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Acta Sociologica 2012 55: 251
DOI: 10.1177/0001699312450591

Article

Acta Sociologica
55(3) 251–272

DOI: 10.1177/0001699312450591
asj.sagepub.com
SAGE

Does education affect opinions on economic inequality? A joint mean and dispersion analysis

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Abstract

Research on public opinion on economic inequality mainly focuses on the legitimation of inequalities and possible discrepancies between public opinion on fair economic inequality and factual income distributions. However, what has been neglected is the extent to which individual or country characteristics affect *deviations* from *average* public opinion. To account for these deviations, we establish a joint multi-level mean–dispersion model and scrutinize the impact of educational systems as a hitherto neglected factor that may affect dispersion in opinion distributions. Besides an individual's level of education and welfare state characteristics, we show that vocational orientation of educational systems, too, has a substantial impact. This institutional feature appears to reduce the extent to which individual opinions deviate from average public opinion on the fairness of economic inequalities.

Keywords

dispersion, education, inequality, legitimation, redistribution

Introduction

Public opinion on the fairness of economic inequality informs us about the extent to which current economic distribution in a society is considered legitimate. If average opinion regarding tolerable economic inequalities substantially differs from the actual level of economic inequality, this may indicate a legitimation crisis in the political field (Alesina and Glaeser 2007). However, individuals in any society do not exactly conform with the average opinion. Their opinions, to some degree, deviate from this average.

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The overall magnitude of these deviations may facilitate or hinder concerted action that would address economic inequalities. Therefore scrutiny of public opinion would be more comprehensive if the examination of factors that shape average opinion is accompanied by the analysis of variables that determine deviations of individual opinions from this very average.

The central concern of research on public opinion regarding economic inequalities, however, has been the differences between groups in terms of their *average* opinions about inequality and redistribution. The main focus has been the way in which the various redistribution policies that address economic inequalities have been evaluated by different groups across countries. Within this framework, average opinions have been of crucial importance in revealing the degree of legitimacy that redistribution policies enjoy (see, e.g., Alesina and Angeletos, 2005; Alves and Rossi, 1978; Bean and Papadakis, 1998; Bonoli, 2000; Bowles and Gintis, 2000; Esping-Andersen, 1999; Fong, 2001; Funk, 2000; Kelly and Evans, 1993; Kunovich and Slomczynski, 2007; Linos and West, 2003; Shepelak, 1989; Svallfors, 1997). However, little attention has been given to the analysis of *dispersion* of opinions. This is unfortunate because 'the' public opinion is actually the 'average of individual opinions'. Two societies with the same average opinion on the fairness of economic inequalities or legitimacy of redistribution policies may have unequal degrees of dispersion around this average. Consequently, the legitimacy of various redistribution policies that address economic inequality and the political leverage that is necessary for sustaining or changing these policies may be different in two societies despite a similar level of average public support for redistribution and/or political action. Thus, analysis of the dispersion of public opinion would provide important insight that might complement the existing research on public opinion on economic inequality and redistribution.

Besides the exclusive focus in the literature on average opinions, which overlooks dispersions, there is also another gap that requires attention. Although the relationship between various social policy regimes and public opinion on economic inequalities has been widely studied, the role of educational systems has not been part of this research agenda. We argue that education may influence public opinion not only due to level of education but also because of the impact of institutional characteristics of educational systems. However, there is no systematic inquiry about the effects of education on the formation of public opinions on economic inequalities.

Against this background, we examine the impact of educational institutions on public opinion by establishing a joint mean and dispersion multi-level model. We benefit from the existing approaches to means and variance regression (Aitkin, 1987; Alvarez and Brehm, 1995, 1998; Jaeger, 2009; Smyth et al., 2001; Western and Bloome, 2009), but we implement this approach in a multi-level context (see Lee and Nelder, 2006). Our data come from the ISSP 1999 Social Inequality Survey and cover 15 countries.

Our results show that the welfare system is influential in the formation of public opinion on economic inequalities but that education too appears to be an important factor that shapes opinions through its individual and institutional level effects. Higher educational attainment seems to be associated with a more favourable perception of the existing income distribution, thus, income inequalities. Vocational orientation of educational systems also influences opinions about the fairness of economic inequalities; in educational systems with a strong vocational orientation, the dispersion in public opinion on economic inequalities appears to be less.

Theoretical framework: Education and opinions on economic inequality

Public opinion on economic inequalities has been studied mainly by focusing on the factors that affect average opinion in society in order to scrutinize the way in which economic inequalities are legitimatized (see, e.g., Alesina and Angeletos, 2005; Alves and Rossi, 1978; Fong, 2001; Funk, 2000; Hermkens and Boerman, 1989; Jasso, 1978; Kelly and Evans, 1993; Kunovich and Slomczynski, 2007; Linos and West, 2003; Marshall et al., 1999; Shepelak, 1989). However, the sole examination of average opinions

without scrutinizing dispersion in the multitude of opinions that generate these averages would not tell the whole story, because concerted action is crucial for addressing economic inequalities, and the proximity of individual opinions about the fairness of economic inequalities is crucial for concerted action (Popper, 1945 [2011]: 332–335). Therefore what makes individual opinions deviate from average opinion on fairness of economic inequalities is as important as the average opinion that emerges from these individual opinions.

The dispersion of opinions can be scrutinized by addressing a technical issue. In multivariate models it usually is assumed that while conditional mean value of a dependent variable varies, its variance remains constant (Hanushek and Jackson 1977: 142-143 , Faraway 2005: 17, Gujarati 2003: 398-400). However, this assumption may prevent us from probing deeper into the insights generated by the opinions on economic inequality. Variances around the conditional mean value of opinions on economic inequality, if not assumed to be constant, indicate an important thing: the extent to which a group has a consistent judgment on the fairness of economic inequalities. Because what is analyzed as public opinion is actually the average opinion of individuals in a group. In other words, public opinion is the conditional mean value of the opinions of individuals who share the same values in some other variables. The strength of the same average opinion in expressing 'the public opinion' of two groups or societies would be different if one of these societies has an opinion distribution that is highly dispersed around this average. For example, individuals living in conservative welfare states have a strong average preference for redistribution, while the dispersion within those regimes is also quite high compared to Scandinavian regimes (Jaeger, 2009). Indeed, one may argue that groups with narrow dispersion are more in agreement about the fairness of economic inequalities and this would facilitate any concerted action or inaction. Groups characterized by wider dispersions, however, are likely to lack a strong agreement and thus are probably less capable of addressing various inequalities. However, a study of these dispersions has been lacking in the literature.

We aim to fill this gap by simultaneously studying the factors that generate public opinion on economic inequalities and the factors that make individuals deviate from this very opinion. In this endeavour we are especially interested in the role of education.

The main focus of studies on public opinion has been the impact of welfare regimes (see, e.g., Alves and Rossi, 1978; Bean and Papadakis, 1998; Bonoli, 2000; Bowles and Gintis, 2000; Fong, 2001; Funk, 2000; Hassenfeld and Rafferty, 1989; Hermkens and Boerman, 1989; Linos and West, 2003; Svallfors, 1997). There is, however, little research on how education and its institutional structure affect the mean and dispersion of individuals' opinions on economic inequality (see Koçer and Van de Werfhorst, 2012). This lack of attention is unfortunate. Personal values and opinions are established during the formative phase in life as individuals receive their formal education, and are stable across the life course (Hyman and Wright, 1979; Inglehart, 1990; Pascarella and Terenzini, 1991). Moreover, it is through educational systems that individuals 'expand and rationalize social realities that enter into their choices' and learn 'their own futures' (Meyer, 1977: 72 f.). Our aim, therefore, is to explore the impact of education on opinions about economic inequality.

