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Tim Krieger, Christine Meemann, Stefan Traub

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Inequality, Life Expectancy, and the Intragenerational Redistribution Puzzle
Some Experimental Evidence

Abstract

In most OECD countries, pension reform policy has decreased the level of intragenerational redistribution over the last three decades, that is, redistribution among members of the same generation with high and low pension entitlements. This trend has occurred despite heterogeneity in life expectancy linked to socioeconomic status having a regressive impact on out-comes. This paper contributes to solving this puzzle by means of a controlled laboratory experiment. We study the causal relationship between inequality of entitlements, mortality risk, and the size of redistribution in a stylized social security system. We find that mortality risk, when negatively correlated with entitlements, significantly lowers subjects' willingness to redistribute payoffs from high-entitlement to low-entitlement subjects. We explain this finding with efficiency preferences and an alienation effect. The alienation effect is the tendency to attach a lower social weight to the short-lived poor.

JEL-Codes: D630, D810, H550, I140.

Keywords: inequality, life expectancy, risk, redistribution, pension reform, efficiency preferences, alienation effect experiment.

Tim Krieger
Department of Economics
University of Freiburg / Germany
tim.krieger@vwl.uni-freiburg.de

Christine Meemann
Department of Economics
Helmut-Schmidt-University
Hamburg / Germany
meemannc@hsu-hh.de

*Stefan Traub**
Department of Economics
Helmut-Schmidt-University
Hamburg / Germany
traubs@hsu-hh.de

*corresponding author

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1 Introduction

The aim of this paper is to study, by means of a laboratory experiment, the causal relationship between heterogeneity in life expectancy due to economic inequality and the amount of *intra*generational redistribution in a stylized social security system, that is, redistribution among members of the same generation with high and low pension entitlements in a social security system. The growing heterogeneity of life expectancy based on socioeconomic status (SES; for empirical evidence, see Duleep 1986, Marmot 2005, Cutler et al. 2006, Waldron 2013, and Chetty at al. 2016) exerts a dampening effect on the progressivity of social security systems. It is puzzling, therefore, that pension reform policies in OECD countries have *decreased* the level of intragenerational redistribution over the last three decades (Fenge et al. 2003, Lindbeck and Persson 2003, Werding 2003, Queisser and Whitehouse 2005, Krieger and Traub 2011, Brendler 2021, Klos et al. 2022) instead of counterbalancing the regressive impact of differences in life expectancy. To solve this puzzle, we assess the redistribution preferences of subjects in an experimental setting from behind a 'veil of ignorance' (VOI) by exogenously modifying the size and distribution of 'mortality risk'.

Our paper is the first to study the intragenerational redistribution puzzle in detail. We do so by means of a laboratory experiment in which subjects are assigned the role of an *involved* social planner. In the framework of a hypothetical social security system, the social planner is asked to redistribute benefits among a group of persons who differ in their contribution-based entitlements. Depending on the treatment, the group members may also differ in their 'mortality risk', which is implemented in the experiment as the probability of default in terms of receiving a zero payoff instead of the benefit. The decision of the social planner is made from behind the VOI, that is, she learns her position in the group in terms of her own entitlement, mortality risk, and (expected) benefit only after having made her choice about the level of redistribution.[1]

at the WISO laboratory of the University of Hamburg.

[1] The VOI approach mimics the decision of a young adult who has to determine, according to her preferences, the level of redistribution in her country's social security system without knowing her future income position in society. Note that, according to Browning (1975), only the young generation's voting decision on the level of redistribution is socially optimal. Gaertner et al. (2017) argue that redistributive policies provide insurance against future negative income shocks and that the demand for redistribution is therefore expected to correlate with individual risk preferences. Using a representative sample of

Specifically, we investigate whether and how the social planner reacts to differentials in the distribution of mortality risk. The experiment involves four risk treatments: a control treatment without mortality risk; a treatment with equal mortality risk; and two treatments with skewed mortality risk, where income positions with lower entitlements exhibit a higher mortality risk. In one of the two skewed-mortality-risk treatments, redistribution results in a loss of efficiency. We use this treatment to test the hypothesis that efficiency concerns are responsible for the intragenerational redistribution puzzle. In the other treatment, subjects receive a compensation for the expected efficiency loss. We use this treatment to test the 'alienation hypothesis' that holds that unequal mortality risk reduces societal interest in redistribution in favor of the poor.

Our main results are as follows. Confirming the intragenerational redistribution puzzle in the experimental laboratory, we find that mortality risk reduces redistribution when mortality risk is unequally distributed. We also find that higher replacement ratios, i.e. larger social security systems, involve less redistribution, which is commensurate with the empirical evidence. In line with the literature (see Gaertner et al. 2017), risk aversion in subjects leads to a higher level of redistribution. When redistribution involves an efficiency loss in the treatment with skewed mortality risk, the level of redistribution is partly determined by subjects efficiency preferences. However, redistribution is also reduced when redistribution does not involve an efficiency loss. We show that this result can be traced back to an alienation effect that is mediated by inequality aversion, the belief that success in life depends on 'effort' or 'luck and connections', and the propensity to blame victims.

All in all, as far as the results from our laboratory experiment can be generalized to real world social security systems, our results suggest that the intragenerational redistribution puzzle can only partly be explained by efficiency concerns. Our results show that the demand for redistribution also decreases because society becomes alienated from the needs of the poor. Increasing inequality, both in terms of socioeconomic status and life expectancy, therefore poses a self-reinforcing challenge to social cohesion.

In the next section, we briefly review the related literature. Section 3 introduces our experimental design and Section 4 the working hypotheses.

the Swedish population, they indeed found a significant and robust positive correlation between risk aversion and the demand for redistribution.

Section 5 presents the results. In Section 6, we discuss the results and conclude the paper.

2 Literature Review

Our paper relates to two larger strands of the literature, which we will discuss in the following. In a first subsection, we will take a closer look at the intragenerational redistribution puzzle. We do so by first summarizing the literature on the correlation between socio-economic status (SES) and life expectancy, and discussing the theoretical and political implications for intragenerational distribution resulting from it. We then summarize the literature showing that, contrary to the normative expectation, the degree of intragenerational redistribution has decreased. At the end of this subsection, we take this puzzle as an opportunity to formulate two hypotheses about the connection between mortality risk and redistribution, namely the efficiency hypothesis and the alienation hypothesis. The second subsection situates our study in the experimental literature on distributive preferences and risk-taking choices.

2.1 The Intragenerational Redistribution Puzzle

Numerous empirical studies provide evidence for a significant positive correlation between socio-economic status (SES) variables like education and income, on the one hand, and health and life expectancy, on the other hand, not only *between* countries[2] but also *within* countries.[3] Within-country studies usually rely on administrative data provided, for example, by the US Social Security Administration (Duleep 1986, 1989) or the German Pension Fund (Shkolnikov et al. 2007, Wenau et al. 2019). Chetty at al. (2016) have recently shown that, for a large sample of US tax payers in the 2001-2014 period, higher income was associated with greater longevity throughout the income distribution. The gap in life expectancy between the top and the bottom 1% percentile was 14.6 years for men and 10.1 years for women. Furthermore, male (female) income earners in the top 5% percentile on average

[2]The 'Preston Curve' is a graphical representation of the relationship between per capita income and average life expectancy (see Preston 1975).

[3]For empirical results and literature reviews see, for example, Duleep (1986), Marmot (2005), Cutler et al. (2006), Waldron (2013), and Chetty at al. (2016).

gained 2.34 (2.91) life years while the bottom 5% on average gained only 0.32 (0.04) life years.

Several authors have emphasized that the positive correlation between SES and life expectancy matters for the design and reform of social security systems (for example, Gil and Lopez-Casasnovas 1998, Borck 2007, Krieger and Lange 2012, Waldron 2013). This is because there may be significant regressive intragenerational redistribution effects, that is, implicit transfers within age cohorts from short-living poor to long-living rich. For instance, investigating intragenerational redistribution in the U.S. social security system, Liebman (2002) has found differential mortality to cause "average lifetime benefits to fall in the lowest AIME [Average Indexed Monthly Earnings] quintile by about $3,330, or about 2 percent. In contrast, benefits rise in the highest AIME quintile by $2,424, or about 1 percent" (p. 34). Assessing the overall progressivity of the US social security system, Coronado et al. (2011) conclude that "[u]sing mortality information that differs by lifetime income dampens progressivity slightly, as people with higher lifetime incomes live longer and therefore draw benefits longer" (p. 29).[4]

One may therefore expect policy makers to compensate the short-lived poor for their disadvantage by reforming social security systems to *increase* the level of intragenerational redistribution.[5] This reasoning is in line with theoretical predictions. For instance, Bommier et al. (2011a, 2011b) explore *optimal* redistribution between individuals who differ in their life expectancy. They show that when the social planner exhibits intertemporal risk (inequality) aversion "long-lived individuals work longer and have lower instantaneous consumptions than short-lived individuals" (Bommier et al. 2011a, p. 285).[6] Related to this optimality result—but without explicit ref-

[4]Similar results can be found, for example, in Caldwell (1999), Coronado et al. (1999, 2000), Gustmann and Steinmeier (2001), Brown et al. (2006) and Goda et al. (2011).

[5]Some studies consider the level of intragenerational redistribution as the outcome of the political process, although typically without considering heterogeneity in life expectancy. See, for example, Casamatta et al. (2000a, 2000b), Conde-Ruiz and Profeta (2007), Cremer et al. (2007) and Cremer and Pestieau (2011). According to Casarico and Devillanova (2008), pension reforms resulting in a move toward more *funding* in a (multi-pillar) pension system may affect preferences for intragenerational redistribution in the pay-as-you-go pillar. Furthermore, political outcomes may be influenced by the expected effects of pension system design on long run growth (for example, Docquier and Paddison 2003, Hachon 2010).

