Wealth Inequality, Personality and Risk Taking*

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Abstract

Risk taking is intimately linked to inequality. This paper presents representative evidence that individuals' willingness to take risk increases with "perceived" wealth inequality and that this effect is moderated by a key personality trait, an individuals' locus of control. Using a large-scale survey in Germany, we manipulate perceptions of wealth inequality by randomly varying response categories when asking participants about their wealth level and measure their risk tolerance in an subsequent incentivized lottery task. We find that participants who are confronted with wide response categories and thus are induced to perceive the wealth distribution as highly unequal choose riskier lotteries than participants facing narrow response categories. We show that this effect is more pronounced among people who more firmly believe that life outcomes are beyond one's control (external locus of control). This highlights that individual responses to social influences are shaped through the moderating role of personality and cannot be assumed to be uniform across society.

Keywords: inequality, risk taking, personality, locus of control, survey experiment
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1 Introduction

Decisions under risk are ubiquitous in life, and these decisions inevitably affect the distribution of income and wealth. While the standard assumption in economics is that risk preferences are stable and unaffected by social influences, mounting evidence suggests that preferences are shaped by economic and social environment (e.g., Hoff and Pandey, 2006; Benjamin et al., 2010; Malmendier and Nagel, 2011; Giuliano and Spilimbergo, 2013; Kosse et al., 2020; Butler and Fehr, 2020; Cappelen et al., 2020). In this paper, we investigate the possibility that the (perceived) distribution of wealth alters risk taking.

People living in a society characterized by high wealth inequality are almost inevitably exposed to others with a significantly better relative standing. This links inequality tightly to issues of upward social comparison. Psychological research suggests that the widening gap between one's own endowments and that of relatively better off peers, which is inherent to higher inequality, increases the personal perception of what is needed to be content (e.g., Payne, Brown-Iannuzzi and Hannay, 2017*a*; Mishra, Hing and Lalumiere, 2015). Enhanced risk taking then arguably is a strategy to fulfill these increased needs.

To account for potential heterogeneity in the appetite for risk, we aim to uncover the extent to which these differences are driven by personality traits. In our context, we argue that predominantly individuals with an external locus of control (Rotter, 1966) – that is, the perception that life outcomes are beyond one's control and rather a result of fate or luck – are prone to react by increasing tolerance towards risk. Alternatives to improve one's relative standing involve increasing the level of effort invested into work or education (Bowles and Park, 2005). However, if one does not believe that effort has a significant influence in determining life outcomes, this option might not be appealing.

We examine the impact of perceived wealth inequality on risk preferences in a representative sample of the German population. We designed and implemented a tailor-made survey module in the Innovation Sample of the German Socio-Economic Panel (SOEP-IS). Pre-treatment we measure personality traits such as optimism and locus of control. To manipulate perceptions of the wealth distribution, we asked participants about their net wealth using two versions of predefined wealth categories. Half of the respondents were randomly presented categories with relatively wide intervals, e.g., the lowest category ranges from zero to 250,000 euro. Accordingly, the overwhelming majority of respondents (about 80 percent) should place themselves into this

category and thus should perceive the distribution of wealth as very unequal. The remaining half of participants faced much smaller intervals where, for example, the lowest category included the bottom-20 percent of the German net wealth distribution (i.e., less than 2,500 euro) and the highest category starts from the 60th percentile (i.e., 112,000 euro). This implies that in contrast to the treatment condition, the vast majority should locate themselves in the middle and top categories, which likely creates a more equal perception of the wealth distribution. Importantly, the experimental design manipulates perceptions of wealth inequality in a subtle way and implicitly prompts subjects to engage in upward social comparison. Subsequently, respondents participate in an easy-to-understand incentivized lottery choice task, suited for elicitation of risk preferences in general population samples.

We find that our treatment manipulation has a large effect on participants income inequality perceptions. Treated participants believe that the gross household income threshold for the top-10% of the income distribution is 27 percent higher than the estimates of participants in the control group. This strong "first-stage" effect translate into a treatment effect. That is, participants who are induced to perceive the wealth distribution as highly unequal are more likely to choose riskier lotteries than participants perceiving a relatively equal distribution. At the same time, there is a substantial degree of heterogeneity in the data, driving this result. Participants displaying an internal locus of control – which have a relatively higher presence in SOEP – tend not to show any reaction to the treatment. On the other hand, those subjects with an external locus of control increase their risk tolerance substantially. Importantly, we can rule out that other factors interact with our treatment. In particular we find no evidence that other personality traits, such as the Big 5 or optimism, play a role. The same is true for socio-economic characteristics that typically correlate with risk taking, such as gender, employment status, and income.

These findings tie into several literatures. First, it relates to a growing literature that tries to study the effects of inequality and social comparison on risk preferences experimentally (Fafchamps, Kebede and Zizzo, 2015; Payne, Brown-Iannuzzi and Hannay, 2017*a*; Haisley, Mostafa and Loewenstein, 2008; Mishra, Hing and Lalumiere, 2015). For example, Payne, Brown-Iannuzzi and Hannay (2017*a*) and Fafchamps, Kebede and Zizzo (2015) show that it is especially the notion of upward comparison driving the effect of inequality on risky behavior in their experiments. Though, both studies directly embed the experimental manipulation of perceived inequality into the risk elicitation framework, thereby prompting participants rather explicitly to consider risk taking as an option. Moreover, Kuziemko et al. (2014) demonstrate that people have an aversion

towards being ranked in the lowest category, and are willing to accept gambles in order to move out of the last place. Haisley, Mostafa and Loewenstein (2008) is most closely related in terms of the treatment manipulation. However, they study a small non-representative sample of low-income people at a Greyhound bus station and use a rather ad hoc measure of risk attitudes. The experiment in this paper moves beyond that by: (1) addressing a large representative sample of the German population, (2) using a risk elicitation method that allows for parameterization of the utility function, and (3) studying the role of personality in shaping responses to social influences.

The latter is tied to efforts of incorporating personality traits into economic analysis Borghans et al. (2008) more systematically. While prior studies have correlated locus of control tendencies with risk attitudes or used it as predictor for economic outcomes (Becker et al., 2012; McGee and McGee, 2016), we focus on how this relationship is influenced by environmental factors such as inequality. In a related fashion, Pinger, Schäfer and Schumacher (2018) illustrate that internally controlled subjects process information about their own experimental investment outcomes differently from externally controlled, eventually leading to less consistent decisions. Caliendo, Cobb-Clark and Uhlendorff (2015) include control tendencies into a job search framework, arguing that people with an external locus of control believe less in a relationship between their own search effort and the arrival rate of job offers.

On a more general level, this paper also adds to the discussion about the stability of risk preferences (see Schildberg-Hörisch, 2018, for a thorough review). Malmendier and Nagel (2011) illustrate that the macroeconomic history an individual experiences over the course of his or her life might be such an exogenous factor. In line with this, the results of this study indicate that, for individuals that perceive to have little control over their life, the same could hold true for economic inequality. We discuss potential implications of this differentiation below.

The remainder of this paper is organized in the following way: section 2 provides some theoretical background on the relationship between inequality and risk tolerance, section 3 presents the experimental design and the underlying study sample, while section 4 contains the empirical results. The study concludes with a general discussion in section 5.

2 Theoretical Background

Traditionally, economic analysis has treated risk preferences as given and thus mostly studied the unidirectional relationship between risk tolerance and economic inequality. Indeed, Milton

Friedman argued in a classic paper that differences in individual risk preferences culminate in varying levels of inequality (Friedman, 1953). More recently, scholars began to enrich the analysis by explicitly including social interdependencies and influences into the picture (Trautmann and Vieider, 2012). A series of studies highlighted that the outcome of a reference person, influences individual decisions in risky contexts (Linde and Sonnemans, 2012; Gamba, Manzoni and Stanca, 2017). While this type of social comparison relates to inequality, it is more direct and personal than the overall societal distribution of income or wealth.

