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Distaste for inequality? The role of risk aversion

Ada Ferrer-i-Carbonell
Institute for Economic Analysis (CSIC)
Email: ada.ferrer@iae.csic.es.
Barcelona GSE, IZA, and MOVE fellow
&
Xavier Ramos
Universitat Autònoma de Barcelona; Departament d'Economia Aplicada;
Email: xavi.ramos@uab.cat
IZA and EQUALITAS fellow

Abstract

Risk aversion is an important argument to explain why individuals may dislike inequality. However, this relationship has not been empirically tested for large representative samples. Using a representative panel for Germany, we estimate this relationship by linking subjective well-being (a proxy for utility), inequality, and self-reported risk attitudes. The results confirm that risk aversion has a positive effect on dislike for inequality: more risk averse individuals are also more inequality averse. This relationship however is partly driven by other individual characteristics (gender, education, and income) that are correlated with risk attitudes.

JEL-codes: D3; D6; I3.

Keywords: inequality aversion; risk attitudes; subjective well-being, German SOEP, panel data.

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1. Introduction and background

In recent years there has been an accumulation of empirical evidence suggesting that individuals dislike inequality (Alesina and Giuliano, 2011 and Dawes et al., 2007). Individuals' preference for inequality are shaped by several factors, including: (i) their own characteristics, such as endowments and abilities; current income, for instance, is a good predictor of preferences for redistribution (Roemer, 1975; Meltzer and Richard, 1981), (ii) their individual history, which in turn shapes subjective expectations on own economic position (Piketty, 1995; Bénabou and Ok, 2001; Ravallion and Lokshin, 2000; Alesina and La Ferrara, 2005), and (iii) social norms and fairness perceptions; e.g. in societies where individual effort, and not luck, is thought to determine economic success, individuals are likely to be less concerned about inequality (Alesina and Glaeser, 2004; Alesina and Angeletos, 2005).[1]

Within the group of individual characteristics, risk attitude is an important factor that shapes individuals' taste for inequality directly, but also in indirect ways. The direct effect operates mainly through the information that the current income distribution may reveal about individual's future position. If indeed the current income distribution is informative about the income distribution in the near future, as risk attitudes influence the weight that individuals assign to different points of the income distribution (Vickerey, 1945; Harsanyi, 1955), more risk averse individuals will assign a higher utility value to worse outcomes and therefore have a strongest dislike for inequality. For instance, the notion that good prospects of upward mobility may explain distaste for inequality-reducing policies even amongst poor individuals only holds if individuals are not too risk averse, for otherwise (risk averse) individuals will "realize that redistribution provides valuable insurance against the fact that their income may go down as well as up" (Bénabou and Ok, 2001, p. 448). Likewise, more risk averse individuals are more in favor of welfare policies that socially insure against income-risk and reduce income disparities, such as unemployment or disability benefits.

Indirectly, risk attitudes also exert influence on inequality tolerance, as they also shape or condition some of the factors that in turn have a direct effect on individuals' taste for inequality. For example, individuals' risk attitudes are correlated with gender, education, and wages, which in turn correlate with inequality aversion. In addition, risk attitude is also the channel through which other factors affect inequality preferences. As outlined above, individual history is related to their taste for inequality. Now, the effect of individual history, and especially of negative life experiences, such as unemployment spells or negative income shocks

[1] See Alesina and Giuliano (2009) for a recent comprehensive survey of the many determinants of individual preference for redistribution.

is (partly) captured by risk attitudes, as such negative life experiences makes individuals more risk averse —which in turn increases their inequality dislike (Alesina and Giuliano, 2011). In section 2.2 we discuss the endogeneity issue.

Despite the theoretically appealing importance of risk attitudes on shaping individuals' dislike for inequality, the empirical literature on individual dislike for inequality, however, has not paid much attention to the role of risk attitudes. The relationship between risk attitudes and distaste for inequality has only been tested in the lab, and not for general population samples. Using experimental data, Carlsson et al. (2005) find that more risk averse people tend also to be more inequality averse. Kroll and Davidovitz (2003) as well as Brennan et al. (2008) report evidence in support of the positive relationship between risk aversion and inequality intolerance.[2]

This paper fills this gap by characterizing dislike for inequality according to individuals risk aversion. To this end, we use for first time a large representative panel data set with about 25,000 individuals living in Germany to estimate this relationship. In particular, we study whether the correlation between inequality and utility depends on individuals' risk attitudes by using a self-reported measure of satisfaction as a proxy for utility. Our findings corroborate that more risk averse individuals show a stronger dislike for inequality. These results are robust to different specifications, econometric methods, and to the inclusion of variables that correlate with individual risk attitudes and individual economic vulnerability. In this paper we use a self-reported measure of satisfaction as a proxy for utility, one of the empirical strategies used to understand individuals' dislike for inequality. Subjective measures of satisfaction have been increasingly used in economics since the pioneer work of Easterlin in 1974. Since then, subjective measured have empirically shown its validity as a measure of individuals' well-being and utility and have been therefore used in various applications. The existing empirical evidence has shown that inequality, usually measured as the Gini coefficient in the region or country where the individual lives, has a negative effect on self-reported well-being or life satisfaction (see Ferrer-i-Carbonell and Ramos, 2014, for a recent survey). This means that other things being equal individuals in more unequal societies report on average a lower score in the satisfaction scale.

[2] A related strand of the literature examines the relationship between social welfare judgments and choice under uncertainty from a normative standpoint, using questionnaire experiments (Amiel et al., 2009; Bosmans and Schokkaert, 2004; Bernasconi, 2002). Ours is a positive and not a normative study.