[6]Using micro simulations, Fehr and Kindermann (2008), Fehr et al. (2013), and Fehr and Uhde (2014) have found that—starting from a purely contribution-related benefit

erence to social welfare maximization—is Breyer and Hupfeld's (2009, 2010) concept of 'distributive neutrality' in pension systems. According to their concept, a pension system satisfies distributive neutrality when "the ratio between total benefits and total contributions does not vary systematically with average annual earnings" (Breyer and Hupfeld 2010, p. 67).[7] Distributive neutrality implies that the return in terms of the expected benefit of one unit of contribution should be equal for all members of the same age cohort.

These theoretical predictions are, however, inconsistent with recent findings from general-equilibrium macroeconomic models as well as empirical evidence from OECD pension systems. Regarding the first, Bagchi (2019) examines the implications of differential mortality rates on how different social security benefit-earnings rules (ranging from zero redistribution to full redistribution) affect welfare in the U.S. economy. He finds that when earnings and mortality risk are negatively correlated, welfare is maximized under the current U.S. benefit-earnings rule. A more progressive benefits-earnings rule maximizes welfare only when mortality risk is uncorrelated with earnings, therefore warranting less redistribution through social security in the presence of differential mortality risk. In their general equilibrium incomplete market OLG model for the U.S. economy, Bishnu et al. (2019) arrive at similar effects and state the following: "(...) when we ignore mortality differentials, progressive PAYG dominates non-progressive-non-redistributive PAYG program. This result changes when [we] take differential mortality into our account and non-redistributive PAYG dominates the progressive PAYG" (p. 3).

Regarding the latter, empirical analyses of pension reforms (for example, Fenge et al. 2003, Lindbeck and Persson 2003, Werding 2003, Queisser and Whitehouse 2005, Krieger and Traub 2011, Brendler 2021, Klos et al. 2022) suggest that the level of intragenerational redistribution[8] in the first pillar of

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system—increasing the flat-benefit share (to levels of 30-50 percent) leads to significant welfare gains, once factors such as income uncertainty, liquidity constraints, disability and mortality risks are taken into account.

[7]'Distributive neutrality' is a generalization of the principle of tax-benefit proportionality and takes income group-specific differences in life expectancy into account (Breyer and Hupfeld 2009).

[8]Broadly speaking, there are two types of redistribution in pay-as-you-go pension systems, which both affect the rate of return on an individual's contribution to the social security system. These are *inter*generational and *intra*generational redistribution (Klos et al. 2022). Intergenerational distribution is among members of consecutive generations. It depends on the system's replacement ratio, which is determined first and foremost by the

many OECD countries' pension systems has in fact been *decreasing* over the last decades.

Table 1: Trends of Replacement Ratio and Bismarckian Factor in Selected OECD Countries

LIS Wave	Time Period	Replacement Ratio	Bismarckian Factor
1	(1979-1983)	0.119	0.263
2	(1983-1987)	0.121	0.262
3	(1988-1992)	0.127	0.284
4	(1993-1997)	0.138	0.350
5	(1998-2002)	0.149	0.390
6	(2003-2004)	0.119	0.311

Source: Krieger and Traub (2011). Database: Luxembourg Income Study (LIS). Unbalanced sample. Means for 10 to 20 OECD countries. The Replacement Ratio is the share of pension income over total income. The Bismarckian factor compares the inequality of pension benefits with the inequality of household net incomes. The higher the Bismarckian factor, the lower the level of intragenerational distribution.

With respect to intragenerational redistribution, two ideal types of pension systems exist. *Bismarckian* systems are characterized by a strict proportionality between earnings and paid-out pension benefits, while *Beveridgean* systems provide flat benefits regardless of previous earnings. Most real-world pension schemes are somewhere between these extremes (see Krieger and Traub 2011, 2013). The level of intragenerational redistribution in a pension system can be measured by the 'Bismarckian factor' (see Cremer and Pestieau 1998), a $[0, 1]$-index comparing "the inequality of pension benefits with the inequality of household net income, assuming that the principle of participation equivalence holds" (Krieger and Traub 2013, p. 64).[9] The

relative size of consecutive generations. That is, the more contributors, the higher one's own pension benefit. Secondly, intragenerational redistribution is among members of the same generation with different pension entitlements. High-income earners may receive relatively lower pension benefits per unit of contribution than low-income earners, which implies a relatively higher rate of return for the latter.

[9]Earlier work by Lefèbvre and Pestieau (2006) and Lefèbvre (2007) uses a similar con-

higher the index, the lower the level of intragenerational redistribution and the more Bismarckian the social security system is.

Conducting a comparative study for 20 OECD countries using micro data from the Luxembourg Income Study (LIS), Krieger and Traub (2011) show that the average OECD pension system became more 'Bismarckian' (see Table 1). The Bismarckian factor increased by 2.4% per 5-year LIS Wave in the time period between 1979 and 2002 (LIS Waves 1 to 5). Moreover, the generosity of the pension system (the ratio between total pension payments and total incomes) increased by 0.6% per 5-year LIS Wave.[10]

This trend is confirmed in a recent case study of Germany by Klos et al. (2022), who develop a new index measure for intragenerational redistribution in pension systems. The measure relates work-life contributions to the pension scheme and the resulting benefit entitlements to a benchmark, which rests on the ratio of two hypothetical benefit distributions resulting from idealized Beveridgean and Bismarckian pension systems.[11] The authors show that the degree of intragenerational redistribution dropped by approx. 25% between 2007 and 2013. New legislation that—independent of life expectancy—doubled child benefits for mothers of children born before 1992 led to a jump in the degree of intragenerational redistribution (for women only, not for men) from 2014 onward.[12]

In summary, the literature clearly shows a negative association between SES and mortality risk. In order to maximize social welfare, an inequality-averse society should therefore increase the degree of intragenerational redistribution or at least ensure distributive neutrality of the pension system.

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cept and introduces a non-normalized 'index of non-contributiveness' (INC). An alternative measure to the INC is the 'index of progressivity' (OECD 2013), which relates inequality in pension benefits to inequality in earnings, thereby providing an indirect measure of intragenerational redistribution.

[10]In seven countries (Finland, Germany, Ireland, Italy, Luxembourg, Mexico and Switzerland), the increase of the Bismarckian factor was relatively strong; eight countries (Australia, Austria, Belgium, Canada, France, Spain, United Kingdom, United States) showed a modest increase; the Bismarckian factor decreased for only five countries (Denmark, Greece, Netherlands, Norway, Sweden). An update of the data set including more countries, more waves and some data revisions is given in Krieger and Traub (2013).

[11]The construction of the measure thereby follows broadly the construction of Lorenz curves and the Gini coefficient as well as the Suits index (Suits 1977) for measuring inequality in tax systems (Klos et al. 2022).

[12]Further evidence in this direction for the German case has been provided by Stöwhase (2016).

However, the actual level of intergenerational redistribution has instead declined in most OECD pension systems, and the interesting question arises as to what is causing this puzzling outcome. One obvious explanation could be efficiency preferences. Intragenerational redistribution in favor of the short-lived poor could be perceived as inefficient. We will test this hypothesis in our experiment by systematically varying the efficiency loss caused by redistribution and by eliciting subjects' efficiency preferences.

The social-psychological literature offers additional insights into the potential role of (asymmetric mortality) risk in intragenerational redistribution. Lerner's (1980) 'just world hypothesis' suggests that people may hold a belief in 'deservingness', namely, that people are responsible for their own situation. The link between SES, including variables such as income and pensions, and health or mortality is expressed through two alternative explanations: SES may influence health status and mortality ('social causation') or the health status contributes to SES ('social drift'). According to Adler and Ostrove (1999, p. 8), "(a)lthough there is some reciprocal influence of SES and health, the data are more compelling for social causation than for social drift". Analogously, Hoffmann et al. (2019, p. 1363) state that "the main pathway is from SES to health, regardless of the exact SES variable used." In a meta-analysis by Kröger et al. (2015), however, no preference for one of the two causal directions could be found.

Regardless of this ambiguity in the academic literature, people may take a one-sided perspective on this link and believe more in the social causation channel. That is, when a higher mortality risk is seen as the result of low income, with low income itself being the result of low effort, the short-lived poor may not be seen as deserving. In this case, the social planner's attention may shift away from the low-entitlement-high-mortality-risk group members. We call this pattern of behavior the *alienation effect*. In order to test the alienation effect and separate it from efficiency preferences, we conduct a treatment where mortality risk is unequally redistributed and redistribution of entitlements does not involve an efficiency loss. Furthermore, we elicit subjects' inequality aversion and apply three instruments to also elicit subjects' attitudes towards justice and redistribution, namely the 'General Belief in a Just World Scale' (GBJW) by Dalbert et al. (1987), subjects' belief whether it is 'effort' or 'luck and connections' (ELC) that bring success in life, and subjects' propensity to blame victims PBV; see Montada et al. 1986, Montada 1998).

2.2 Experimental Literature

Our paper is linked to several important contributions in the experimental literature. There is a long tradition of experimental papers investigating subjects' distributive preferences from behind the veil of ignorance, starting with the works of Frohlich et al. (1987a, 1987b) and Frohlich and Oppenheimer (1990). They and several other authors (for a survey, see Herne and Suojanen 2004) investigate whether subjects would be able to reach an unanimous agreement on a specific distributive principle. Typically, groups do reach an agreement. Yet the most frequently chosen distributive principle is neither Rawls' difference principle (maximizing the income of the worst off) nor Harsanyi's utilitarian principle (maximizing the average income) as hypothesized, but rather a mixed distributive principle (the 'Boulding principle', see Traub et al. 2005) that is best be described as maximization of the average income subject to a floor constraint. This corresponds to Krieger and Traub's (2011, 2013) observation of an intermediate Bismarckian factor in real-world pension schemes.[13]

Some recent papers (for example, Herne and Suojanen 2004, Traub et al. 2005, Traub et al. 2009, Kittel et al. 2017) vary the amount of information given to subjects, that is, the 'thickness' of the veil of ignorance, while they make their distributive choices. Herne and Suojanen (2004) find more Rawlsian choices in the 'no veil of ignorance' treatment than in the 'veil of ignorance' treatment. Traub et al. (2005) compare 'risk' treatments, where subjects receive information on outcomes and probabilities, with 'ignorance' treatments, where subjects receive information only about the set of potential outcomes but not on their probabilities. Subjects were willing to tolerate more inequality and requested a higher floor constraint with probability information than without. Furthermore, the experiment involves 'umpire' treatments, where subjects have no stakes in the game, and 'self-concern' treatments, where subjects become income recipients after lifting the VOI. When probability information is available, personally affected subjects become significantly less inequality averse than neutral 'umpires'. Studying how subjects experimentally solve equity-efficiency trade-offs in a ranking task of income distributions, Traub et al. (2009, p. 398) conclude that "[t]he self-interested social planner attaches greater importance to establishing an

[13]It is also reflected in the 'Boskin proposal' for the U.S., which proposes separating Social Security into an insurance and a transfer part (Boskin 1986, Huggett and Ventura 1999).

income distribution that is equitable enough not to be protested but still allows to outperform the others." Using a within-subjects design, Kittel et al. (2017) show that disclosing the social planners social position significantly raises her self-interest.