Why would we then expect inequality to alter individual risk attitudes? The economic literature has brought forward two prominent explanations. First, people might have an intrinsic desire for status. Ray and Robson (2012) incorporate this notion into a dynamic growth model and illustrate that pareto-inefficient gambling is a product of convergence of the wealth level to its steady state. As Hopkins (2018) points out, however, their model proposes a negative relationship between inequality and risk-taking. Following Hopkins and Kornienko (2010), he argues that one should differentiate between inequality in initial endowments and inequality in final rewards. If societal rewards, such as jobs, educational opportunities, or potential spouses, are allocated in a tournament, in which agents compete using their initial endowments, both types of inequality lead to different predictions regarding risk taking. If endowments are distributed unequally, incentives to gamble are low as it is harder to overtake competitors. If on the other hand, rewards are distributed unequally, the marginal utility of performing better in the tournament increases ceteris paribus and so does the incentive to gamble. He shows that this holds particularly true for individuals at the lower end of the initial distribution of endowments. Hence, a second causal link between inequality and risky behavior might consist of the competition for societal rewards rather than the direct utility from status itself.

Naturally, economists are not the only ones who studied this link. The psychologists Payne, Brown-Iannuzzi and Hannay (2017*a*) propose that economic inequality alters the reference level of what an individual considers as enough to be satisfied. According to them, due to the natural desire of humans to engage in upward social comparison, they are aware of the relatively better endowments of some part of the population. If inequality increases this gap, they subsequently adapt their perceived needs upwards. Drawing from risk-sensitivity theory (Mishra, 2014), they then argue that risk-taking is a potential strategy to fulfill these needs.This is related to the idea of an aspiration level, exogenously set through inequality. Genicot and Ray (2017*a*) provide a growth model, in which inequality and aspirations evolve interdependently. Diecidue and Van De Ven

(2008) introduce aspirations in an expected utility framework and show that this creates a kink in the utility function, such that being below the aspiration level corresponds to risk-seeking, whereas being above corresponds to risk-aversion. In this line of thought, inequality conveys information about what is potentially attainable in society (Payne, Brown-Iannuzzi and Hannay, 2017*b*; van Hoorn, 2017). Particularly if one accepts this point of view, a pressing question is why risk-taking should be a viable strategy in the first place. Individuals to which inequality serves as information about potentially attainable societal outcomes, could alternatively respond to this information by increasing the level of effort exerted, be it in educational terms or at the work place. In fact, the already mentioned study by Hopkins and Kornienko (2010) illustrates the relationship between effort and inequality in societal rewards.

We argue that personality could be an important factor in determining which strategy is particularly salient to which individual. While personality has been long considered as cornerstone explaining heterogenity in human behavior, it only recently received attention by economists who started to integrate personality, such as the Big Five or locus of control, into economic decision-making (Borghans et al., 2008; Almlund et al., 2011; Becker et al., 2012). For example, Caliendo, Cobb-Clark and Uhlendorff (2015) introduce the concept of locus of control into a job search framework, arguing that an internal locus of control comes with a firmer belief into a positive relationship between search effort and the arrival rate of job offers. In a related fashion, we might expect that individual control beliefs moderate whether we perceive risk taking as a solution mechanism or not. Those who think that their actions are of modest importance in determining life-outcomes – i.e., those that have an external locus of control – will potentially place less weight on increased effort and choose riskier strategies instead. In the terminology of Caliendo, Cobb-Clark and Uhlendorff (2015), we might thus say that even though in general we expect that $\frac{\partial RiskTolerance}{\partial Inequality} \geq 0$, this relationship is moderated by a parameter ϕ, for which higher values indicate a rather external locus of control. Then, $\frac{\partial^2 RiskTolerance}{\partial Inequality \partial \phi} > 0$. The absolute effect of inequality on risk-taking then depends on the relative presence of individuals with an internal or external belief system.

3 Research Design

3.1 Setting

We run our study using the Socio-Economic Panel Innovation Sample (SOEP-IS), which is a companion survey of the German Socio-Economic Panel (SOEP). The SOEP-IS is a nationally representative longitudinal study that collects basic socio-demographic and socio-economic information, measures of attitudes, preferences and psychological traits as well as perceptions about various personal and social issues, ranging from individual well-being to immigration.[1] In addition, it offers researchers the possibility to include tailor-made survey modules, incentivized decision tasks, and experiments. Participating households are surveyed on a yearly basis and all household members above age 16 are interviewed in computer-assisted face-to-face interviews (for more detailed information on the SOEP-IS see Richter and Schupp, 2015).

3.2 Design of the survey module

Our survey module consists of three parts: questions on personality traits, the treatment manipulation, and a lottery task to measure risk preferences (see the Appendix for the full details of the survey module). The first part elicits key personality traits that relate to risk preferences, such as optimism and locus of control (LoC). We measure optimism with two questions: a general question about optimism regarding the future (on a 4-point scale) taken from the SOEP and a question about the likelihood of experiencing an event relative to an average person (on a 7-point scale). LoC characterizes the extent to which someone believes that life events are under their control (Rotter, 1966). We implemented the same ten items that are routinely used in the SOEP (Nolte et al., 1997). For each item, participants had to determine to which degree they agree with statements such as *"the course of my life is depending on me"* or *"which opportunities I have in life is determined by social conditions"*, using a Likert-scale ranging from 1 (disagree completely) to 7 (agree completely).

The second part contains our treatment manipulation, which is embedded in a question about respondent's wealth. Specifically, we ask respondents to indicate their net wealth using five predefined wealth categories. To manipulate respondents' perception of the spread of wealth, we randomly vary the available categories. That is, we assign half of the respondents to categories with relatively wide intervals, i.e., *less than €275,000; 275,001 to 468,000; 468,001 to 722,000; 722,001 to*

[1] Note that these basic questions are the same as in the SOEP. Moreover, the SOEP-IS uses the same infrastructure and methods as the SOEP (see Goebel et al., 2018, for more details) and, in particular, both surveys are administered by the same professional surveying company using experienced and trained interviewers.

989,000; more than €989,000 (inequality condition), while the other half of respondents is assigned to much smaller intervals, i.e., *less than €2,500; 2,501 to 11,000; 11,001 to 27,000; 27,001 to 112,000; more than €112,000* (control condition), see also Table A2 in the Appendix.[2] In the inequality condition the overwhelming majority of respondents (about 80 percent) should place themselves into the lowest category and thus should perceive the distribution of wealth as more unequal. In contrast, in the control condition the vast majority should locate themselves in the middle and top categories, which likely creates a more equal perception of the wealth distribution.[3]

The manipulation is subtle and builds on research showing that response behavior and judgments can depend on the design of response scales. Response scales inevitable carry information about the population distribution, which may be readily used by respondents to inform their decisions (e.g., Schwarz et al., 1985; Rockwood, Sangster and Dillman, 1997; Menon, Raghubir and Schwarz, 1997). In particular, they may use this information for social comparisons. While such comparisons are likely the case in both conditions, they are predominantly upward facing for respondents in the inequality condition as most of them are located in the lowest category of the wealth distribution. In contrast to the control condition, respondents were not only primed to consider their relative position in society, but in addition to perceive the society as unequal as the categories suggest the existence of (potentially many) other households with considerably higher endowments.

Directly after the wealth categorization, respondents participate in a risk-preference elicitation task. We use a choice set that requires respondents to make a single choice from a set of six gambles (Binswanger, 1980; Eckel and Grossman, 2002). Each gamble consist of an equal chance of receiving a low payoff and a high payoff. While the first gamble guarantees respondents a payoff of 50€, the remaining gambles gradually decrease the low payoff and increase the high payoff (see Table 1). Thus, the lotteries are increasing in expected value, but also in the implicit level of risk (standard deviation). This task is easy to understand and therefore well suited for eliciting risk preferences in a sample of the general population (Charness, Gneezy and Imas, 2013). We incentivized the task by randomly selecting one in ten respondents and paying them the outcome of their chosen gamble.

[2] We constructed the intervals based on the 2014 German data of the Household Finance and Consumption Survey (HFCS). The upper bounds of the intervals correspond to the 20th, 30th, 40th, and 60th percentile of the distribution in the control condition and to the 80th, 90th, 95th, and 97th percentile in the inequality condition (see Deutsche Bundesbank, 2016, for more information).

[3] Haisley, Mostafa and Loewenstein (2008) have used a similar method the manipulate perceived income inequality.

Table 1: Overview of Gambles

	Payoffs	EV	S.D.	CRRA-Interval
Lottery 1	(50, 50)	50	0	$[7.51, \infty)$
Lottery 2	(45, 95)	70	$25\sqrt{2}$	$[1.74, 7.51]$
Lottery 3	(40, 120)	80	$40\sqrt{2}$	$[0.812, 1.74]$
Lottery 4	(30, 150)	90	$60\sqrt{2}$	$[0.315, 0.812]$
Lottery 5	(10, 190)	100	$90\sqrt{2}$	$[0, 0.315]$
Lottery 6	(0, 200)	100	$100\sqrt{2}$	$(-\infty, 0]$

Note: Each participant could choose one lottery from above. A randomly drawn 10% of all participants received a pay-off according to their chosen lottery. Within each lottery both pay-offs were equally likely – all amounts in €. The CRRA coefficient interval derives from an assumed utility function of the form $u(x) = \frac{x^{1-\sigma}}{1-\sigma}$, where x is the respective payoff and σ the coefficient of interest.