It is natural to expect an individual's level of education to influence his opinions. However, it is also clear that positions in the income distribution are closely related to education levels. Opinions might also be affected by income and income usually increases as a result of educational attainment. Highly educated individuals may evaluate existing economic inequalities more positively, demanding less redistribution. However, here it may be the income generated by education rather than the content of education that forms the opinion. On the other hand, educational attainment, besides providing higher income, may also cultivate 'tolerant' values conducive to the emergence of opinions that favour more redistribution in order to address economic inequalities (Van de Werfhorst and De Graaf, 2004).

We expect that opinions are not only shaped by individuals' level of education but that they are also influenced by the institutional features of educational systems. We identify two features that are relevant for formation of opinions.

The first is the degree of vocational orientation of the educational systems. It is relevant for economic inequality as it affects the transition from school to work. In educational systems that are strongly

vocationally oriented, such as in Germany and The Netherlands, the transition from school to work runs more smoothly than in systems that are less vocationally oriented. This has been demonstrated at the individual level in terms of hazard rates of finding employment after leaving school, and at the aggregate level with regard to youth unemployment rates (Breen, 2005; Müller and Gangl, 2003; Shavit and Müller, 1998). Moreover, as Brunello and Checchi (2007) have shown, equality of educational opportunity is not negatively affected by a strong vocational orientation but rather by early tracking. These findings suggest that vocational orientation has an 'inclusive' effect: individuals in countries where the education system is vocationally oriented may choose their future positions more consciously, thanks to the smooth transition from school to work. Thus one might expect individuals in such countries to have less adversarial feelings about their society and to be less likely to deviate radically from the prevailing average opinion on inequality. Therefore one may expect increasing vocational orientation to cause lower levels of dispersion in opinions.

However, there is a second feature of educational systems that is likely to have an opposite influence on dispersion of opinions: the extent to which systems stratify students in separate school types early in the school career. In strongly tracked systems such as Germany and The Netherlands, individuals are placed in separate school buildings or even separate organizations as early as the age of 10 and 12. Students in the lower tracks are well aware of their enrolment in non-academic education, preparing for employment in the skilled working class rather than for tertiary education. On the other hand, students in the academic track are aware of their relatively advantaged position, leading to university qualifications and advantaged structural locations in the social order. Moreover, in a tracked educational system, students are better aware of their future position in the stratification order, and can predict their future educational attainment better than students in comprehensive educational systems (Buchmann and Park, 2009). It is reasonable to expect that this distinct and 'early' realization of future positions in social stratification translates into more strongly differentiated opinions among students about the fairness in prevailing economic circumstances while they are still relatively young. Therefore, one may argue that in countries where there is strong stratification in education there would be segregated subgroups in society in terms of their perception of, and judgment, on economic inequalities. This might lead to wider dispersions around public opinion. In less stratifying educational systems, by contrast, students would be more mixed and their future chances in life less determined. This appears more conducive for developing similar perceptions and judgments about economic inequality with the result that an individual's opinion would not deviate much from public opinion.

Interestingly, these two features of educational systems are positively correlated[1] despite the opposite expectations that they generate in terms of their impact on dispersion of opinions (Van de Werfhorst, 2011). Thus it would be interesting to examine their impact simultaneously.

However, in order to clarify the individual and institutional level influence of education on opinions about inequalities, some other potentially influential factors must also be taken into account.

It can be argued that the actual level of economic inequality in a country may shape the extent to which existing income distribution is considered fair. In countries with high levels of inequality, individuals may negatively evaluate the existing economic inequalities. But if the actual inequality is not very high then economic inequalities might be much less of a concern. Moreover, changes in economic factors, such as GDP growth, unemployment and inflation, always influence the material conditions and perceptions of individuals with some delay and in relation to their power to alter the existing factual inequality. Thus the factual inequality prevailing at any moment in time may be perceived as the aggregated history of the preceding changes in the economic factors that affect individual opinion on economic inequalities. Therefore, the factual inequality prevailing in societies should be included in the analysis.

Obviously, any attempt of capturing the impact of education on opinions about economic inequalities would be incomplete unless the effect of an institution which is intimately related to economic inequality is taken into account: the welfare system. One may argue that all social policies aim at reducing or at least preventing the worst instances of different forms of actual and potential economic inequalities.

Therefore, the welfare system in a country may influence the extent to which citizens, on average, desire more or less economic equality and may also influence the deviation of individual opinions from this very average (Jaeger, 2009). Thus, in order to isolate the impact of education at both individual and institutional level on opinions it is necessary to take the impact of the welfare system into account.

Analytical framework: A new measure for inequality judgment and its modelling

Osberg and Smeeding (2006) created a measurement for the individual sense of fairness of the perceived income distribution based on a battery of questions in the ISSP survey. Respondents are asked to give their view on the actual and ideal wage for ten occupations.[2] This is a measure of 'what is' and 'what ought to be' for ten different occupations. From the answers, Osberg and Smeeding establish the following equation:

$$\hat{Y}_k^{ought} = \beta_0 + \beta_1 Y_k^{is} \; \mathrm{k} = 1, 2, ..., 10 \qquad (1)$$

The crucial element in this equation[3] is the slope coefficient β_1, which summarizes respondents' overall sense of fairness in income distribution. If $\beta_1 = 1$, then the respondent, in relative terms,[4] is satisfied with the distribution of income across occupations; thus, the existing inequality in income distribution is fair. On the other hand, $\beta_1 > 1$ implies that well-paying occupations, again in relative terms, should receive more and poorly paying occupations should receive less. In other words, more inequality is required relative to what one perceives to be reality. In contrast to these straightforward interpretations $\beta_1 < 1$ may indicate three different things. First, if $0 < \beta_1 < 1$, the respondent is of the opinion that occupations currently receiving high wages should receive less and those receiving relatively low wages should get more. Thus, existing inequality is unfair and more equality is desired. However, this kind of reduction in inequality would not transform the existing ranking of occupations in terms of earnings but would reduce the differences between them. This means that the respondent is not against the nature of existing inequality (i.e. who is above whom in terms of income) but its magnitude. Secondly, if $-1 < \beta_1 < 0$ this still means that occupations which are currently receiving high wages should receive less and the others receiving relatively low wages more. However, now the ranking of occupations would change so that currently high earning occupations would earn less than currently low earning occupations. Thus, this kind of reduction in inequality would transform the nature of inequality in the income distribution in terms of ranking of occupations but the new inequality would still be 'less unequal' in its entirety than the existing one. This implies that the respondent is against both the nature and magnitude of inequality. Finally, if $\beta_1 < -1$ this would again indicate that professions currently receiving high wages should receive less and those that receive relatively low wages should get more. However, this would transform the existing income distribution in such a way that not only the positions of currently high and low earning occupations would be switched in wage hierarchy but the resulting income distribution in relative terms would be 'more unequal' than the existing one. The only difference would be that currently low earning occupations would benefit from this new and higher overall inequality. This is an interesting position because it hints that the respondent is not against magnitude of inequality, and in fact desires even more of it, but that the respondent is only against the current nature of inequality.