The rest of the paper is organized as follows. Section 2 explains our empirical strategy and describes the data and key variables, notably our direct measures of utility and risk as well as the measure of inequality. Section 3 presents our main findings, robustness checks, and heterogeneous effects, while the last section provides concluding comments.

2. Empirical strategy

2.1 The model and its estimation

We start from the premise that, *ceteris paribus*, individual utility U (or satisfaction) depends on the inequality I existing in the region and year where the individual lives. In other words

$$U = f(X, I) \tag{1}$$

where X is a set of variables that describe the situation of the individual. Assume a linear functional form, we can rewrite (1) as

$$U = \alpha + \beta I + \gamma X \tag{2}$$

where, in accordance with previous literature, we expect β to be negative. The objective of this paper is to try to disentangle whether the relationship between inequality dislike (β) and life satisfaction (U) can be partly explained by individuals' risk attitudes. To test for this, we estimate β for individuals with different risk attitudes, using the following augmented specification:

$$U_{it} = \alpha + \beta_r I_{gt} + \gamma_r X_{it} + \delta_r T + \zeta_r G + \eta_{i+}\varepsilon_{it}$$

where i indicates the individual, t the time, g the region where the respondent lives, and r = (L, H) represents the individual risk attitude. Since we use a measure of willingness to take risk (as opposed to aversion to risk), H denotes high willingness to take risk, while L denotes low willingness to take risk —we explain below in Section 2.2 how high and low willingness to take risk are defined and measured. Different β_r estimates for individuals with different risk attitudes would indicate that the effect of inequality on individuals' satisfaction or utility is partly explained by their risk attitude. If, as explained above, inequality dislike is positively related to risk aversion (i.e. negatively related to willingness to take risk) we should find $\beta_H > \beta > \beta_L$. If $\beta < 0$, this means that $\beta_L < 0$. However, β_H, may take any sign, and if negative needs to be larger than β_L. It will be also negative if risk lovers are also worse-off with higher inequality levels, or alternatively positive if regional inequality increases risk lover's life satisfaction.

Equation (3) includes a set of time dummy variables (T), which capture all those unobservable variables that are time specific, and a set of regional dummy variables (G), which indicate in which of the 39 Government Regions (*Regierungsbezirke*, corresponding to NUTS2) the respondent lives. The inclusion of time and region variables will allow us to distinguish the inequality effect from that of other regional and time characteristics, such as inflation or tax systems, which we do not specifically control for. Although the regional and time dummy variables collapse characteristics that can be correlated with both, inequality and life satisfaction, we do control in equation (3) for regional unemployment (unemployment shapes inequality over the business cycle), GDP growth, median income in the region, and poverty separately. While the first two variables are obtained from official sources, the other two are calculated from the data.

The empirical analysis uses longitudinal data and we can thus include an individual fixed effect (η_i) that captures individual traits that are unobservable and time persistent (e.g. cognitive and non-cognitive abilities). Finally, the equation includes the usual error term (ε_{it}). Since observations are clustered at the regional level, we use two methods to address the possible correlation of errors within the cluster. To start with, we report standard errors clustered at the region level. Now, since the number of clusters (39) is too small (Angrist and Pischke, 2009; Cameron and Miller, 2010; Wooldrige, 2006), we also report bootstrapped standard errors that result from estimating the fixed effect regression with clustered standard errors at regional level 500 times. Since we cannot include the regional dummies in the specification of the bootstrapped regressions, point estimates of the two methods will be different. Since there is virtually no difference in terms of trade-offs between variables and statistical significance between estimating equation **¡Error! No se encuentra el origen de la referencia.** by means of a linear or an ordered categorical estimator (Ferrer-i-Carbonell and Frijters, 2004), we estimate the equation using a linear estimator (OLS extensions), as it is usually done in the literature.

2.2 Measuring strategy

Life satisfaction

The empirical strategy uses a measure of subjective life satisfaction, as in Easterlin's pioneering work in 1974, as a proxy for well-being or utility. Since Easterlin's first work, there is accumulating evidence that individuals are able and willing to provide a meaningful answer when asked to value their satisfaction with their live. Over the last years, economists have used this self-reported satisfaction measure as a proxy for utility so as to contribute to a better understanding of individuals' preferences and behavior by empirically testing existing theoretical assumptions and concepts, and socially and politically relevant ideas. One such

application is the measurement of inequality dislike or inequality aversion by examining the correlation between inequality in the region and individuals' reported life satisfaction (Alesina, Di Tella and MacCulloch, 2004; Morawez et al., 1977; and Schwarze and Harpfer, 2007). This evidence points to a negative relationship between inequality and life satisfaction, i.e., individuals are inequality averse. In this paper we extend this current work by looking at heterogeneity defined through individual risk aversion. This indirect way of measuring inequality dislike avoids some important shortcomings of the alternative experimental methods used for the same purpose, which are based either on Okun's (1975) leaky bucket experiment (Pirttilä and Uusitalo, 2010; Amiel et al., 1999) or on directly letting respondents choose between different income distributions in a hypothetical society (Carlsson et al., 2005). The increasing availability of self-reported satisfaction questions in large representative datasets allows estimate inequality aversion parameters that are representative of the population of a country. In addition, evidence from the lab is prone to biases, such as the social desirability bias, which are not present when estimating inequality attitudes indirectly with life satisfaction.