3.3 Data

We collect data from a sample of 1,114 individuals using the 2017 wave of the SOEP-IS. The longitudinal character of SOEP-IS gives us access to a rich set of controls and missing observations are typically rare. Our study requires that respondents (i) made an active choice in the wealth categorization and (ii) participated in the risk-preference elicitation task. However, respondents were free to answer questions and participate in this task. Consequently, we exclude all subjects with missing observations resulting in a sample of 864 observations. In Section 4.1, we provide evidence that there is no differential selection into compliance with the treatment manipulation.

Risk measure. Our main variable of interest is the choice of respondents in the risk-preference elicitation task. As discussed above, the task involves a single choice, is easy to implement, and, importantly, easy to understand (see e.g., Dave et al., 2010).[4] At the same time, the setup of the task is rich enough to obtain detailed utility information. Following the literature, we assume that respondents are expected utility maximizers, exhibiting constant relative risk aversion (CRRA), see e.g., Chiappori and Paiella (2011).[5] Under this assumption, we can represent utility as $u(x) = \frac{x^{1-\sigma}}{1-\sigma}$, where x is the respective pay-off and σ is the coefficient of relative risk aversion, where higher values correspond to greater risk aversion. Table 1 shows the lotteries along with the corresponding

[4] About 89 percent rated the comprehensibility of the risk-elicitation task as good and only 2 percent rated the description of risk-elicitation task as too complicated.

[5] It seems reasonable to assume CRRA in our context even if relative risk aversion is not constant, as the payoffs in our gambles are relatively small.

CRRA intervals in the last column. The intervals are determined by the indifference between a gamble with its preceding and successive gamble and range from extreme risk aversion ($\sigma > 7.51$) to risk neutral (loving) ($\sigma \leq 0$).

Personality measures. Before the treatment manipulation, we elicit two important personality traits that are related to risk preferences: optimism and locus of control. Following Kling, Liebman and Katz (2007), we combine the two questions on optimism into an index by standardizing the two variables and taking a equally-weighted average. For locus of control (LoC) we combine seven of the ten items into a single proxy for locus of control beliefs in accordance with prior studies (Specht, Egloff and Schmukle, 2013; Cobb-Clark and Schurer, 2013).[6] We standardize this measure to have a mean of zero and a standard deviation of one and higher values correspond to a more external LoC. While the use of a single measure for LoC makes the interpretation more straightforward, other measures differentiate between between external and internal LoC. For example, Pinger, Schäfer and Schumacher (2018) perform a principal component analysis to extract a separate score for internal and external control beliefs. As discussed in more detail below, the main results of the heterogeneity analysis do not depend on the choice of how to construct the measure for individual locus of control.

Covariates and Balance. We control for a set of observables that have been shown to relate to risk aversion (see Dohmen et al., 2011). These observables include age, gender, education, parents education, net income, marital status, the number of household members, employment status (unemployed, retired), citizenship and region (East/West Germany). Education is measured by the highest degree or diploma taking into account general schooling, vocational and university education. Accordingly, higher categories represent a higher level of education. We use this scheme instead of years of schooling as it better describes educational attainment in Germany (see Card, 1999).[7] In addition, we include the educational background of both parents by using eligibility for attending university (completed Abitur) as a proxy for high educational attainment.

In Appendix Table A1, we present p-values of a set of linear regressions assessing the balance of the observables presented above across treatment and control group. The results of these regressions (including an F-test for joint significance of all covariates) indicate that the treatment

[6] For an overview over the wording of each item and the construction of the LoC scale, see Table A6 and the footnotes therein.

[7] Germany tracks students after four to six years of schooling into different types of high schools. Consequently, the same number of years of schooling not necessarily implies the same level of educational attainment.

and control group are very similar along these observables. In the following, we will show all empirical results with and without covariates.

4 Results

4.1 Average Treatment Effect

Self-categorization. We start with taking a closer look at the answers to the wealth categorization. Table A2 in the Appendix shows the categories in both conditions along with the share of responses. As intended, the majority of respondents in the control condition align themselves in one of the three top categories starting from 11,000€, while about 80 percent of respondents in the inequality condition place themselves in the lowest category.[8] Accordingly, the treatment has been successful in sorting respondents into the different wealth categories. Importantly, the wider wealth intervals of the inequality induced a large majority of respondents to feel that their wealth is at the bottom of the distribution and that social comparisons are upward, if they compare their wealth situation with others.

First stage. In Table 2, we present the effect of our treatment on inequality perceptions, our "first stage." We show how categorizition into wider categories affects subsequent perceptions about the household income threshold for the top-10% of the income distribution before taxes. The table indicates a strong effect: being treated increases the threshold by about 27 percent.[9] This result is robust to excluding outliers, i.e., the bottom and top-5% of the distribution.

Regression Analysis. To investigate the impact of perceived wealth inequality more thoroughly, we use the observed lottery choices to estimate boundaries for intervals of the utility function parameters assuming CRRA as is common in studies using similar elicitation methods (Binswanger, 1980; Carvalho, Prina and Sydnor, 2016; Carvalho, Meier and Wang, 2016). We use the following basic specification:

$$CRRA_i = \beta_0 + \beta_1 * Inequality + \beta_2 * X + \epsilon_i \quad (1)$$

[8]Note that, according to the 2014 HFCS (Deutsche Bundesbank, 2016), the 80th percentile of the net-wealth distribution in Germany is about 275,000€, which roughly fits to the survey responses three years later.

[9]Looking at the raw data, the average threshold is about 810,000€for participants in the treatment group, whereas it is about 640,000€in the control group. The medians are much lower (300,000 vs. 200,000€) indicating that the distribution is heavily left-skewed.

Table 2: Treatment Effect on Subjective Threshold for Top 10% Gross Income

Dependent Variable: Perceived Top-10% Household Income				
	(1)	(2)	(3)	(4)
Treated	0.244***	0.244***	0.176**	0.165**
	(0.089)	(0.089)	(0.071)	(0.070)
Constant	12.439***	12.439***	12.430***	12.340***
	(0.062)	(0.062)	(0.049)	(0.257)
Covariates	No	Yes	No	Yes
Observations	820	820	739	739
R^2	0.01	0.01	0.01	0.06

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Dependent variable: natural logarithm of indicated subjective threshold for top 10% yearly gross income in Germany. Subjects answered the following question: "According to you, from which yearly gross amount of income on does one belong to the richest 10% of households in Germany?." Columns (3) and (4) exclude outliers, i.e., thresholds below 60,000€(lowest 5% of answers) or above 2,875,000€(highest 5%). Controls include: age, income, education, number of household members, satisfaction with health, and indicators for gender, marital status, employment status, East Germany, non-German citizenship status, qualification for university (Abitur) of mother and father. Standard errors in parentheses.

Figure 1 illustrates the predicted results and indicates a sizable shift towards a lower CRRA parameter σ in the inequality condition, indicating more risk tolerance. Table 3 presents the estimates underlying Figure 1. Specification (1) of Table 3 includes only a constant and a treatment dummy, whereas specification (2) additionally controls for the covariates listed in Table A1. The estimated treatment effect is in both cases almost identical and negative, indicating that the treatment increased risk tolerance.

To put the results into perspective, consider that the treatment effect amounts to a 17 percent change relative to the control group mean in specification (1). Carvalho, Prina and Sydnor (2016), for example, estimate that a random assignment to savings accounts for rural Nepalese households leads to a 17 percent increase in risky choices in a similar lottery task. Other studies estimate gender differences in CRRA parameters of 30 percent (e.g., Garbarino, Slonim and Sydnor, 2011). Given these numbers, the average treatment effect presented above appears sizable.