It has also been shown (see, for example, Konow 1996, Bénabou and Tirole 2006, Krawczyk 2010, Cappelen et al. 2013, Durante et al. 2014, Gaertner et al. 2017) that the information given about the source of outcomes and the degree of individual responsibility, respectively, influences preferences for redistribution and distributive choices. If the source is luck (outcome generation is uncontrollable) rather than effort (outcome generation is controllable), the frequency of egalitarian choices and, more generally, the support for redistribution increase. Explaining the differences between the size of the welfare states in the U.S. and Europe, Alesina et al. (2001, p. 237) point out that "(i)n Europe, the poor are generally thought to be unfortunate, but not personally responsible for their own condition", which is why they find that the share of social spending is higher in Europe.

Closely related to this strand of the literature, and in line with this paper, a number of experimental papers deal with the impact of risk on distributive choices. Rohde and Rohde (2011) do not find a significant impact of the risk others face on individuals' risk choices for themselves. However, subjects prefer payoff risks to be independent across individuals (in terms of every other subject receiving the same lottery) rather than correlated (in terms of every other subject receiving the same risky outcome). Using a modified dictator game, Brock et al. (2013) find that dictators transfer less income than in the standard dictator game if the transfer was risky.[14] Cappelen et al. (2013) investigate the distributive choices of 'spectators' and 'stakeholders' in decision tasks where inequality is the result of previous risk-taking choices. On the one hand, most subjects find it fair to eliminate inequalities between lucky and unlucky risk takers; on the other hand, subjects find inequalities between risk takers and subjects who have chosen the safe option justified.[15]

[14]Freundt and Lange (2017), employing some variants of the dictator game, examine further the role of risk for pro-social preferences. They find, first, that when the payoff of the dictator becomes risky, risk-averse dictators reduce giving in comparison to non-risk-averse dictators. Second, when the payoff of the recipient becomes risky, dictators giving to recipients believed to be non-risk-averse is reduced in comparison to recipients which are believed to be risk-averse.

[15]Using the 2008 European Social Survey (ESS), Reeskens and van Oorschot (2013) report that respondents support a mixture between the equity principle and the equality

Cettolin and Riedl (2017) conducted a laboratory experiment in which two subjects, called recipients, had to produce a joint monetary surplus in a real-effort task. The real-effort task was calibrated in order to level out productivity differences. A third uninvolved subject, called the spectator, had to distribute the surplus between both recipients. In the control treatment, the recipients received exactly the amounts that were allocated to them by the spectator. As expected by the authors, almost all spectators chose the equal split. All other distribution tasks involved varying degrees of payoff uncertainty for one of the two recipients, that is, she received a lottery that had the amount allocated to her as an expected value. The experiment shows that spectators are willing to allocate less to the recipient facing risk, the riskier the lottery.

Apart from not having a social-security framing, the aforementioned studies differ in several respects from our own experiment. In Rohde and Rohde (2011) and Brock et al. (2013), decision-makers knew their positions in the society. In Cappelen et al. (2013), redistribution choices were made after resolving uncertainty with respect to income. Cettolin and Riedl (2017) studied the redistribution decisions of uninvolved spectators. In contrast, we study the redistribution preferences of involved social planners from behind the veil of ignorance, that is, subjects make their decisions without knowing their final positions in society and before resolving the uncertainty regarding the income of that position.

3 The Experiment

The experiment was fully computerized. It consisted of three parts and a post-experimental questionnaire. The third part, the redistribution task, was the main task of the experiment and is explained in the following subsection. In the first and second part of the experiment, we elicited subjects' risk attitudes and social preferences. The respective procedures are explained in Subsection 3.2. We introduce the post-experimental questionnaire in Subsection 3.3. Finally, the implementation of the experiment is explained in Subsection 3.4.

principle when asked for just redistribution with respect to pension benefits, while they largely support the equality principle with respect to unemployment benefits. The authors conclude from their findings that equality prevails for less controllable risks, while equity tends to matter more for social risks that are regarded as a personal choice.

3.1 Redistribution Task

In the redistribution task, subjects were randomly organized into groups of five that stayed together for the whole task. They were presented with a table with five columns ('positions') labelled 'A' to 'E' in the top table row (for screenshots and instructions see Appendix C). Subjects were told that each group member would be randomly assigned to one of the five positions after the end of the task. The second table row ('entitlement') showed a certain number of points allocated to each position. Subjects were told that these numbers represented earnings-related contributions to an unspecified social security system. The third table row ('payoff') stated the social security benefit in points.

Below the table, subjects could use a slider in order to change the distribution of benefits according to the following formula:

$$b_i = r \times [c_i \times (1 - \lambda) + \lambda\mu] \ . \tag{1}$$

b_i denotes the benefit of position i, $i \in \mathbb{P} = \{A, \ldots, E\}$, r is the *replacement ratio*, that is, the conversion rate from contributions to benefits, c_i denotes the contribution of position i, λ is the *redistribution parameter*, and $\mu = \sum_{i \in \mathbb{P}} c_i/5$ is the average contribution. Note that the redistribution parameter is one minus the 'Bismarckian factor' introduced in Subsection 2.1.

The subjects' task was to use the slider to choose their preferred degree of redistribution of the initial social security contributions from among the five positions. Any slider position on the closed interval $\lambda \in [0, 100]$ percent was eligible. The initial position of the control was zero. This setting was equivalent to $\lambda = 0$, that is, there was a perfectly proportional relationship between social insurance contributions and benefits—a perfectly Bismarckian pension system. By moving the ruler to the right, the distribution of benefits changed continuously towards a more equal distribution, until a uniform distribution of benefits was reached at 100% ($\lambda = 1$). While the contributed points stated in the 'entitlement' table row remained unchanged, shifting the ruler back and forth visibly changed the benefit points stated in the 'payout' table row. For an example, see the instructions in Appendix C.

Within-subjects Treatments

The redistribution task was repeated six times (rounds), as indicated in the top panel of Table 2. Each round involved a different parametrization of the replacement ratio $r \in \{\text{Low}, \text{High}\}$ and of the distribution of entitlements {Symmetric/Low Variance (SL), Symmetric/High Variance (SH), and Right Skewed/Low Variance (RL)}. The mean was always $\mu = 2000$ points. We combined the two replacement ratios with the three entitlement distributions, which gave six rounds.

Table 2: Treatments and Round Parametrization

Treatment	Position A	Position B	Position C	Position D	Position E	var	skew
Within-subjects							
Distribution of Entitlements (mean = 2000*)*							
Symmetric/Low Variance (SL)	1000	1500	2000	2500	3000	0.35	0.0
Symmetric/High Variance (SH)	500	1750	2000	2250	3500	0.53	0.0
Right Skewed/Low Variance (RL)	1250	1600	1750	2100	3300	0.25	0.97
× *Replacement Ratio:* Low (0.1)/High (0.3)							
Between-subjects							
Mortality Risk							
No Risk (NR)	0%	0%	0%	0%	0%		
Equal Risk (ER)	20%	20%	20%	20%	20%		
Skewed Risk & Leaky Bucket (SRL)	33%	27%	20%	13%	7%		
Skewed Risk & Compensation (SRC)	33%	27%	20%	13%	7%		

Table notes. The table displays the within-subjects (top panel) and between-subjects (bottom panel) treatment structure of the experiment. Each subject was randomly assigned to one of the four between-subjects treatment. All subjects passed through six rounds (3 distributions of entitlements × 2 replacement ratios). var=coefficient of variation; skew=skewness parameter.

Between-subjects Treatments

Depending on the session, subjects were assigned to one of four risk treatments that differed with respect to the subjects' 'mortality risk', that is, the probability that a subject would not receive her benefits irrespective of having made a (virtual) contribution (see the bottom panel of Table 2). The baseline treatment, NO RISK (NR), was conducted exactly as described above, that is, the default probability p_i was equally fixed at 0% for all positions. In the other three risk treatments, we added a 'risk' table row to the bottom of the table stating the default probability for each position. In the EQUAL RISK (ER) treatment, p_i was equally fixed at 20%.

In the SKEWED RISK & LEAKY BUCKET (SRL) and SKEWED RISK & COMPENSATION (SRC) treatments, we computed the individual default probabilities of the positions using their ordinal ranks, $p_i = (6-\text{rank}(i))/15 \times 100\%$, and rounded them to the next integer. The average default risk was still 20% as in the ER treatment, but now positions with lower entitlements had a higher mortality risk. Moreover, as compared to the ER treatment, slider positions greater than zero involved a 'leaky bucket'—a loss of expected benefits that increased in the redistribution parameter λ. The SRC treatment completely compensated subjects for the expected loss of benefits caused by redistribution by adding $t_k \times r\lambda$ points to each income position, where $k \in \{SL, SH, RL\}$ and $t_k \in \{82.5, 106.25, 75.375\}$. The compensation amounted to a maximum of 6.6% of the expected benefit in the ER treatment.