In the data set used in this paper individuals are asked *How satisfied they are with their life, all things considered*, where the answers are reported on a 0 (completely dissatisfied) to 10 (completely satisfied) scale. The three basic assumptions underlying subjective satisfaction measures (Ferrer-i-Carbonell and Frijters, 2004) are: (i) individuals are able to evaluate their life satisfaction, (ii) there is a positive monotonic relationship between the answer to such questions and the theoretical concept we are interested in, and (iii) the answer to such questions are interpersonal comparable. A good account of such measures, the underlying assumptions, its applications, and its (empirical) validity can be found in Clark et al. (2008), Ferrer-i-Carbonell and Frijters (2004), Senik (2005), and Van Praag and Ferrer-i-Carbonell (2008).

Risk attitudes

The German Socio-Economic Panel (SOEP) questionnaire asked respondents to report their willingness to take risk in 8 years: 2004, 2006, and every year from 2008 to 2013. Our sample is confined to these eight years. The question runs as follows: "How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?" Respondents can answer on a 0 (risk averse) to 10 (fully prepared to take risks) scale. The answer to this question provides a direct measure of risk on an 11 point scale. Such measure contrasts with indirect approaches in which measures of risk attitudes are derived from observed behavior, such as playing the lottery or investing in risky assets. Direct measures of risk can be easily introduced in general large household panel questionnaires, as the present case proofs. This allows the researcher to test for new ideas in general large population surveys, which contrasts with the most experimental studies done with small groups of individuals,

which may suffer from external validity as they are often difficult to generalize to the whole population. In other words, the use of general measures of risk attitudes (or attitudes in general) opens up new lines of research in the same way that subjective satisfaction measures did. It remains very important to validate this direct measure of risk, which has been done by a group of economists (Dohmen et al., 2005) involved in the introduction of this survey measure in the German SOEP. Their main result is that there is a relationship between the answer to the risk question used in this paper and individual behavior. To come to this conclusion, the authors perform a complementary experiment with a group of individuals that are comparable to the ones answering the German SOEP questionnaire. In addition, the authors show that there is a correlation between the reported willingness to take risk and self-reported behavior in the questionnaire, such as holding stocks, smoking, and occupational choice. We have also examined the relationship between this measure of risk attitude and a set of individual characteristics that are known to correlate with risk attitudes and came to very consistent results, e.g. women are more risk averse, and years of education and income correlate negatively with risk aversion.

As outlined in Section 2.1, to explore the role of risk attitudes on inequality dislike, we will compare the effect of inequality on life satisfaction for risk lovers (β_H), i.e. respondents who report being very much prepared to take risks (corresponding to answers 9 and 10), and no risk lovers (β_L). Risk lovers comprise a small proportion, 2.6%, of the sample. This divide between the two groups allows identifying risk lovers as those individuals who show different behavior from the rest of the population.

Are risk changes endogenous to life events and individual characteristics?

A relevant question is whether risk attitude is a persistent trait (e.g., Cooper et al., 2000; and Zuckerman and Kuhlman, 2000) or instead it changes over time or, most importantly, it depends on individuals' changing circumstances that at the same time are related to characteristics correlated with life satisfaction. We check our data for yearly changes on risk attitudes (or two years for 2006 and 2008) on the 0 to 10 original scale. The average yearly change for all observations (over 115,000) is -0.026 (sd. 2.24), 25% of which do not report any change, 31% report a one point change, and 11% report a two points change on the 0 to 10 scale. If we look at the longer term difference from 2004 to 2013, we have over 7,900 respondents who participated in both years. The average difference between those two nineteen-years-apart reported risk is -0.23 (sd 2.51). While only 20% of the respondents do not change their risk attitude, 30% change it with by one point, 21% by two points, and the remaining 30% change it by 3 (half of them) or more points. Most important, changes in risk attitudes from one wave to the other do not correlate with most individual characteristics.

Regression analysis shows that the only statistically significant coefficient between risk attitudes and individual characteristics is being disabled (1.6% significance). The remaining coefficients are non-significant and are very small in size. The complete table is in the appendix (A3).

Inequality: the Gini coefficient

To examine the impact of inequality on life satisfaction or utility we need to estimate a measure of inequality that is able to reflect individual's perceptions. To this end, we will measure inequality at Government region level (*Regierungsbezirke*, corresponding to NUTS2), which is an area closer to the individual than the country and, at the same time, is large enough not to be picking up relative income effects.[3] In order to capture changes over time, the inequality measure will be allowed to change for every sample year. This means that we distinguish among 39 different government regions in 8 different time periods. In line with the literature, we use the Gini coefficient to measure inequality in the distribution of equivalized income of the region, that is, income deflated by the modified OECD scale, which weights the first adult by 1, the second and subsequent adults by 0.5, and each child by 0.3. The Gini coefficient is known to give more importance to income disparities in the middle of the distribution than the tails, when aggregating income differences. To check the robustness of our findings we will use the Mean Log Deviation (MLD) and the Theil index, two measures of the Generalized Entropy Family that give more weight to differences in the lower tail of the distribution (Cowell, 2011).

2.3 The data

The empirical analysis uses the German Socio-Economic Panel (SOEP) (Wagner et al., 2007), a representative German household panel that started in 1984 in West Germany, which includes East German respondents since 1990. As outline above, we use data for the 8 years for which there is available information on individual risk attitudes, that is, 2004, 2006, and every year from 2008 to 2013. Table 1 shows descriptive statistics for the main variables used in the empirical analysis.

