] Outcome variables in the columns are transformed to z-scores so that coefficients can be compared across outcomes. The "Outcome mean" row shows the average, non-standardized fairness views by reference group and highlights the different levels of perceived unfairness across reference groups. The precisely estimated means confirm that education and sector-level income differences are considered significantly more unfair than inequality overall within cohort or within other reference groups.

Panel A shows the simple correlations, while panel B includes as controls fixed effects for cohort, gender, municipality, educational level, sector of work, and employment status. The inclusion of controls makes no substantial difference. A higher position in the cohort and a higher positive misperception of the position both significantly correlate with lower perceptions of unfairness, a higher belief in the role of effort over luck, and a higher likelihood of being right-wing. The precisely estimated coefficients on actual position show that moving from the bottom of the cohort distribution to the top is associated with a one standard deviation change or more in the perceived unfairness within all reference groups. Across reference groups, moving up by 10 positions in

[18] Appendix Tables A-6 and A-7 show similar results if we restrict the sample to only include respondents whose reported group matches the group reported in the register data.

the income distribution is correlated with a 0.12-0.14 standard deviation increase in perceived unfairness. The effects of moving up in misperceived rank are around 30-60% of moving up in actual rank across the reference groups, yet still significant and sizable.

On the full range of other outcomes, Table A-8 shows that respondents who are ranked higher or who misperceive their position as being higher are also significantly more likely to say that inequality is not a problem, that they are satisfied with their life, that their work effort has paid off, that they support less redistribution, that the rich deserve to keep their income, and that being poor is one's own fault.

4.2 Historical Variation in Social Positions

What is the relative importance of your social position today and your position historically in shaping your views on fairness, inequality, and politics? To address this question, we make use of the rich register data to reconstruct people's income and economic histories for the last twenty years and correlate these with their views today. In this section, we focus on their income path in general, while in the next section, we look at the effects of changes in social position due to specific negative and positive shocks.

Figure 12 plots respondents' views on fairness, source of inequality and politics against their position in the cohort, measured at different points in time. More precisely, we split the last twenty years into five-year intervals and also show views as a function of their father's position relative to other fathers in the cohort. All outcomes plotted in the different panels are standardized z-scores, so that the magnitudes are comparable.

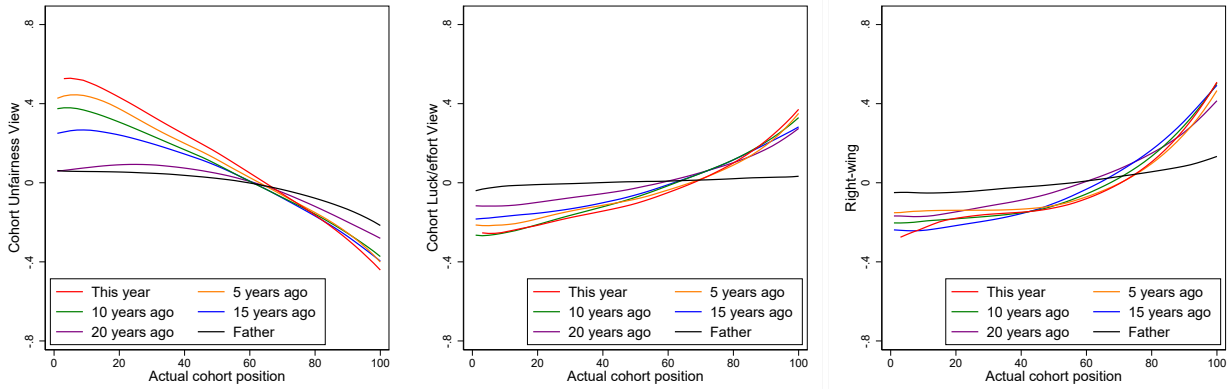
Panel A depicts the z-score of the answers to the question whether income inequality for people within the same cohort is unfair. In line with previous results, we observe a strong negative correlation between current social position and unfairness with a change of close to one standard deviation in unfairness when going from the bottom to the top of the income distribution. The association between fairness view today and historical social position becomes weaker and weaker when going backwards in time from today to twenty years ago. The father's social position measured when the individual was 15 years old is almost unrelated to fairness views today. Recall from Section 3 that perceived and actual position are quite closely aligned for most respondents. Thus, although we do not have respondent's history of perceived positions (as opposed to actual positions), it is likely that these have co-moved to a significant extent.

Panels B and C show how views on the source of inequality (effort versus luck) and political views relate to historical social position. Clearly, these outcomes are not as strongly related to current social position as the view on fairness and they do not show the same systematic trend over time (lines for different years are much closer to each other). This suggest that these outcomes are more sticky and do not move together with changes in social position to the same extent as do views of fairness.

The patterns in Figure 12 whereby historical social position matters less and less for current views can be understood by a larger degree of income mobility when looking over a longer time span. Indeed, Appendix Table A-9 and A-10 show that the correlation between the current social position and the historical position decreases the longer we go back in time. To understand whether historical position is correlated with fairness view conditional on current position, Table 5 reports results from multivariate regressions. Each column shows the regression coefficients of the view variables in the column title on positions 20, 15, 10 and 5 years ago, as well as this year's position, and controlling for cohort, gender, education, and treatment fixed effects. The table shows that the coefficients on current social position are large on all fairness views, in particular compared

FIGURE 12: HISTORIC COHORT POSITION AND FAIRNESS, LUCK VS. EFFORT AND POLITICAL VIEW

(A) FAIRNESS (B) EFFORT/LUCK (C) POLITICAL VIEW



Notes: Bandwidth for local linear polynomials is 20. For *Father*, the x-axis is the father's position among fathers when the respondent was 15 years old. In all panels, the y-axis is the z-score for the survey answers. All panels are based on the same respondents from the control group.

to political views. Some of the historical positions are also significantly related to fairness, but they matter much more for the political view, where even the position of the father is strongly significant conditional on the individual's own historical positions. Appendix Tables A-11, A-12 and A-13 show that the conclusions are unchanged if we leave out the controls, use 5 year average position instead of yearly position 20, 15, 10 and 5 years ago or restrict the sample.[19]

4.3 Natural Experiment: Variation in Social Positions due to Unemployment, Health Shocks, Disability, or Promotions

How do shocks to social position affect people's views on fairness? We consider four major life events, negative and positive, that could have happened to people over the past ten years: having experience an unemployment spell, having become disabled, having had a health condition that requires hospitalization, and having received a promotion in one's company.

For each of these shocks, we perform the analysis on the subsample of individuals who did not experience this shock in any of the years 2008-11 (the "pre-shock" period) and assign a treatment indicator to individuals who experienced the shock sometime during the years 2012-2017 (shock period). We regress our fairness outcomes, perceptions of the role of effort, and being right-wing on the treatment indicator, detailed individual level controls including fixed effects for cohort, gender, municipality, education, sector and percentile cohort position prior to the shock and control also for respondents' vote in the last general election.[20] The question we are asking thus is: conditional

[19] In Appendix Figure A-20 and Table A-14, we produce similar plots for other outcomes. The pattern between history and views today varies in a way that is consistent with priors on which attitudes are more likely to persist and which are likely to be mostly related related to current circumstances. Most strongly related to current positions are respondents' life satisfaction and their view on whether their work effort has paid off. Slightly less so, but still quite correlated with today's position is the view that being poor is not one's own fault.

[20] The unemployment shock is defined as more than three months of unemployment in at least one year in the shock period. We estimate this regression on respondents who were not unemployed according to this definition at anytime

Table 5: Income History and Fairness, Luck vs. Effort and Political View

	More unfair					More effort	Right-wing
	Cohort	Gender	Mun.	Edu.	Sector		
Position father	-0.059	-0.051	-0.068	-0.081*	-0.075*	0.025	0.122***
	(0.037)	(0.037)	(0.037)	(0.036)	(0.037)	(0.037)	(0.036)
Position -20 yr.	-0.122**	-0.097*	-0.108**	-0.113**	-0.131**	0.061	0.141***
	(0.042)	(0.041)	(0.041)	(0.040)	(0.041)	(0.042)	(0.041)
Position -15 yr.	-0.203***	-0.169***	-0.148**	-0.126**	-0.139**	0.131**	0.268***
	(0.048)	(0.048)	(0.048)	(0.047)	(0.048)	(0.049)	(0.047)
Position -10 yr.	-0.085	-0.100	-0.117*	-0.186***	-0.162**	0.206***	0.197***
	(0.058)	(0.057)	(0.057)	(0.056)	(0.057)	(0.058)	(0.057)
Position -5 yr.	-0.108	-0.096	-0.152*	-0.108	-0.130	0.037	-0.030
	(0.070)	(0.068)	(0.069)	(0.067)	(0.069)	(0.070)	(0.068)
Position this yr.	-0.655***	-0.618***	-0.647***	-0.678***	-0.761***	0.540***	0.358***
	(0.074)	(0.073)	(0.073)	(0.071)	(0.074)	(0.074)	(0.072)
Observations	9046	9046	9046	9046	8575	9046	9046
Controls	✓	✓	✓	✓	✓	✓	✓

Notes: All outcomes are z-scores. *Position* denotes the cohort position from percentile 1 to 100 divided by 100. A coefficient of 1 means that going from the bottom of the distribution to the top increases the outcome by one standard deviation. *More unfair* and *More effort* are in the cohort dimension. *Position father* is the repondent's father's income rank when the respondent was 16 years old compared to other fathers of 16 year olds. *Controls* includes a treatment indicator cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

on starting from the same position ten years ago, and conditional on an array of personal characteristics, do those that experienced one of these four shocks that shifted their social position hold different views today than those who did not?

Table 6 shows the results. Column 9 reports the size of the subsamples of analysis for each type of shock, column 10 shows the share of those who are affected by the shock (treatment group), and column 1 shows the effect of the shocks on the current social position. The unemployment and promotion propensities are 5-7 percent with large effects on social position going in opposite directions. Disability is rare, hitting less than 1 percent of the sample, but causes a drop of more than 20 percentiles in social position. In contrast, half of the sample visits the hospital during the shock period, but this shock is only associated with an average drop of 2 percentiles in social position.

in the pre-shock period and who were in the workforce for the entire ten-year period. A disability shock is identified by a respondent receiving disability insurance benefits in one of the years in the shock period (according to the official Integrated Database for Labour Market Research, IDA, from Statistics Denmark). We only use respondents who were not on disability insurance in the pre-shock period. Hospitalization denotes at least one emergency room visit or hospital visit by referral from a general practitioner, but excluding visits due to congenital diseases, pregnancy, or routine checks, which do not reflect unexpected health shocks. In the regression we only use respondents who were not hospitalized according to this definition in the pre-shock period. Finally, promotion in the table indicates if a respondent switched from a job position as regular employee in the pre-shock period to a management position in the following period.

The outcomes in columns 2-7 are z-scores. Respondents who have experienced any of the negative shocks (unemployment, disability, and hospitalization) are significantly more likely to see inequality as unfair within all (large) reference groups. In contrast, those who have been promoted are less likely to consider inequality as unfair, especially within sector, which is the domain most closely related to work promotions. Consistent with our results above, the effects of the shocks are weaker and less significant on the perceived role of effort versus luck relative to their effect on fairness views. Yet, those who have experience disability are significantly less likely to believe effort is more important; the opposite holds for those who have experienced a promotion. Respondents who have experienced a promotion are significantly more likely to be right-wing. There are no other significant effects on political view.[21]

Of course, these results do not necessarily identify the causal effects as the shocks are not random and may be correlated with other unobservable characteristics of the respondents that also affect their views. Still, the detailed controls, accounting for the starting position ten years ago and for past political affiliation do bring us closer to a quasi-experiment. We actually obtain similar effects if we omit individual level controls except for starting position (see Appendix Table A-17), suggesting that there is not a highly systematic correlation between these individual characteristics and the likelihood of these shocks occurring. It is also illuminating to be able to study four different types of shocks, with some that could be perceived closer to quasi-experimental conditional on this set of controls (e.g., hospitalization or disability) than others (e.g., promotion).

Second, there are different channels through which these shocks could affect views, over and above the social position. Yet, clearly, social position is affected and, furthermore, the shocks that move social position the most are also the ones that have the largest effects on fairness views. As we have four different shocks, we can exploit the fact that they move social positions to different extents and estimate the implied impact of social position on fairness views if the only channel through which the shocks acted on views was through social position. Put differently, to explore this further, we can do an IV-type analysis where we instrument for current position using the occurrence of these shocks. This is in Table A-18. The pooled IV results, using all four shocks are close to the baseline correlations in Table 4. Using the shocks as instruments one by one yields broadly consistent effects as well, except for hospitalization, which is both very frequent and shifts income position only by a little (the "first stage" is very weak). The magnitude of the effects of social position on fairness views from this suggestive IV is thus very consistent with the simple OLS correlations.

[21] The results are similar if we restrict the sample to only include respondents whose reported group matches the group reported in the register data (see Appendix Table A-15). Table A-16 shows the other views and attitudes as a function of past shocks.

Table 6: Historic Shocks and Fairness, Luck vs. Effort and Political View

	Current	More unfair					M. effort	Right-	N	Affected
	position	Cohort	Gender	Mun.	Edu.	Sector	Cohort	wing		%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Unemployment	-12.2***	0.19***	0.22***	0.20***	0.17***	0.19***	-0.098	-0.026	7537	5.03
	(0.78)	(0.050)	(0.049)	(0.049)	(0.048)	(0.051)	(0.051)	(0.046)		
Disability	-21.6***	0.26*	0.51***	0.39**	0.24		-0.28*	-0.18	9246	0.61
	(2.31)	(0.13)	(0.13)	(0.13)	(0.13)		(0.13)	(0.12)		
Hospitalization	-1.82***	0.093**	0.079**	0.089**	0.060*	0.039	-0.0096	-0.0070	4749	55.5
	(0.49)	(0.029)	(0.028)	(0.028)	(0.027)	(0.028)	(0.029)	(0.026)		
Promotion	8.44***	-0.11*	-0.10*	-0.10*	-0.15***	-0.20***	0.13**	0.14***	7970	6.66
	(0.74)	(0.045)	(0.044)	(0.044)	(0.043)	(0.044)	(0.045)	(0.040)		
Pre-shock position FE	✓	✓	✓	✓	✓	✓	✓	✓		
Controls	✓	✓	✓	✓	✓	✓	✓	✓		

Notes: All outcomes are z-scores. Each cell in the table is a separate regression of the column outcome on the row regressor and the controls indicated in the bottom part of the table. The explaining variables are all indicators that equal 1 if the respondent experienced the shock between 2012 and 2017. In each row, we exclude respondents who experienced the shock between 2008 and 2011. For *Unemployment*, we only use respondents who were in the workforce in the entire period. For *Disability*, we do not estimate the effect on fairness within sector, because very few disabled people work. The controls indicated in the bottom are included in all regressions. *Controls* includes cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects, all measured in 2008, a treatment indicator and an indicator that equals one if a respondent voted for a right-wing party in the 2015 general election. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.4 Survey Experimental Variation in Social Position: Correction of Misperceptions

The previous sections documented strong associations between fairness views and actual and perceived cohort positions of the individuals. In this section, we analyze the casual impact of changes in perceived position on fairness views. As described in section 2.2, we informed a random half of the sample (the treatment group) about their true social positions before the module asking about their views on fairness, effort versus luck and political attitudes. The rest of the sample was informed about their true position only after this module (the control group).