Decision Modes and Incentives

While choosing their individually best payoff distributions by setting the slider, subjects had to take into account one of the two following payoff rules. At the end of the experiment, one round was randomly selected for payoff. The subjects were randomly assigned to the positions in their groups denoted 'A' to E' such that all positions were taken exactly once. In *Median Vote*, the level of redistribution to be applied for payoff was determined by simple majority vote. For example, if $(12, 20, 32, 40, 68)\%$ was the vector of individually preferred levels of redistribution, the payoffs were computed according to equation (1) using its median level, namely 32 percent ($\lambda = 0.32$). In *Random Dictator*, the level of redistribution to be applied for payoff was determined by randomly selecting one of the five group members as a dictator. Payoffs were then computed according to equation (1) using the random dictator's preferred level of redistribution. In the three treatments with default risk, the computer randomly selected (while taking the default probabilities into account) one position to receive a zero payoff instead of the benefits.

The two incentive schemes are preference-revealing. Strategic considerations, such as coalition building, cannot play a role in the subjects' decisions due to anonymous data collection and randomized sampling of groups. Furthermore, since the subjects learned their roles only after the experiment was completed, they made their decisions in accordance with the impartial observer theorem (Harsanyi 1953, 1955) from behind the veil of ignorance (VOI).[16] Median Vote is our main voting rule, whereas Random Dictator is exclusively employed as a robustness check in the NR treatment with a reduced number of subjects. Hopp et al. (2018) found redistribution choices in the lab to be more extreme under the *Random Dictator* rule than under that *Median Vote*.

3.2 Elicitation of Risk Attitudes and Social Preferences

The first part of the experiment elicited risk attitudes using a standardized lottery-selection design (see Holt and Laury 2002, 2005) in the modified version of Balafoutas et al. (2012), where the subjects have to decide between a secure payment $12.5 \times z$, $z = 1, \ldots, 10$ and a lottery $(125, 0.5; 0, 0.5)$. A subject should switch only once from the risky lottery to the safe payment but never in the other direction. If a subject switches before $z = 5$, she is risk-averse; otherwise, she is risk-loving. The *risk index* is given by $R = z/10$, where smaller values reflect more risk aversion. $R = 1$ if the safe payment is chosen only when it stochastically dominates the lottery. When a subject switched more than once or in the wrong direction, R was set equal to 0.5. One decision was randomly chosen and paid out. For the instructions, see Appendix C.1.

In part 2, we elicited our subjects' social preferences using the double price-list technique developed by Kerschbamer (2015) and applied, for example, in Balafoutas et al. (2012). For the instructions see Appendix C.2. The elicitation method engages subjects with two blocks of five binary choices between different allocations. In the first block, the subjects have to decide how to distribute 100 between themselves and another random subject: they can choose an egalitarian distribution of $50 : 50$ or an unequal distribution of $50 + x : 65$, where $x \in \{-10, -5, 0, 5, 10\}$. Obviously, the unequal

[16]For experimental studies comparing redistribution preferences from behind a VOI of involved and uninvolved dictators, see, for example, Amiel et al. (2009), Traub et al. (2009), and Durante et al. (2014).

distribution increases efficiency from 5 up to 25 points, but involves *disadvantageous inequality* for the decision maker. A rational subject switches at most once from the egalitarian distribution (50 : 50) to the unequal distribution ($50 + x : 65$), but never in the other direction. If a subject switches to the unequal distribution before or at $x = 0$, it means she is willing to sacrifice her own income in order to increase efficiency. If she switches later, it means she is willing to tolerate disadvantageous inequality only when being compensated for it. A measure of *efficiency preference*, therefore, is given by the willingness-to-pay $WTP_d = -(0.5 \times (x_{-1} + x))/15$, where x_{-1} is the last choice before switching. We set WTP_d to 0.667 (-0.667) if a subject chooses the unequal (egalitarian) distribution in all rounds. *The larger WTP_d, the greater the subject's preference for efficiency.*

Analogously, the second block, the *advantageous inequality* block, involves five choices between an egalitarian distribution of 100 points (50 : 50) and an unequal distribution $50 + y : 35$, where $y \in \{-10, -5, 0, 5, 10\}$. The unequal distribution decreases efficiency from 5 up to 25 points and involves advantageous inequality for the decision maker. Own payoff maximization would imply that the subject switches to the unequal distribution only after $y = 0$ (50 : 35). If she switches before that choice, she is spiteful, willing to sacrifice her own income in order to minimize the income of the other player. The later she switches, the more compensation she would require to tolerate advantageous inequality. A measure of *inequality aversion*, therefore, is given by the willingness-to-pay $WTP_a = (0.5 \times (y_{-1} + y))/15$, where y_{-1} is the last choice before switching. We set WTP_a to -0.667 (0.667) if a subject chooses the unequal (egalitarian) distribution in all rounds. *The larger WTP_a, the greater the subject's inequality aversion.*

The two blocks were presented randomly. The subjects received a combined payoff of one of the ten choices as a decision maker and one of the ten choices as an 'other participant'. It was not possible to be matched with the same person twice.

3.3 Post-Experimental Questionnaire

After the end of the experiment, we asked the subjects to fill in a non-incentivized personal questionnaire. We asked for subjects' gender, age, and major. We also asked them to state whether they would evaluate themselves as 'risk-neutral', 'risk-averse', or 'risk-loving' on a five-point scale. The Q-index was encoded as follows: $Q = -2, -1, 0, 1, 2$, from risk-averse to risk-loving. Next to these questions, we asked subjects, first, whether mortality risk played a role in their decision (not asked in the NR treatment), and, second, what type of social security they assumed behind the unspecified social security in the experiment.

In two sessions each of the ER and SRC treatments, we applied the following three instruments to elicit subjects' attitudes towards justice and redistribution (also see Appendix C.4):

1. The 'General Belief in a Just World Scale' (GBJW) by Dalbert et al. (1987), a six-item inventory from the psychology literature, and originally developed in the German language, to determine subjects' general belief in a just world. Subjects had to state whether they agree or disagree to the six statements on a six-point scale. The GBJW $\in [1, 6]$ score is the average of the six items, where lower scores mean a stronger belief in a just world.

2. A question from the World Values Survey (WVS), a ten-point scale to elicit subjects' beliefs about whether it is 'effort' or 'luck and connections' (ELC) that brings success in life. Higher values of the ELC $\in [1, 10]$ score indicate a stronger belief in luck and connections.

3. A vignette describing the correlation between low income and mortality in the context of old-age poverty to elicit subjects' propensity to blame victims (see Montada et al. 1986, Montada 1998). Subjects were asked for their degree of agreement or disagreement with four statements on a six-point scale. The PBV $\in [1, 6]$ score is the average of the four items (the two negatively worded statements 2 and 3 were recoded accordingly), where higher scores mean a greater propensity to blame victims.

3.4 Procedure

The experiment was programmed in z-tree (Fischbacher 2007) and conducted at the experimental laboratory of the University of Hamburg (WiSo Forschungslabor) between June 2019 and August 2021. Subject recruiting was done using h-root (Bock et al. 2014). Participation took about 55 minutes. Payoffs ranged from 7.50 Euro to 33.00 Euro; the average payoff was 18.00 Euro.

We conducted two sessions each for treatments No Risk (NR), Skewed Risk & Leaky Bucket (SRL), and Skewed Risk & Compensation (SRC), and 4 sessions for treatment Equal Risk (ER). 250 subjects (5 subjects per group × 5 groups per session × 2(4) sessions per treatment × 4 risk treatments) participated in these sessions. We collected six observations on the redistribution parameter λ for each subject. Altogether, we have 1500 observations, which will be treated as independent since we used the random lottery incentive system (only one randomly chosen round was paid off). Additionally, we conducted one session with 25 subjects for the NR treatment with a random dictator setup (150 observations) in order to test for response mode effects (see Appendix B). Under the Random Dictator treatment, subjects on average chose a higher level of redistribution, and egalitarian choices were more frequent than under the Median Voter treatment.

The majority of the subjects in the 10 main sessions is female[17] (150, 60%). The subjects' average age is 26.7 years. A relative majority of the subjects major in economics or business (58, 23.2%). The average risk score according to the Holt-Laury test is $\bar{R} = 0.52$, that is, close to risk neutrality ($R = 0.5$). The average risk self-assessment is $\bar{Q} = -0.09$, that is, slightly risk averse ($Q < 0$). Subjects' mean WTP_d is 0.08 (neutral towards efficiency) and the mean WTP_a is 0.32 (mildly inequality averse).

4 Working Hypotheses

Preference for Intragenerational Redistribution

Most real-world pension schemes involve at least some intragenerational redistribution (see Krieger and Traub 2011, 2013) because a majority of voters exhibit a preference for political income redistribution. Höcht et al. (2012) show experimentally that voters' fairness preferences matter for redistribution outcomes only when the fair–minded voters are pivotal. Using data from the International Social Survey Programme (ISSP) for twelve OECD countries, Corneo and Grüner (2002) report that in all countries except for Australia, Canada, and the US, most respondents support the statement that the government is responsible for reducing the differences in income between people with high incomes and those with low incomes. Hence, we hypothe-

[17]In the regression analysis below, one neither female nor male subject will be included in the base category 'male'.

size that the average subject, who has to balance entitlements in the form of contributions with expected benefits, generally exhibits a preference for intragenerational redistribution:

H1(*preference for intragenerational redistribution*): $0 < \lambda^\star < 1$.

Mortality Risk

How does the treatment variation with respect to the mortality risk affect subjects' redistribution preferences? The preferred redistribution parameter $\lambda^\star$ corresponds for each income position to a certain ratio of expected benefits to contributions, $\theta_i = (1 - p_i)b_i/c_i$. If $\lambda = 0$ and $p_i = p \; \forall \; i$, then θ_i is equal for all income positions and $\theta_i/\theta_j = 1$. Choosing $\lambda > 0$ favors low income positions i over high income positions j, $\theta_i > \theta_j$ and $\theta_i/\theta_j > 1$. Introducing equal mortality risk does not alter the 'fair' ratio between any two expected-benefit-to-contribution ratios. Hence, we hypothesize that the preferred redistribution parameter is not affected by equal mortality risk:

H2(*equal mortality risk*): $\lambda^\star_{\text{NR}} = \lambda^\star_{\text{ER}}$.