Table 1 shows that on average individuals are rather satisfied with their life, which is a usual finding in Western societies. Although the Gini coefficient is calculated by using equivalent income, in explaining life satisfaction we use household income. The reason behind this

[3] Measuring individual's perceptions about (income) inequality is far from trivial. Individuals may have incorrect perceptions about the 'true' level of inequality depending on the relative position they have in their reference group (Cruces et al., 2013). As the SOEP does not report information about this source of bias, we cannot correct for it and rely on the standard estímate that results from reported income levels.

decision is that if we were to use equivalent income we would be imposing the same transformation to all individuals and we would therefore ignore the different consumption patterns and preferences that households may have. In order to control for differences in household size, however, the regression equation for life satisfaction introduces the number of adults and children as explanatory variables. The regression analysis also includes other individual characteristics that are typically found important determinants of life satisfaction: amount of savings in Euro, age of the individual (introduced in squared logarithms), whether the individual has a partner, is unemployed, does not work, or suffers from some disability, and years of education.

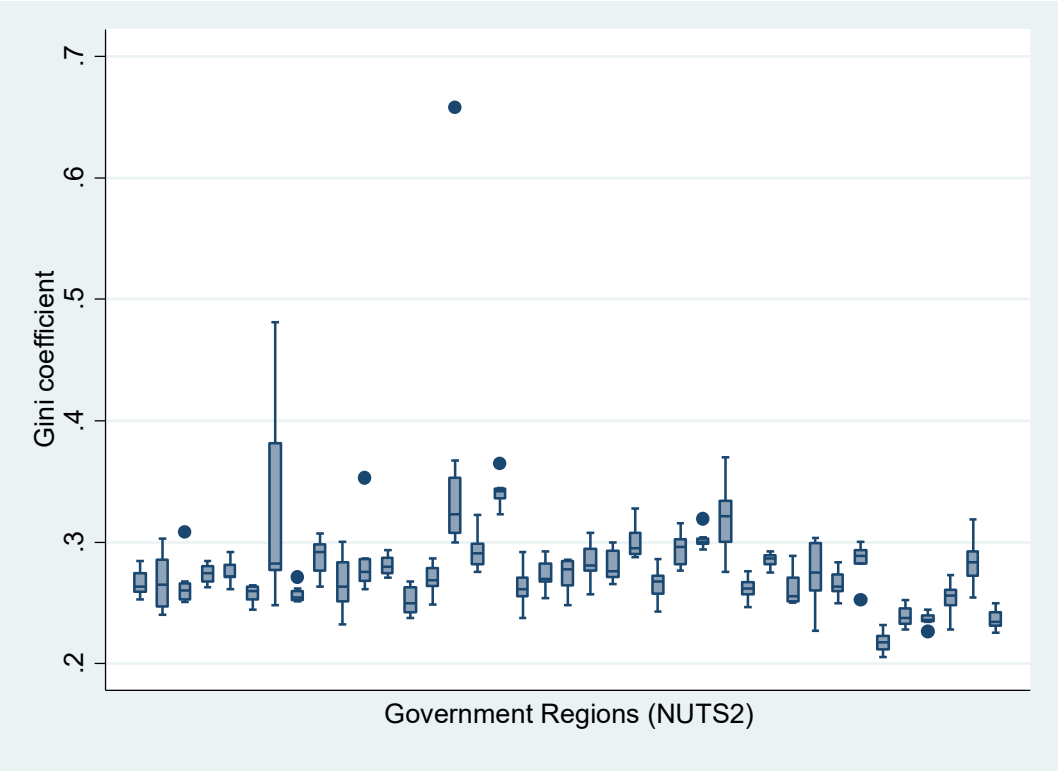
Table 1: Sample descriptive statistics, German SOEP 2004, 2006, 2008-2013

Variable	Mean	Std. Dev.
Life Satisfaction (0 to 10)	6.99	1.77
Prepared to take Risks (0 to 10)	4.42	2.31
NUTS 2 Gini coefficient	0.27	0.04
Ln (age)2	15.13	2.79
Individual has a partner [0,1]	0.62	0.49
Household income (per month, after taxes)	2864.64	2140.93
Individual is unemployed [0,1]	0.05	0.22
Individual does not work [0,1]	0.43	0.49
Savings (in €)	330.32	869.71
Individual is disabled [0,1]	0.14	0.34
Ln (number of adults in the household)	1.12	0.26
Ln (number children in the household)	0.24	0.42
Ln (years education)	2.48	0.21
Federal GDP	99.11	7.12
Federal unemployment rate	7.92	3.96
Federal Poverty	0.13	0.02
Federal Median income	1457.65	152.10
Year		
2006	0.14	0.35
2008	0.12	0.33
2009	0.13	0.33
2010	0.12	0.32
2011	0.12	0.32
2012	0.12	0.33
2013	0.12	0.33

The average willingness to take risk is 4.42 (sd. 2.31) with most individuals (21%) concentrated at 5 and 47% of them reporting a 4 or less. In other words, 68% of individuals report a 5 or below. Individuals classified as risk lovers (categories 9 and 10) represent 2.6% of the sample. The average unemployment rate over the sample period is about 7.9%, ranging from 3% (in Bavaria in 2013) to 22.4% (Saxony-Anhalt in 2004). The regional unemployment trends reflect the business cycle of the German economy as well as the regional disparities that tend to persist over time. The GDP growth also shows large regional and time variations.

The average Gini coefficient across the 39 Government regions over the sample period is 0.265. Within state (over time) variation of the Gini coefficient is key to our empirical strategy. As Figure 1 shows, such variation is not driven by few states or certain episodes. Gini differences between Government regions are time persistent and range from an average Gini over the years of 0.218 (nuts Middle Hesse) to 0.342 (nuts Muenster). As Figure 1 clearly shows, the largest Gini estimate for region Brunswick is implausibly larger than any other estimate. However, our main results are robust to dropping this possible outlier from the analysis. Variation over time is smaller than between region variation, and ranges from 0.281 in 2004 to 0.271 in 2013.