Of course, one has to ensure that none of these outcomes emerges as an unintended consequence of the method used for estimating equation [1]. The idea is to use the slope in equation [1] as a summary measure of perceived fairness. This slope value should reflect the general opinion of each respondent about the income status of ten occupations. Thus equation[1] should be estimated in such a way that extreme opinions of respondents about 'is' and 'ought' of a particular occupation should not to be the main determinants of the slope values. We use Huber regression as we estimate equation [1], which prevents extreme opinions about single occupations from being over-influential and thus leads to robust β_1 values (Faraway, 2005: 99 f.; Maronna et al., 2006: 78–110). After our Huber regression-based

calculations for each respondent, we observed that of 8,980 individuals from 15 countries only 142 had $\beta_1 < -1$, which corresponds approximately to 1.5 per cent of the total, while 611 individuals had β_1 values between –1 and 0, which means approximately 7 per cent of the total. We opted for excluding individuals with $\beta_1 < -1$, which represent extremely small groups in each country. Thus, in this study the lower boundary for slope coefficient in equation [1] is –1, which ensures that $\beta_1 < 1$ only indicates desire for reducing inequality (though, for a small group, this may also imply changing the nature of inequality) not more inequality in another form.

Against this background one can see that the slope coefficient maps the real line above –1 into three opinions: the segment smaller than 1 is mapped into 'more equality in income distribution is needed to have a just society'; the segment larger than 1 is mapped into 'more *in*equality is needed to a have just society'; and, finally, the point 1 is mapped into 'the current income distribution is suitable for a just society'. In order to deduce our dependent variable we transform this slope coefficient (for each respondent captured by double subscripts ij) as follows:

$$\pi_{ij} = 1 - \beta_{1(ij)} \tag{2}$$

so that it mirrors around 0. Thus $\pi > 0$ indicates that respondent demands more equality but $\pi < 0$ indicates desire for more inequality, and $\pi = 0$ implies that according to respondent the existing income distribution already generates a just society (see Appendix III). This new measure compared to β_1 facilitates the interpretation of equations that involve the opinion on inequalities as dependent variable by allowing us to perceive the positive and negative signs of independent variables as contributions to favourable or unfavourable evaluation of the existing income distribution. Thus, we aim to scrutinize the (conditional) mean values of π and the (conditional) dispersions that emerge around this (conditional) means. In order to clarify possible interpretations of variables that may explain these entities, it is useful to be explicit.

Conditional mean

Variables with a negative effect on the conditional mean of π may be considered as motivating people to evaluate the perceived income distribution favourably and/or demand more inequality because a negative effect on the conditional mean would either bring it closer to zero from right when it is positive (from more equality to less equality) or move it further into the negative part of the real line when it is already below zero (from inequality to even more inequality). Variables with a positive effect on conditional mean should be interpreted as increasing an individual's desire to demand more equality because a positive effect on the conditional mean of π would either bring it closer to zero from left when it is negative or move it further into the positive part of the real line when it is already above zero.

Conditional dispersion around the mean

Variables with a negative effect on the dispersion of π are conducive to the emergence of common opinions about fairness. However, those which have a positive impact on the dispersion of π are detrimental to the emergence of common opinions because a negative impact would bring all different individual judgments closer to their conditional mean, while a positive impact on the dispersion of π would do the exact opposite and disperse these judgments further away from the conditional mean.

A joint mean and dispersion multi-level model

In standard regression analysis all errors are considered to be generated by independent normal distributions with zero mean and identical variances (Faraway, 2005: 53). However, quite often errors are generated by normal distributions with zero mean but unequal variances (heteroskedasticity). This may lead to wrong conclusions as to the significance of independent variables (Gujarati, 2003: 398–400). If one

has a reasonable knowledge about the distinctive variance value of each error distribution it is possible to remedy the problem by generating distinct weights for each multivariate observation (Hanushek and Jackson, 1977: 150–153). Ideally, this weighing operation would transform the distinctive variance values into a single value that remains the same across all error distributions. However, quite often one does not know the distinctive variance values of error distributions. Moreover, the fact that each observation has an error distribution with its own distinctive variance may also have a substantive meaning and using inaccurate weights not only fails to solve the problem but also prevents us from comprehending this substantive meaning (Aitkin, 1987; Verbyla, 1993: 493).

The joint mean–dispersion models are designed to solve the heteroskedasticity problem in a constructive way. The basic idea is to first establish a regression equation, called the mean component, in order to make inferences about the conditional mean values of dependent variable values. Then the residuals of this mean component are used to generate a set of proxy values for the variances of error distributions. This set of proxies is used as dependent variable values in a second regression equation, which is called the dispersion component, to make inferences about the factors that determine the variance structure. Then the mean component is estimated once again but this time by using the fitted values of the dispersion component as weights. This entire process should be repeated until convergence (Carrol and Ruppert, 1988; Juutilainen and Röning, 2008).

In short, our mean–dispersion model is based on two regression equations: one explaining the conditional mean values, the other accounting for the distinct variance values. These two equations feed into each other until convergence.

There are several mean–dispersion algorithms in the statistics literature where the mean component is a simple linear model and the dispersion component a generalized linear model with a logarithmic link function (Aitkin, 1987; Faraway, 2006: 144; Nelder et al., 1998; Smyth et al., 2001). In the social science literature, besides this combination (Western and Bloome, 2009) there are also models in which the mean component is a binary choice model (Alvarez and Brehm, 1995, 1998). In all these models the observations come from non-hierarchical data; thus, a simple linear model or binary choice model is appropriate for the mean component. However, in our analysis of π values we face individuals from different countries and it is reasonable to assume that there is a hierarchical structure: individuals are nested within countries. Thus, in our analysis we use a multi-level regression equation with random intercepts for the mean component instead of a simple linear model (Lee and Nelder, 2006; Lindquist et al., 2012). More complicated multi-level models, for example with random slopes, might capture the hierarchical structure even better, but, due to the degrees of freedom issues resulting from the small number of countries (15) in our data set, we opt for the random intercepts model for our mean component.

Our model is depicted briefly in Table 1 and details are given in Appendix I. In step I, we construct a multi-level mean component with random intercepts. There are two error terms in this model: individual level errors and country level errors. Each one is normally distributed with zero mean and possibly heteroskedastic variances, but the covariance is assumed to be zero. The total variance of our mean component is the sum of these two distinct variance values. Our interest lies with the heteroskedastic individual level variances that generate individual level errors. In step II, we construct two sets of proxy values by using the residuals obtained from the mean component in step I, which is fitted by using the maximum likelihood method. A_j values are the proxies for country level variances and B_{ij} the proxies for individual level variances. In step III, we construct our dispersion component as a gamma regression equation in order to account for B_{ij} values. This model is also fitted by the maximum likelihood method. The most important element of our algorithm is a check, through a chi-square deviance comparison test, of whether this dispersion component is statistically different from the null model that contains only an intercept and suggests homoskedasticity. In step IV, we redefine the total variance of our mean component. In this operation we use the fitted values of the dispersion component as our new individual level variances, but we retain A_j values defined in step II as our country level variances. Finally, in step V we define a set of weights by using the new total variance obtained in the previous step. Then we reconstruct our mean component once again but this time we weigh each dependent and independent variable value. We repeat all steps until convergence.