In contrast, skewed mortality risk lowers the ratio of expected benefits to contributions θ_i more than θ_j and, therefore, requires a *higher* level of redistribution in order to keep θ_i/θ_j constant:

H3(*skewed mortality risk*): $\lambda^\star_{\{\text{SRL, SRC}\}} > \lambda^\star_{\{\text{ER, NR}\}}$.

One objection might be that skewed mortality risk involves an efficiency loss. When subjects exhibit efficiency preferences, they reduce redistribution, causing the intragenerational redistribution puzzle. Hence, we implemented, as described in Subsection 3.1, skewed default risk in two different treatments, SRL and SRC, where SRC does not involve a 'leaky bucket'. Since SRC is then equivalent to ER in terms of efficiency, we should observe:

H3'(*efficiency loss*): $\lambda^\star_{\text{SRL}} < \lambda^\star_{\text{SRC}} = \lambda^\star_{\text{ER}}$.

However, we suspect that an additional cause of the intragenerational redistribution puzzle is that inequality arising from skewed default risk is not seen as a societal but as an individual problem, and this reduces the propensity to redistribute in favor of the poor. To investigate this conjecture, we test

H3"(*alienation effect*): $\lambda^\star_{\text{SRC}} < \lambda^\star_{\text{ER}}$.

Replacement Ratio and Distribution of Entitlements

Since the replacement ratio r cancels out of the fraction θ_i/θ_j, it should not affect the choice of the redistribution parameter:

H4(*replacement ratio*): $\lambda^{\star}_{r=\text{Low}} = \lambda^{\star}_{r=\text{High}}$.

Comparing the symmetric distribution with low variance (SL) and the symmetric distribution with high variance (SH), higher variance leads to higher θ_i/θ_j-ratios for given $\lambda > 0$ and, therefore, we expect *lower* redistribution parameters in the latter treatment. Comparing the symmetric distribution with low variance (SL) and the right-skewed distribution with low variance (RL), right-skewedness leads to lower θ_i/θ_j-ratios for given $\lambda > 0$ and, therefore, we expect *higher* redistribution parameters:

H5a(*variance*): $\lambda^{\star}_{SH} < \lambda^{\star}_{SL}$, and
H5b(*skewness*): $\lambda^{\star}_{RL} > \lambda^{\star}_{SL}$.

Risk Aversion, Inequality Aversion, and Efficiency Preferences

We hypothesize in line with Gaertner et al. (2017) that risk aversion in social planners leads to higher redistribution preferences (R denotes the risk index, Q the risk self-assessment; see Subsection 3.2). Moreover, we expect that inequality averse social planners are less inclined to accept inequality of contributions as a justification for inequality of expected benefits (WTP_a denotes the willingness to pay for advantageous inequality, see Subsection 3.2). We should also observe a negative correlation between subjects' efficiency preference WTP_d (see Subsection 3.2).

H6a(*risk aversion*): $\partial\lambda^{\star}/\partial R < 0$ and $\partial\lambda^{\star}/\partial Q < 0$,
H6b(*inequality aversion*): $\partial\lambda^{\star}/\partial WTP_a > 0$, and
H6c(*efficiency preferences*): $\partial\lambda^{\star}/\partial WTP_d < 0$.

5 Results

The presentation of the results proceeds as follows. In Subsection 5.1, we analyze the data with respect to between-subjects treatment effects (risk treatments). In Subsection 5.2, we turn to the within-subjects treatment effects (replacement ratio and entitlement distribution). The third subsection confirms the results of analyzing mean levels of redistribution by a random-effects panel tobit regression, where we also control for subjects' sociodemographic characteristics and attitudes. Subsection 5.4 investigates potential preference channels for the relationship between efficiency loss and the level of redistribution, namely efficiency preferences and risk preferences. Subsection 5.5 investigates possible preference channels for the relationship between skewed mortality risk and redistribution, namely inequality aversion, generalized beliefs in a just world, belief in effort or luck and connections, and the propensity to blame the victim. Each part of the analysis ends with a summary result. Note that we briefly compare the results of the median voter setup with the random dictator setup in Appendix B. The data analysis was done using the statistical package STATA. The data and do-files are available from the authors upon request.

5.1 Mortality Risk and Redistribution

Figure 1 displays the mean of the preferred level of redistribution (λ in percent) by mortality risk. Recall that we applied four different risk treatments: No Risk (NR), Equal Risk (ER), Skewed Risk & Leaky Bucket (SRL), and Skewed Risk & Compensation (SRC). Case numbers, means, and standard errors can be taken from Table 7 in the Appendix.

The figure shows that the mean level of redistribution is between 50% and 70%, depending on the risk treatment. In order to test hypothesis **H1** ($0 < \lambda^\star < 1$), we performed the following binomial test. Assuming that the subjects choose $\lambda^\star = 0$ ($\lambda^\star = 1$) with probability $p = 10\%$ and $\lambda^\star > 0$ ($\lambda^\star < 1$) with probability $1 - p = 90\%$, where p is the significance level of the test, the critical value for $n = 300$ is $k = 30$ (apart from ER, where $n = 600$ and $k = 60$). We actually observe, in the order of the treatments, $k = [18, 31, \mathbf{45}, \mathbf{38}]$ ($k = [0, 2, 5, 0]$). Accordingly, if we consider individual choices instead of means, the test results show that the first part of **H1**, $\lambda^\star > 0$, has to be rejected for both skewed mortality risk treatments, since subjects did not redistribute at all in significantly more choices than expected. On the other hand, the second part of **H1**, $\lambda^\star < 1$, cannot be rejected for any of the treatments.

In the NR treatment, subjects' mean redistribution preference is 70.22%; in ER it is 67.88%, see Figure 1. Their difference is insignificant ($p = 0.290$, two-tailed t test). This result confirms hypothesis **H2** ($\lambda^\star_{\mathrm{NR}} = \lambda^\star_{\mathrm{ER}}$) that introducing equal mortality risk does not alter subjects' redistribution pref-

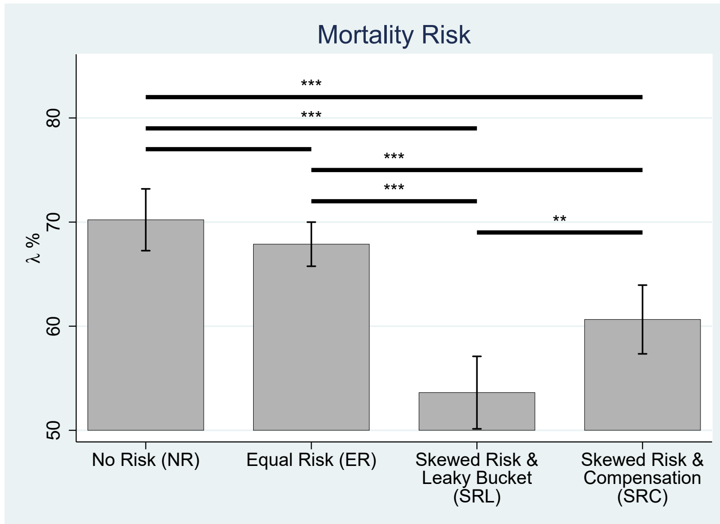

Figure 1: Mean Level of Redistribution by Mortality Risk. Error bars represent 90% confidence intervals for the mean of the redistribution parameter λ in percent. $n = 300$ ($n = 600$) for each bar NR, SRL, and SRC (ER). Asterisks denote the significance level of a two-tailed t-test (Welch test) on the equality of two means: *$p \leq 0.10$, **$p \leq 0.05$, ***$p \leq 0.01$.

erences.

Hypothesis **H3** ($\lambda^{\star}_{\{\text{SRL, SRC}\}} > \lambda^{\star}_{\{\text{ER, NR}\}}$), which holds that skewed mortality risk causes a higher average redistribution preference in subjects (who want to keep the ratio of expected benefits and contributions constant) is clearly rejected (see Figure 1). In fact, in SRL the average redistribution parameter is 53.62%, which is significantly *lower* than the 70.22% ($p \leq 0.01$) in NR and the 67.88% ($p \leq 0.01$) in ER. The same applies to SRC. Here, the redistribution parameter is 60.64%, which is also significantly *lower* than in NR ($p \leq 0.01$) and ER ($p \leq 0.01$).

Turning to the efficiency-loss hypothesis (**H3'**: $\lambda^{\star}_{\text{SRL}} < \lambda^{\star}_{\text{SRC}} = \lambda^{\star}_{\text{ER}}$), we observe a significant difference between SRL and SRC ($p = 0.016$) in the direction postulated by the hypothesis. However, the second part ($\lambda^{\star}_{\text{SRC}} = \lambda^{\star}_{\text{ER}}$) is clearly rejected, because in SRC redistribution is still lower than in ER ($p \leq 0.01$) (and also NR, $p \leq 0.01$). Hence, the alienation-effect hypothesis (**H3"**: $\lambda^{\star}_{\text{SRC}} < \lambda^{\star}_{\text{ER}}$) cannot be rejected by the data.

We summarize this part of the analysis as follows:

Result 1 *Mortality risk does not generally reduce redistribution, but only when it is unequally distributed. This result confirms the intragenerational redistribution puzzle. However, the puzzle cannot be explained by the efficiency loss alone; it requires a further explanation, which could be the alienation effect.*

5.2 Replacement Ratio and Distribution of Entitlements

Figure 2 displays the mean of the preferred level of redistribution (λ in percent) by replacement ratio (Panel a) and shape of entitlement distribution (Panel b). Again, case numbers, means, and standard errors can be taken from Table 7 in the Appendix.