Table 7 shows the main experimental results. The outcome variables are exactly as in Table 4, which focused on simple correlations. The rows here show the coefficients on actual position, on the misperception level of the respondent (perceived minus actual position), on an indicator for being in the treated group, and on the interaction between the treatment indicator and the level of misperception. The treatment has positive significant effects on views of fairness, but it is the interaction with misperception that is most telling. In line with the correlations in Table 4, respondents with positive misperceptions in general believe inequality is less unfair, conditional on position fixed effects. But when they are informed about their misperception, their views on inequality revert back to being more aligned with those of respondents at the same income position who do not overestimate their position to start with (i.e., the coefficients on the treatment effect interacted with positive misperceptions cancel out those on having a strong positive misperception). The opposite happens for respondents with negative misperceptions. These patterns confirm that the treatment acts differently based on whether respondents were over- or underestimating their rank to start with, as it corrects their misperceptions and thus moves perceived position in different directions.

The last two columns show that the treatment has no significant effects on the role of effort versus luck and on political preferences. Similarily, we do not detect any significant effects on other views and attitudes (see Appendix Table A-19). This suggests that changes in perceived social position have stronger effects on fairness than on other normative views.

The appendix reports a number of robustness checks: The results are unaffected if we include controls (see Table A-20). The treatment information is based on people's reported income, not on their actual income, so one may potentially worry that the treatment effects could be affected by errors in people's reported income. However, this is not the case. As Appendix Table A-21 shows, restricting the sample to respondents who reported their own income accurately gives the same results. We also check that the heterogeneous treatment effect is indeed driven by the misperception, rather than by income per se. Appendix Table A-22 shows that the results are unchanged if we also include treatment-income interactions in the regressions. Appendix Tables A-23 and A-24 show similar results when we use actual groups instead of reported groups and if we restrict the sample to respondents whose reported group matches the group observed in the register data, for each reference group.

5 Concluding Remarks

Our results provide answers to the opening questions in the Introduction. First, we find that people, although making systematic misperceptions, are well informed about social positions. People tend to believe others are closer to themselves than they really are and, in this sense, perceive inequalities to be smaller than they really are. This applies across all reference groups and both when people report social positions of themselves and others (P50 and P95). However, the misperceptions are

Table 7: Survey Information Experiment and Fairness, Luck vs. Effort and Political View

	More unfair within reference group					More	Right-
	Cohort	Gender	Municip.	Education	Sector	effort	wing
Position	-1.148***	-1.092***	-1.255***	-1.393***	-1.373***	0.935***	0.961***
	(0.049)	(0.049)	(0.048)	(0.048)	(0.052)	(0.049)	(0.045)
Misperception	-0.356***	-0.577***	-0.461***	-0.398***	-0.819***	0.530***	0.528***
	(0.092)	(0.086)	(0.083)	(0.075)	(0.079)	(0.092)	(0.084)
Treatment	0.080***	0.059**	0.062**	0.049*	0.039	-0.006	-0.024
	(0.021)	(0.021)	(0.021)	(0.020)	(0.020)	(0.021)	(0.020)
T × Misperception	0.307**	0.274*	0.187	0.036	0.259**	-0.140	-0.008
	(0.118)	(0.110)	(0.108)	(0.091)	(0.093)	(0.118)	(0.109)
N	9331	9331	9331	9331	8854	9331	9331

Notes: All outcomes are z-scores. The misperceptions are the actual misperceptions, meaning the difference between perceived position and actual position within the reported reference group specified in each column. For the *More effort* and *Right-wing* outcomes, we use cohort misperception. *Right-wing* is imputed based which party the respondent reported to vote for if there was an election today. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

not large. They may seem large when assessing peoples own position, as normally done in the literature, but this is due to a mechanical mean-reversion property when asking about ranks.

Second, we provide a number of results suggesting that the fairness views of people depend strongly on their current social position. Fairness views – in contrast to political views – correlate strongly with current social positions compared to past positions. Movements up or down in social positions caused by real-life shocks or induced by information treatments strongly correlate with peoples' fairness views and not much with their political views.

Third, people consider inequalities conditional on the same level of education or sector of work as most unfair. Exactly in these dimensions, where it matters most, people are least informed about inequality and lower-income people strongly overestimate their positions. Standard tax-transfer policies are not targeted such dimensions of inequality in particular and it is an open question what drives this observed pattern. One reason could be that people see education and type of work as choices of individuals that are key determinants of income. People from the same cohort, gender, or municipality can have very different education and work and so it is more expected that they earn different levels of income. The flip side is then that inequality conditional on the key determinants of income (education and sector of work) seems more due to factors outside of people's control and, therefore, is perceived as more unfair.

Are our results portable to other countries? Clearly, Denmark is one of the most equal countries in the world (Atkinson and Søgaard, 2016; Boserup et al., 2016; Jakobsen et al., 2020) and attitudes vary across countries (Alesina et al., 2001, 2018; Almås et al., 2020). Yet, because we analyze rank positions, relative inequality perceptions (e.g, differences between perceived and actual P95 levels compared to corresponding P50 levels) and relative fairness views across reference groups, it is not clear a priori that our results should be different in one direction or the other.

Key to our results is the linking of large-scale survey data on perceived social positions and

fairness to administrative records on actual social positions across time, life events and reference groups. We see this combination of subjective and objective information as a promising avenue to learn more about the determinants of perceptions and attitudes. Future research along this line could explore the link between people's circumstances and life histories and a broad range of perceptions and attitudes

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APPENDIX

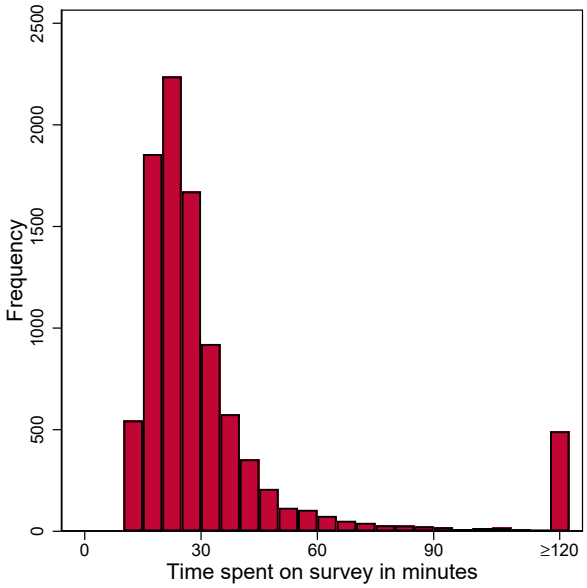
A-1 Survey Quality

Table A-1: Attrition analysis

	Not in sample	
Panel A		
Treatment	0.007	(0.008)
Male	-0.083***	(0.008)
Age	0.001	(0.003)
Married	-0.021**	(0.008)
Ref.: Middle 40%		
Bottom 50 %	0.149***	(0.009)
Top 10 %	-0.060***	(0.012)
Ref.: Master programs		
Primary education	0.157***	(0.017)
Upper secondary edu.	0.017	(0.019)
Vocational education	0.086***	(0.012)
Short cycle higher edu.	0.014	(0.017)
Bachelor programs	0.026*	(0.012)
Ref.: Nothern Jutland		
Copenhagen	0.016	(0.015)
Sealand	-0.000	(0.016)
Southern Denmark	0.007	(0.015)
Middle Jutland	-0.014	(0.015)
Observations	13667	
Panel B		Share
Not in the sample		0.312
Conditional on not being in the sample		
Drop out at consent question		0.033
Drop out at income question		0.327
Drop out before treatment		0.775
Drop out after treatment		0.037
Screened out		0.158

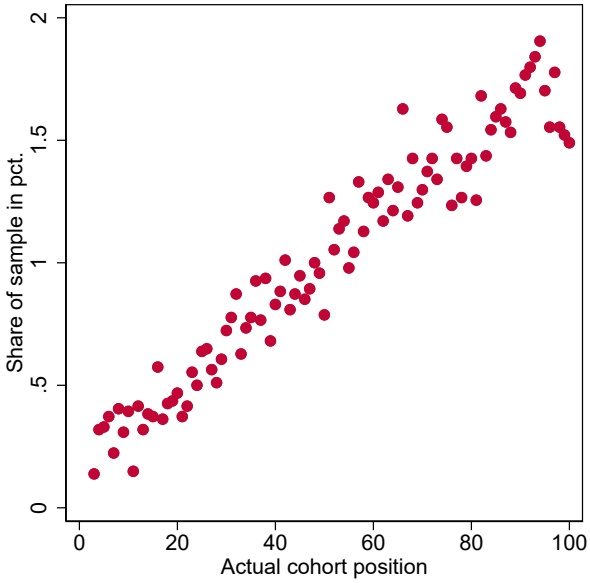
Notes: Respondents who dropped out before the treatment, were not assigned to either the treatment or control group. We randomly assign these individuals to one of the groups. The number of observations in the regression in Panel A is 19 lower than total number of people who started the survey. This is because we miss educational information for these individuals. The sum of *Drop out before treatment*, *Drop out after treatment* and *Screened out* sum to 97%. The last 3% are people who are assigned to the control but do not complete the survey. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

FIGURE A-1: FULL DISTRIBUTION OF TIME SPENT ON ANSWERING THE SURVEY



Notes: The figure shows the distribution of time spent on the survey for the sample. The bin width is 5 minutes and the distribution is censored above 120 minutes.

FIGURE A-2: DISTRIBUTION OF ACTUAL COHORT POSITION



Notes: The panel shows the share of respondents in the sample from each income position.

Table A-2: Treatment balancing

	Control	Treatment	Difference	
Actual cohort position	64.003	64.370	-0.367	(0.513)
Treatment information	-5.812	-6.048	0.237	(0.335)
Cohort misperception	-5.767	-6.064	0.297	(0.353)
Economic policy view	0.001	-0.001	0.001	(0.021)
Male	0.511	0.518	-0.007	(0.010)
Age	47.058	46.998	0.060*	(0.029)
Primary education	0.077	0.075	0.001	(0.005)
Upper secondary education	0.061	0.054	0.007	(0.005)
Vocational education	0.317	0.312	0.005	(0.010)
Short cycle higher education	0.090	0.091	-0.001	(0.006)
Bachelor programs	0.264	0.274	-0.010	(0.009)
Master programs	0.190	0.193	-0.003	(0.008)
Self-employed	0.037	0.037	0.000	(0.004)
Employee	0.901	0.903	-0.002	(0.006)
Unemployed	0.013	0.013	-0.000	(0.002)
Private sector	0.660	0.657	0.003	(0.010)
Not in work force	0.049	0.047	0.002	(0.004)
Copenhagen	0.087	0.086	0.001	(0.006)
Sealand	0.237	0.229	0.008	(0.009)
Southern Denmark	0.199	0.215	-0.016	(0.008)
Middle Jutland	0.312	0.308	0.004	(0.010)
Nothern Jutland	0.164	0.161	0.003	(0.008)
N			9415	

Notes: Column 1 and 2 show the group means of the variables. Column 3 shows the difference. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-3: Match between survey response and register data

	N	Share
Correct municipality	9,239	0.98
Correct level of education	6,958	0.74
Correct sector	6,768	0.72
All correct	4,952	0.53

Table A-4: Change of workplace and misreporting of sector

	Probability of misreporting sector		
Same workplace in 2018 as in 2017	-0.113***	-0.102***	-0.102***
	(0.011)	(0.011)	(0.011)
Same workplace in 2016 as in 2017		-0.035**	-0.035**
		(0.011)	(0.011)
Constant	0.366***	0.384***	0.350***
	(0.009)	(0.011)	(0.021)
Observations	9415	9415	9415
R^2	0.012	0.013	0.026
Controls			✓

Notes: Controls include cohort FE, gender dummy and educational level FE. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A-2 Full survey

A-2.1 Questionnaire in English

Consent

Background questions

1. What is your birthyear
   Dropdown menu with years. Only 1969-1973 accepted.

2. What is your gender?
   Male; Female

3. How many siblings do you have with the same biological mother and father as you?
   0; 1; 2 or more

4. Which municipality did you live in at the beginning of 2017? Note that, in the following options, some of the municipalities are grouped together.
   Dropdown menu with Danish municipalities

5. Which of the following categories best describes your highest educational level?
   Primary education; Upper secondary education; Vocational education and training; Short cycle higher education; Bachelor program or vocational bachelor education; Master program or PhD program

6. What was your employment status at the beginning of 2017?
   Full-time employment; Part-time employment; Self-employed; Unemployed; Not in the labor force

7. Which sector did you work in at the beginning of 2017? Note that we mean the sector, which your workplace belongs to. For example, if you work with PR in a bank, you should choose the sector "Finance and insurance" and not the sector "Information and communication".
   Construction; Real estate activities; Business services; Finance and insurance; Trade and transport; Manufacturing, raw material extraction and utilities; Information and communication; Culture, leisure and other services; Agriculture, forestry and fishing; Public administration, education, health and social work activities

Political views

1. Which political party did you vote for in the last general election (in 2015)?
   Socialdemokratiet; Venstre, Danmarks Liberale Parti; Radikale Venstre; Enhedslisten - De Rød-Grønne; Det Konservative Folkeparti; Alternativet; SF - Socialistisk Folkeparti; Liberal Alliance; Kristendemokraterne; Dansk Folkeparti; Other; Did not vote; Do not wish to answer

2. How would you describe your attitude towards economic policy?
   Very left wing; Left wing; Moderate; Right wing; Very right wing

Income

1. We will now ask you about your total income before tax in 2017. You should not include contributions to employer-managed pension schemes or forced pension contributions. When we later will inform you about your own position, it is important that you state your total income as precisely as possible. If you are in doubt about the amounts, you can view them on your annual statement for 2017 from SKAT under *Opgørelse af indkomst* below *Før AM-bidrag*. You can also see a description of the different categories below. Note: In the scheme below we ask you to please state the yearly amounts in entire thousand kroner. If you enter 1 this corresponds to 1.000 DKK.
   Salary and fees; Net profit from self-employment; Unemployment benefits, social assistance, study grants and pension payments

Perceptions

1. Instruction video

2. We will now ask you a question to see if you have understood the video's explanation of the ladder's different positions. Think about a person with an income, where 73 out of 100 people have an income that is the same as or less than this person's income. 27 out of 100 people have an income, which is higher than this person's income. Select this person's position on the income ladder using the slider below.

3. What do you think the income for P50 was in 2017 for individuals born [PIPED birthyear]? Remember that P50 is the income, where half have an income that is the same as or less than this income, and half have an income that is higher than this income. Remember also that income is before tax for the whole of 2017 and consists of salary, net profit from self-employment, other business income, unemployment benefits, transfers and payments from private and public pensions. Note: Please state your answer in entire thousand DKKs. If you enter 1 it corresponds to 1.000 DKK

4. We will now ask you what you think the before tax income for P50 was in 2017 for the groups below, which you are a part of. The first slider shows your answer from the previous question. You can use the other sliders to select, what you think the income was for P50 for the different groups of people, who were born the same year as you.