Figure 1. Distribution (Box-Cox) of Gini coefficient by Government regions.



3. Results

3.1 The effect of inequality on satisfaction

Table 2 shows the results of estimating equation (3)**¡Error! No se encuentra el origen de la referencia.** with individual fixed effects. As outlined above, we present estimates and its standard errors, when the latter are clustered at regional level (in the upper panel), and when the standard errors are obtained by bootstrapping equation (3) with 50 replications (lower panel). Recall that point estimates are different because we cannot include regional fixed effects in the lower panel.

In the first specification we do not allow risk attitudes to play any role on life satisfaction, and find the expected negative relationship between inequality (measured by the Gini coefficient at NUTS 2 level) and life satisfaction. This means that on average individuals dislike inequality. This finding is in line with the previous literature that has also used subjective measures to empirically test inequality aversion in Western European countries (Alesina at al., 2004; Schwarze and Harpfer, 2007).

In order to assess the importance of individuals' dislike for inequality, we can compare its effect on life satisfaction with that of other variables of interest (e.g. income). For example, we can compute the equivalent income of a change in inequality, using the results of the upper panel of Table 2. This is the income change equivalent, in terms of life satisfaction, to a percentage change in inequality. A 0.05 drop in the Gini coefficient (which represents about an 18.9% reduction from the current level) would be equivalent to a 10.94% income increase, which is equivalent to 314 Euro a month at the sample mean. Similarly, a 10% reduction in the average Gini is equivalent to a 5.77% household income increase, at sample mean this is 165 Euro per month.

As outlined above, our inequality aversion estimates are in line with previous empirical evidence. Using the same data for Germany (SOEP) for a time period previous to ours (1985-1998), a similar regression-based approach and estimation method, Schwarze and Haerpfer (2007) find a similar estimate of inequality aversion: a 5.5% income increase offsets the negative effect on life satisfaction of a 10% increase in average inequality. The effect of the Gini coefficient and of log household income on life satisfaction is estimated to be -0.362 and 0.319 respectively.

Table 2: Life Satisfaction, by risk attitudes. German SOEP, 2004, 2006, 2008-2013, fixed effects estimators.

	(1) Total Sample	(2) Risk Taking	(3) No Risk Taking
	Clustered Standard Errors		
Gini	-0.536***	0.919	-0.558***
	(0.195)	(2.242)	(0.198)
	Bootstrapped Standard Errors		
Gini	-0.482*	1.336	-0.511**
	(0.250)	(2.517)	(0.251)
N	137851	3548	134303

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Individual FE regression with year (and NUTS 2 in the upper panel) FE. Standard errors clustered at NUTS 2 level. Botstrapped standard errors obtained after 500 replications.
Controls include: ln2(age), partner, ln(household income), unemployed, not employed, savings, disability, ln(number of adults), ln (number of children), ln(years of education), unemployment rate, GDP, poverty rate, and median income at the federal level.

The coefficient estimates for the control variables shown in Appendix Tables A1 and A2 offer no surprises: we find the usual positive relationship between life satisfaction and household income, having a partner, amount of savings, and the logarithm of age squared, and the also common negative relationship between satisfaction and being unemployed, being disabled, the number of adults and children in the household, and years of education. In order to control for time and region characteristics and to distinguish them from the inequality in the region and year, we included a set of dummy variables indicating the region and year where the respondent lives. In addition, and as we have pointed out above, since regional unemployment, economic growth, poverty, and median income affect life satisfaction and may correlate with inequality, we have singled out these two macro variables from the regional and time characteristics and have separately controlled for it. The results in Appendix Tables A1 and A2 show that GDP growth, poverty, and median income do not have an independent effect beyond the effects already captured by the regional and time dummies. Regional unemployment, like the Gini, however does have a statistically significant negative coefficient.

3.2 The role of risk on shaping inequality dislike

This section focuses on the main empirical test of this paper, namely to examine the role that individual's risk attitudes have on determining inequality dislike. To this end we estimate equation (3) for two groups that differ in their risk attitudes, and test whether the β_r coefficient, which measures dislike for inequality, is the same or differs across the two groups, i.e. we test whether $\beta_L = \beta_H$. In particular, the expected positive relationship between inequality dislike and risk aversion implies $\beta_H > \beta > \beta_L$.

Columns (2) and (3) of Table 2 report β_H and β_L, respectively. The estimate of β_L in column (3) indicates that inequality reduces life satisfaction of individuals who are not prepared to take risks. This result is statistically significant regardless of the estimation method used to compute standard errors. The effect of inequality on life satisfaction, however, is the opposite for individuals who are prepared to take risks, although the point estimate is very imprecisely estimated, with a standard error larger than the coefficient. Now $\beta_H>0$, implying that risk lovers like inequality. Thus, we conclude that inequality does not seem to affect risk takers, and if it does, the effect would be positive. Finally, a simple test of means indicates that $\beta_H > \beta_L$, as expected (p-value <0.000 in both panels).

In order to assess the importance of risk attitudes in shaping individuals' inequality dislike, we calculate the equivalent income of a 0.05 decrease in the Gini for individuals who are not prepared to take risks, using the estimates of the upper panel, where standard errors are clustered at regional level. A 0.05 decrease in the Gini coefficient increases the life satisfaction of non-risk-takers by 0.028 ((-0.558)*(-0.05)), which is equivalent to an 11.7% income increase or, at sample average 334 Euro per month. At sample averages, this implies an elasticity of 0.002 (0.4%/18.9%).