The mean value of λ for a high replacement ratio (61.88%) is significantly lower than for a low replacement ratio (66.21%, $p \leq 0.05$). Hence, we have to reject **H4** ($\lambda^{\star}_{r=\text{Low}} = \lambda^{\star}_{r=\text{High}}$). This means that the elasticity of the redistribution parameter with respect to the replacement ratio is negative, $d\lambda^{\star}/dr = -21.65\%$, that is, larger social security systems involve less redistribution. The observation agrees perfectly with the empirical evidence concerning the relative size of Beveridgean and Bismarckian social security systems (Krieger and Traub 2011, 2013).

Somewhat surprisingly, there are no significant differences for λ with respect to the shape of the entitlement distribution. Hence, we have to reject hypotheses **H5a** ($\lambda^{\star}_{SH} < \lambda^{\star}_{SL}$) and **H5b** ($\lambda^{\star}_{RL} > \lambda^{\star}_{SL}$).

We summarize this part of the analysis as follows:

Result 2 *Larger social security systems involve less redistribution. Changing the inequality of the distribution of entitlements does not affect the level of redistribution.*

5.3 Regression Analysis

In Table 3, we present the results of a regression analysis for the treatment effects with the preferred level of redistribution as the endogenous variable. Since $\lambda \in [0, 100]\%$ is censored from below and above, and because we have repeated measurements (six observations per subject corresponding to the six rounds of the experiment), we apply a random effects tobit panel model. Model I reports the between-subjects treatment effect of mortality

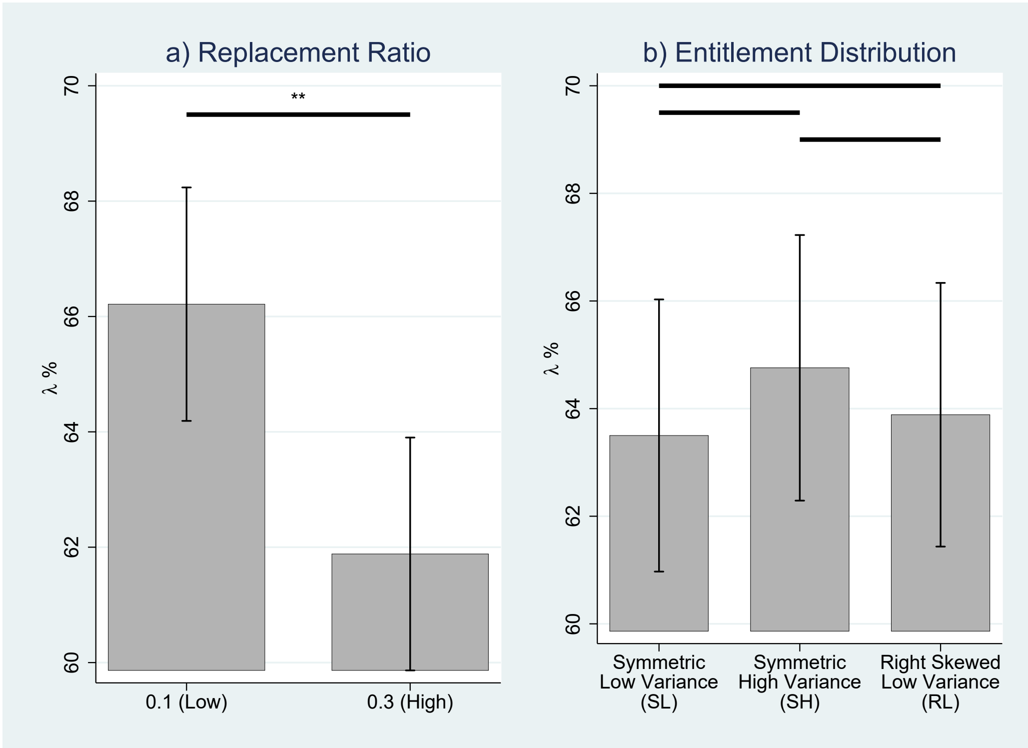

Figure 2: Mean Level of Redistribution by Replacement Ratio (Panel a), and Entitlement Distribution (Panel b). Error bars represent 90% confidence intervals for the mean of the redistribution parameter λ in percent. Case numbers: a) $n = 750$ for each bar; b) $n = 500$ for each bar. Asterisks denote the significance level of a two-tailed t-test (Welch test) on the equality of two means: $^{*}p \leq 0.10$, $^{**}p \leq 0.05$, $^{***}p \leq 0.01$.

risk, Model II reports the within-subjects treatment effect of varying the replacement ratio and the shape of the entitlement redistribution, Model III combines both, and Model IV additionally includes sociodemographic controls, risk self-assessment, and the outcome of the social-preferences test. Note that we used the risk self-assessment Q instead of the risk-index R, because it gave a better fit in the regressions. The correlation between both variables is 0.325 ($p \leq 0.01$).

As can be seen in the table, the tobit panel regression largely confirms Result 1. While introducing equal mortality risk (ER) did not alter subjects' redistribution preferences as compared to the base category (NR), mortality

Table 3: Regression Analysis of Treatment Effects

Model	I	II	III	IV
Mortality Risk (Base Category: NR)				
ER	-3.37	—	-3.44	-1.30
	(8.11)		(8.11)	(7.80)
SRL	-26.68***	—	-26.74***	-26.60***
	(9.35)		(9.35)	(9.03)
SRC	-19.26**	—	-19.30**	-18.26**
	(9.32)		(9.32)	(9.11)
χ^2(SRL=SRC)	0.64	—	0.64	0.87
Replacement Ratio (Base Category: Low)				
High	—	-6.56***	-6.57***	-6.58***
		(1.93)	(1.93)	(1.93)
Entitlement Distribution (Base Category: SL)				
SH	—	2.67	2.67	2.67
		(2.36)	(2.36)	(2.36)
RL	—	1.42	1.41	1.42
		(2.36)	(2.36)	(2.36)
Intercept	84.35***	75.81***	86.31***	90.35***
	(6.64)	(3.48)	(6.85)	(15.39)
Controls	No	No	No	Yes
Wald χ^2	12.60***	12.81***	25.34***	47.84***
n	1500	1500	1500	1500

Table notes. First row: coefficient of a random-effects tobit model with the redistribution parameter λ in percent as the endogenous variable. Second row: standard errors in parenthesis. 132 left censored observations (lower limit: 0%); 477 right censored observations (upper limit: 100%). Controls: Gender, Age, Economics Student, Risk Self-Assessment Q (Risk Loving: $Q \geq 0$, Risk Averse: $Q < 0$), Inequality Aversion WTP_a, Efficiency Preference WTP_d. Asterisks denote the significance level of a two-tailed t-test: *$p \leq 0.10$, **$p \leq 0.05$, ***$p \leq 0.01$.

risk that is negatively correlated with entitlements generally led to a significant drop in the redistribution parameter λ of more than 26 percentage points in SRL and about 19 percentage points in SRC in Models I, III, and IV.

Contrary to our previous result for the efficiency loss hypothesis (**H3'**), the regression coefficients of the skewed mortality risk treatments with a 'leaky bucket' (SRL) and with compensated efficiency loss (SRC) are not significantly different (see the row with the respective χ^2-values). This result strengthens our argument that efficiency concerns alone cannot explain the intragenerational redistribution puzzle. Note that a technical reason for this slight discrepancy is that accounting for multiple observations leads to higher standard errors.

The regression analysis clearly confirms Result 2 regarding the size of the social security (replacement ratio) and inequality (distribution of entitlements), see Models II-IV.

Table 4: Control Variables

Model	IV
Variable	all
Gender	-2.96
(1=female)	(6.02)
Age	-0.17
	(0.50)
Economics	-14.05**
(1=yes)	(6.75)
Risk Self-	-11.26***
Assessment Q	(3.16)
Efficiency	-9.39
Preference WTP_d	(10.05)
Inequality	13.25
Aversion WTP_a	(11.04)
Wald χ^2	47.84***
n	1500

Table notes. First row: coefficient of a random-effects tobit model with the redistribution parameter λ in percent as the endogenous variable. Second row: standard errors in parenthesis. 132 left censored observations (lower limit: 0%); 477 right censored observations (upper limit: 100%). Risk Self-Assessment $Q = -2, -1, 0, 1, 2$, Risk Averse: $Q < 0$, Risk Loving: $Q \geq 0$. Efficiency preference: $WTP_d \in [-0.667, 0.667]$; Inequality Aversion: $WTP_a \in [-0.667, 0.667]$. Asterisks denote the significance level of a two-tailed t-test: *$p \leq 0.10$, **$p \leq 0.05$, ***$p \leq 0.01$.

Including the control variables in Model IV (see Table 4) reveals that subjects' risk self-assessment is highly significant ($p \leq 0.01$). The more risk-averse a subject was (the lower the Q value is), the more she was willing to redistribute entitlements, which is in line with hypothesis **H6a**. Both inequality aversion (WTP_a) and the efficiency preference (WTP_d) exhibit the expected sign (positive for inequality aversion, negative for the efficiency preference), but neither regression coefficient is significant. Hence, we have to reject **H6b** and **H6c**.

Result 3 *In line with the literature (see Gaertner et al., 2017), risk aversion in social planners leads to a high level of redistribution.*

Gender and age did not correlate with subjects' redistribution preferences. Economics students' willingness to redistribute was significantly lower as compared to other students. This observation is in line with the social preferences literature showing that economics students are on average less inequality averse and attach more value to efficiency (see, for example, Fehr et al. 2006).