5. What do you think the income for P95 was in 2017 for individuals born in [PIPED birthyear]? Remember that P95 is the income, where 95 out of 100 have an income that is the same as or less than this income, and 5 out of 100 have an income that is higher than this income. Please state your answer in entire thousand DKKs. If you enter 1 it corresponds to 1.000 DKK

6. We will now ask you what you think the before tax income for P95 was in 2017 for the groups below, which you are a part of. The first slider shows your answer from the previous question. You can use the other sliders to select, what you think the income was for P95 for the different groups of people, who were born the same year as you.

7. Your rank among [PIPED SEX]. Now, think about all [PIPED SEX] born in [PIPED BIRTHYEAR]. Use the slider to select where you think you were placed on the income ladder in 2017 for this group of people. Later we will inform you about your true position.

8. Your rank within [PIPED MUNICIPALITY] municipality. Now, think about people who also lived in [PIPED MUNICIPALITY] at the beginning of 2017 and were born in [PIPED BIRTHYEAR]. Use the slider to select where you think you were placed on the income ladder in 2017 for this group of people. Later we will inform you about your true position.

9. Your rank with in the educational level [PIPED EDUCATION]. Now, think about people whose educational level also was [PIPED EDUCATION] at the beginning of 2017 and were born in [PIPED BIRTHYEAR]. Use the slider to select where you think you were placed on the income ladder in 2017 for this group of people. Later we will inform you about your true position.

10. Your rank within the sector [PIPED SECTOR]. Now, think about people who also worked in [PIPED SECTOR] at the beginning of 2017 and were born in [PIPED BIRTHYEAR]. Use

the slider to select where you think you were placed on the income ladder in 2017 for this group of people. Later we will inform you about your true position.

11. Think about your [FOR WOMEN: mother's. FOR MEN: father's] total income in year, where you turned 15. Compared to other [FOR WOMEN: mothers. FOR MEN: fathers] of children, who were also born in [PIPED BIRTHYEAR], where do you think your [FOR WOMEN: mother. FOR MEN: father] was placed on the income ladder in the year, where you turned 15?

12. Is your income higher or lower than [FOR REPONDENTS WITH ONE SIBLING: your brother's/sister's income? FOR RESPONDENTS WITH 2 OR MORE SIBLINGS: the average income of your siblings?]
Higher; The same; Lower

13. Think about your colleagues at the beginning of 2017. By colleagues, we mean the people who had the same workplace as you at the beginning of 2017. A workplace usually has the same address; consequently, if you, for example, worked in a chain store, then your colleagues are those who worked in the same store as you and not all the people, who were employed in the same company. How many worked at your workplace, including yourself, at the beginning of 2017? If you cannot remember the exact number, then write your best guess.

14. Imagine that we rank you and your colleagues by your income in 2017, such that the person with the lowest income is number 1 and the person with the highest income is number [PIPED # COWORKERS]. Where do you think you were placed in this rank in 2017?

15. Think about your neighbors at the beginning of 2017. By neighbors, we mean the people who lived on the same road as you, if you lived in a house, or the people living on the same stairwell as you, if you lived in an apartment. Think only about the people, who were between 25 and 65 years old. How many people lived on the same road or on the same stairwell as you, including your own household, at the beginning of 2017? If you cannot remember the exact number, then write your best guess.

16. Imagine that we rank you and your neighbors by your income in 2017, such that the person with the lowest income is number 1 and the person with the highest income is number [PIPED # NEIGHBORS]. Where do you think you were placed in this rank in 2017?

17. Think about your schoolmates when you were 15 years old. By schoolmates, we mean everybody at your school, who was born in [PIPED BIRTHYEAR], and not just the people in the same class as you. How many schoolmates were you including yourself? If you cannot remember the exact number, then write your best guess.

18. Imagine that we rank you and your schoolmates by your income in 2017, such that the person with the lowest income is number 1 and the person with the highest income is number [PIPED # SCHOOLMATES]. Where do you think you were placed in this rank in 2017?

Treatment

For the treatment group this block appears here. For the control group it appears after the block "Outcomes".

For each reference group, cohort/gender/municipality/educational level/sector, we provide the followong information:

You GUESSED that you were on position PXX.
Based on the income you have entered, your TRUE position is PXX.
You are actually X positions higher/lower on the ladder than you thought.

Outcomes

1. Do you think that it is fair or unfair on a scale from 1 to 7 that there are differences in income among people born the same year as you within the following reference groups that you are a part of yourself in 2017?
   (a) Differences in income between people born in [PIPED BIRTHYEAR]
   (b) Differences in income between [PIPED SEX] born in [PIPED BIRTHYEAR]
   (c) Differences in income between people, who live in [PIPED MUNICIPALITY] municipality
   (d) Differences in income between people, who have the educational level [PIPED EDUCATION]
   (e) Differences in income between people, who work in the sector [PIPED SECTOR]
2. Now, think about people born the same year as you within your reference groups (see below). Indicate on a scale from 1 to 7 for each referencegroup to what extent you think differences in income are caused by differences in people's efforts in life or caused by differences in luck. By luck, we mean conditions, which you have no control over. By effort, we mean conditions, which you can control.
   (a) Reason for different incomes among people born in [PIPED BIRTHYEAR]?
   (b) Reason for different incomes among [SEX] born in [PIPED BIRTHYEAR]?
   (c) Reason for different incomes among people living in [PIPED MUNICIPALITY] municipality?

(d) Reason for different incomes among people with the educational level [PIPED EDUCATION]?

(e) Reason for different incomes among people working in the sector [PIPED SECTOR]?

3. Which party would you vote for if there was a general election today?
   Socialdemokratiet; Venstre, Danmarks Liberale Parti; Radikale Venstre; Enhedslisten - De Rød-Grønne; Det Konservative Folkeparti; Alternativet; SF - Socialistisk Folkeparti; Liberal Alliance; Kristendemokraterne; Dansk Folkeparti; Nye Borgerlige; Other; Do not wish to answer

4. Below, you see six statements, which one can either agree or disagree with. We would like you to state to what degree you agree or disagree with each statement on a scale from 1 to 7.

   (a) Income inequality is a problem in Denmark

   (b) The government should increase redistribution of income by increasing taxes and transfers to reduce inequality

   (c) I am generally satisfied with my life

   (d) My work has generally paid off

   (e) People with high incomes have worked hard for their income and deserve it

   (f) If a person is poor this is mainly due to lack of effort from his or her side

Outro

1. It is detrimental for our study that we only use responses from people, who have given the survey their full attention; otherwise, many years of work will go to waste. You will automatically participate in the lottery no matter what you answer, but we would like to know how much attention you have given the survey.
   1 I barely gave the survey any attention; ... ; 7 I gave the survey my full attention

2. Do you think that the survey was biased?
   Yes, it was right winged; Yes, it was left winged; No, it was neutral

3. If you have any comments about the survey, then you are welcome to write them here:

Figure A-3: Income Question

We will now ask you about your **total income BEFORE tax in 2017**. You should **NOT** include contributions to employer-managed pension schemes or mandatory pension contributions. When we later will inform you about your own position, it is important that you state your total income as precisely as possible. If you are in doubt about the amounts, you can view them on your annual statement for 2017 from SKAT under *Opgørelse af indkomst* below **Før AM-bidrag**. You can also see a description of the different categories below.

Note: In the scheme below we ask you to please state the **yearly** amounts in **entire thousand DKK**. If you enter 1 this corresponds to 1,000 DKK.

Salary and fees		thousand DKK
Net profit from self-employment		thousand DKK
Unemployment benefits, social assistance, study grants and pension payments		thousand DKK
Total	0	thousand DKK

Examples

Salary and fees: Taxable wage income before tax and before labor market contribution and fees. You should include:

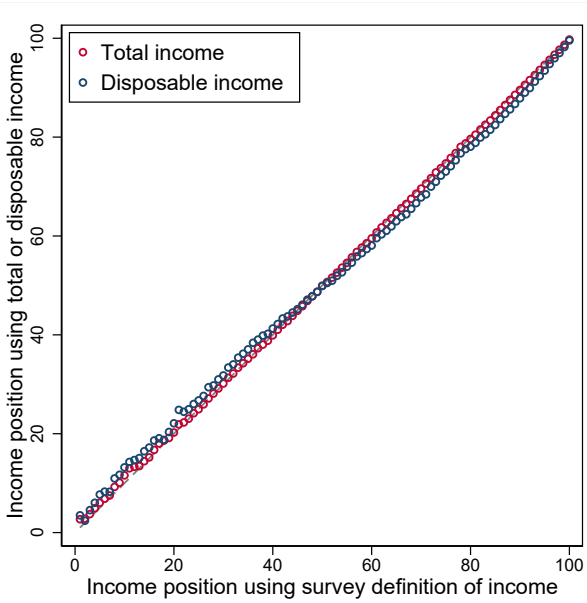
- Value of fringe benefits
- Taxable foreign wage
- Wage during sickness and maternity/paternity leave
- Fees from board duties, consultancy work, talks etc.
- Value of stock options, severance pay and anniversary bonus

On your tax statement this corresponds to box 11 + 12 + 14.

Net profit from self-employment: Net profit from self-employment after capital income and expenses. On your tax statement this corresponds to box 111 minus box 112.

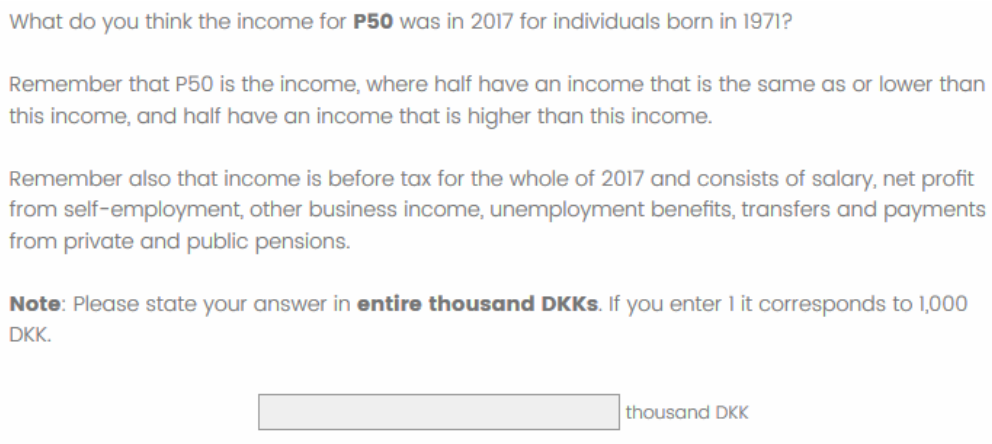
Unemployment benefits, social assistance, study grants and pension payments: Unemployment benefits, cash benefits, sickness benefits, maternity/paternity benefits, study grants, payments from private pensions, public pensions and disability pensions. On your tax statement this corresponds to box 16.

Figure A-4: Comparison of Position using Different Income Definitions



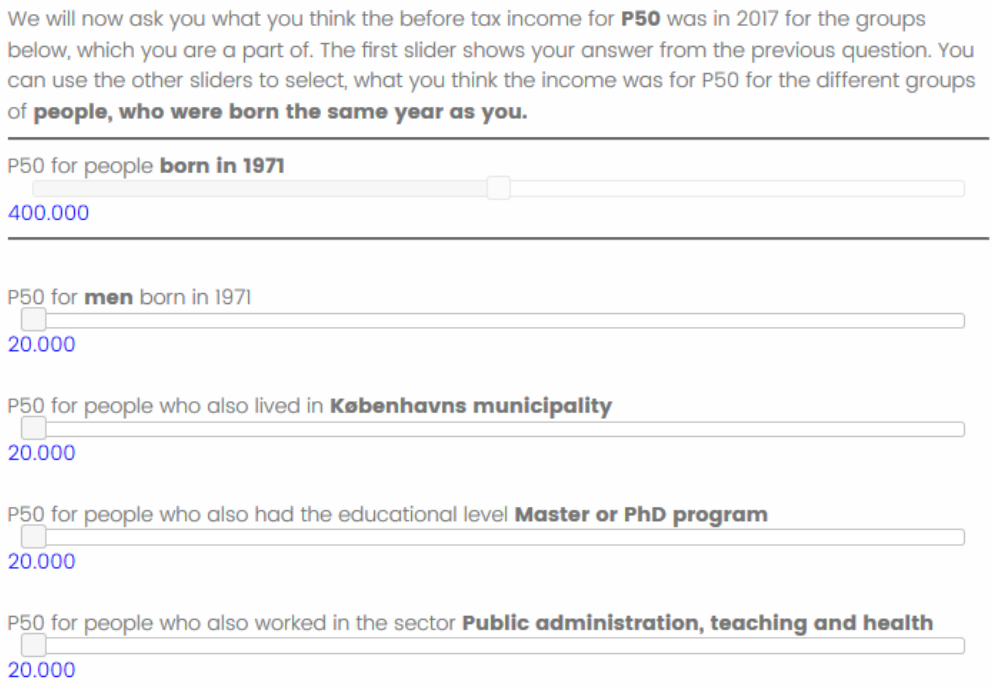
Notes: The figures uses all individuals born from 1969 to 1973 observed in the income register data. N=389,759. We use total income and disposable income as defined by Statistics Denmark.

Figure A-5: Elicitation of cohort P50 perception



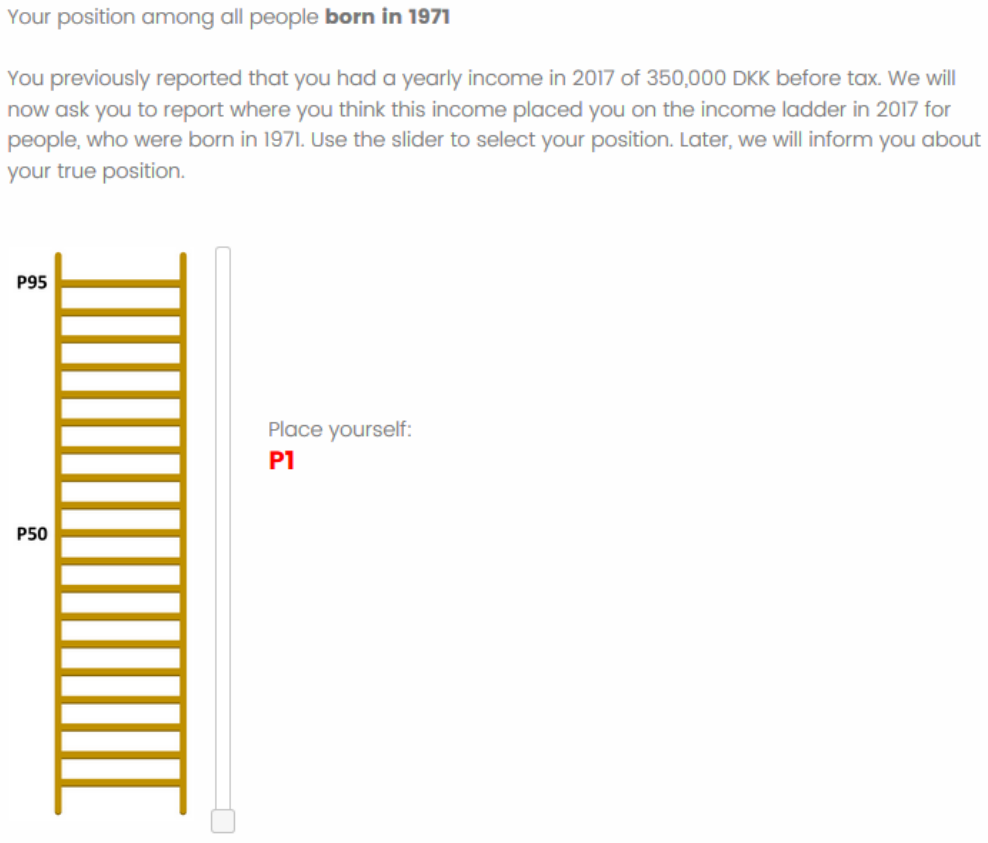
Notes: The figure shows a screenshot from the survey for a person who reported being born in 1971.