In sum, the results using self-reported life satisfaction as a proxy for utility indicate that risk attitudes are one of the reasons why individuals might dislike inequality, to the extent that risk lovers do not show inequality aversion.

3.3 Robustness analysis

For the sake of comparability with previous findings in the literature, our baseline analysis relies on the Gini coefficient. This index, however, has two salient features which bear on the inequality estimates and orderings across regions and years: First, the Gini coefficient is mostly sensitive to differences in income shares in the middle part of the distribution, which implies that it is less sensitive to such differences in either tail of the distribution, where outliers may lie. Because of this, the Gini coefficient is more robust to outliers than other indices. Second, the distance concept of the Gini coefficient is rank dependent. That is, the relative position of individuals in the income distribution matters for the inequality assessment.

In this section we check whether our main findings are robust to using indices of inequality that are sensitive to different parts of the income distribution and whose distance concept does not depend on rank. Tables 3 and 4 show the effect of inequality on life satisfaction by risk attitudes, when inequality is measured by the Mean Logarithmic Deviation (MDL) and Theil's entropy index, respectively. Both the MLD and the Theil index are members of the Generalized

Entropy Family of inequality indices, which satisfy basic properties such as the principle of transfers, anonymity, scale invariance and population invariance, like the Gini coefficient. Both indices however use a distance concept which is rank independent and are more sensitive to differences in income shares in the bottom part of the distribution, especially so the MLD (Cowell, 2011).

The estimates displayed in Tables 3 and 4 suggest that our main finding (i.e. risk aversion shapes individual's dislike for inequality) is robust to how inequality is measured. Inequality dislike is larger amongst individuals who are not very prepared to take risks than amongst risk takers. The negative estimate of inequality dislike is statistically significant when standard errors are clustered by NUTS2, but are more imprecisely estimated when standard errors are bootstrapped, regardless of the inequality index employed. In particular, the effect of both the MLD and the Theil on life satisfaction is more imprecisely estimated than that of the Gini coefficient, when standard errors are bootstrapped. This may be due to the larger robustness of the Gini coefficient to extreme or outlier observations, pointed out above.

Table 3. Effect of Inequality (MLD) on Life Satisfaction, by Risk attitudes. German SOEP, 2004, 2006, 2008-2013, fixed effects estimators.

	(1) Total Sample	(2) Risk Taking	(3) No Risk Taking
	Clustered Standard Errors		
Theil	-0.325***	0.826	-0.350***
	(0.103)	(1.381)	(0.107)
	Bootstrapped Standard Errors		
Theil	-0.307	0.898	-0.334*
	(0.190)	(1.735)	(0.190)
N	137851	3548	134303

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Individual FE regression with year (and NUTS 2 in the upper panel) FE. Standard errors clustered at NUTS 2 level. Botstrapped standard errors obtained after 500 replications. Same controls as in Table 2.

Table 4. Effect of Inequality (Theil) on Life Satisfaction, by Risk attitudes. German SOEP, 2004, 2006, 2008-2013, fixed effects estimators.

	(1) Total Sample	(2) Risk Taking	(3) No Risk Taking
	Clustered Standard Errors		
Theil	-0.151***	0.305	-0.165***
	(0.043)	(0.651)	(0.045)
	Bootstrapped Standard Errors		
Theil	-0.144	0.322	-0.158
	(0.130)	(0.948)	(0.131)
N	137851	3548	134303

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Individual FE regression with year (and NUTS 2 in the upper panel) FE.

Standard errors clustered at NUTS 2 level. Botstrapped standard errors obtained after 500 replications. Same controls as in Table 2.

3.4 Heterogeneous effects

This section explores heterogeneous effects of risk attitudes on inequality dislike, across the individual characteristics that are found to correlate with risk attitudes, namely gender, education, and income (Hartog, Ferrer-i-Carbonell, and Jonker, 2002). As argued in the introduction, risk attitudes correlate with other individual characteristics that, at the same time, correlate with inequality aversion. In particular, women, lower educated and also poorer individuals tend to be more risk averse and, at the same time, more inequality averse, as they face larger risks of falling down in the income distribution. To this we estimate β_r in equation (3) for four population subgroups, defined by the interaction of risk attitude, on the one hand, and gender (men and women), education attainment (high education (tertiary education) and lower education); or poverty status (when the poverty line is set at 60% of the median equivalent household income, at the year and federal level). Tables 5a to 5c show the estimates by risk attitudes and gender, poverty status, and education, respectively.

Given the smaller sample sizes, point estimates for risk takers have large standard deviations, which render the interpretation of heterogeneous effects for risk takers meaningless. We shall thus discuss heterogeneous effect amongst no risk takers. The upper panel of Table 5a shows that the inequality dislike for non-risk-taker women is -0696, while that for non-risk-taker men is -0.405 (and imprecisely estimated). Therefore, women show a stronger inequality dislike than men (the difference between the two point estimates being significant with a *p*-value<0.000, regardless of the estimation method). Non-risk-taker poor individuals also show a stronger distaste for inequality than non-risk-taker non-poor individuals (see Table 5b). Although the point estimate for non-poor individuals is not precisely estimated, the difference between the two coefficients is statistically significant (*p*-value<0.000, regardless of the estimation method). Table 5c shows that by education level, non-risk-taker lower educated individuals also display lower tolerance for inequality than their higher educated counterpart, who displays a lower and imprecisely estimated point estimate. Again, the difference between the two coefficients is statistically significant (*p*-value<0.000, regardless of the estimation method).