Robustness. Recall that participation in the risk-preference elicitation task was voluntary. Consequently a potentially worrisome threat to internal validity is differential selection into the risk-preference elicitation task. We address this issue in severaly ways. First, we note that the sample

Figure 1: Distribution of predicted CRRA parameters by treatment status

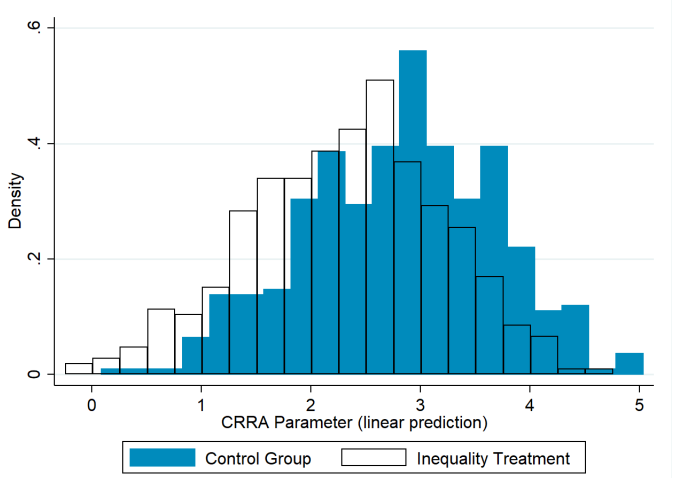


Table 3: Average Treatment Effect

Dependent Variable:	CRRA Parameter		Inequality Treatment	
	(1)	(2)	(3)	(4)
Treated	-0.490*	-0.503*		
	(0.292)	(0.288)		
General Risk			-0.011	-0.015
			(0.018)	(0.018)
Constant	2.811***	3.960***	0.493***	0.594***
	(0.205)	(1.036)	(0.017)	(0.124)
Covariates	No	Yes	No	Yes
Observations	864	864	846	846
Log-likelihood / R^2	-1965.1	-1946.7	0.00	0.02

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
First two columns present interval regressions with standard errors in parentheses where the dependent variable is the CRRA parameter ρ (with lower values indicating higher tolerance for risk). Last two columns present OLS regressions with standard errors in parentheses, where the dependent variable is an indicator for the treatment. *General Risk* coded as z-score of answers to the general risk question in the SOEP, with higher values indicating less risk-aversion. Controls include: age, income, education, number of household members, satisfaction with health, and indicators for gender, marital status, employment status, East Germany, non-German citizenship status, qualification for university (Abitur) of mother and father.

is balanced on a set of important covariates, see Table A1. Second, we take advantage of the rich data of the SOEP-IS and that it includes a qualitative measure of general risk attitudes (on a scale ranging from 0 – not at all willing to take risks – to 10 – very willing). Prior research has shown that this survey item correlates strongly with experimentally elicited risk measures and is predictive of risk taking in several domains (Dohmen et al., 2011). As illustrated in the last two columns of Table 3, the general risk question is not a significant predictor of treatment status for those who participated in the risk-elicitation task. Therefore, it is unlikely that the main effects are driven by selection bias. Reassuringly, including the variable on general risk does not change the main results, even though it correlates significantly with the elicited risk preferences (Table A5, Appendix). In the Appendix (Table A3), we provide further evidence that non-participation in the risk-elicitation task is random. Third, we show that our results are robust to re-weighting the study sample to match the socio-economic characteristics of the full sample. That is, we use a probit regression to predict the sampling probability of each participant with a set of observable characteristics, and use the inverse of this probability to construct individual weights (see Table A4 in the Appendix for the results). Taken together, there is little reason to worry that the decision to participate in the lottery task biases our estimates.

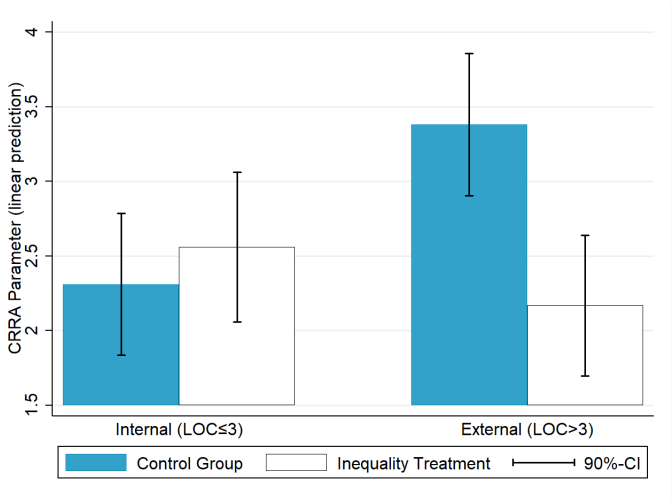
4.2 Heterogeneous effects: Locus of Control

The analysis so far has focused on average treatment effects indicating more risk tolerance if respondents perceive the wealth distribution as more unequal. As reasoned above, however, we hypothesize that the responses to inequality differ with respect to personal beliefs about the extent of one's own agency in determining life outcomes, i.e., with respect to an individual's locus of control (henceforth: LoC).

Immediately before the treatment manipulation, we implemented a ten-item module to elicit respondents' LoC. As outlined in Section 3.3, we create a single measure for LoC on a scale from 1 to 7, where higher values imply more external beliefs. The median score in our sample is 3 (average 3.13), indicating that the majority of respondents have internal control beliefs.[10] Figure 2 shows the effect of the inequality treatment on the predicted CRRA parameters separately for a median split along the LoC score. While the treatment difference is not significant for participants with below median beliefs ($p = 0.360$), those with above median beliefs (more external beliefs) show a sizable reaction ($p = 0.000$). The treatment effect in this case corresponds to a shift towards

[10] This is in line with previous findings from the SOEP (e.g., Nolte et al., 1997; Weinhardt and Schupp, 2014)

Figure 2: Median LoC Split - Treatment Effects



increased risk tolerance of 33.9% (90%-CI: [14.4%, 53.3%]).

In Table 4, we present regression results on the interaction between the inequality condition and LoC using the following specification for the latent CRRA parameter:

$$CRRA_i^* = \beta_0 + \beta_1 * Inequality_i + \beta_2 * LoC + \beta_3 * Inequality_i \times LoC_i + \epsilon_i. \quad (2)$$

The main coefficient of interest in this section thus is β_3, which captures differences in the treatment effect across varying levels of individual control beliefs. As illustrated in column (1), there is a significant and sizable interaction effect between the inequality treatment and LoC. Respondents with a higher LoC score, indicating more external beliefs, display a higher risk tolerance (i.e., a lower CRRA parameter). Adding covariates to control for basic socio-demographic characteristics has virtually no effect on the coefficient estimate of the interaction term.

While this provides evidence for the moderating role of personal traits in shaping responses to social influences, the first two columns of Table 4 also indicate a relationship between LoC and risk preferences in the control condition. In line with previous research, it seems that an internal LoC is associated with a higher tolerance towards risk (Becker et al., 2012; Salamanca et al., 2016), though the inclusion of controls weakens the relationship (column 2).[11]

A widespread concern is that LoC merely captures the effects of other personality traits,

[11] For example, Salamanca et al. (2016) demonstrate a positive relationship between internal control beliefs and the likelihood of households to hold equity using data from a Dutch National Bank survey. Becker et al. (2012) illustrate that risk taking is associated with internal LoC using data from the SOEP, but that these correlations are small.

Table 4: Heterogeneous Effects - LoC

Dependent Variable: CRRA Parameter				
	(1)	(2)	(3)	(4)
Inequality x LoC	-0.923***	-0.929***	-0.871***	-0.917***
	(0.30)	(0.30)	(0.30)	(0.30)
Locus of Control	0.574***	0.356	0.254	0.351
	(0.22)	(0.22)	(0.23)	(0.22)
Covariates	No	Yes	Yes	Yes
*Big*5	No	No	Yes	No
Optimism	No	No	No	Yes
$Log-Likelihood$	-1938.2	-1920.5	-1903.9	-1918.8
N	853	853	847	852

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Interval regressions. *LoC* is the z-score of a single index, constructed as detailed in Table A6. Higher values correspond to more external beliefs. Controls include: age, income, gender, marital status, education, number of household members, employment status, East/West Germany, non-German citizenship status, indicators whether mother/father holds high school degree, and satisfaction with health. Standard errors in parentheses.

such as the Big 5. Including the Big 5s as additional controls, reduces the coefficient estimates of LoC and the interaction term a bit, but does not affect the significance and the interpretation of results (Column 3). Optimism is another trait that may play a role in this context. According to Dohmen, Quercia and Willrodt (2018), optimism is a significant predictor of risk attitudes, as it arguably determines whether individuals focus on positive or negative aspects of risk-taking. However, controlling for optimism leaves the estimates and our conclusions unaffected (Column 4).[12]

To summarize, the interaction term remains essentially unaffected throughout all the specifications, indicating that the shift in risk parameters is stronger for respondents with higher external control beliefs. Moreover, the magnitude is large. The interaction effect in Table 4 indicates that a one standard deviation shift towards more external beliefs, leads to a difference in the corresponding treatment effect that is twice the size of even the strongest effect size documented in the previous section.