Figure A-6: Elicitation of large reference group P50 perceptions



Notes: The top slider shows the piped answer to the question in figure A-5 and cannot be moved. The sliders go from 20,000 to 8,069,000 in 200 steps according to $Y = 20000 * EXP(0.03 * Step)$. In the middle position the slider has the value 402,000.

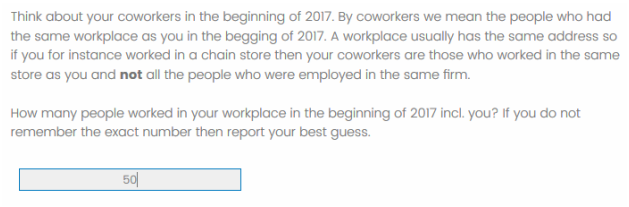
Figure A-7: Elicitation of own perceived position



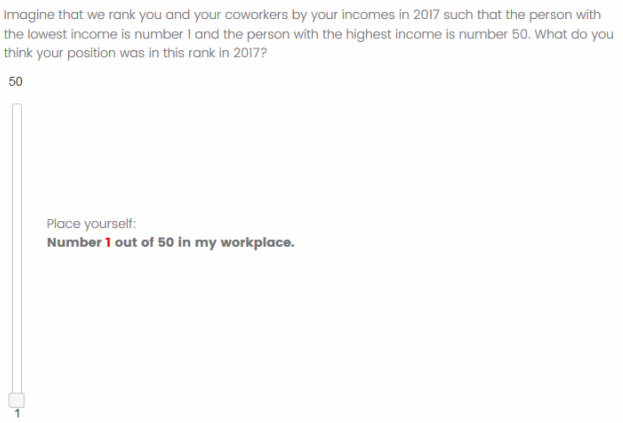
Notes: The figure shows a screenshot from the survey for a person who reported being born in 1971 and having an income of 350,000 DKK. The slider starts at P1, and when the respondent moves the slider with the cursor, the position marked with red changes accordingly.

FIGURE A-8: ELICITATION OF NUMBER OF CO-WORKERS AND POSITION AMONG CO-WORKERS

(A) NUMBER OF CO-WORKERS



(B) POSITION AMONG COWORKERS



Notes: The figure shows two screenshots from two pages in the survey. In this example, the respondent reports having 50 co-workers in the left panel (the box is empty as default). In the right panel, this number is piped as the max of the slider, and when the respondent moves the slider with the cursor the red position number changes accordingly.

A-2.2 Instruction video script

We will now ask you some questions regarding the distribution of income between Danes born the same year as you.

It may be difficult to answer, but we ask you to try your best.

There are differences between peoples' incomes. Some people have a high income, others have a low income.

The ladder to the left illustrates **how the incomes are distributed between Danes** born the same year as you.

This is also called the income distribution

Think of 100 people born the same year as you.

They are ranked according to their income such that the person with the lowest income is at the bottom of the ladder and the person with the highest income is at the top of the ladder.

Look at the person next to the first rung of the ladder.

5 out of 100 people (i.e. 5 %) have an income which is the same as or **lower** than the income of this person.

We call this P5, because the person has position 5 on the income ladder.

The person on the middle rung has position 50.

Exactly half of all people (i.e. 50 %) born the same year as you have an income which is

the same as or **lower** than the income of this person and **exactly half** have an income which is **higher** than the income of this person.

We call the position in the middle for P50.

Remember that P50 is the position in the middle since we will use this several times in the following questions.

The person next to the top rung has position 95.

95 out of 100 (i.e. 95 %) have an income which is the same as or **lower** than the income of this person and only 5 out of 100 people born the same year as you (i.e. 5 %) have an income which is higher than the income of this person.

Remember what P95 indicates since we are going to use this several times.

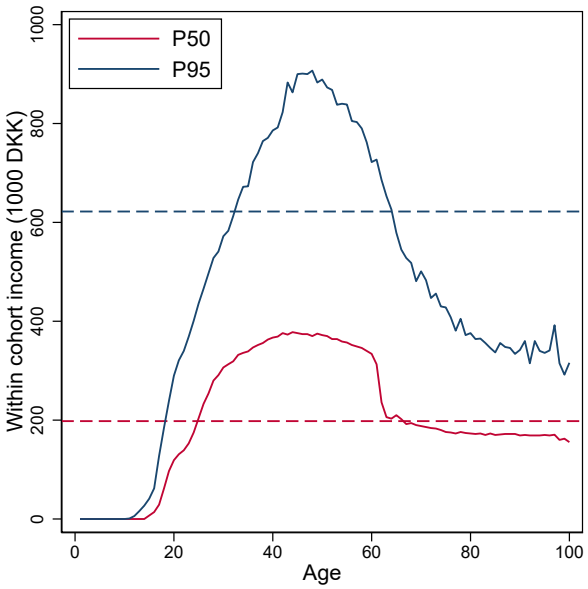
Shortly, we will now ask you what you think the income is for P50 and P95, respectively, for Danes born the same year as you

Next, we will ask you what you think **your position** is on the ladder.

You are welcome to watch the video again if you are not sure of the meaning of the different positions.

A-3 Overall perceptions

FIGURE A-9: WITHIN COHORT P50 AND P95 BY AGE



Notes: This figure shows the within cohort P50 and P95 income based on a 10% sample of the full population in Denmark. We use the same income definition as in the survey which excludes early retirement benefits, since the cohorts surveyed are not yet eligible for this benefit. The age cut-off for early retirement benefits is 60 and therefore we see a sharp drop at this age. We include pension payments, since we cannot disentangle old age pension and disability pension.

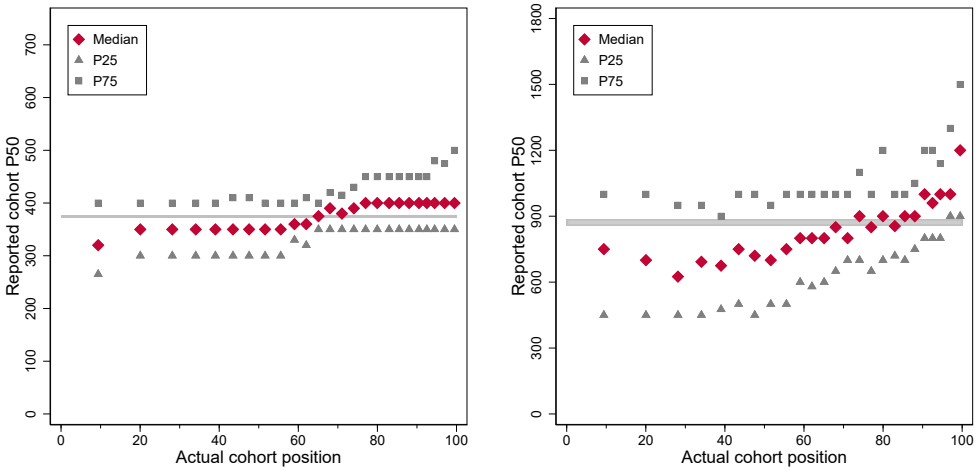
TABLE A-5: MOMENTS IN THE FULL INCOME DISTRIBUTION

	Income distribution percentiles				
	P5	P25	P50	P75	P95
Full population	0	57	198	358	622
Adult population	36	158	261	394	670
Working age population	39	217	333	447	751
Prime age population	112	262	373	502	896

Notes: This table shows different moments of the income distribution in 1,000 DKK based of different definitions of the population. The moments are based on a 10% sample of the full population in Denmark in 2017. *Adult population* are individuals from age 18 and up. *Working age population* are from age 25 to 65 and *Prime age population* are from age 45 to 50.

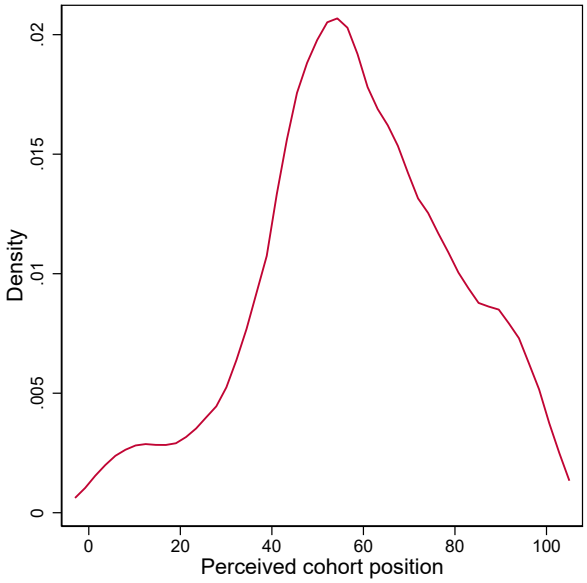
Figure A-10: Perception of cohort P50 and P95

(a) P50 (b) P95



Notes: The left shows the median of the perceived P50 reported in DKK by position of people in the within-cohort income distribution. The right panel similarly shows the perceived P95. Both bin scatter figures have 25 bins.
Notes:

Figure A-11: Distribution of perceived cohort position

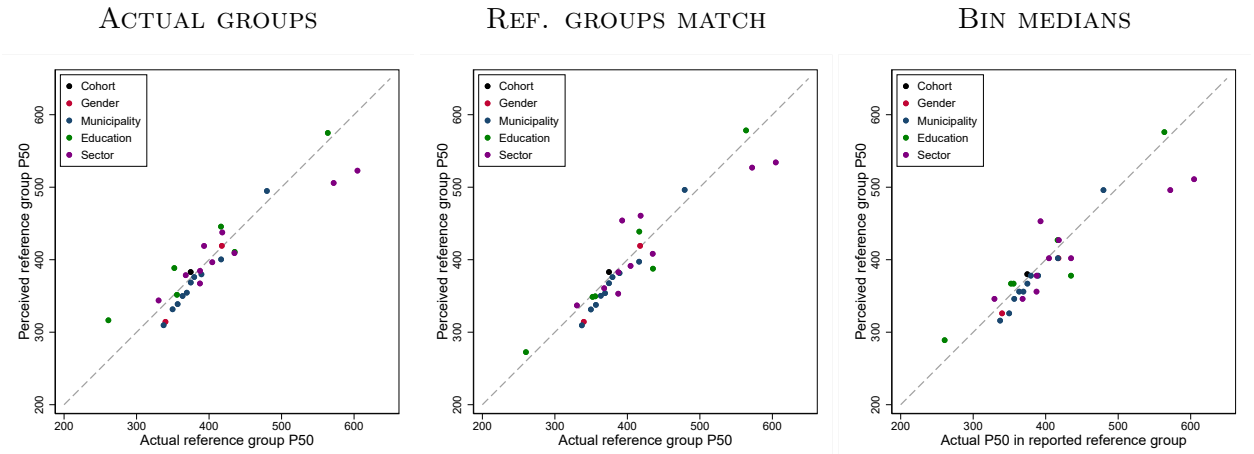


Notes: The panel shows a density plot and is constructed using Epanechnikov kernels with a bandwidth of 5.

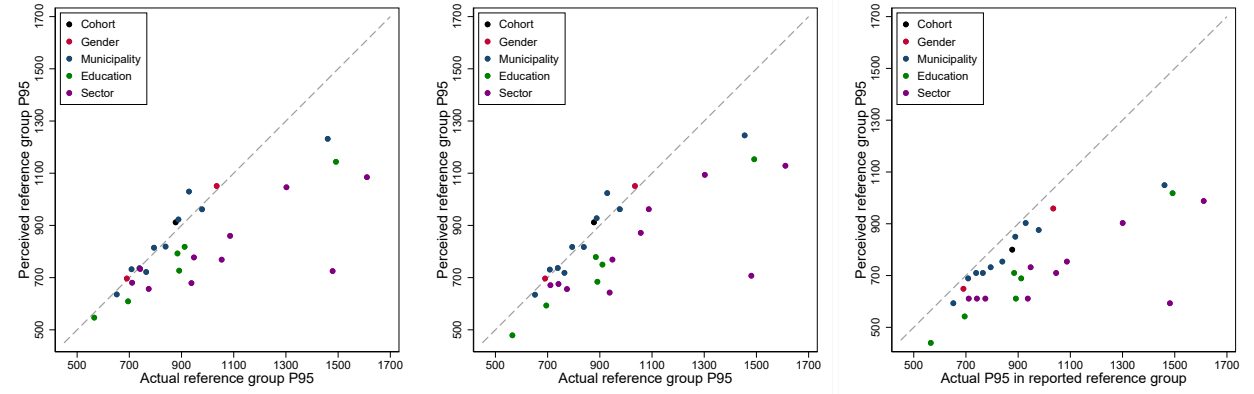
A-4 Reference groups

Figure A-12: Perceived P50 and P95 Incomes for Large Reference Groups with Sample Restrictions and Using Medians

(a) P50



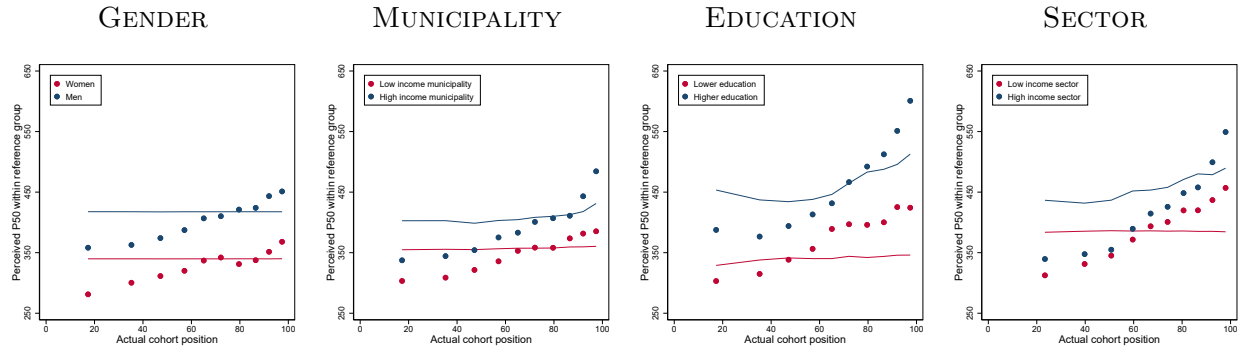
(b) P95



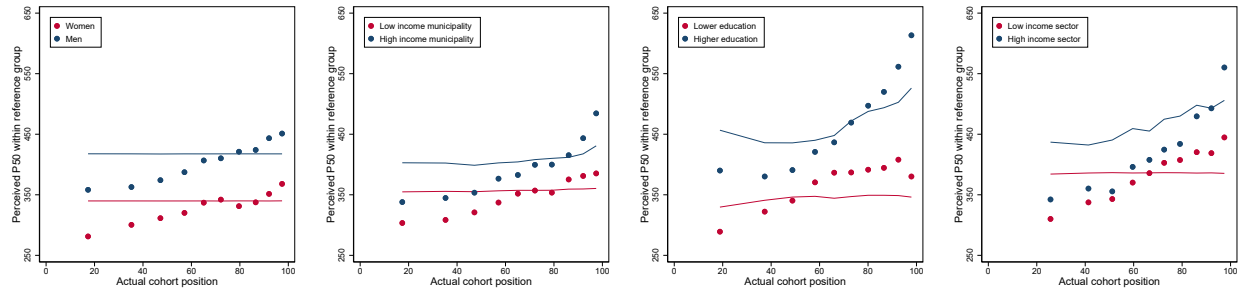
Notes: In the left panels, we use actual reference group instead of reported reference group. In the middle panels, we restrict the sample and only include respondents in each reference group if the reported group matches the group observed in the register data. In the right panels, we show bin medians instead of bin means using the same sample as in figure 5. For gender, we show one scatter for men and one for women. For municipality we divide the respondents into 10 similar sized groups based on the actual municipality P50 and P95 income and plot one scatter for each group. For education and sector we show one scatter for each educational level or sector. The scatters show the means and median of the reported P50 or P95 winzorized at the 5th and 95th percentile within the group.