5.4 Efficiency Loss and Redistribution

In this subsection, we take a closer look at the effect of the efficiency loss on the level of redistribution. There could be two preference channels for the effect. First, we suppose a direct effect via subjects' efficiency preferences. In the previous subsection (see Table 4), we have shown that efficiency preferences, measured by WTP_d, exhibit an insignificant negative effect on the level of redistribution when entering the regression as a covariate. However, analyzing the *interaction* between the risk treatment and efficiency preference may reveal additional insights. We expect that the negative association between efficiency preference and level of redistribution in the risk treatment with efficiency loss (SRL) is greater than in the equal risk treatment without efficiency loss (ER), $|\partial\lambda^\star_{\text{SRL}}/\partial WTP_d| > |\partial\lambda^\star_{\text{ER}}/\partial WTP_d|$. In contrast to this, the SRC treatment compensates subjects for the efficiency loss. Hence, we expect that there is no difference between SRC and ER treatment, $|\partial\lambda^\star_{\text{SRC}}/\partial WTP_d| = |\partial\lambda^\star_{\text{ER}}/\partial WTP_d|$.

The second channel could affect the level of redistribution via the subjects' risk preferences. In the previous subsection (see Table 4), we have shown that risk aversion in subjects, measured by Q, increases the level of redistribution

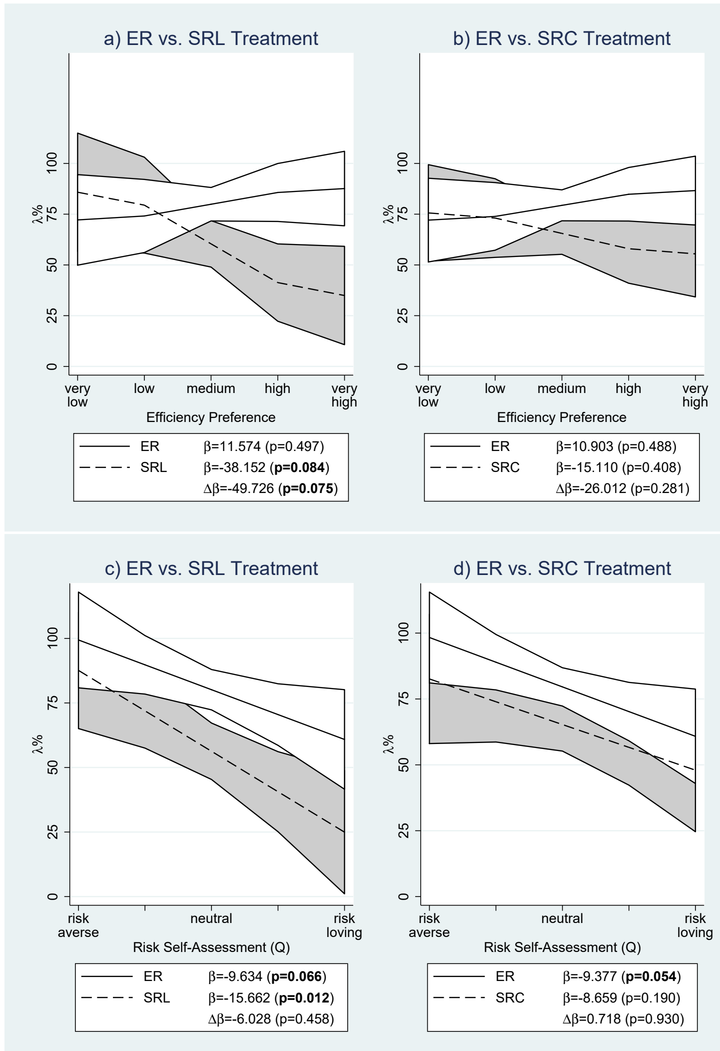

Figure 3: Efficiency Loss and Redistribution. The diagrams display the marginal effect (ME) β of efficiency preference WTP_d (upper panels) and risk self-assessment Q (lower panels) on the level of redistribution λ in percentages and their 90% confidence intervals. Risk treatments: ER=equal risk, SRL=skewed risk & leaky bucket, SRC=skewed risk & compensation. ME is estimated by a random-effects tobit panel regression. The legends also display the interaction terms of $WTP_d \times$ Risk Treatment and $Q \times$ Risk Treatment, $\Delta\beta$. $n = 1200$.

when entering the regression as a covariate. Here, we also analyze the *interaction* between the risk treatment and risk self-assessment. The expected loss of efficiency in the SRL treatment makes it riskier to redistribute in favor of the poor. Hence, we expected that risk averse subjects redistribute less in the SRL as compared to the ER treatment, $|\partial\lambda^\star_{\text{SRL}}/\partial Q| > |\partial\lambda^\star_{\text{ER}}/\partial Q|$. In contrast to this, there should be no difference between the SRC and ER treatments, $|\partial\lambda^\star_{\text{SRC}}/\partial Q| = |\partial\lambda^\star_{\text{ER}}/\partial Q|$.

Figure 3 displays the results of testing the efficiency-preference channel (top panels) and the risk-preference channel (bottom panels). The diagrams show the marginal effect β of WTP_d (Q) on the level of redistribution by treatment and 90% confidence intervals. The marginal effect is estimated by a random-effects tobit panel regression. In the legend, we also display the interaction term $WTP_d \times$ Risk Treatment ($Q \times$ Risk Treatment), $\Delta\beta$. Additionally, Table 5 shows the contrast (i.e. the treatment difference of the estimated marginal effect on the level of redistribution) for different scores of WTP_d and Q.

Table 5: Efficiency Loss: Contrast of the Marginal Effects

	ER vs. SRL			ER vs. SRC		
Score	Contrast	se	p	Contrast	se	p
efficiency preference (WTP_d)						
very low	13.6	22.3	0.540	3.5	19.1	0.853
low	5.3	18.0	0.767	-0.8	15.5	0.958
medium	-19.5	8.6	0.023	-13.8	7.8	0.076
high	-44.4	14.5	0.002	-26.8	13.1	0.040
very high	-52.7	18.5	0.004	-31.2	16.5	0.059
risk self-assessment (Q)						
risk averse	-11.8	17.7	0.505	-15.7	18.2	0.388
-1	-17.8	11.1	0.109	-15.0	11.3	0.183
neutral	-23.8	8.2	0.003	-14.3	7.5	0.058
+1	-29.9	11.9	0.012	-13.6	11.0	0.218
risk loving	-35.9	18.7	0.055	-12.9	17.9	0.473

Table notes. Contrast (treatment difference of the estimated marginal effects of WTP_d and Q on the level of redistribution) at different scores in percentage points. Random-effects panel tobit regression. se: standard error. p: significance level. $n = 1200$.

Panel a) of Figure 3 shows (i) that there is no relationship between efficiency preference and redistribution in the ER treatment, (ii) that there is a significant negative relationship between efficiency preference and redistribution in the SRL treatment, and (iii) that the interaction term is significant. Moreover, Table 5 points out that this interaction is mainly due to the subjects who have at least medium or higher efficiency preferences.

As expected, Panel b) confirms that there is no such effect for the comparison of the ER and SRC treatments, because the negative association between efficiency preference and level of redistribution in the SRC treatment is much weaker and becomes insignificant. However, the contrasts in Table 5 still indicate significant treatment effects in the—at least mildly—efficiency-loving subjects (even though there is no efficiency loss). Perhaps, these subjects suspect that the compensation procedure itself involves inefficiency losses.

With respect to the risk-preference channel, Panels c) and d) of Figure 3 broadly confirm the strong positive relationship between risk aversion and redistribution preference that we already recorded in Result 3. The interaction terms are insignificant. The lower panel of Table 5 indicates, if at all, a very mild interaction effect for the SRL treatment, because the contrasts become greater as the level of risk aversion decreases.

We summarize the analysis as follows:

Result 4 *The main channel for the effect of efficiency losses on the level of redistribution is the subjects' efficiency preferences.*

5.5 Alienation Effect

The previous analysis has shown that efficiency preferences are important for explaining reduced redistribution in the SRL treatment. However, Result 1 and the regression analysis have shown that the intragenerational redistribution puzzle cannot be explained by efficiency preferences alone, because redistribution is still significantly lower in the SRC treatment than in the ER treatment even though subjects are compensated for the expected loss of benefits. We called this phenomenon, that is, the tendency to attach a lower social weight to the short-lived poor, the 'alienation effect'. In this subsection, we are looking for channels through which the skewness of the mortality-risk distribution may affect the level of redistribution when subjects are compensated for the efficiency loss. Hence, we only compare ER and SRC treatments in the following.

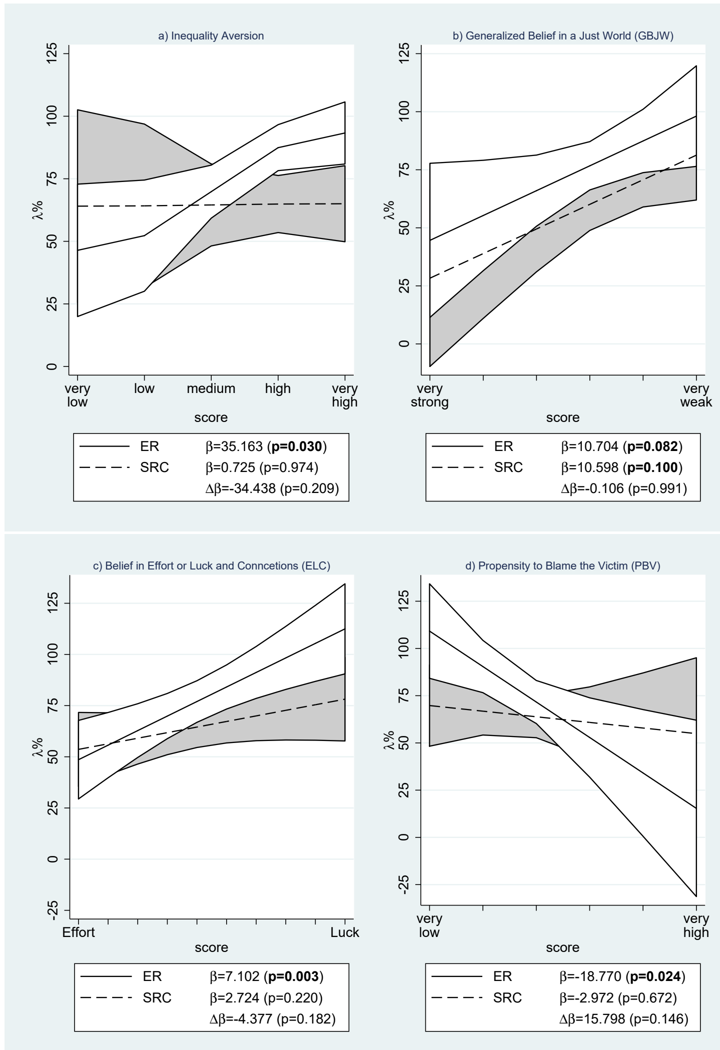

Figure 4: Alienation Effect. The diagrams display the marginal effect (ME) β of a) inequality aversion WTP_a, b) belief in a just world (GBJW), c) belief in effort or luck and connections (ELC), and d) the propensity to blame the vicitim (PBV) on the level of redistribution λ in percentages by risk treatment (ER: equal risk, SRC: skewed risk & compensation) and their 90% confidence intervals. ME is estimated by a random-effects tobit panel regression. The legends also display the interaction terms of item and risk treatments, $\Delta\beta$. $n = 900$.