[12]The optimism proxy used in Table 4 derives from the question *"If you think about the future: Are you... (1) optimistic; (2) rather optimistic than pessimistic; (3) rather pessimistic than optimistic; (4) pessimistic?"*, which was administered to the participants shortly before the LoC module. It is distinct from the optimism proxy in (Dohmen, Quercia and Willrodt, 2018).

Alternative Explanations / Robustness. To more thoroughly check whether the observed interaction effect captures the effect of other personality traits, we ran additional regressions that interact the inequality treatment with each component of the Big 5 personality trait and the three different optimism proxies. The results in Appendix Table A8 show that all interaction terms are insignificant, suggesting that these personality traits are not a substitute in terms of the moderating role that the control beliefs play.

Albeit not statistically significant, one might nonetheless view the baseline differences presented above as another angle from which to interpret the results: that of a catching-up story. If subjects with internal control beliefs have a significantly higher baseline level of risk tolerance, there might simply be less scope to increase this value further. Those participants with external control beliefs could then be converging to their peers. From this starting point, there is no need to hypothesize about the moderating nature of LoC beliefs.

However, if convergence was driving the results, we should observe the same interaction effects for more groups that differ significantly at baseline. Such group differences exist for this sample between male and female participants, as well as between employed and unemployed. In each case, the latter group starts off with substantially less tolerance towards risk.[13] Traditionally, economists also argue that risk-aversion is decreasing in income (Guiso and Paiella, 2008) and education (Outreville, 2015). However, for neither of the four candidates there is a significant interaction effect with the treatment that could provide evidence in favor of the catching-up framework (Table A9, Appendix).[14]

Besides analyzing these potential alternative explanations, we performed several additional robustness checks. For example, we show that the heterogeneous effects are robust to re-weighting the study sample to match the socio-economic characteristics of the full sample (Table A7). Following Pinger, Schäfer and Schumacher (2018), we also conducted a principal component analysis to split the LoC scale into two separate scales capturing internal and external tendencies. This additionally addresses concerns about the unweighted average used for the single LoC indicator so far (Cobb-Clark and Schurer, 2013). Table A10 shows that the choice of how to represent individual LoC beliefs does not affect our conclusions in a meaningful way.

[13] The sample gender difference in the implicit CRRA parameter is roughly 33%, the unemployed/employed contrast is at 29%, both magnitudes lie well above the difference observed for the LoC.

[14] In the education case convergence exists to some degree, if one dichotomizes the sample into those with a high school degree (German: *Abitur*) and those that left school earlier.

5 Discussion and Concluding Remarks

We presented evidence from a survey experiment in a representative sample of the German population that perceiving the wealth distribution as unequal leads to more risk taking. Such behavior is more pronounced among people displaying an external locus of control. When interpreting our results one should keep in mind that the lottery choices participants faced yielded a maximum possible pay-off of 200€. Even though this is a substantial amount of money, it hardly changes the wealth distribution and much less the perceived distribution. This makes the results of the heterogeneity analysis even more considerable. Clearly, subjects cannot expect to move out of their relative position by winning high amounts in this particular experiment. Yet, those with more externally oriented control beliefs do choose significantly riskier options. Thus, the results in this paper identify a societal sub-group that, when confronted with upward social comparison, shows significant malleability in risky behavior.

This begs the question of the consequences for society. There is some prior evidence that inequality correlates positively with gambling (Haisley, Mostafa and Loewenstein, 2008; Canale et al., 2017; Freund and Morris, 2006). Besides gambling, a more general increased tolerance towards risk could also adversely influence decisions in other domains and thereby explain the correlation between inequality and high-levels of crime (Choe, 2008) or poor health (Pickett and Wilkinson, 2015). In fact, it could add to poverty-trap-like issues (Bernheim, Ray and Yeltekin, 2015; Dalton, Ghosal and Mani, 2015; Mani et al., 2013) if people predominantly take bad risks, and it may lead to aspiration failures and frustration, in particular, among lottery losers (Genicot and Ray, 2017*b*; Ray and Genicot, 2019; La Ferrara, 2019). On the other hand, lower risk aversion is typically associated with striving for self-employment in the labor market (Falk et al., 2018), and might promote selection into higher education (Outreville, 2015). The welfare implications are therefore not clear-cut.[15]

This study set out to investigate the effect of inequality on risk tolerance. By differentiating along the lines of individual LoC beliefs, it demonstrates that such a relationship especially exists for externally controlled individuals in a large representative sample of the German population. By design, it remains silent, however, on which alternative responses those participants with more

[15]Extrapolating from the elicited risk measure in this study is complicated due to the fact that it is primarily a measure of financial risk-taking. However, even though Dohmen et al. (2011) show that domain-specific risk questions in SOEP outperform the general risk question in predicting real-world outcomes, they also highlight that the latter performs relatively well overall. Given the already discussed significant correlation between the elicited CRRA parameters and the general risk question, we believe that the results in this paper are informative for broader outcome domains as well.

internal control beliefs might choose. Theoretically, it could well be that rather internal subjects increase their tolerance towards risk as well, yet focus on domains such as education or the labor market, which might be captured only poorly by the rather financial risk proxy used throughout this work. As reasoned above, they might also react by increasing their own levels of effort, in order to better their relative standing. We believe that future research can paint a more nuanced picture of the effect of inequality on individual behavior by focusing on the moderating role that beliefs about the determinants of life outcomes play.

An interesting question is whether inequality may influence risky decisions on a short-term basis through emotional affect or by inducing long-term level changes in the underlying attitudes towards risk (Schildberg-Hörisch, 2018). It appears reasonable to assume that the inequality manipulation in this paper rather led to short-term fluctuations around a baseline level of risk aversion – driven by induced feelings of envy. An interesting open question is how prolonged periods of experienced inequality translate into attitudes towards risk. Roth and Wohlfart (2018) show that the level of societal inequality that participants faced when they were between 18 and 25 years old – a period in life the authors refer to as "formative years" – significantly correlates with their attitudes towards redistribution. As these are also years in which people need to take crucial career related decisions, answering the question gains even more relevance. Tausch and Zumbuehl (2018) illustrate that elicited risk preferences vary also with respect to the presence of economic topics in the media. While they do not consider coverage of inequality related topics, we might speculate that this could be one channel that connects inequality and risk attitudes.

In a related fashion, we might wonder how repeated exposure to societal inequality influences personal control beliefs. While Cobb-Clark and Schurer (2013) argue that locus of control is a relatively stable character trait (as is typically assumed for personality traits), Davidai (2018) suggests that rising inequality shifts beliefs about the determinants of wealth and poverty away from internal and towards external attributions. As it is precisely the sub-group with more externally oriented control beliefs that responded to the inequality treatment in this experiment, a change in the composition of society with respect to control beliefs could alter the overall impact of inequality on risk tolerance. Thus, while this paper contributes valuable experimental evidence on the connection between inequality, personality, and individual decision-making, there are still many open questions that make for a promising research agenda.

References

Almlund, Mathilde, Angela Lee Duckworth, James Heckman, and Tim Kautz. 2011. "Personality psychology and economics." In *Handbook of the Economics of Education*. Vol. 4, 1–181. Elsevier.

Becker, Anke, Thomas Deckers, Thomas Dohmen, Armin Falk, and Fabian Kosse. 2012. "The relationship between economic preferences and psychological personality measures." *Annual Review of Economics*, 4(1): 453–478.

Benjamin, Daniel J, James J Choi, A Joshua Strickland, et al. 2010. "Social identity and preferences." *American Economic Review*, 100(4): 1913–1928.

Bernheim, B Douglas, Debraj Ray, and Şevin Yeltekin. 2015. "Poverty and self-control." *Econometrica*, 83(5): 1877–1911.

Binswanger, Hans P. 1980. "Attitudes toward risk: Experimental measurement in rural India." *American Journal of Agricultural Economics*, 62(3): 395–407.