Table 5a. Effect of Inequality on Life Satisfaction, by Risk attitudes and gender. German SOEP, 2004, 2006, 2008-2013, fixed effects estimators.

(1)	(2)	(3)	(4)	(5)
Total	Female No Risk	Male No Risk	Female Risk	Male Risk

	Sample	Taker	Taker	Taker	Taker
	Clustered Standard Errors				
Gini	-0.536***	-0.696***	-0.405	-2.931	3.054*
	(0.195)	(0.211)	(0.386)	(4.059)	(1.762)
	Bootstrapped Standard Errors				
Gini	-0.482*	-0.636**	-0.361	-3.149	3.627
	(0.250)	(0.287)	(0.490)	(7.270)	(2.275)
N	137851	71043	63260	1227	2321

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Individual FE regression with year (and NUTS 2 in the upper panel) FE. Standard errors clustered at NUTS 2 level. Botstrapped standard errors obtained after 500 replications. Same controls as in Table 2.

Table 5b. Effect of Inequality on Life Satisfaction, by Risk attitudes and poverty status. German SOEP, 2004, 2006, 2008-2013, fixed effects estimators.

	(1)	(2)	(3)	(4)	(5)
	Total Sample	Not Poor No Risk Taker	Poor No Risk Taker	Not Poor Risk Taker	Poor Risk Taker
	Clustered Standard Errors				
Gini	-0.536***	-0.457**	-1.211	1.729	-6.048
	(0.195)	(0.175)	(0.786)	(1.725)	(4.855)
	Bootstrapped Standard Errors				
Gini	-0.482*	-0.466**	-1.017	2.617	-4.538
	(0.250)	(0.224)	(0.941)	(2.139)	(16.973)
N	137851	117226	17077	2925	623

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Individual FE regression with year (and NUTS 2 in the upper panel) FE. Standard errors clustered at NUTS 2 level. Botstrapped standard errors obtained after 500 replications. Same controls as in Table 2.

Table 5c. Effect of Inequality on Life Satisfaction, by Risk attitudes and education level. German SOEP, 2004, 2006, 2008-2013, fixed effects estimators.

	(1)	(2)	(3)	(4)	(5)
	Total Sample	Not High Educated No Risk Taker	High Educated No Risk Taker	Not High Educated Risk Taker	High Educated Risk Taker
	Clustered Standard Errors				
Gini	-0.536***	-0.653**	-0.315	2.957	-2.528
	(0.195)	(0.255)	(0.256)	(2.985)	(1.557)
	Bootstrapped Standard Errors				
Gini	-0.482*	-0.603*	-0.273	2.864	-1.472
	(0.250)	(0.327)	(0.339)	(3.379)	(3.153)
N	137851	97303	37000	2682	866

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Individual FE regression with year (and NUTS 2 in the upper panel) FE. Standard errors clustered at NUTS 2 level. Botstrapped standard errors obtained after 500 replications. Same controls as in Table 2.

In sum, conditional on not being very prepared to take risks, women, poorer and lower educated individuals show larger distaste for inequality. These population subgroups are also found to be more risk averse. Although poorly estimated, we can argue that the role that risk attitudes play on shaping inequality aversion is partly driven by individual characteristics (gender, education, and income) that are correlated with risk attitudes. In fact, our sample sizes already show that there are more males, poor individuals, and low educated not willing to take risk, while the opposite is true for risk takers.

Conclusions

Individual preference parameters are central to the modelling and understanding of individual behavior. Risk aversion has been said to help explain why individuals may dislike inequality, since it influences the weight that individuals give to the risk of having a worse social or income position in the future. Only recently, researchers have started to elicit individual preferences for equality separately from individuals' attitudes towards risk and have explored the relationship between the two. So far, this has been only done by means of experiments and not for large representative samples. This paper employs a self-reported happiness question as in Easterlin (1974) and a measure of risk attitudes from a large and representative panel data set for Germany (SOEP) to empirically identify the link between the two. To the best of our knowledge these are the first estimates ever obtained from representative survey data. We empirically explore the relationship between inequality and risk aversion and find that risk attitudes is and individual characteristic that explains dislike for inequality. These findings are in line with patterns found in experimental setups. The role of risk attitudes in shaping inequality aversion can be assessed by examining the income equivalent of a change in current inequality. Our results show that while most individuals would be indifferent between a 0.05 Gini reduction (18% of the average Gini across years and regions) and an about 11% household income increase, this number is negative although very imprecisely estimated for risk lover individuals (2.6% of the sample). In other words, most individuals in our sample would be willing to give up 11% of their income to see the Gini coefficient in their region reduced by 18%. Our results are rather robust to other measures of inequality. In the paper however we also show that the importance of risk attitudes on shaping individuals own inequality aversion is partly driven by other individual characteristics (gender, education, and income) that are correlated with risk attitudes. In other words, inequality aversion is not only driven by risk attitudes *per se*, but also by individual characteristics that strongly correlate with them. Disentangling the independent effect of both is a difficult task that falls outside the realm of this paper.

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APPENDIX

Table A1: Effect of Inequality on Life Satisfaction, by Risk attitudes. German SOEP, 2004, 2006, 2008-2013, fixed effects estimators. Clustered Standard Errors.