Table 1. Mean–dispersion algorithm

(Step I): Constructing the Mean Component

$$\pi_{ij} = \beta_0 + \beta_1 X_1 + \ldots + \beta_p X_p + \alpha_j + \varepsilon_{ij}$$

α_j: country level errors ε_{ij}: individual level errors

$$\alpha_j \sim n(0, \sigma_{\alpha_j})\ \varepsilon_{ij} \sim n(0, \sigma_{\varepsilon ij})\ \mathrm{cov}(\alpha_j, \varepsilon_{ij}) = 0$$

$$\sigma^2_{\pi_{ij}} = \sigma^2_{\alpha_j} + \sigma^2_{\varepsilon_{ij}}$$

(Step II): Defining variance proxies

$$A_j = \frac{\hat{\alpha}^2_j}{\sum_{i=1}^{n_j}(1-h_{ij})} \quad \text{and} \quad B_{ij} = \frac{\hat{\varepsilon}^2_{ij}}{(1-h_{ij})}$$

h_{ij} are leverages, and, $\hat{\alpha}^2_j$ and $\hat{\varepsilon}^2_{ij}$ are squared residuals obtained from the mean component

(Step III): Constructing the Dispersion Component

$$B = \exp(\gamma_0 + \gamma_1 X_1 + \ldots + \gamma_p X_p + \varphi)\ \varphi\text{: errors from gamma distribution}$$

$$\hat{B} = \exp(\hat{\gamma}_0 + \hat{\gamma}_1 X_1 + \ldots + \hat{\gamma}_p X_p)$$

(Step IV): Redefining variance components

$$\hat{\sigma}^2_{ij} = \hat{B}_{ij},\ \hat{\sigma}^2_{\alpha_j} = A_j,\ \hat{\sigma}^2_{\pi_{ij}} = \hat{\sigma}^2_{\alpha_j} + \hat{\sigma}^2_{\varepsilon_{ij}}$$

(Step V): Recurrence

Go back to step (I) and re-estimate the mean model with weights

$$w_{ij} = \frac{1}{\hat{\sigma}^2_{\pi_{ij}}}$$

Repeat all steps until convergence
(see appendix I for details)

Independent variables and data

Our data come from the ISSP 1999 Social Inequality Survey. Due to the lack of availability of institutional data on educational systems and systematically missing answers in 'ought' and 'is' questions that are crucial for our dependent variable, we use data from 15 countries and 8,838 individuals (see Appendix II). At the individual level we have gender, age, educational level and income as our independent variables in both components of the system.

As an indicator of respondents' level of education we use the cross-national educational degree in the ISSP Social Inequality Survey. This categorical variable consists of six educational situations: incomplete primary, primary degree, incomplete secondary, secondary degree, incomplete university, university degree. We merge the first three situations and create our reference category of 'low education'

We take the difference between individuals' income and median income in their country expressed in terms of the latter as our measure, which leads to comparable income scores across countries. That is, if the income of an individual is I_{ij} and the median income in her country is M_i, then our income measure becomes:

$$\frac{I_{ij} - M_i}{M_i} \tag{3}$$

On a country level, we have institutional characteristics of the educational system, social policy and actual inequality as our variables.

To capture the institutional features of educational systems we use two indices: the level of tracking (i.e. tracking index) and the degree of vocational orientation of education systems (for a similar approach see Bol and Werfhorst 2013). The *tracking index* variable is created by a factor analysis on three variables: the age of first selection, the number of tracks available to a 14-year-old student and the length of the tracked curriculum as a proportion of total length of secondary education. We created a

z-standardized scale, standardizing on the total country data set. The *vocational orientation* variable is the percentage of students within upper secondary education enrolled in a vocational track and it is derived from the data collected by the OECD and UNESCO. Again, this variable is z-standardized across countries. Upper secondary vocational enrolment is a common indicator of the vocational orientation of a country and is available for a large number of countries (see Shavit and Müller, 1998).

It is important to note that standardizing these two indices by using extended country-level data sets is a deliberate choice that allows us to avoid making a country's relative position on a macro-variable dependent on whether the country participates in the micro-level data set.[5]

We use two variables to capture the social policy effects. First, we include social expenditure as a share of the GDP obtained from the OECD database. Second, we construct a dichotomized variable that captures the difference between the social-democratic welfare systems in Esping-Andersen (E-A) typology (1990) and the others. This generates a dummy variable (*not social democratic welfare state*) which equals 1, except for Scandinavian countries. We use social democratic countries as our reference category in order to ensure that we have a relatively homogeneous group as the basis of comparison.[6] Finally, we use the Gini coefficient (after taxes) provided by OECD to control for the impact of actual inequality on opinion formation (see Appendix II).

Results

Before presenting our results it is worthwhile to take a look at the distribution of our dependent variable π across countries (see Appendix III). In all countries there are two modalities (except for Norway and Spain). The first centres around 0 and indicates the existence of a pro-status-quo segment in the population which (on average) considers the existing income inequality just; the second centres around a positive value and hints that, in all countries, there is a pro-equality segment that (on average) desires more levelling of incomes. Of course, the fact that, in all countries, this second modality is centred around a value smaller than 1 suggests that the existing income hierarchy between 10 occupations that are examined in the ISSP survey is not generally questioned. In other words, what is desired is quantitative adjustment in income levels in favour of poorly paying professions, but not a qualitative shift that would change the ranking of professions in terms of their income. It is also important, from a comparative perspective, to examine the relative size and spread of pro-status-quo and pro-equality modalities across countries. In this respect, it is interesting to observe that, in Germany and the USA, in contrast to remaining countries, the size of the rather narrowly spread pro-status-quo modality exceeds that of pro-equality modality. The other extreme cases are Norway and Spain, where pro-status-quo modality almost does not exist. However, a quick look at Appendix II shows that resemblances between these countries in terms of their π distributions cannot readily be matched by similarities in the other variables that we use in our analysis.

The findings of our mean-dispersion analysis are given in tables 2, 3 and 4. In these tables, for each model, the first column depicts the mean component, and the second gives the dispersion component. In mean components, positive effects reveal more demand for equality. In dispersion components, variables with negative coefficients reduce the variance and thus increase the proximity between opinions but positive coefficients indicate that the variable is associated with increasing dispersion, thus it reduces the proximity among opinions.