FIGURE A-13: PERCEIVED P50 INCOMES FOR LARGE REFERENCE GROUPS WITH SAMPLE RESTRICTIONS

(A) ACTUAL REFERENCE GROUPS

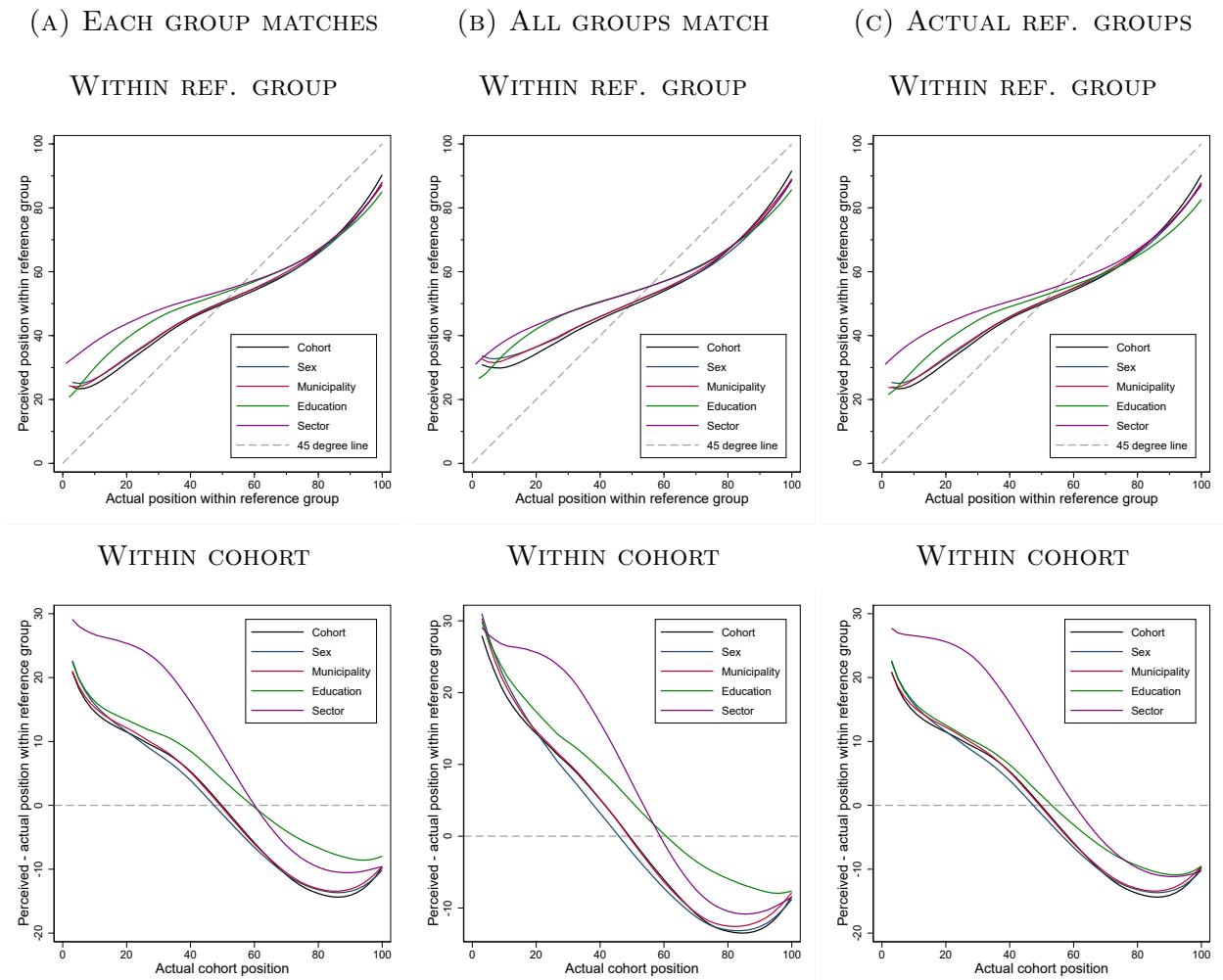


(B) REFERENCE GROUPS MATCH



Notes: In the top panels, we use actual reference group instead of reported reference group. For each reference group, the bottom panels only include respondents whose reported reference group matches the actual reference group. The solid lines indicate the actual average P50 for each group within the bin. The high/low income split for municipality is based on the median of within cohort in sample actual municipality P50 income. This is also the case for sector. For education, *Higher education* is short cycle higher education, bachelor programs and master programs.

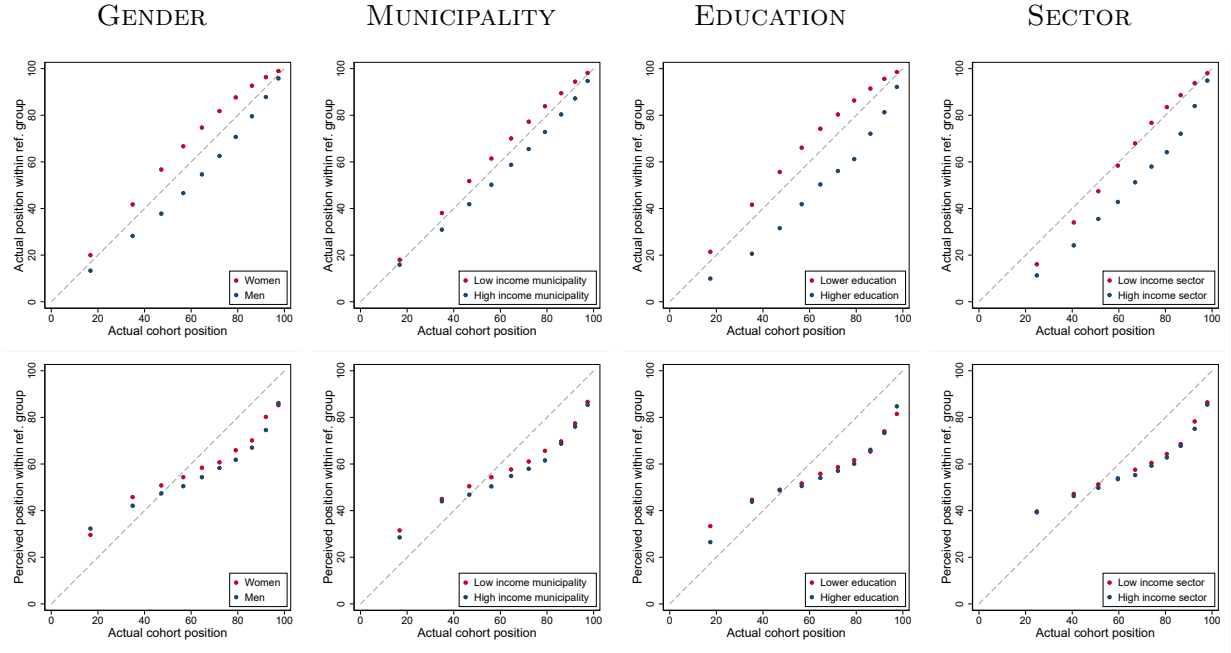
Figure A-15: Perceived and Actual Position for Large Reference Groups with Sample Restrictions



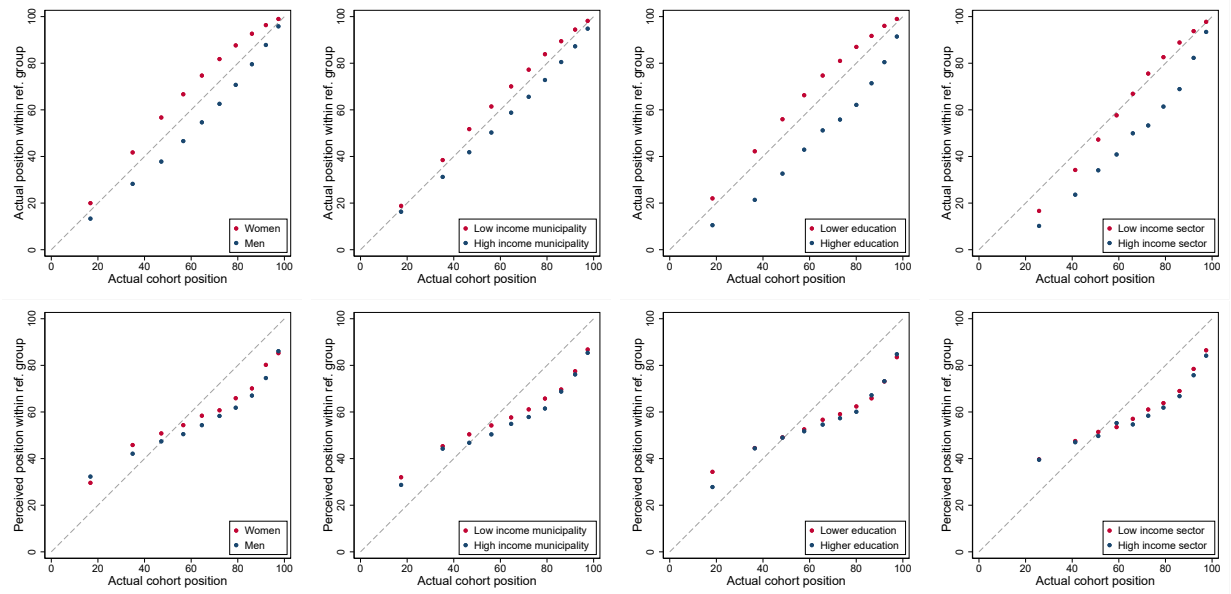
Notes: In the left panels, we only use respondents in each reference group if the reported group matches the group observed in the register data. In the middle panels, only respondents where all reported groups match the groups in the register data are included and the sample is the same across groups. In the right panels, we use actual reference groups instead of reported reference groups. The local linear polynomials have a bandwidth of 10.

FIGURE A-14: CORRELATION BETWEEN ACTUAL COHORT POSITION AND WITHIN LARGE REFERENCE GROUPS WITH SAMPLE RESTRICTION

(A) ACTUAL REFERENCE GROUP



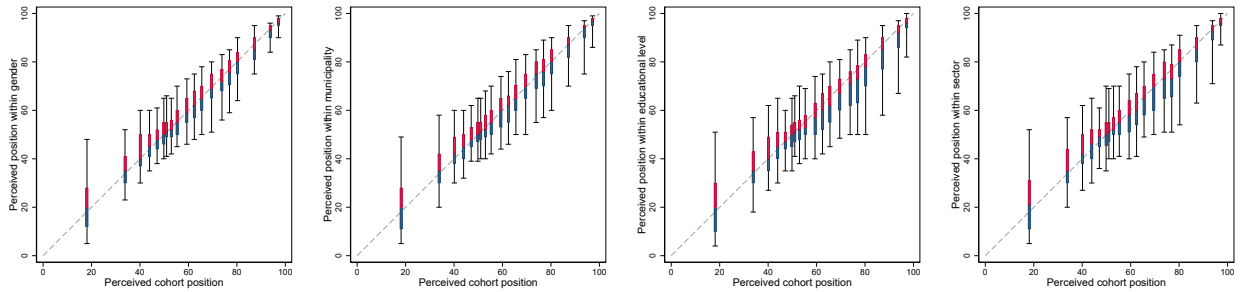
(B) REFERENCE GROUPS MATCH



Notes: In panel A, we use actual reference groups instead of reported reference groups. For each reference group, the figures in panel B only include respondents whose reported reference group matches the actual reference group. The high/low income split for municipality is based on the median of within cohort in sample actual municipality P50 income. This is also the case for sector. For education, *Higher education* is short cycle higher education, bachelor programs and master programs.

FIGURE A-16: VARIATION IN PERCEIVED POSITION ACROSS LARGE REFERENCE GROUPS

(A) GENDER (B) MUNICIPALITY (C) EDUCATION (D) SECTOR

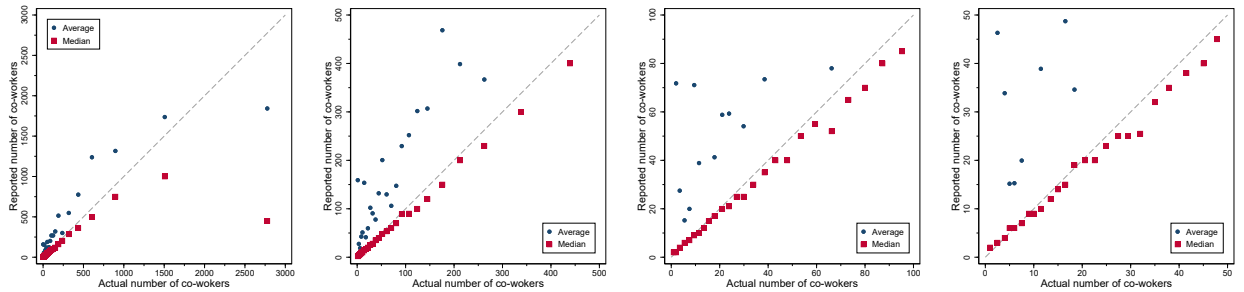


Notes: This figure shows 5th, 25th, 50th, 75th and 95th percentile of reported position within the large reference group by bins of perceived cohort position.