Borghans, Lex, Angela Lee Duckworth, James J Heckman, and Bas Ter Weel. 2008. "The economics and psychology of personality traits." *Journal of Human Resources*, 43(4): 972–1059.

Bowles, Samuel, and Yongjin Park. 2005. "Emulation, inequality, and work hours: Was Thorsten Veblen right?" *The Economic Journal*, 115(507): F397–F412.

Butler, Jeffrey V, and Dietmar Fehr. 2020. "The Causal Effect of Cultural Identity on Cooperation." *mimeo*.

Caliendo, Marco, Deborah A Cobb-Clark, and Arne Uhlendorff. 2015. "Locus of control and job search strategies." *Review of Economics and Statistics*, 97(1): 88–103.

Canale, Natale, Alessio Vieno, Michela Lenzi, Mark D Griffiths, Alberto Borraccino, Giacomo Lazzeri, Patrizia Lemma, Luca Scacchi, and Massimo Santinello. 2017. "Income inequality and adolescent gambling severity: Findings from a large-scale Italian representative survey." *Frontiers in Psychology*, 8: 1318.

Cappelen, Alexander W, John A List, Anya Samek, and Bertil Tungodden. 2020. "The effect of early education on social preferences." *Journal of Political Economy*, forthcoming.

Card, David. 1999. "The causal effect of education on earnings." In *Handbook of labor economics*. Vol. 3, 1801–1863. Elsevier.

Carvalho, Leandro S, Silvia Prina, and Justin Sydnor. 2016. "The effect of saving on risk attitudes and intertemporal choices." *Journal of Development Economics*, 120: 41–52.

Carvalho, Leandro S, Stephan Meier, and Stephanie W Wang. 2016. "Poverty and economic decision-making: Evidence from changes in financial resources at payday." *American Economic Review*, 106(2): 260–84.

Charness, Gary, Uri Gneezy, and Alex Imas. 2013. "Experimental methods: Eliciting risk preferences." *Journal of Economic Behavior & Organization*, 87: 43–51.

Chiappori, Pierre-André, and Monica Paiella. 2011. "Relative risk aversion is constant: Evidence from panel data." *Journal of the European Economic Association*, 9(6): 1021–1052.

Choe, Jongmook. 2008. "Income inequality and crime in the United States." *Economics Letters*, 101(1): 31–33.

Cobb-Clark, Deborah A, and Stefanie Schurer. 2013. "Two economists' musings on the stability of locus of control." *The Economic Journal*, 123(570): F358–F400.

Dalton, Patricio S, Sayantan Ghosal, and Anandi Mani. 2015. "Poverty and aspirations failure." *The Economic Journal*, 126(590): 165–188.

Dave, Chetan, Catherine C Eckel, Cathleen A Johnson, and Christian Rojas. 2010. "Eliciting risk preferences: When is simple better?" *Journal of Risk and Uncertainty*, 41(3): 219–243.

Davidai, Shai. 2018. "Why do Americans believe in economic mobility? Economic inequality, external attributions of wealth and poverty, and the belief in economic mobility." *Journal of Experimental Social Psychology*, 79: 138–148.

Deutsche Bundesbank. 2016. "Vermögen und Finanzen privater Haushalte in Deutschland: Ergebnisse der Vermögensbefragung 2014." *Monatsbericht März*, 61.

Diecidue, Enrico, and Jeroen Van De Ven. 2008. "Aspiration level, probability of success and failure, and expected utility." *International Economic Review*, 49(2): 683–700.

Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp, and Gert G Wagner. 2011. "Individual risk attitudes: Measurement, determinants, and behavioral consequences." *Journal of the European Economic Association*, 9(3): 522–550.

Dohmen, Thomas J, Simone Quercia, and Jana Willrodt. 2018. "Willingness to take risk: The role of risk conception and optimism." *IZA Discussion Paper No. 11642*.

Eckel, Catherine C, and Philip J Grossman. 2002. "Sex differences and statistical stereotyping in attitudes toward financial risk." *Evolution and human behavior*, 23(4): 281–295.

Fafchamps, Marcel, Bereket Kebede, and Daniel John Zizzo. 2015. "Keep up with the winners: Experimental evidence on risk taking, asset integration, and peer effects." *European Economic Review*, 79: 59–79.

Falk, Armin, Anke Becker, Thomas Dohmen, Benjamin Enke, David Huffman, and Uwe Sunde. 2018. "Global evidence on economic preferences." *The Quarterly Journal of Economics*, 133(4): 1645–1692.

Freund, Elizabeth A, and Irwin L Morris. 2006. "Gambling and income inequality in the states." *Policy Studies Journal*, 34(2): 265–276.

Friedman, Milton. 1953. "Choice, chance, and the personal distribution of income." *Journal of Political Economy*, 61(4): 277–290.

Gamba, Astrid, Elena Manzoni, and Luca Stanca. 2017. "Social comparison and risk taking behavior." *Theory and Decision*, 82(2): 221–248.

Garbarino, Ellen, Robert Slonim, and Justin Sydnor. 2011. "Digit ratios (2D: 4D) as predictors of risky decision making for both sexes." *Journal of Risk and Uncertainty*, 42(1): 1–26.

Genicot, Garance, and Debraj Ray. 2017*a*. "Aspirations and inequality." *Econometrica*, 85(2): 489–519.

Genicot, Garance, and Debraj Ray. 2017*b*. "Aspirations and inequality." *Econometrica*, 85(2): 489–519.

Giuliano, Paola, and Antonio Spilimbergo. 2013. "Growing up in a Recession." *Review of Economic Studies*, 81(2): 787–817.

Goebel, Jan, Markus M Grabka, Stefan Liebig, Martin Kroh, David Richter, Carsten Schröder, and Jürgen Schupp. 2018. "The German Socio-Economic Panel (SOEP)." *Jahrbücher für Nationalökonomie und Statistik*.

Guiso, Luigi, and Monica Paiella. 2008. "Risk aversion, wealth, and background risk." *Journal of the European Economic association*, 6(6): 1109–1150.

Haisley, Emily, Romel Mostafa, and George Loewenstein. 2008. "Subjective relative income and lottery ticket purchases." *Journal of Behavioral Decision Making*, 21(3): 283–295.

Hoff, Karla, and Priyanka Pandey. 2006. "Discrimination, social identity, and durable inequalities." *American Economic Review*, 96(2): 206–211.

Hopkins, Ed. 2018. "Inequality and risk-taking behaviour." *Games and Economic Behavior*, 107: 316–328.

Hopkins, Ed, and Tatiana Kornienko. 2010. "Which inequality? The inequality of endowments versus the inequality of rewards." *American Economic Journal: Microeconomics*, 2(3): 106–37.

Kling, Jeffrey R, Jeffrey B Liebman, and Lawrence F Katz. 2007. "Experimental analysis of neighborhood effects." *Econometrica*, 75(1): 83–119.

Kosse, Fabian, Thomas Deckers, Pia Pinger, Hannah Schildberg-Hörisch, and Armin Falk. 2020. "The formation of prosociality: causal evidence on the role of social environment." *Journal of Political Economy*, forthcoming.

Kuziemko, Ilyana, Ryan W Buell, Taly Reich, and Michael I Norton. 2014. ""Last-place aversion": Evidence and redistributive implications." *The Quarterly Journal of Economics*, 129(1): 105–149.

La Ferrara, Eliana. 2019. "Aspirations, Social Norms, and Development." *Journal of the European Economic Association*, 17(6): 1687–1722.

Linde, Jona, and Joep Sonnemans. 2012. "Social comparison and risky choices." *Journal of Risk and Uncertainty*, 44(1): 45–72.

Malmendier, Ulrike, and Stefan Nagel. 2011. "Depression babies: do macroeconomic experiences affect risk taking?" *Quarterly Journal of Economics*, 126(1): 373–416.

Mani, Anandi, Sendhil Mullainathan, Eldar Shafir, and Jiaying Zhao. 2013. "Poverty impedes cognitive function." *Science*, 341(6149): 976–980.

McGee, Andrew, and Peter McGee. 2016. "Search, effort, and locus of control." *Journal of Economic Behavior & Organization*, 126: 89–101.

Menon, Geeta, Priya Raghubir, and Norbert Schwarz. 1997. "How much will I spend? Factors affecting consumers' estimates of future expense." *Journal of Consumer Psychology*, 6(2): 141–164.

Mishra, Sandeep. 2014. "Decision-making under risk: Integrating perspectives from biology, economics, and psychology." *Personality and Social Psychology Review*, 18(3): 280–307.