In the mean component of model 1 (see Table 2) the coefficients of gender and age variables suggest that men are less inclined to demand levelling of incomes and, as individuals get older, they tend to evaluate existing income distribution more favorably. More important for our inquiry, however, are the coefficients of education variables. Here educational attainment appears to be negatively associated with the conditional mean value of π. Coefficients of variables that capture the level of education ('full secondary', 'incomplete university', 'university') are all significant and negative compared to the reference category of low education that contains 'incomplete primary', 'primary degree', 'incomplete secondary'. This implies that individuals with higher educational attainment are inclined to think that

Table 2. Mean dispersion analysis (variables with p<0.05 are given in boldface)

	Model I *mean*		Model I *dispersion*		Model II *mean*		Model II *dispersion*	
	b	SE	b	SE	b	SE	b	SE
INDIVIDUAL LEVEL								
Male	**−0.0203**	**0.0038**	**0.0607**	**0.0307**	**−0.0204**	**0.0038**	**0.063**	**0.0305**
Age	**−0.001**	**0.0001**	0.0005	0.001	**−0.001**	**0.0001**	0.0007	0.0009
Secondary	**−0.0424**	**0.0049**	0.0065	0.0381	**−0.0424**	**0.0049**	−0.0012	0.038
Incomplete university	**−0.0336**	**0.0068**	0.0056	0.0527	**−0.0348**	**0.0068**	0.0048	0.0537
University	**−0.0355**	**0.0059**	0.0302	0.0447	**−0.0364**	**0.0058**	0.0466	0.0458
Income	**−0.0088**	**0.0039**	−0.0236	0.0296	**−0.0087**	**0.0038**	−0.0327	0.03
COUNTRY LEVEL								
Tracking index					**−0.0168**	**0.0079**	**0.0327**	**0.0153**
Vocational orientation					−0.002	0.0085	**−0.0424**	**0.0156**
MODEL STATISTICS								
No. of observations	8838		8838		8838		8838	
Country variance (15) ~	0.001				0.001			
Individual variance	heteroskedastic				heteroskedastic			
Deviance	14559		19023		14557		18978	
Null.deviance			19032				19003	
Compared to			null		model I		null	
Chi.square			9		2		25	
d.f.			6		2		8	
p <			—		—		0.01	

income distribution is fair, while people with lower levels of education prefer more levelling of incomes. It is important to note that also the income variable[7] has a negative and significant impact, implying that higher income is associated with favourable opinions about existing income inequalities. What is important about this finding is that it allows us to attribute the negative impact of higher educational attainments to the content of education rather than its indirect effect through income. As we mention below, the addition of multiplicative interactions (between education and income) does not change these effects.

On the other hand, when we look at the second column in *model I* we can see that there is only one individual level variable with an effect on dispersion, i.e. gender. The positive significant effect of the male dummy suggests that the dispersion of opinion among men is higher than among women. This may render agreement among men as to what needs to be done to attain a fair income distribution more difficult compared to women. However, it should be noted that in its entirety the dispersion component in *model I* is not statistically different from the null model, which implies that one cannot reject the homoskedasticity hypothesis in this case.

In *model II* we add institutional features of educational systems to *model I*. A quick look at the model statistics reveals that it is essentially the statistical significance of the dispersion component that justifies *model II*. It is clear that all effects of individual level variables remain the same in terms of their signs and significance in both the mean and dispersion components. Moreover, the tracking index that reflects the level of between-school tracking in an educational system, too, has a significant and negative coefficient in the mean component, suggesting that higher tracking index values are associated with a more pro-status-quo attitude about the existing income distribution. In other words, in countries where the education system is strongly tracked, one might expect individuals to be more inclined to consider the existing economic inequalities just. On the other hand, when we examine the variables in *model II* that capture the institutional features of educational systems in the dispersion component, we can see that here the *tracking index* variable has a positive significant effect while the vocational orientation variable

has the opposite sign. In purely technical terms, one might interpret these coefficients as follows. Increasing vocational orientation, because of its negative effect on the dispersion of π, may facilitate the emergence of consensuses. But increasing tracking may hinder the emergence of an opinion on economic inequality shared by many people due to the expansion in the dispersion of π which it causes. However, given that, in this analysis, we compare a small number of rather different countries, one should, in substantive terms, only cautiously argue that in countries where the vocational orientation of the educational system is high one might expect individuals to subscribe to the average opinion about the fairness of income inequalities, but in countries where the educational system is strongly tracked, one might expect individuals to deviate from this average opinion.

However, these interpretations should be subjected to further inquiry. Will they remain intact if the influences of actual inequality and the welfare system are taken into account? To what extent are they driven by the observations from a small part of our data set? In order to examine these two questions, first we run six more models by adding variables that capture inequality and the welfare system in different combinations. Second, we repeat the analysis by excluding single countries and groups of countries to see the extent to which these exclusions affect the outcomes.

Our control models are presented in Tables 3 and 4.

In *control I*, we examine whether the addition of actual inequality measured by the Gini coefficient after taxes affects the effects of the tracking index and vocational orientation in both the mean and dispersion components. It is clear from Table 3 that despite this inclusion both our educational variables retain their significance in the dispersion component (the latter is now at the 0.1 level) and that the coefficient of tracking index remains significantly negative in the mean component. Thus, even in countries with similar magnitude of income inequality we can see that more tracked educational systems are related to higher dispersions in preferences regarding the levelling of incomes, whereas the vocational orientation of the system is related to more agreement on the desired amount of levelling of incomes. Moreover, the mean component of *control I* shows that the inclination of individuals to consider the existing income distribution fair in countries where educational system is strongly tracked seems not to be affected by the level of actual inequality.

When we examine the influence of social expenditure in *control II* as a percentage of GDP, we can see that there is a positive significant effect in the mean component and a negative significant effect in the dispersion component (both at the 0.1 level). Thus, increasing share of social policy in GDP seems to be associated with a desire for more equality and with a reduction in the deviation of opinions on economic inequalities. In other words, in countries with a large social policy in terms of share of GDP, one might expect to see that individual opinions closely cluster around an average opinion which favours more levelling of incomes. In this model, the sign and coefficient of the tracking index in the mean component remains negative and significant. We can also see that both the vocational orientation and the tracking index retain their signs and remain significant in the dispersion component, though now their significance is reduced to the 0.1 level.

In *control III*, we replace social expenditure with a welfare state variable which contrasts the reference category of the social democratic welfare state with others. Here, we still observe the negative and significant effect of the tracking index in the mean component but it is no longer significant in the dispersion component. In other words, if we control for the generosity of the welfare state, we no longer see a positive relationship between the tracking and the dispersion, whereas we can still observe that dispersions in opinions are lower in more vocationally oriented educational systems.

Now we proceed with the control models given in Table 4, where we add inequality and welfare system variables simultaneously to model II. In *control IV*, the addition of social expenditure and inequality does not change the sign and significance of the tracking index in the mean component; now only the vocational orientation retains its sign and significance in the dispersion component. In *control V*, we keep the inequality variable but replace social expenditure with a welfare state variable. In this model, the tracking index once again remains negatively significant in the mean component. Moreover, both the tracking index and the vocational orientation variables become positively and negatively significant,

Table 3. Control models I, II and III (variables with $p<0.05$ are given in **boldface**)