FIGURE A-17: ACTUAL AND REPORTED NUMBER OF PEOPLE IN SMALL REFERENCE GROUPS

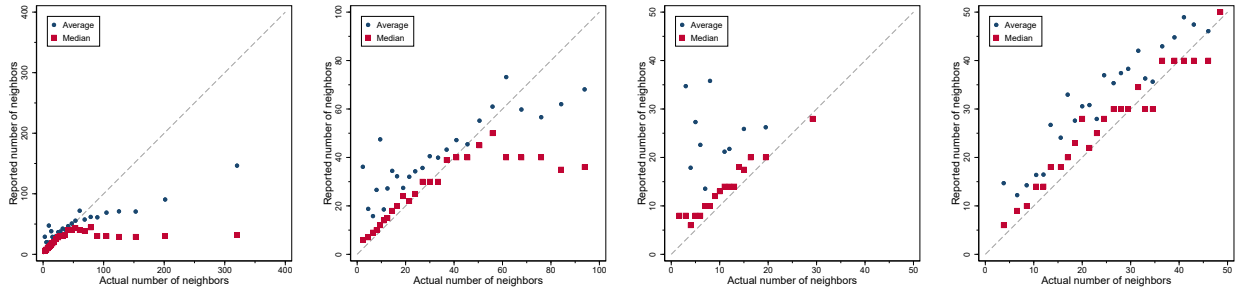
(A) CO-CORKERS

< 4000 < 500 < 100 < 50

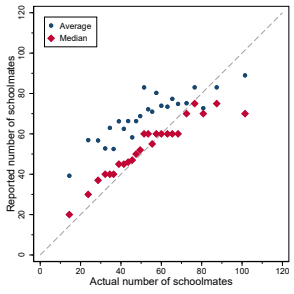


(B) NEIGHBORS

< 500 < 100 < 50 (APARTMENTS) < 50 (HOUSES)

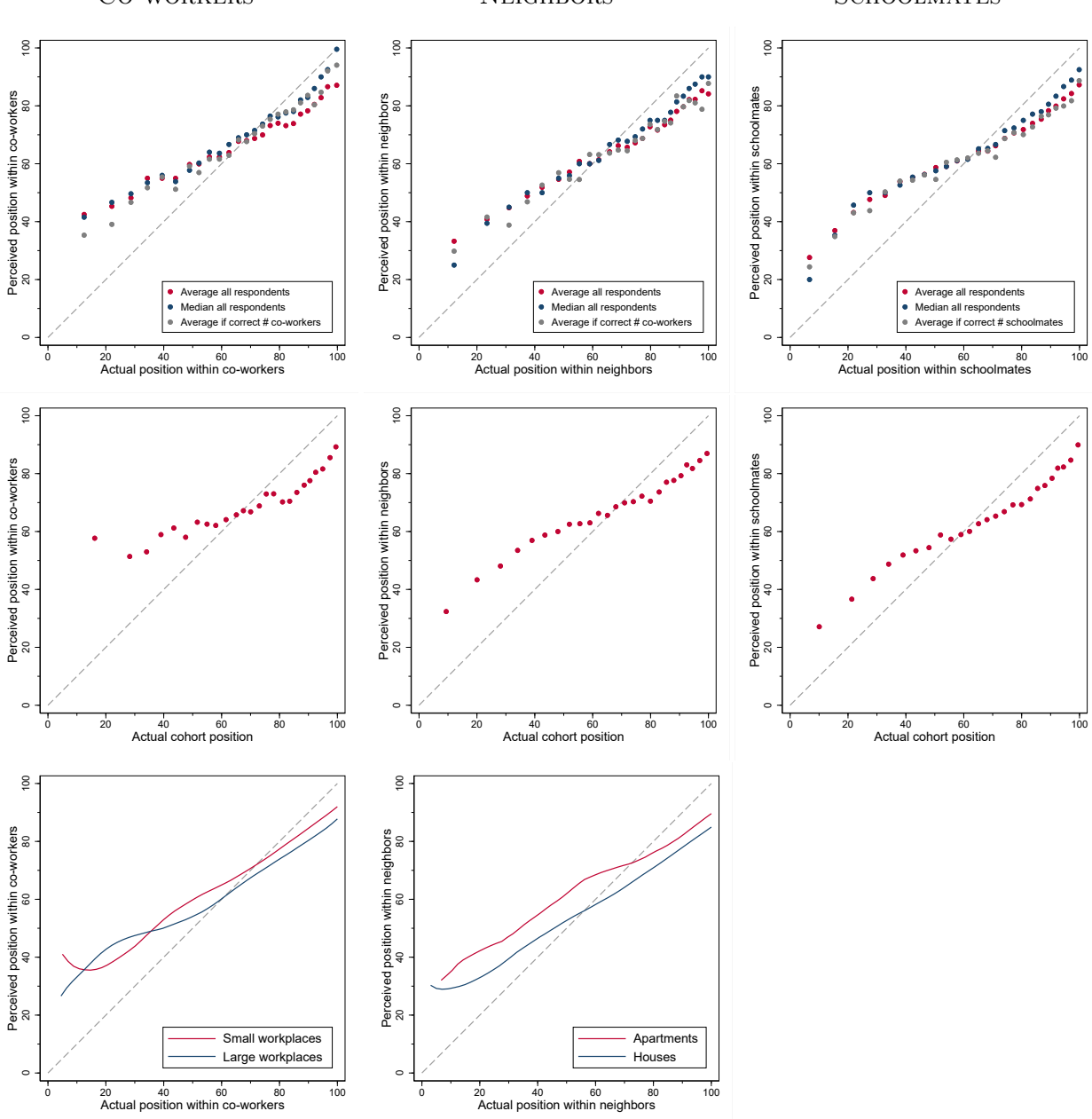


(C) SCHOOLMATES



Notes: The figures show bin scatters of the reported number of co-workers by the actual number of co-workers. In each panel, the sample is restricted to observations where the *Actual number of co-workers* is below a certain threshold. All observations are used to calculate the bin averages but the panels only show the averages if they are smaller than the threshold. There are 25 bins in each panel and there is the same number of observations behind each bin. The bin averages are only plotted if they are lower than the maximum actual number. For *Schoolmates*, the figure is based on respondents enrolled in "Grundskole" (Basic School) at age 15. The figure excludes observations from one very large school.

Figure A-18: Perceived position in small reference groups

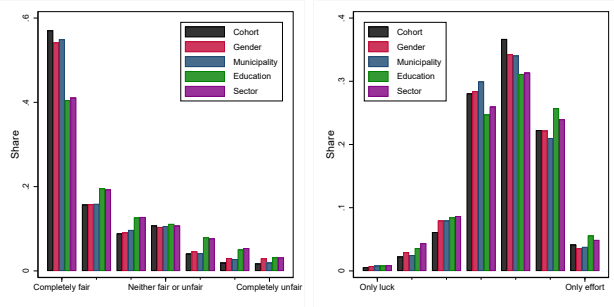


Notes: There are 25 bins in each panel. They are of equal size, except the top bin for co-workers and neighbors in the top panels, which have more observations. The top panels show similar patterns as in figure 9 using medians instead of averages or restricting the sample to respondents who reports a number of people in the small reference group that matches the number observed in the register data ± 10%. In the bottom panels, we use actual cohort position instead actual position within the small reference group. Again, we see a pattern similar to figure 9. The local linear polynomials have a bandwidth of 10 and are based on the respondents who report the correct number of people in the reference group ±10%. Small workplaces have 10 to 100 employees. Large workplaces have more than 100 employees.

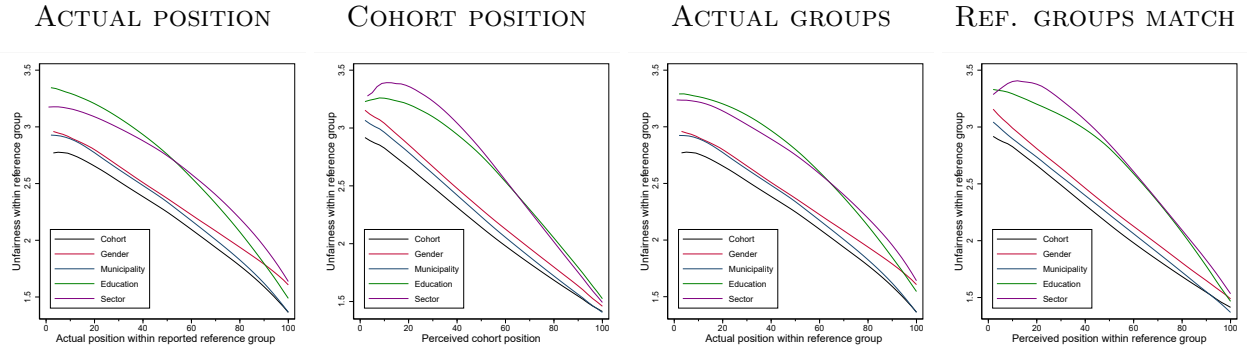
A-5 Social positions and fairness views

Figure A-19: View on Fairness and Effort vs. Luck Within Large Reference Groups: Distribution and by Position

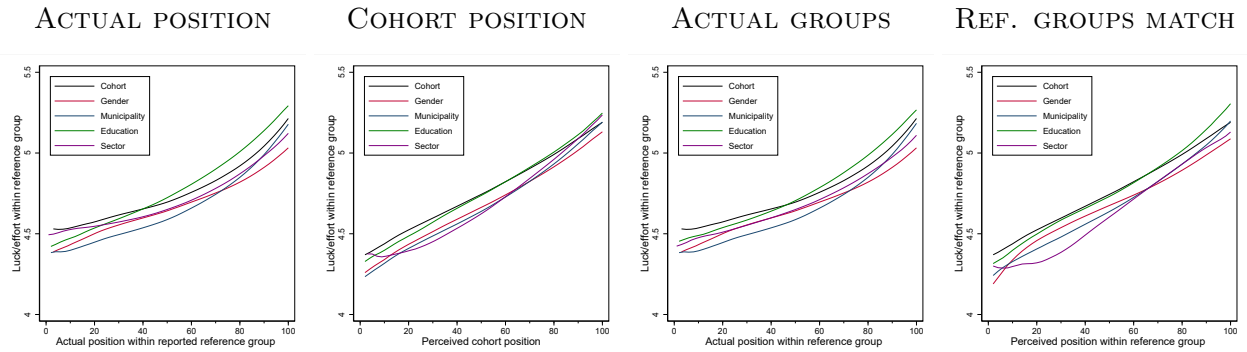
(a) Distributions



(b) Fairness



(c) Luck vs. effort



Notes: The figure only uses responses from the control group. The local linear polynomials have a bandwidth of 20. The top row panels show the raw distribution of the answers on the 7 point scale. The middle and bottom rows show different robustness checks. In the first column panels, we use actual position within each reference group instead of perceived position as in figure 11. In the second column panels, we use perceived cohort position. In the third column panels, we use actual reference groups instead of reported reference groups. In the fourth column panels, we only include respondents for each group if the reported group matches the group observed in the register data.

TABLE A-6: CORRELATION BETWEEN ACTUAL POSITION AND MISPERCEPTION AND FAIRNESS, LUCK VS. EFFORT AND POLITICAL VIEW WITH ACTUAL REFERENCE GROUPS

	More unfair					More	Right-
	Cohort	Gender	Mun.	Edu.	Sector	effort	wing
Panel A: No controls							
Position	-1.18***	-1.13***	-1.27***	-1.38***	-1.44***	0.81***	0.91***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Misperception	-0.38***	-0.60***	-0.47***	-0.43***	-0.83***	0.43***	0.45***
	(0.10)	(0.09)	(0.09)	(0.08)	(0.09)	(0.10)	(0.10)
Panel B: With controls							
Position	-1.09***	-1.01***	-1.10***	-1.04***	-1.22***	0.92***	0.86***
	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)	(0.09)	(0.09)
Misperception	-0.40***	-0.41***	-0.41***	-0.28***	-0.54***	0.46***	0.44***
	(0.10)	(0.10)	(0.09)	(0.09)	(0.09)	(0.10)	(0.10)
N	4690	4690	4690	4690	4330	4690	4690

Notes: In the table, we only use the control group respondents and use actual reference groups instead of reported groups. All outcomes are z-scores. *Position* denotes the actual position within reference group from percentile 1 to 100 divided by 100. A coefficient of 1 means that going from the bottom of the distribution to the top increases the outcome by one standard deviation. Similarly, *Misperception* is the difference between perceived and actual position within the reference group divided by 100. For *More effort* and *Right-wing* we use cohort position and misperception. *Controls* includes cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects. *Outcome mean* is the mean of the non-standardized outcome variable and *Outcome std. err.* is the standard error of the estimated mean. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-7: Correlation Between Actual Position and Misperception and Fairness, Luck vs. Effort and Political View with Sample Restrictions

	More unfair					More	Right-
	Cohort	Gender	Mun.	Edu.	Sector	effort	wing
Panel A: No controls							
Position	-1.18***	-1.13***	-1.27***	-1.45***	-1.46***	0.81***	0.91***
	(0.07)	(0.07)	(0.07)	(0.08)	(0.09)	(0.07)	(0.07)
Misperception	-0.38***	-0.60***	-0.48***	-0.52***	-0.93***	0.43***	0.45***
	(0.10)	(0.09)	(0.09)	(0.10)	(0.11)	(0.10)	(0.10)
Panel B: With controls							
Position	-1.09***	-1.01***	-1.10***	-1.12***	-1.19***	0.92***	0.86***
	(0.09)	(0.08)	(0.09)	(0.09)	(0.10)	(0.09)	(0.09)
Misperception	-0.40***	-0.41***	-0.41***	-0.39***	-0.58***	0.46***	0.44***
	(0.10)	(0.10)	(0.09)	(0.10)	(0.11)	(0.10)	(0.10)
N	4690	4690	4598	3451	3217	4690	4690
Outcome mean	(2.01)	(2.16)	(2.08)	(2.6)	(2.58)	(4.81)	(3.01)
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.01)

Notes: In the table we only use the control group respondents and for each reference group, we only include respondents whose reported group matches the group reported in the register data. All outcomes are z-scores. *Position* denotes the actual position within reference group from percentile 1 to 100 divided by 100. A coefficient of 1 means that going from the bottom of the distribution to the top increases the outcome by one standard deviation. Similarly, *Misperception* is the difference between perceived and actual position within the reference group divided by 100. For *More effort* and *Right-wing* we use cohort position and misperception. *Controls* includes cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects. *Outcome mean* is the mean of the non-standardized outcome variable and *Outcome std. err.* is the standard error of the estimated mean. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-8: Correlation Between Actual Position and Misperception and Inequality Views

	Ineq. not prob.	Less redist.	Less satis.	Work not paid off	Rich not deserve	Poor's own fault
Panel A: No controls						
Position	2.32***	2.07***	-1.22***	-2.20***	-1.45***	-1.08***
	(0.12)	(0.13)	(0.11)	(0.11)	(0.11)	(0.11)
Misperception	0.95***	0.78***	-0.38*	-1.08***	-0.83***	-0.69***
	(0.18)	(0.19)	(0.16)	(0.16)	(0.16)	(0.16)
Panel B: With controls						
Position	1.17***	1.15***	-0.83***	-1.36***	-1.07***	-0.57***
	(0.08)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Misperception	0.50***	0.46***	-0.32**	-0.70***	-0.60***	-0.44***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
N	4690	4690	4690	4690	4690	4690
Outcome mean	(4.08)	(4.52)	(2.32)	(2.53)	(3.19)	(4.78)
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)

Notes: In the table we only use the control group respondents. All outcomes are z-scores. *Position* denotes the actual cohort position from percentile 1 to 100 divided by 100. A coefficient of 1 means that going from the bottom of the distribution to the top increases the outcome by one standard deviation. Similarly, *Misperception* is the difference between perceived and actual cohort position divided by 100. *Controls* includes cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects. *Outcome mean* is the mean of the non-standardized outcome variable and *Outcome std. err.* is the standard error of the estimated mean.Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A-6 Income History and Life Events

Table A-9: Pairwise correlations of historic income positions

	-20 yr.	-15 yr.	-10 yr.	-5 yr.	This yr.
-20 yr.	1.00	0.41	0.29	0.22	0.22
-15 yr.	0.41	1.00	0.62	0.54	0.51
-10 yr.	0.29	0.62	1.00	0.70	0.65
-5 yr.	0.22	0.54	0.70	1.00	0.78
This yr.	0.22	0.51	0.65	0.78	1.00

Notes: Based on the full cohorts born between 1969 and 1973. We only include individuals we observe in all years. N=355,625.