Mishra, Sandeep, Leanne S Son Hing, and Martin L Lalumiere. 2015. "Inequality and risk-taking." *Evolutionary Psychology*, 13(3): 1 – 11.

Nolte, Helmut, Christoph Weischer, Uwe Wilkesmann, Jakob Maetzel, and Hans Georg Tegethoff. 1997. "Kontrolleinstellungen zum Leben und zur Zukunft–Auswertung eines neuen, sozialpsychologischen Itemblocks im sozio-oekonomischen Panel." *Diskussionspapier der Fakultät für Sozialwissenschaft der Ruhr-Universität Bochum*.

Outreville, J François. 2015. "The relationship between relative risk aversion and the level of education: a survey and implications for the demand for life insurance." *Journal of Economic Surveys*, 29(1): 97–111.

Payne, B Keith, Jazmin L Brown-Iannuzzi, and Jason W Hannay. 2017*a*. "Economic inequality increases risk taking." *Proceedings of the National Academy of Sciences*, 201616453.

Payne, B Keith, Jazmin L Brown-Iannuzzi, and Jason W Hannay. 2017*b*. "Reply to van Hoorn: Social comparisons of "enough" are an informational signal." *Proceedings of the National Academy of Sciences*, 114(25): E4900–E4900.

Pickett, Kate E, and Richard G Wilkinson. 2015. "Income inequality and health: a causal review." *Social science & medicine*, 128: 316–326.

Pinger, Pia, Sebastian Schäfer, and Heiner Schumacher. 2018. "Locus of control and consistent investment choices." *Journal of Behavioral and Experimental Economics*, 75: 66–75.

Ray, Debraj, and Arthur Robson. 2012. "Status, Intertemporal Choice, and Risk-Taking." *Econometrica*, 80(4): 1505–1531.

Ray, Debraj, and Garance Genicot. 2019. "Aspirations: A review." *mimeo*.

Richter, David, and Jürgen Schupp. 2015. "The SOEP Innovation Sample (SOEP IS)." *Schmollers Jahrbuch*, 135(3): 389–399.

Richter, David, Maria Metzing, Michael Weinhardt, and Jürgen Schupp. 2013. "SOEP scales manual." SOEP Survey Papers.

Rockwood, Todd H, Roberta L Sangster, and Don A Dillman. 1997. "The effect of response categories on questionnaire answers: context and mode effects." *Sociological Methods & Research*, 26(1): 118–140.

Roth, Christopher, and Johannes Wohlfart. 2018. "Experienced inequality and preferences for redistribution." *Journal of Public Economics*, 167: 251–262.

Rotter, Julian B. 1966. "Generalized expectancies for internal versus external control of reinforcement." *Psychological monographs: General and applied*, 80(1): 1.

Salamanca, Nicolas, Andries de Grip, Didier Fouarge, and Raymond Montizaan. 2016. "Locus of Control and Investment in equity." IZA Discussion Paper.

Schildberg-Hörisch, Hannah. 2018. "Are risk preferences stable?" *Journal of Economic Perspectives*, 32(2): 135–54.

Schwarz, Norbert, Hans-J Hippler, Brigitte Deutsch, and Fritz Strack. 1985. "Response scales: Effects of category range on reported behavior and comparative judgments." *Public Opinion Quarterly*, 49(3): 388–395.

Specht, Jule, Boris Egloff, and Stefan C Schmukle. 2013. "Everything under control? The effects of age, gender, and education on trajectories of perceived control in a nationally representative German sample." *Developmental psychology*, 49(2): 353.

Tausch, Franziska, and Maria Zumbuehl. 2018. "Stability of risk attitudes and media coverage of economic news." *Journal of Economic Behavior & Organization*, 150: 295–310.

Trautmann, Stefan T, and Ferdinand M Vieider. 2012. "Social influences on risk attitudes: Applications in economics." *Handbook of risk theory: Epistemology, decision theory, ethics, and social implications of risk*, 575–600.

van Hoorn, André. 2017. "Informational content of relative deprivation as a channel linking economic inequality to risk taking." *Proceedings of the National Academy of Sciences*, 114(25): E4899–E4899.

Weinhardt, Michael, and Jürgen Schupp. 2014. "Multi-Itemskalen im Soep Jugendfragebogen." SOEP Survey Papers.

Appendix

Table A1: Covariate Balance

	Mean Treatment (S.D.)	**Mean Control (S.D.)**	**P-Value**
Female	0.528	0.539	0.761
	(0.5)	(0.499)	
Age	50.726	52.052	0.281
	(17.9)	(18.18)	
Education	3.679	3.702	0.817
	(1.461)	(1.468)	
Mother has Abitur	0.101	0.077	0.214
	(0.302)	(0.267)	
Father has Abitur	0.16	0.141	0.424
	(0.367)	(0.348)	
Income (net/month)	2198.975	2072.789	0.087
	(1107.208)	(1058.343)	
Married	0.552	0.527	0.469
	(0.498)	(0.5)	
No. of HH Members	2.439	2.343	0.227
	(1.181)	(1.143)	
Unemployed	0.05	0.066	0.303
	(0.217)	(0.248)	
Retired	0.259	0.291	0.301
	(0.439)	(0.455)	
East Germany	0.16	0.193	0.207
	(0.367)	(0.395)	
Citizenship (Non-German)	0.054	0.041	0.553
	(0.227)	(0.198)	
Statisfaction with Health	6.599	6.775	0.257
	(2.364)	(2.197)	
General Risk Attitude	4.869	4.933	0.700
	(2.428)	(2.349)	
$Prob > F$			0.490

Note: Each row presents the means of *covariate* in the two groups along with the p-values from separate OLS regressions of the form $y_i = \beta_0 + \beta_1 * Covariate + \epsilon_i$. $Prob > F$ is the p-value from an F-test for joint significance of all covariates. Education is measured in 7 categories according to the International Standard Classification of Education (ISCED), with higher categories representing a higher level of education. Abitur is the final exam at the end of high school and a prerequisite for attending university. Thus, Mother (Father) with Abitur is a proxy for highly educated parents. Income is the equivalence scale determined by the square root scale (i.e., we divide the monthly household net income by the square root of the number of household members). Citizenship indicates non-German citizenship status. Satisfaction with health is measured one a scale from 0 (completely dissatisfied) to 10 (completely satisfied). General Risk is a qualitative risk measure on a scale from 0 (not at all willing to take risks) to 10 (very willing to take risks).

Table A2: Wealth Categories by Treatment Group

Control			**Inequality**		
Wealth Category in €	*N*	*%-Share*	*Wealth Category in €*	*N*	*%-Share*
<2,500	119	27.05	<275,000	335	79.01
2,501 – 11,000	88	20.00	275,001 – 468,000	54	12.74
11,001 – 27,000	51	11.59	468,001 – 722,000	22	5.19
27,001 – 112,000	74	16.82	722,001 – 989,000	7	1.65
>112,001	108	24.55	>989,001	6	1.42

Table A3: Non-participation in the risk-elicitation task

Panel a)			
Non-participation in treatmend and control			
	Treatment	Control	N
Non-participation	0.031	0.140	1,024
	(0.023)	(0.016)	
Panel b)			
Baseline difference in risk between participation and non-participation			
	Non-participation	Participation	N
General Risk	0.027	-0.023	1,005
	(0.087)	(0.034)	
Panel c)			
Baseline difference in risk of non-participators in treatment and control			
	Treatment	Control	N
General Risk	0.002	0.003	159
	(0.156)	(0.116)	

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
OLS regressions with standard errors in parentheses. Panel a) reports the difference in the likelihood of non-participtionin treatment versus control. Panel b) reports the baseline difference in general risk attitudes between participating and non-participating respondents. *General Risk* coded as z-score of answers to the general risk question in the SOEP, with higher values indicating less risk-aversion. Panel c) displays the baseline difference in in general risk attitudes of non-participating respondents in treatment and control group.

Table A4: Re-Weighted Results for Main Treatment Effect

Dependent: CRRA Parameter		
	(1)	(2)
Inequality Treatment	-0.545*	-0.560*
	(0.298)	(0.292)
Constant	2.827***	4.162***
	(0.224)	(1.033)
Covariates	No	Yes
$Log - Likelihood$	-2476.5	-2454.7
N	864	864

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Interval regressions. Observations weighted by the inverse of the probability that they are part of our study sample. The propensity scores stem from a probit regression of a dummy equal to one in case the participant was part of the study sample on the following covariates: age, income, gender, marital status, education, number of household members, employment status, East Germany dummy, non-German citizenship status, indicators whether mother/father holds high school degree, and satisfaction with health. Standard errors in parentheses.