	Control I *mean*		Control I *dispersion*		Control II *mean*		Control II *dispersion*		Control III *mean*		Control III *dispersion*	
	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE
INDIVIDUAL LEVEL												
Male	**−0.0203**	**0.0038**	**0.0638**	**0.0305**	**−0.0202**	**0.0038**	**0.0648**	**0.0306**	**−0.0204**	**0.0038**	**0.062**	**0.0306**
Age	**−0.001**	**0.0001**	0.0007	0.0009	**−0.001**	**0.0001**	0.0007	0.0009	**−0.001**	**0.0001**	0.0007	0.0009
Secondary	**−0.0426**	**0.0049**	0.003	0.0382	**−0.042**	**0.0049**	−0.0049	0.0382	**−0.0424**	**0.0049**	−0.0009	0.038
Incomplete university	**−0.0346**	**0.0068**	0.006	0.0538	**−0.0342**	**0.0068**	0.0033	0.054	**−0.035**	**0.0068**	0.003	0.0539
University	**−0.0363**	**0.0058**	0.0512	0.046	**−0.0356**	**0.0058**	0.0482	0.046	**−0.0364**	**0.0058**	0.0447	0.046
Income	**−0.0093**	**0.0038**	−0.0299	0.0304	**−0.0092**	**0.0038**	−0.0287	0.0303	**−0.0088**	**0.0038**	−0.0299	0.0302
COUNTRY LEVEL												
Tracking index	**−0.0204**	**0.0081**	**0.0352**	**0.0155**	**−0.0161**	**0.0078**	0.0279	0.0155	**−0.0186**	**0.0094**	0.0268	0.0174
Vocational orientation	−0.0108	0.0097	−0.0344	0.0181	−0.0104	0.0096	−0.0307	0.0171	−0.0004	0.0098	**−0.0379**	**0.0169**
Inequality	−0.473	0.2578	0.4293	0.4701								
Social expenditure					0.0039	0.0021	−0.0061	0.0034				
Welfare state									0.0118	0.0301	0.0374	0.0534
MODEL STATISTICS												
Observations	8838		8838		8838		8838		8838		8838	
Country variance	0.001				0.001				0.0011			
Individual variance	heteroskedastic				heteroskedastic				heteroskedastic			
Deviance	14566		19191		14563		19098		14555		19045	
Null.deviance			19217				19129				19070	
Compared to	model II		null		model II		null		model II		null	
Chi.square	9		26		6		31		2		25	
d.f.	1		9		1		9		1		9	
$p <$	0.01		0.01		0.05		0.01		—		0.01	

Table 4. Control models IV, V and VI

	Control IV *mean*		Control IV *dispersion*		Control V*mean*		Control V *dispersion*		Control VI *mean*		Control VI *dispersion*	
	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE
INDIVIDUAL LEVEL												
Male	**−0.0202**	**0.0038**	**0.0646**	**0.0306**	**−0.0204**	**0.0038**	**0.0637**	**0.0305**	**−0.0203**	**0.0038**	**0.0657**	**0.0306**
Age	**−0.001**	**0.0001**	0.0007	0.0009	**−0.001**	**0.0001**	0.0007	0.0009	**−0.001**	**0.0001**	0.0007	0.0009
Secondary	**−0.0422**	**0.0049**	−0.0071	0.0389	**−0.0426**	**0.0049**	0.0036	0.0382	**−0.042**	**0.0049**	−0.0055	0.0388
Incomplete university	**−0.0344**	**0.0068**	0.0028	0.0539	**−0.0346**	**0.0068**	0.0092	0.0539	**−0.0342**	**0.0068**	0.0085	0.0539
University	**−0.0359**	**0.0058**	0.0468	0.0462	**−0.0365**	**0.0058**	0.0534	0.0464	**−0.0358**	**0.0058**	0.0527	0.0465
Income	**−0.0092**	**0.0038**	−0.0308	0.0305	**−0.0093**	**0.0038**	−0.0314	0.0303	**−0.0093**	**0.0038**	−0.0325	0.0303
COUNTRY LEVEL												
Tracking index	**−0.0185**	**0.0086**	0.0263	0.0164	**−0.0423**	**0.0113**	0.0352	0.0207	**−0.0417**	**0.0114**	0.0314	0.0209
Vocational orientation	−0.0125	0.0103	−0.0328	0.0182	−0.0087	0.0093	−0.0342	0.018	−0.0113	0.0096	−0.0325	0.0181
Inequality	−0.2776	0.3441	−0.1979	0.618	**−1.1653**	**0.3573**	0.4193	0.6465	**−0.9322**	**0.3937**	−0.0539	0.7236
Social expenditure	0.0025	0.0028	−0.007	0.0045					0.004	0.0026	−0.0074	0.0045
Welfare state					**0.106**	**0.0398**	0.0019	0.0734	**0.1183**	**0.0413**	−0.0275	0.0747
MODEL STATISTICS												
Observations	8838		8838		8838		8838		8838		8838	
Country variance	0.001				0.0009				0.0009			
Individual variance	heteroskedastic				heteroskedastic				heteroskedastic			
Deviance	14564		19237		14576		19032		14577		19343	
Null. deviance			19269				19059				19375	
Compared to	M II	C I	C II	C III	null	M II	C I	C II	C III	null	M II	C I	C II	C III	null
Chi.square	7	2	1	9	32	19	10	13	21	27	20	11	14	22	32
d.f.	2	1	1	1	10	2	1	1	1	10	2	1	1	1	11
p-value <	0.05	—	—	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

respectively, in the dispersion component, though only at the 0.1 level. Finally, in *control VI* we use inequality, social expenditure and welfare state variables simultaneously. Here, while the tracking index retains its sign and significance in the mean component, only vocational orientation remains significant in the dispersion component.

By taking all these control models into account one might, in purely technical terms, argue that, of the institutional features of educational systems the tracking index appears to have a negative effect on the average opinion about the fairness of economic inequality, while the degree of vocational orientation seems to have a significantly negative impact on the dispersion of opinions around this very average. Neither effect disappears in the presence of welfare system and actual inequality variables. However, given that all these analyses are based on comparison of a relatively small set of rather different countries (in terms of their economic, political and social security systems), we also conducted a robustness analysis. In this, we rerun the *control IV* model 18 times, each time excluding a single country and then group of countries (i.e. Anglo-Saxon, Scandinavian, East European countries) to see the extent to which the results are driven by the observations coming from a small part of our data set. This robustness analysis[8] reveals that the significance of the tracking index in the mean component is essentially generated by the values of Germany, because as soon as we exclude Germany the significance of this variable in the mean component disappears.

Against this background, we argue that of the two institutional features of educational systems that we have scrutinized the vocational orientation appears to have a negative and significant effect on the dispersion of opinion about the fairness of economic inequalities. In other words, increasing vocational orientation in a country *ceteris paribus* may be conducive to emergence of a common opinion on the fairness of economic inequalities. If we also include our findings regarding individual level variables, then we can argue that our analysis shows a distinctive influence of education on opinions about economic inequality at both individual and institutional levels. This remains intact in the presence of multiplicative interaction terms.[9]

Conclusion

In this article, we have argued that examination of public opinion would be more comprehensive if it is accompanied by scrutiny of the dispersion of opinions, because dispersion of opinions about the fairness of economic inequalities is crucial for concerted action that would address these inequalities. Therefore, we opted for an approach which emphasizes the importance of the dispersion as a statistic and requires simultaneous modelling of factors that shape the mean and dispersion of opinion distributions.