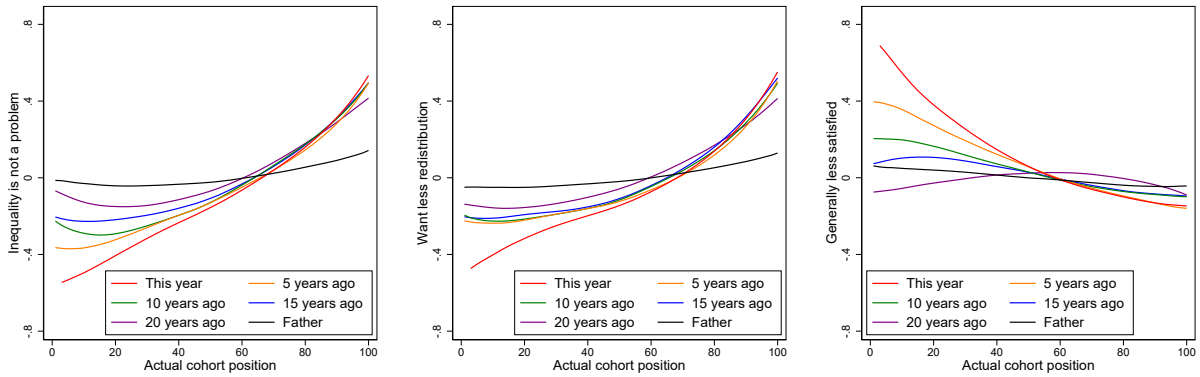
Table A-10: Transition matrix of income position 20 years ago and today

	Quintile today					
	1	2	3	4	5	Total
Quintile 20 years ago						
1	5.2	3.2	3.1	3.9	4.4	19.8
2	5.2	4.7	3.5	3.3	3.2	19.9
3	3.4	6.0	4.9	3.4	2.3	20.1
4	2.0	4.0	5.5	5.0	3.5	20.1
5	1.5	2.1	3.8	5.4	7.3	20.1
Quintile 10 years ago						
1	9.5	4.4	2.0	1.5	1.0	18.3
2	4.0	8.7	4.8	1.9	0.7	20.1
3	1.9	4.4	8.0	4.9	1.3	20.5
4	1.2	1.8	4.7	8.6	4.2	20.6
5	0.8	0.7	1.3	4.2	13.4	20.5
Total	17.4	20.1	20.8	21.1	20.7	100.0

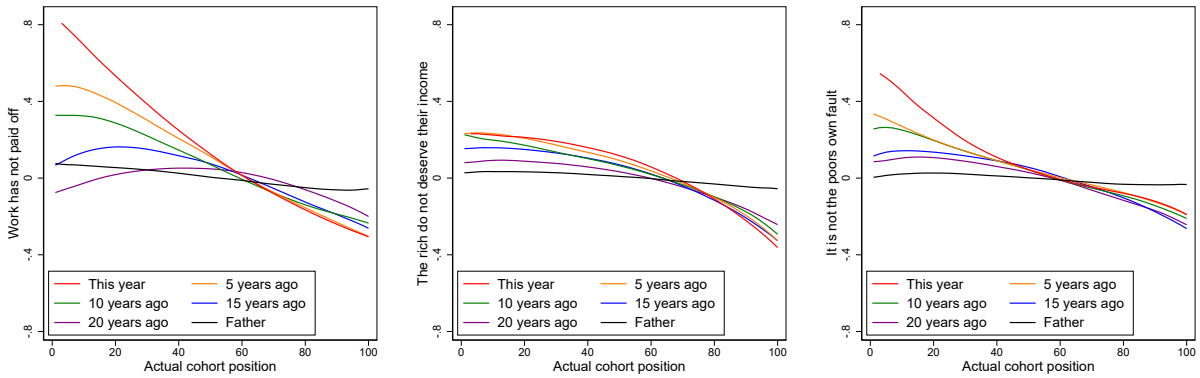
Notes: Based on the full cohorts born between 1969 and 1973. We only include individuals we observe in all years. The columns do not sum to 20% each because immigrants are included when the income percentiles are generated but not in the table, since we do not observe them historically. N=355,625.

Figure A-20: Historic Cohort Position and Inequality Views

(a) Inequality (b) Redistribution (c) Satisfaction



(d) Work (e) Rich (f) Poor



Notes: Bandwidth for local linear polynomials is 20. For *Father*, the x-axis is the father's position among fathers when the respondent was 15 years old. In all panels, the y-axis is the z-score for the survey answers. All panels are based on the same respondents from the control group. N=4657.

TABLE A-11: INCOME HISTORY AND FAIRNESS, LUCK VS. EFFORT AND POLITICAL VIEW WITHOUT CONTROLS

	More unfair					More effort	Right-wing
	Cohort	Gender	Mun.	Edu.	Sector		
Position father	-0.049	-0.027	-0.063	-0.040	-0.047	-0.023	0.065
	(0.036)	(0.036)	(0.036)	(0.035)	(0.036)	(0.036)	(0.036)
Position -20 yr.	-0.153***	-0.183***	-0.150***	-0.308***	-0.265***	0.169***	0.305***
	(0.037)	(0.037)	(0.037)	(0.036)	(0.037)	(0.037)	(0.037)
Position -15 yr.	-0.228***	-0.217***	-0.182***	-0.228***	-0.236***	0.171***	0.352***
	(0.048)	(0.047)	(0.047)	(0.047)	(0.048)	(0.048)	(0.048)
Position -10 yr.	-0.099	-0.155**	-0.145*	-0.290***	-0.269***	0.205***	0.239***
	(0.057)	(0.057)	(0.057)	(0.056)	(0.057)	(0.058)	(0.057)
Position -5 yr.	-0.110	-0.093	-0.159*	-0.077	-0.113	-0.009	-0.061
	(0.069)	(0.068)	(0.068)	(0.068)	(0.070)	(0.069)	(0.069)
Position this yr.	-0.739***	-0.725***	-0.764***	-0.716***	-0.858***	0.527***	0.353***
	(0.068)	(0.068)	(0.068)	(0.067)	(0.071)	(0.069)	(0.068)
Observations	9046	9046	9046	9046	8575	9046	9046
Controls							

Notes: All outcomes are z-scores. *More unfair* and *More effort* are in the cohort dimension. *Position father* is the repondent's father's income rank when the respondent was 16 years old compared to other fathers of 16 year olds. All positions used as explaining variables have been re-scaled to go from 0.1 to 1. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE A-12: INCOME HISTORY AND FAIRNESS, LUCK VS. EFFORT AND POLITICAL VIEW WITH 5-YEAR AVERAGE INCOME POSITIONS

	More unfair					More effort	Right-wing
	Cohort	Gender	Mun.	Edu.	Sector		
Pos. -20 to -16	-0.221***	-0.186**	-0.189**	-0.198***	-0.197***	0.182**	0.357***
	(0.059)	(0.058)	(0.058)	(0.057)	(0.058)	(0.059)	(0.058)
Pos. -15 to -11	-0.156*	-0.151*	-0.142	-0.147*	-0.136	0.149*	0.227**
	(0.074)	(0.073)	(0.073)	(0.071)	(0.073)	(0.075)	(0.073)
Pos. -10 to -6	-0.084	-0.087	-0.121	-0.150	-0.135	0.083	0.143
	(0.091)	(0.090)	(0.090)	(0.088)	(0.090)	(0.092)	(0.090)
Pos. -5 to -1	-0.271*	-0.212	-0.271*	-0.269*	-0.260*	0.122	-0.149
	(0.114)	(0.113)	(0.113)	(0.110)	(0.114)	(0.115)	(0.112)
Position this yr.	-0.516***	-0.511***	-0.518***	-0.525***	-0.635***	0.470***	0.408***
	(0.092)	(0.091)	(0.091)	(0.089)	(0.093)	(0.093)	(0.091)
Observations	9316	9316	9316	9316	8825	9316	9316
Controls	✓	✓	✓	✓	✓	✓	✓

Notes: All outcomes are z-scores. *More unfair* and *More effort* are in the cohort dimension. *Pos. -20 to -16*, *Pos. -15 to -11*, *Pos. -10 to -6* and *Pos. -5 to -1* are five year average positions. All positions used as explaining variables have been re-scaled to go from 0.1 to 1. *Controls* includes a treatment indicator, cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE A-13: INCOME HISTORY AND FAIRNESS, LUCK VS. EFFORT AND POLITICAL VIEW WITH SAMPLE RESTRICTIONS

	More unfair					More effort	Right-wing
	Cohort	Gender	Mun.	Edu.	Sector		
Position father	-0.059	-0.051	-0.070	-0.112**	-0.024	0.025	0.122***
	(0.037)	(0.037)	(0.037)	(0.042)	(0.044)	(0.037)	(0.036)
Position -20 yr.	-0.122**	-0.097*	-0.118**	-0.103*	-0.148**	0.061	0.141***
	(0.042)	(0.041)	(0.041)	(0.046)	(0.049)	(0.042)	(0.041)
Position -15 yr.	-0.203***	-0.169***	-0.147**	-0.143**	-0.081	0.131**	0.268***
	(0.048)	(0.048)	(0.048)	(0.053)	(0.058)	(0.049)	(0.047)
Position -10 yr.	-0.085	-0.100	-0.119*	-0.195**	-0.177*	0.206***	0.197***
	(0.058)	(0.057)	(0.058)	(0.066)	(0.071)	(0.058)	(0.057)
Position -5 yr.	-0.108	-0.096	-0.143*	-0.109	-0.205*	0.037	-0.030
	(0.070)	(0.068)	(0.069)	(0.078)	(0.086)	(0.070)	(0.068)
Position this yr.	-0.655***	-0.618***	-0.646***	-0.683***	-0.729***	0.540***	0.358***
	(0.074)	(0.073)	(0.073)	(0.085)	(0.094)	(0.074)	(0.072)
Observations	9046	9046	8878	6698	6164	9046	9046
Controls	✓	✓	✓	✓	✓	✓	✓

Notes: For each reference group, we only include respondents if the reported group matches the group observed in the register data. All outcomes are z-scores. *More unfair* and *More effort* are in the cohort dimension. *Position father* is the repondent's father's income rank when the respondent was 16 years old compared to other fathers of 16 year olds. All positions used as explaining variables have been re-scaled to go from 0.1 to 1. *Controls* includes a treatment indicator, cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-14: Income History and Inequality Views

	Inequal. not prob.	Less redist.	Less satis.	Work not paid off	Rich don't deserve	Not poors own fault
Position father	0.088*	0.115**	-0.006	0.009	-0.028	-0.020
	(0.035)	(0.036)	(0.038)	(0.037)	(0.037)	(0.037)
Position -20 yr.	0.142***	0.137***	0.001	-0.017	-0.147***	-0.110**
	(0.040)	(0.041)	(0.042)	(0.041)	(0.042)	(0.041)
Position -15 yr.	0.087	0.190***	-0.103*	-0.114*	-0.169***	-0.076
	(0.046)	(0.047)	(0.049)	(0.048)	(0.049)	(0.048)
Position -10 yr.	0.112*	0.040	0.061	-0.021	0.023	0.069
	(0.055)	(0.057)	(0.059)	(0.058)	(0.058)	(0.058)
Position -5 yr.	0.061	0.012	-0.207**	-0.283***	-0.208**	-0.050
	(0.066)	(0.068)	(0.071)	(0.069)	(0.070)	(0.069)
Position this yr.	0.694***	0.699***	-0.455***	-0.714***	-0.551***	-0.261***
	(0.070)	(0.072)	(0.075)	(0.073)	(0.074)	(0.073)
Observations	9035	9035	9035	9035	9035	9035
Controls	✓	✓	✓	✓	✓	✓

Notes: All outcomes are z-scores. *More unfair* and *More effort* are in the cohort dimension. *Position father* is the repondent's father's income rank when the respondent was 16 years old compared to other fathers of 16 year olds. All positions used as explaining variables have been re-scaled to go from 0.1 to 1. *Controls* includes a treatment indicator, cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-15: Historic Shocks and Fairness, Luck vs. Effort and Political View with Sample Restrictions

	More unfair					M. effort	Right-
	Cohort	Gender	Mun.	Edu.	Sector	Cohort	wing
Unemployment	0.19***	0.22***	0.20***	0.17**	0.21**	-0.098	-0.026
	(0.050)	(0.049)	(0.050)	(0.058)	(0.068)	(0.051)	(0.046)
Observations	7537	7537	7397	5599	5498	7537	7537
Affected %	5.03	5.03	4.96	4.80	3.62	5.03	5.03
Disability	0.26*	0.51***	0.39**	0.32*		-0.28*	-0.18
	(0.13)	(0.13)	(0.14)	(0.15)		(0.13)	(0.12)
Observations	9246	9246	9073	6841		9246	9246
Affected %	0.61	0.61	0.57	0.61		0.61	0.61
Hospitalization	0.093**	0.079**	0.090**	0.054	0.0098	-0.0096	-0.0070
	(0.029)	(0.028)	(0.028)	(0.032)	(0.034)	(0.029)	(0.026)
Observations	4749	4749	4662	3543	3257	4749	4749
Affected %	55.5	55.5	55.5	55.5	54.3	55.5	55.5
Promotion	-0.11*	-0.10*	-0.10*	-0.17***	-0.19***	0.13**	0.14***
	(0.045)	(0.044)	(0.044)	(0.050)	(0.054)	(0.045)	(0.040)
Observations	7970	7970	7832	5950	5622	7970	7970
Affected %	6.7	6.7	6.7	6.7	6.4	6.7	6.7
Pre-shock position FE	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓

Notes: For each reference group, we only include respondents if the reported group matches the group observed in the register data. All outcomes are z-scores. Each cell in the table is a separate regression of the column outcome on the row regressor and the controls indicated in the bottom part of the table. The explaining variables are all indicators that equal 1 if the respondent experienced the shock between 2012 and 2017. In each row, we exclude respondents who experienced the shock between 2008 and 2011. For *Unemployment*, we only use respondents who were in the workforce in the entire period. *Controls* includes cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects, all measured in 2008, a treatment indicator and an indicator that equals one if the respondent voted for a right-wing party in the 2015 general election. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-16: Historic Shocks and Inequality Views

	Inequal. not prob.	Less redist.	Less satis.	Work not paid off	Rich don't deserve	Not poors own fault	N	Affected %
Unemployment	-0.14**	-0.098*	0.15**	0.17***	0.10*	-0.040	7537	5.03
	(0.047)	(0.047)	(0.052)	(0.051)	(0.051)	(0.050)		
Disability	-0.20	-0.36**	0.27	0.37**	0.19	0.48***	9246	0.61
	(0.12)	(0.12)	(0.14)	(0.13)	(0.13)	(0.13)		
Hospitalization	-0.035	-0.0100	0.075*	0.076**	0.058*	0.066*	4749	55.5
	(0.026)	(0.026)	(0.029)	(0.029)	(0.028)	(0.027)		
Promotion	0.16***	0.17***	-0.13**	-0.098*	-0.15***	-0.034	7970	6.66
	(0.041)	(0.041)	(0.045)	(0.045)	(0.044)	(0.044)		
Pre-shock position FE	✓	✓	✓	✓	✓	✓		
Controls	✓	✓	✓	✓	✓	✓		

Notes: All outcomes are z-scores. Each cell in the table is a separate regression of the column outcome on the row regressor and the controls indicated in the bottom part of the table. The explaining variables are all indicators that equal 1 if the respondent experienced the shock between 2012 and 2017. In each row, we exclude respondents who experienced the shock between 2008 and 2011. For *Unemployment*, we only use respondents who were in the workforce in the entire period. *Controls* includes cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects, all measured in 2008, a treatment indicator and an indicator that equals one if the respondent voted for a right-wing party in the 2015 general election. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE A-17: HISTORIC SHOCKS AND FAIRNESS, LUCK VS. EFFORT AND POLITICAL VIEW WITHOUT CONTROLS

	Current	More unfair					M. effort	Right-	N	Affected
	position	Cohort	Gender	Mun.	Edu.	Sector	Cohort	wing		%
Unemployment	-12.3***	0.17**	0.19***	0.18***	0.098	0.13*	-0.069	0.014	7537	5.03
	(0.81)	(0.051)	(0.050)	(0.050)	(0.050)	(0.052)	(0.051)	(0.051)		
Disability	-24.8***	0.32*	0.56***	0.44***	0.26*		-0.31*	-0.21	9246	0.61
	(2.40)	(0.13)	(0.13)	(0.13)	(0.13)		(0.13)	(0.13)		
Hospitalization	-2.20***	0.11***	0.098***	0.11***	0.080**	0.065*	-0.022	-0.029	4749	55.5
	(0.51)	(0.029)	(0.028)	(0.028)	(0.028)	(0.028)	(0.029)	(0.028)		
Promotion	8.86***	-0.13**	-0.12**	-0.13**	-0.16***	-0.22***	0.15**	0.18***	7970	6.66
	(0.77)	(0.045)	(0.044)	(0.045)	(0.044)	(0.045)	(0.045)	(0.044)		
Pre-shock position FE	✓	✓	✓	✓	✓	✓	✓	✓		
Controls										

Notes: All outcomes are z-scores. Each cell in the table is a separate regression of the column outcome on the row regressor and the controls indicated in the bottom part of the table. The explaining variables are all indicators that equal 1 if the respondent experienced the shock between 2012 and 2017. In each row, we exclude respondents who experienced the shock between 2008 and 2011. For *Unemployment*, we only use respondents who were in the workforce in the entire period. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-18: Historic Shocks and Fairness, Luck vs. Effort and Political View with 2SLS

	More unfair					M. effort	Right-	N	Affected
	Cohort	Gender	Mun.	Edu.	Sector	Cohort	wing		%
Unemployment	-1.52***	-1.71***	-1.64***	-1.27***	-2.17***	0.80	0.21	7537	5.03
	(0.41)	(0.39)	(0.41)	(0.37)	(0.59)	(0.41)	(0.38)		
Disability	-1.21*	-2.20***	-1.72**	-1.11		1.30*	0.84	9246	0.61
	(0.60)	(0.58)	(0.57)	(0.58)		(0.61)	(0.55)		
Hospitalization	-5.09**	-3.83*	-4.80*	-3.43	-2.54	0.53	0.39	4749	55.5
	(1.93)	(1.54)	(1.87)	(1.76)	(2.30)	(1.55)	(1.37)		
Promotion	-1.28*	-1.16*	-1.20*	-1.53***	-1.85***	1.54**	1.63***	7970	6.66
	(0.52)	(0.50)	(0.50)	(0.43)	(0.42)	(0.53)	(0.49)		
Pooled	-1.51***	-1.91***	-1.69***	-1.48***	-2.10***	1.15***	0.73*	29685	12.1
	(0.33)	(0.34)	(0.34)	(0.32)	(0.38)	(0.32)	(0.31)		
Pre-shock position FE	✓	✓	✓	✓	✓	✓	✓		
Controls	✓	✓	✓	✓	✓	✓	✓		

Notes: All outcomes are z-scores. Each cell in the table is a separate 2SLS regression of the column outcome on current position instrumented using the row regressor and the controls indicated in the bottom part of the table. The instruments are all indicators that equal 1 if the respondent experienced the shock between 2012 and 2017. In each row, we exclude respondents who experienced the shock between 2008 and 2011. For *Unemployment*, we only use respondents who were in the workforce in the entire period. *Controls* includes cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects, all measured in 2008, a treatment indicator and an indicator that equals one if the respondent voted for a right-wing party in the 2015 general election. Standard errors in parentheses. In the pooled regression we cluster the standard errors at the individual level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A-7 Survey experiment

Table A-19: Survey Information Experiment and Inequality Views

	Inequal. Cohort	Less Gender	Less Municip.	Work not Education	Rich don't Sector	Not poors effort
Position	1.232***	1.068***	-0.738***	-1.218***	-0.871***	-0.624***
	(0.048)	(0.048)	(0.049)	(0.048)	(0.049)	(0.049)
Misperception	0.502***	0.400***	-0.214*	-0.559***	-0.495***	-0.386***
	(0.089)	(0.091)	(0.093)	(0.090)	(0.092)	(0.091)
Treatment	-0.014	0.025	0.003	0.017	0.023	0.019
	(0.021)	(0.021)	(0.022)	(0.021)	(0.021)	(0.021)
T × Misperception	-0.021	0.070	-0.101	0.016	0.277*	0.006
	(0.115)	(0.117)	(0.119)	(0.116)	(0.118)	(0.118)
N	9322	9322	9322	9322	9322	9322

Notes: All outcomes are z-scores. The misperceptions are the actual cohort misperceptions, meaning the difference between perceived position and actual position. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-20: Survey Information Experiment and Fairness, Luck vs. Effort and Political View with Controls

	More unfair within reference group					More	Right-
	Cohort	Gender	Municip.	Education	Sector	effort	wing
Position	-1.017***	-0.942***	-1.060***	-1.052***	-1.115***	0.985***	1.008***
	(0.062)	(0.060)	(0.060)	(0.055)	(0.058)	(0.063)	(0.055)
Misperception	-0.338***	-0.355***	-0.373***	-0.331***	-0.554***	0.576***	0.569***
	(0.092)	(0.087)	(0.084)	(0.075)	(0.078)	(0.092)	(0.081)
Treatment	0.085***	0.063**	0.062**	0.050**	0.041*	-0.008	-0.030
	(0.021)	(0.021)	(0.021)	(0.019)	(0.020)	(0.021)	(0.019)
T × Misperception	0.329**	0.265*	0.195	0.037	0.264**	-0.155	-0.051
	(0.118)	(0.108)	(0.107)	(0.090)	(0.090)	(0.118)	(0.104)
N	9331	9331	9331	9331	8854	9331	9331
Controls	✓	✓	✓	✓	✓	✓	✓

Notes: All outcomes are z-scores. The misperceptions are the actual misperceptions, meaning the difference between perceived position and actual position within the reported reference group specified in each column. For the *More effort* and *Right-wing* outcomes, we use cohort misperception. *Right-wing* is imputed based which party the respondent reported to vote for if there was an election today. *Controls* includes cohort fixed effects, a male dummy, municipality fixed effects, educational level fixed effects and sector (incl. unemployed/not in workforce) fixed effects. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-21: Survey Information Experiment and Fairness, Luck vs. Effort and Political View if Income is Reported Correctly

	More unfair within reference group					More	Right-
	Cohort	Gender	Municip.	Education	Sector	effort	wing
Position	-1.143***	-1.085***	-1.217***	-1.411***	-1.326***	0.932***	0.992***
	(0.053)	(0.054)	(0.053)	(0.053)	(0.058)	(0.054)	(0.050)
Misperception	-0.188	-0.519***	-0.343***	-0.198*	-0.639***	0.237*	0.372***
	(0.114)	(0.108)	(0.104)	(0.093)	(0.098)	(0.115)	(0.107)
Treatment	0.081**	0.070**	0.063*	0.022	0.026	0.021	-0.032
	(0.025)	(0.025)	(0.025)	(0.023)	(0.024)	(0.026)	(0.024)
T × Misperception	0.348*	0.419**	0.285*	0.044	0.227	-0.044	0.007
	(0.148)	(0.139)	(0.136)	(0.114)	(0.116)	(0.150)	(0.140)
N	6660	6537	6539	6272	5873	6660	6660

Notes: In this table, we only use respondents whose reported income generate treatment information that is at most five positions from the information they would have received if the reported and actual income exactly matched. All outcomes are z-scores. The misperceptions are the actual misperceptions, meaning the difference between perceived position and actual position within the reported reference group specified in each column. For the *More effort* and *Right-wing* outcomes, we use cohort misperception. *Right-wing* is imputed based which party the respondent reported to vote for if there was an election today. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-22: Survey Information Experiment and Fairness, Luck vs. Effort and Political View with Interaction of Treatment and Position

	More unfair within reference group					More	Right-
	Cohort	Gender	Municip.	Education	Sector	effort	wing
Position	-1.176***	-1.121***	-1.269***	-1.358***	-1.424***	0.816***	0.912***
	(0.069)	(0.069)	(0.068)	(0.068)	(0.073)	(0.069)	(0.063)
Misperception	-0.377***	-0.599***	-0.471***	-0.371***	-0.862***	0.437***	0.489***
	(0.099)	(0.094)	(0.090)	(0.083)	(0.090)	(0.099)	(0.091)
Treatment	0.047	0.023	0.045	0.090	-0.022	-0.150*	-0.083
	(0.062)	(0.063)	(0.062)	(0.059)	(0.065)	(0.062)	(0.057)
T × Misperception	0.351*	0.320*	0.207	-0.019	0.346**	0.053	0.072
	(0.142)	(0.133)	(0.129)	(0.117)	(0.128)	(0.142)	(0.130)
T × Position	0.055	0.061	0.028	-0.071	0.103	0.241*	0.099
	(0.098)	(0.099)	(0.096)	(0.096)	(0.104)	(0.098)	(0.090)
N	9331	9331	9331	9331	8854	9331	9331

Notes: All outcomes are z-scores. The misperceptions are the actual misperceptions, meaning the difference between perceived position and actual position within the reported reference group specified in each column. For the *More effort* and *Right-wing* outcomes, we use cohort misperception and cohort income group. *Right-wing* is imputed based which party the respondent reported to vote for if there was an election today. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-23: Survey Information Experiment and Fairness, Luck vs. Effort and Political View using Actual Reference Groups

	More unfair within reference group					More	Right-
	Cohort	Gender	Municip.	Education	Sector	effort	wing
Position	-1.148***	-1.092***	-1.256***	-1.412***	-1.395***	0.935***	0.961***
	(0.049)	(0.049)	(0.048)	(0.048)	(0.053)	(0.049)	(0.045)
Misperception	-0.356***	-0.577***	-0.458***	-0.449***	-0.790***	0.530***	0.528***
	(0.092)	(0.086)	(0.083)	(0.073)	(0.081)	(0.092)	(0.084)
Treatment	0.080***	0.059**	0.061**	0.051**	0.043*	-0.006	-0.024
	(0.021)	(0.021)	(0.021)	(0.020)	(0.021)	(0.021)	(0.020)
T × Misperception	0.307**	0.274*	0.179	0.053	0.204*	-0.140	-0.008
	(0.118)	(0.110)	(0.108)	(0.091)	(0.096)	(0.118)	(0.109)
N	9331	9331	9331	9331	8647	9331	9331

Notes: In the table, we use actual reference groups observed in the register data instead of reported reference groups. All outcomes are z-scores. The misperceptions are the actual misperceptions, meaning the difference between perceived position and actual position within the reported reference group specified in each column. For the *More effort* and *Right-wing* outcomes, we use cohort misperception. *Right-wing* is imputed based which party the respondent reported to vote for if there was an election today. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A-24: Survey Information Experiment and Fairness, Luck vs. Effort and Political View if Reference Groups Are Reported Correctly

	More unfair within reference group					More	Right-
	Cohort	Gender	Municip.	Education	Sector	effort	wing
Position	-1.148***	-1.092***	-1.245***	-1.489***	-1.403***	0.935***	0.961***
	(0.049)	(0.049)	(0.048)	(0.057)	(0.064)	(0.049)	(0.045)
Misperception	-0.356***	-0.577***	-0.455***	-0.545***	-0.886***	0.530***	0.528***
	(0.092)	(0.086)	(0.084)	(0.088)	(0.097)	(0.092)	(0.084)
Treatment	0.080***	0.059**	0.064**	0.036	0.043	-0.006	-0.024
	(0.021)	(0.021)	(0.021)	(0.023)	(0.025)	(0.021)	(0.020)
T × Misperception	0.307**	0.274*	0.181	0.102	0.292*	-0.140	-0.008
	(0.118)	(0.110)	(0.109)	(0.109)	(0.116)	(0.118)	(0.109)
N	9331	9331	9156	6901	6356	9331	9331

Notes: For each reference group, we only use respondents if the reported group matches the group observed in the register data. All outcomes are z-scores. The misperceptions are the actual misperceptions, meaning the difference between perceived position and actual position within the reported reference group specified in each column. For the *More effort* and *Right-wing* outcomes, we use cohort misperception. *Right-wing* is imputed based which party the respondent reported to vote for if there was an election today. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.