Table A5: Main Effect – Controlling for General Attitudes towards Risk

Dependent: CRRA Parameter		
	(1)	(2)
Inequality Treatment	-0.515*	-0.526*
	(0.30)	(0.29)
General Risk	-0.348**	-0.291*
	(0.15)	(0.15)
Covariates	No	Yes
$Log - Likelihood$	-1919.1	-1900.9
N	846	846

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Coefficients are estimates from interval regressions. *General Risk* coded as z-score of answers to the general risk question in the SOEP, with higher values indicating less risk-aversion. Controls include: age, income, gender, marital status, education, number of household members, employment status, East Germany dummy, German citizenship status, indicators whether mother/father holds high school degree, and satisfaction with health. Standard errors in parentheses.

Table A6: Locus of Control Questions

Locus of Control Module Items					
	N	**Mean**	**S.D.**	**Min**	**Max**
IT 1: The course of my life is depending on me.	864	5.674	1.296	1	7
IT 2: In comparison to others, I have not achieved what I deserve.	857	3.122	1.708	1	7
IT 3: What you achieve in life, is first of all a question of fate or luck.	864	3.47	1.598	1	7
IT 4: I often experience that others are deciding about my life.	862	2.718	1.593	1	7
IT 5: You have to work hard to be successful.	864	5.896	1.12	1	7
IT 6: When I face difficulties in life, I often doubt my abilities.	864	3.163	1.614	1	7
IT 7: Which opportunities I have in life is determined by social conditions.	861	4.46	1.52	1	7
IT 8: More important than all effort, are the abilities you have.	862	4.824	1.356	1	7
IT 9: I have little control over the things happening in my life.	864	2.672	1.435	1	7
IT 10: Social or political involvement can influence social conditions.	859	3.957	1.662	1	7
Locus of Control Index					
LoC = (-(IT1-8)+IT2+IT3+IT4+IT6+IT7+IT9)/7	853	3.132	0.868	1	6.571
External Scale (IT3, IT4, IT6, IT7, IT9)	860	3.101	0.998	1	6.608
Internal Scale (IT1, IT5, IT8)	862	5.484	0.837	2.932	7

Each item required participants to answer on a scale from 1 (disagree completely) to 7 (Agree completely). We follow Specht, Egloff and Schmukle (2013) and the SOEP scales manual Richter et al. (2013) in the choice of items for the combined LoC index. Note that item 1 is recoded in the construction, such that higher values correspond to more external beliefs. Note also that the given procedure implies attaching equal weights to every item as in Cobb-Clark and Schurer (2013). As in Pinger, Schäfer and Schumacher (2018), we additionally construct two separate indices for the items corresponding to internal and external control beliefs respectively. The items are weighted according to a principal component analysis. For the regression analyses we use standardized versions of all indices with a mean of zero and standard deviation of one. The non-standardized figures here are for illustrative purposes.

Table A7: Re-Weighted Results for Heterogeneous Effects

Dependent: CRRA Parameter				
	(1)	(2)	(3)	(4)
Inequality x LoC	-0.889***	-0.888***	-0.831***	-0.878***
	(0.321)	(0.320)	(0.316)	(0.319)
Locus of Control	0.560**	0.341	0.228	0.341
	(0.244)	(0.247)	(0.252)	(0.249)
Covariates	No	Yes	Yes	Yes
*Big*5	No	No	Yes	No
Optimism	No	No	No	Yes
$Log-Likelihood$	-2444.2	-2423.4	-2400.6	-2421.5
N	853	853	847	852

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Interval regressions. Observations weighted by the inverse of the probability that they are part of our study sample. The propensity scores stem from a probit regression of a dummy equal to one in case the participant was part of the study sample on the following covariates: age, income, gender, marital status, education, number of household members, employment status, East Germany dummy, non-German citizenship status, indicators whether mother/father holds high school degree, and satisfaction with health. *LoC* is the z-score of a single index, constructed as detailed in Table A6. Higher values correspond to more external beliefs. Standard errors in parentheses.

Table A8: Heterogeneous Effects - Other Personality Traits

	Dependent: CRRA Parameter							
	Neuroticism	Agreeableness	Extraversion	Openness	Conscientiousness	Optimism	Rel. Optimism	Optimism Index
Inequality	-0.485*	-0.495*	-0.473	-0.501*	-0.457	-0.469	-0.268	-0.249
	(0.29)	(0.292)	(0.292)	(0.292)	(0.291)	(0.291)	(0.31)	(0.31)
Interaction Effect	0.029	-0.143	0.026	0.303	0.032	-0.347	0.299	0.016
	(0.287)	(0.291)	(0.297)	(0.296)	(0.294)	(0.295)	(0.313)	(0.309)
Level Effect	0.461**	0.354*	-0.048	-0.21	0.104	0.153	-0.161	0.022
	(0.203)	(0.202)	(0.215)	(0.209)	(0.208)	(0.207)	(0.212)	(0.212)
Constant	2.802***	2.815***	2.792***	2.817***	2.777***	2.795***	2.616***	2.595***
	(0.203)	(0.204)	(0.205)	(0.204)	(0.204)	(0.204)	(0.218)	(0.218)
N	864	864	863	861	862	863	741	740

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Coefficients are estimates from interval regressions. Higher CRRA parameter values imply increased risk-aversion. All personality indicators are standardized to have a mean of zero and standard deviation of one. *Optimism* derives from the question *"If you think about the future: Are you... (1) optimistic; (2) rather optimistic than pessimistic; (3) rather pessimistic than optimistic; (4) pessimistic?"*. We re-coded the variable, such that higher values imply increased optimism. *Relative optimism* is the unweighted average of four questions for which participants had to indicate on a scale from 1 ("Very much less likely") to 7 ("Very much more likely") how they judged the likelihood to: (1) be financially successful; (2) become seriously ill; (3) be successful in their job; (4) be happy in general, relative to peers of the same age and sex. *Optimism Index* combines both standardized optimism indicators into a single standardized index, attaching equal weights to both. Standard errors in parentheses.

Table A9: Heterogeneous Effects - Other Variables

Dependent: CRRA Parameter				
	(1)	(2)	(3)	(4)
Inequality Treatment	-0.195	-0.392	-3.670	-1.036
	(0.42)	(0.30)	(4.52)	(0.79)
Inequality × Female	-0.542			
	(0.58)			
Female	1.257***			
	(0.41)			
Inequality × Unemployed		-1.389		
		(1.26)		
Unemployed		1.717**		
		(0.83)		
Inequality × ln(Income)			0.427	
			(0.60)	
ln(Income)			-0.899**	
			(0.41)	
Inequality × Education				0.146
				(0.20)
Education				-0.434***
				(0.14)
Constant	2.136***	2.697***	9.570***	4.418***
	(0.30)	(0.21)	(3.08)	(0.55)
$Log-Likelihood$	-1958.9	-1962.9	-1962.1	-1958.1
N	864	864	864	864

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Coefficients are estimates from interval regressions. Standard errors in parentheses.

Table A10: Results for Separate Internal and External LoC Scale

Dependent: CRRA Parameter				
	(1)	(2)	(3)	(4)
Inequality × External Scale	-0.866***	-0.869***	-0.824***	-0.855***
	(0.30)	(0.29)	(0.29)	(0.29)
External Scale	0.527**	0.302	0.165	0.292
	(0.22)	(0.22)	(0.23)	(0.22)
Inequality × Internal Scale	-0.0156	-0.0283	-0.00449	-0.0368
	(0.30)	(0.29)	(0.29)	(0.29)
Internal Scale	0.268	0.192	0.146	0.199
	(0.21)	(0.21)	(0.21)	(0.21)
Covariates	No	Yes	Yes	Yes
*Big*5	No	No	Yes	No
Optimism	No	No	No	Yes
$Log - Likelihood$	-1948.1	-1930.2	-1913.8	-1928.5
N	858	858	852	857

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Estimates from interval regressions. External and internal scale constructed as in Table A6. Both are standardized z-scores. Controls include: age, income, gender, marital status, education, number of household members, employment status, East Germany dummy, non-German citizenship status, indicators whether mother/father holds high school degree, and satisfaction with health. Standard errors in parentheses.