In this endeavour, we focused on the role of education as a hitherto neglected factor that may affect public opinion. Our results suggest that education influences opinions on fairness of income in two ways. First, an individual's level of education appears to be influential in determining their opinion on the fairness of economic inequality. Higher educational attainment seems to be associated with a more favourable perception of the existing income distribution; thus, income inequalities. Second, one institutional feature of educational systems appears to be crucial for opinions on economic inequalities as well: higher vocational orientation appears to be related to narrower dispersions of opinions. This impact remains intact in the presence of factors that capture the influence of the welfare system on public opinion. However, the evidence for the relationship between a tracked educational system and the mean and dispersion of opinion distributions is mixed. Although strongly tracked educational systems seem associated with a more favourable evaluation of perceived economic inequalities, this finding appears driven largely by the observations from Germany. Similarly, controlled for the 'inclusive' effect of vocational educational systems, we do find that inhabitants in countries with more tracked educational systems have larger variabilities in opinions on redistribution. This conforms to the view that a more rigidly tracked educational system during the formative phase of attitude formation is related to a more dispersed society when it comes to opinions on redistribution. However, the coefficient for tracking falls below conventional significance levels once we hold constant for the generosity of the welfare state. As conservative welfare

states are characterized by higher dispersions in opinions (Jaeger 2009) and often have strongly tracked educational systems, further research is necessary in order to fully scrutinize the independent effect of tracking on attitude formation.

These findings have a direct bearing on other studies on the relationship between educational systems and inequalities in education. Similar to Brunello and Checchi (2007), our findings lead to the conclusion that, whereas tracked educational systems have some inequality-inducing relationships, vocational education systems seem to have an 'inclusive' effect on society more than a diverging effect.

Our analysis also hints that the exact magnitude and nature of the influence of some factors, such as the institutional landscape, on public opinion may remain obscure unless dispersion is included in the analysis. Therefore, we argue that public opinion on economic inequalities as a concept should be scrutinized, understood and conveyed in terms of both the mean and the dispersion.

Appendix I: Estimation procedure details

$$\pi_{ij} = \beta_o + \beta_1 X_1 + .. + \beta_n X_n + \alpha_j + \varepsilon_{ij} \tag{1}$$

is a multi-level model with random intercepts with individual (ε_{ij}) and country level errors (α_j).

$$\alpha_j \sim n(0, \sigma_{\alpha_j}) \text{ and } \varepsilon_{ij} \sim n(0, \sigma_{\varepsilon ij}) \text{ and } \operatorname{cov}(\alpha_j, \varepsilon_{ij}) = 0 \tag{2}$$

The total variance of π_{ij} in [1] is

$$\sigma^2_{\pi_{ij}} = \sigma^2_{\alpha_j} + \sigma^2_{\varepsilon_{ij}} \tag{3}$$

the model in [1] in matrix form:

$$\underset{n\times 1}{\Pi} = \underset{(n\times p)}{X}\ \underset{(p\times 1)}{\beta} + \underset{(n\times 1)}{\alpha} + \underset{(n\times 1)}{\varepsilon} \tag{4}$$

Our purpose is to evaluate [1] when both the country level variances ($\sigma^2_{\alpha_j}$) and individual level variances ($\sigma^2_{\varepsilon ij}$) in [3] are heteroskedastic, and also to account for the factors that shape these heteroskedastic variances. To accomplish these goals, we need proxy measures for the variance components in [3].

If $h_{ij}$are the diagonal values of the hat matrix $\underset{(n\times p)}{X}\ (\underset{(n\times p)}{X'}\ \underset{(n\times p)}{X})^{-1}\ \underset{(n\times p)}{X'}$ and $\hat{\alpha}_j, \hat{\varepsilon}_{ij}$ are the residual estimates obtained from the multi-level model in [1], then

$$A_j = \frac{\hat{\alpha}_j^2}{\sum_{i=1}^{n_j}(1 - h_{ij})} \tag{5}$$

In [5], the denominator reduces the impact of extreme values. It is obtained for each country by summing differences between unity and n_j hat values, that is, n_j of the diagonal values of the hat matrix $\underset{(n\times p)}{X}\ (\underset{(n\times p)}{X'}\ \underset{(n\times p)}{X})^{-1}\ \underset{(n\times p)}{X'}$ that corresponds to individuals in that country of sample size n_j. We construct a gamma regression model for these values:

$$A = \exp(\lambda_0 + \lambda_1 X_1 + .. + \lambda_n X_n + \upsilon) \tag{6}$$

(υ refers to gamma errors) the estimates are given by $\hat{A} = \exp(\hat{\lambda}_0 + \hat{\lambda}_1 X_1 + .. + \hat{\lambda}_n X_n)$

The fitted values of equation [6] may be defined as the estimates for the country level variances ($\sigma^2_{\alpha_j}$) in [3] so long as the model [6] is significantly different from the null model, $A = \exp(\lambda_0 + \upsilon)$. More explicitly, if [6] is statistically different from the null model one may put

$$\hat{\sigma}^2_{\alpha_j} = \hat{A}_j \text{ otherwise } \hat{\sigma}^2_{\alpha_j} = A_j \tag{7}$$

Similarly, let's define

$$B_{ij} = \frac{\hat{\varepsilon}^2_{ij}}{1 - h_{ij}} \tag{8}$$

Now let's construct a gamma regression model for these values:

$$B = \exp(\gamma_0 + \gamma_1 X_1 + .. + \gamma_n X_n + \varphi) \tag{9}$$

(here φ refers to gamma errors) the estimates are given by $\hat{B} = \exp(\hat{\gamma}_0 + \hat{\gamma}_1 X_1 + .. + \hat{\gamma}_n X_n)$

The fitted values of equation [9] may be defined as estimates for the individual level variance ($\sigma^2_{\varepsilon_{ij}}$) in [3] so long as the model [9] is significantly different from the null model, $B = \exp(\gamma_0 + \varphi)$. More explicitly, if [10] is statistically different from the null model one may write

$$\hat{\sigma}^2_{\varepsilon_{ij}} = \hat{B}_{ij} \text{ otherwise } \hat{\sigma}^2_{\varepsilon_{ij}} = B_{ij} \tag{10}$$

Now one can define weights in order to remedy the impact of heteroskedastic variances in [3] on the model in [1].

$$w = \frac{1}{\hat{\sigma}^2_{\pi_{ij}}} \text{ where } \hat{\sigma}^2_{\pi_{ij}} = \hat{\sigma}^2_{\alpha_j} + \hat{\sigma}^2_{\varepsilon_i j} \tag{11}$$

We operationalized this algorithm (see Goldstein 1986) using maximum likelihood estimation for [1], [6] and [9]. It turns out that for the independent variables we define in the main text, equation [6] is never significantly different from the null model, but equation [9] is always significantly different (on the basis of chi-square test for the difference between deviance values). This means that individual level variances are heteroskedastic but country level variances may be homoscedastic. (It is possible that with some new independent variables the model in [6] may be significantly different from the null model. Thus we prefer to keep the proxies that retain the possibilities of both heteroskedasticity and homoskedasticity for the country level variances). Therefore we used the algorithm given in Table 1.

Appendix II: Data set description

	Tracking index (1)	Vocational orientation (2)	Gini after tax (3)	Social expenditure (4)	Welfare state (5)	Observations
Australia	−1.10	1.05	0.32	17.5	1	757
Austria	1.74	1.67	0.25	26.1	1	566
Canada	−1.40	−1.7	0.32	17.4	1	645
Czech Republic	1.72	1.84	0.26	19.8	1	934
France	−0.48	0.46	0.28	28.9	1	945
Germany	1.79	0.97	0.27	27.4	1	364
Hungary	1.31	−0.91	0.29	20.8	1	443
Norway	−1.10	0.97	0.26	25.8	0	231
Poland	0.04	0.36	0.32	22.2	1	693
Portugal	0.04	−0.81	0.36	19.8	1	690
Slovenia	0.99	1.14	0.31	18.9	1	663
Spain	−0.76	0.06	0.34	19.9	1	151
Sweden	−1.08	0.77	0.24	30.6	0	769
Britain	−1.10	0.52	0.37	21.2	1	507
USA	−1.40	−1.82	0.36	14.2	1	480

(1) *Tracking index* is created by a factor analysis on three variables: the age of first selection, the number of tracks available to a 14-year-old student, and the length of the tracked curriculum as a proportion of total length of secondary education. The index is z-standardized (see Bol and Werfhorst 2013).