	(1) Total Sample		(2) Risk Taking		(3) No Risk Taking	
Variable	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
giniEQInuts	-0.536	0.195	0.919	2.242	-0.558	0.198
Individual characteristics						
Ln $(age)^2$	0.065	0.053	-0.062	0.390	0.075	0.054
Individual has a partner [0,1]	0.122	0.032	0.393	0.219	0.121	0.032
Ln (Household income (net, monthly))	0.258	0.025	0.517	0.238	0.253	0.024
Individual is unemployed [0,1]	-0.559	0.037	-0.280	0.252	-0.554	0.040
Individual does not work [0,1]	0.007	0.023	-0.084	0.233	0.009	0.023
Savings (in €)	0.000	0.000	0.000	0.000	0.000	0.000
Individual is disabled [0,1]	-0.228	0.030	-0.727	0.388	-0.230	0.029
Ln (# of adults in the household)	-0.108	0.051	-0.281	0.399	-0.117	0.051
Ln (# children in the household)	-0.018	0.035	-0.241	0.234	-0.022	0.035
Ln (years education)	-0.405	0.155	-0.416	1.148	-0.426	0.163
Federal State variables						
Federal GDP	-0.006	0.003	-0.027	0.029	-0.005	0.003
Federal unemployment rate	-0.036	0.005	-0.028	0.051	-0.036	0.005
Federal Poverty	-0.034	0.351	-3.347	3.355	-0.118	0.339
Federal Median income	0.000	0.000	-0.004	0.002	0.000	0.000
Constant	6.436	0.880	15.427	5.424	6.128	0.886
Nuts 2 dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
Std. dev. Individual fixed effect	1.550		2.797		1.556	
Std. dev. Error term	1.184		1.430		1.176	
R2: Within	0.016		0.078		0.015	
R2: Between	0.031		0.004		0.025	
R2: Overall	0.032		0.004		0.027	
Corr(regresors, ind. fixed eff.)	-0.072		-0.740		-0.098	
Number of Observations	137851		3548		134303	
Number of Individuals	34345		2476		33950	

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Individual FE regression with year and NUTS 2 fixed effects. Standard errors clustered at NUTS 2 level.

Controls include: ln2(age), partner, ln(household income), unemployed, not employed, savings, disability, ln(number of adults), ln (number of children), ln(years of education), unemployment rate, GDP, poverty rate, and median income at the federal level.

Table A2: Effect of Inequality on Life Satisfaction, by Risk attitudes. German SOEP, 2004, 2006, 2008-2013, fixed effects estimators. Bootstrapped Standard Errors.

	(1) Total Sample		(2) Risk Taking		(3) No Risk Taking	
Variable	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
giniEQInuts	-0.482	0.250	1.336	2.517	-0.511	0.251
Individual characteristics						
Ln $(age)^2$	0.065	0.051	-0.047	0.400	0.074	0.052
Individual has a partner [0,1]	0.122	0.030	0.352	0.240	0.121	0.030
Ln (Household income (net, monthly))	0.259	0.026	0.459	0.244	0.254	0.025
Individual is unemployed [0,1]	-0.558	0.038	-0.175	0.263	-0.554	0.041
Individual does not work [0,1]	0.006	0.023	-0.181	0.227	0.009	0.023
Savings (in €)	0.000	0.000	0.000	0.000	0.000	0.000
Individual is disabled [0,1]	-0.228	0.029	-0.764	0.382	-0.230	0.028
Ln (# of adults in the household)	-0.110	0.052	-0.191	0.396	-0.119	0.052
Ln (# children in the household)	-0.020	0.035	-0.161	0.244	-0.022	0.035
Ln (years education)	-0.397	0.141	-0.339	1.177	-0.417	0.147
Federal State variables						
gdpfederal	-0.006	0.003	-0.038	0.031	-0.005	0.003
urfederal	-0.037	0.005	-0.060	0.055	-0.037	0.005
poverty	-0.165	0.375	-3.842	3.793	-0.247	0.364
medianincome	0.000	0.000	-0.002	0.002	0.000	0.000
Constant	6.146	0.828	13.197	5.327	5.982	0.841
Nuts 2 dummies	No		No		No	
Year dummies	Yes		Yes		Yes	
Std. dev. Individual fixed effect	1.540		1.883		1.544	
Std. dev. Error term	1.184		1.443		1.176	
R2: Within	0.015		0.046		0.015	
R2: Between	0.037		0.053		0.031	
R2: Overall	0.038		0.058		0.033	
Corr(regresors, ind. fixed eff.)	-0.004		-0.059		-0.032	
Number of Observations	137851		3548		134303	
Number of Individuals	34345		2476		33950	

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Individual FE regression with year fixed effects. Botstrapped standard errors obtained after 500 replications. Controls include: ln2(age), partner, ln(household income), unemployed, not employed, savings, disability, ln(number of adults), ln (number of children), ln(years of education), unemployment rate, GDP, poverty rate, and median income at the federal level.

Table A3 Changes in risk attitudes across waves German SOEP, 2004, 2006, 2008-2013

Variable	Coeff.	Std. Err.
Constant	0.212	(0.161)
Ln $(age)^2$	0.001	(0.004)
Individual has a partner [0,1]	0.034	(0.021)
Ln (Household income (net, monthly))	-0.015	(0.020)
Individual is unemployed [0,1]	0.033	(0.041)
Individual does not work [0,1]	0.026	(0.020)
Savings (in €)	0.000	(0.000)
Individual is disabled [0,1]	-0.056**	(0.024)
Ln (# of adults in the household)	-0.020	(0.041)
Ln (# children in the household)	-0.011	(0.022)
Ln (years education)	-0.052	(0.043)
Number of Observations	77,733	

Standard errors in parentheses. Statistical significance: * 0.1 ** 0.05 *** 0.01