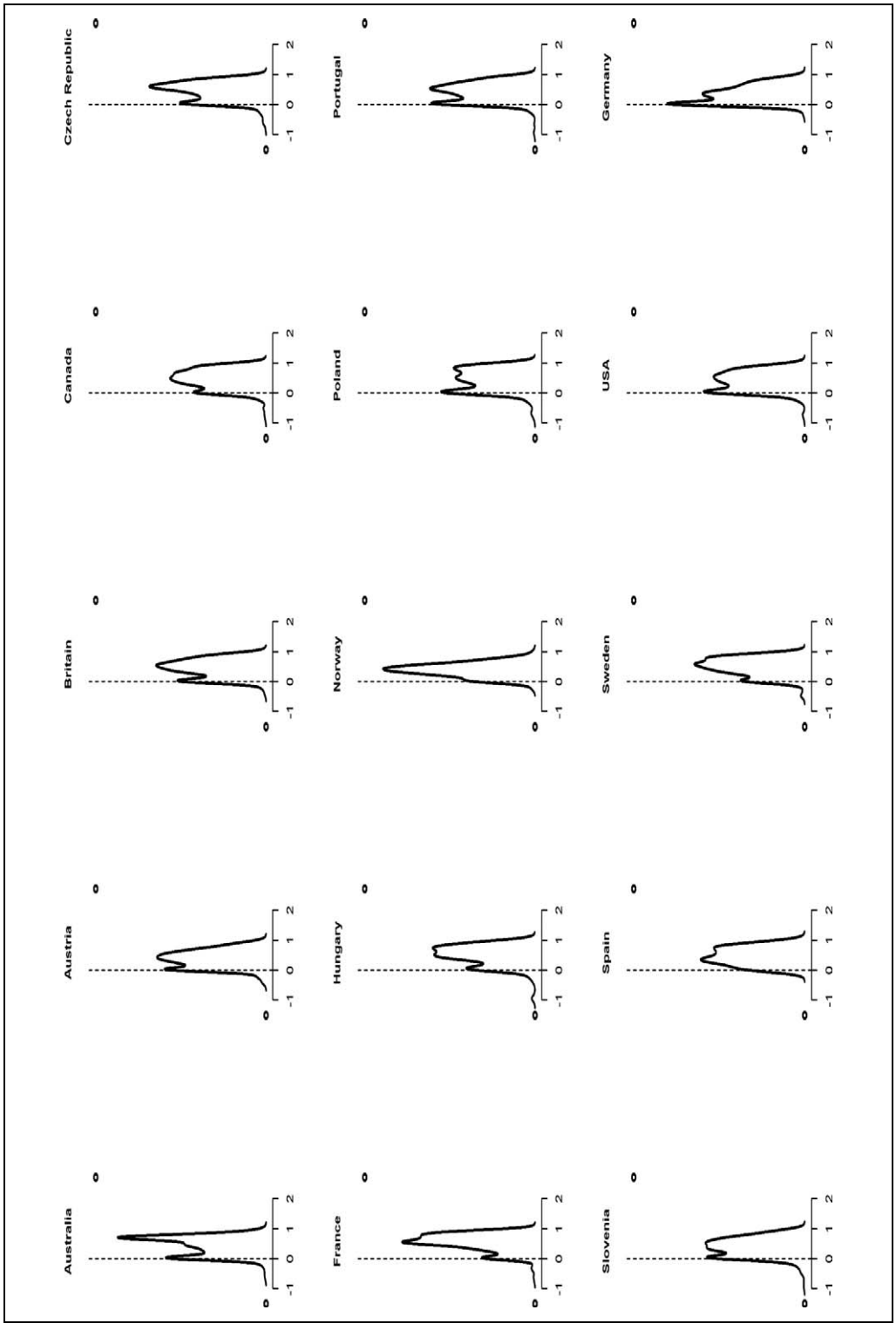
(2) *Vocational orientation*: z-standardized percentage of students within upper secondary education enrolled in a vocational track (see Shavit and Müller, 1998). Again this variable is z-standardized across countries (*source:* OECD and UNESCO statistics).

(3) *Gini after tax*: Gini coefficient estimated on the basis of income after taxes (*source:* OECD statistics).

(4) *Social expenditure*: Share of social expenditure in the GDP (*source:* OECD statistics, except for Poland, which is taken from Postula (2005: 97).

(5) *Welfare state*: This is a dummy variable showing whether a country has a social democratic type welfare system in accordance with Esping-Andersen typology. It equals to 0 for social democratic welfare states and 1 for others (see Esping Andersen, 1990).

Appendix III: Distribution of π values



Funding

Research for this paper has been made possible by a personal VIDI grant of the Netherlands Organization for Scientific Research (NWO) to Herman G. van de Werfhorst, (grant number 452-07-002).

Notes

1. Correlation between vocational orientation and tracking, estimated for 28 countries, is 0.43 ($p = 0.022$).
2. A skilled worker in a factory, a doctor in general practice, the chairman of a large corporation, a lawyer, a shop assistant, the owner-manager of a large factory, a judge in the highest court, an unskilled worker in a factory, a cabinet minister in the national government, someone in respondent's own occupation.
3. Here subscript captures professions included in the analysis.
4. Professions whose perceived actual income is lower than $Y^{is} = \frac{\beta_0}{1-\beta_1}$ are poorly paid, while those whose perceived actual income is higher than this value are relatively well paid. This cut-off point is obtained by evaluating the value of Y^{is} where $Y^{ought} = Y^{is}$. The meaning of the expression 'in relative terms' is related to the intercept term in equation [1]. Here intercept indicates the basic income. Some respondents may want the basic income to be so low that all occupations will receive less than they currently do. However, what we are concerned with is the relative position of all occupations after respondents' adjustment. Therefore the resulting income distribution should be examined in relative terms.
5. A common problem in comparative research of individual and country-level data is that countries are ranked based on their more or less 'coincidental' appearance in the micro-level (survey) data set. We avoid this problem by first gathering information on a maximum number of countries relying on OECD statistics.
6. We also constructed alternative models by taking conservative welfare states as the reference category. These models retain our main conclusions, but appear less convincing.
7. As one of the anonymous reviewers of this article pointed out, income is 'post-treatment' with respect to educational attainment and it may not be proper to add it to a model which aims to estimate the effect of education. We also estimated all models without an income variable. In these models, results are similar to those that we present. Details can be provided on request. Our main interest is with macro level variables and we don't want them to be confounded by income. Therefore we prefer to include income as a variable.
8. Complete robustness analysis can be provided on request.
9. We constructed 32 additional models each of which contains the variables in control VI and an interaction. These models can be provided on request.

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