We investigate four different channels for the alienation effect (see Figure 4): Panel a) inequality aversion (WTP_a), Panel b) generalized belief in a just world (GBJW), Panel c) belief in effort or luck and connections (ELC), and Panel d) propensity to blame victims (PBV). Table 6 shows the contrast of the marginal effect between both treatments at different scores.

The figure shows in Panel a) that inequality aversion has a strong negative effect on the level of redistribution in the ER treatment, but not in the SRC treatment (where the regression line is almost flat). The interaction term is insignificant. The contrast table indicates, however, that subjects who exhibit a high or very high inequality aversion score choose a much higher level of redistribution in the ER treatment than in the SRC treatment. In other words, the skewness of the risk distribution seems to significantly mitigate the inequality-averse subjects' interest in redistribution.

We do not see the same effect for the generalized belief in a just world (Panel b). Higher scores (which mean a weaker belief in a just world) lead to higher redistribution preferences irrespective of the treatment. Turning to the belief in effort or luck and connections (Panel c) shows that believing in luck and connections produces a significantly higher redistribution preference in the ER treatment, while the regression line of the SRC treatment is, like in Panel a), almost flat. Again, the contrast of the marginal effect is significant at higher scores only when subjects have a strong belief that success in life is mainly due to luck and connections. The analysis of the propensity to blame the victim in Panel d) reveals the same pattern. In SRC, subjects' redistribution preferences are almost unaffected by their PBV score; in ER, the marginal effect of the PBV score is significantly negative. The bottom panel of Table 6 shows that the contrast of the marginal effect is significant for subjects who have a low tendency to blame victims.

Result 5 *The alienation effect, i.e. the tendency to redistribute less when mortality risk is negatively correlated with income, can be traced back to the behavior of the inequality averse individuals, to those who believe that success in life is mainly a matter of luck and connections, and to those who think that the poor are not accountable for their fate. So, one could say that it is precisely those who have a relatively high preference for redistribution who show less interest in redistribution when mortality is negatively correlated with income. The empirically surprising decrease in intragenerational redistribution thus indicates a certain 'alienation' of society from the poor.*

Table 6: Alienation Effect: Contrast of the Marginal Effects

Score	ER vs. SRC Contrast	se	p
inequality aversion (WTP_a)			
very low	17.7	28.4	0.534
low	11.9	24.0	0.620
medium	-5.31	11.9	0.654
high	-22.5	8.88	0.011
very high	-28.3	11.9	0.018
belief in a just world ($GBJW$)			
very strong	-16.3	30.7	0.595
2	-16.4	22.3	0.462
3	-16.5	14.6	0.258
4	-16.6	9.3	0.074
5	-16.7	10.9	0.126
very weak	-16.8	17.6	0.340
belief in effort or luck & connections (ELC)			
effort	5.0	16.0	0.753
4	-8.1	9.4	0.388
7	-21.2	10.6	0.046
luck	-34.4	18.2	0.059
propensity to blame the victim (PBV)			
very low	-39.4	20.0	0.049
2	-23.6	11.3	0.038
3	-7.8	9.7	0.418
4	8.0	17.1	0.641
5	23.8	27.0	0.379
very high	39.6	37.4	0.290

Table notes. Contrast (treatment difference of the estimated marginal effects of WTP_a, $GBJW$, ELC, and PBV on the level of redistribution) at different scores in percentage points. Random-effects panel tobit regression. se: standard error. p: significance level. $n = 900$.

6 Discussion and Conclusion

In this paper, we studied, by means of a laboratory experiment, the causal relationship between heterogeneity in life expectancy resulting from socioeconomic status (SES), that is, economic inequality, and the degree of intragenerational redistribution in a stylized social security system. More specifically, we investigated whether and how an involved social planner behind the veil of ignorance reacts to mortality risk differentials.

We designed the stylized social security system as a two-stage lottery that involves uncertainty with regard to (i) one's income position in the group and (ii) one's mortality risk (default probability). We expected the inclusion of mortality risk to affect redistributive preferences only when mortality risk is negatively correlated with entitlements. In order to compensate group members with low entitlements for their reduced expected payoffs, a social planner would have to *increase* the level of intragenerational distribution.

The analysis of our experimental data shows that introducing equal mortality risk does not affect the social planner's preferred level of redistribution as compared to the treatment without mortality risk. However, the social planner's preferred level of intragenerational redistribution significantly *decreases* when the additional uncertainty caused by mortality risk is negatively correlated with entitlements.

This result helps to explain the intragenerational redistribution puzzle that motivated our experiment in the first place, that is, the empirical observation that in most OECD countries pension reform policy decreased the level of intragenerational redistribution over the last decades instead of counterbalancing the regressive impact of heterogeneity in life expectancy based on SES. Three main conclusions can be drawn from our findings.

First, a comparison of the two treatments that include skewed mortality risk with and without efficiency losses shows that efficiency preferences alone cannot explain the intragenerational redistribution puzzle. This can be seen from the fact that there was significantly less redistribution as compared to equal risk even when subjects were compensated for the efficiency loss.

Second, negatively correlated mortality risk seems to have shifted subjects' attention from those group members who exhibited low entitlements and high mortality risk to the whole group. In particular, those who generally showed a relatively high preference for redistribution (in terms of high inequality aversion, a strong belief that success in life is due to luck and connections, and a low propensity to blame the victim) showed less interest in redistribution when mortality was negatively correlated with entitlements. We have called this pattern of behavior the *alienation effect*.

Third, the 'passive' alienation effect is different from actively blaming the low-entitlement-high-mortality-risk group members for their own misery. Hence, the alienation effect complements the literature on *accountability* and redistribution (see, for example, Konow 1996, Krawczyk 2010, Cappelen et al. 2013, Durante et al. 2014) by adding a new aspect to the literature.

All in all, as far as the results from our laboratory experiment can be generalized to real world social security systems, our results suggest that the intragenerational redistribution puzzle can only partly be explained by efficiency concerns. Our results show that the demand for redistribution decreases also because society becomes alienated from the needs of the poor.

Another angle of the problem is that the less people know about their future SES, the more they perceive redistribution within their respective cohort as a decision-making problem under risk. Hence, while a relatively risk-averse society generally prefers a higher level of redistribution, a relatively risk-loving society prefers less intragenerational redistribution, that is, a more Bismarckian social security system. We have confirmed this relationship between risk preference and redistribution preference with our experiment. This conclusion is in line with Alesina et al. (2018), who have shown that US citizens are more (and too) optimistic about intergenerational income mobility in comparison to European citizens and therefore prefer less income redistribution.[18]

One potential criticism of our experimental design concerns an insufficient salience of the social security framing and therefore subjects ignorance of the source of entitlements. We conclude from three facts that this is not the case.

[18]In empirical studies, employment status is often used as a proxy variable for the risk attitude. For example, Guillaud (2013) performed an empirical cross-country analysis of preferences for redistribution in 33 countries where she distinguished between workers in the private sector, the self-employed, and the publicly employed. She showed that self-employed workers, who were hypothesized to be less risk-averse than dependent employees, were significantly less in favor of redistribution than dependent employees. Furthermore, public employees exhibited significantly more positive attitudes towards redistribution. Instead of using a proxy variable like employment status for the risk attitude, Gaertner et al. (2017) directly assessed respondents' risk attitudes and redistribution preferences in a representative survey of the Swedish population. They obtained a significantly positive correlation between risk aversion and the preference for redistribution, a result that was robust to controlling for past income, current income, wealth, and other SES variables drawn from administrative data matched to the survey data.

First, we tried to point out as clearly as we could in the instructions and on the decision screen that the entitlements represent collected entitlements to a social security system resulting from employment and related earnings. Second, more than 40% of the subjects assumed that the social security system in the experiment was a pension insurance, which in Germany is based on the equivalence principle and hence on collected entitlements.[19] Thus, subjects to a certain degree took notice of the social-security framing. Third, the shape of the entitlement distribution did not affect the level of redistribution, which we found in total to have a mean level of redistribution of 64.36%. Most subjects therefore preferred a constant level of redistribution far below the level of 100 (equal distribution) which suggests that subjects recognized the entitlements of each position.

Future research could extend this experiment by examining a situation with earned entitlements versus a situation with random entitlements (see in a different experimental setting, for example, Durante et al. 2014). Furthermore, it would be interesting to see how individuals react to asymmetric risk when risk is not framed as a loss (mortality risk with default probability) but instead as a gain (chance of longevity with gain probability).

To summarize, our experimental evidence suggests that, because of the double uncertainty immanent in the pension system, the intragenerational redistribution puzzle can be explained by efficiency preferences combined with a lower social weight attached to the short-lived poor (alienation effect).

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[19] Data from the post-experimental questionnaire reveals that the largest share with nearly 43.20% of all subjects assumed a pension insurance behind the unspecified social security in the experiment, while the other 56.80% of the subjects stated mixed types of public insurances.

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A Additional Tables

Table 7: Redistribution Parameter by Treatment

	Replacement Ratio											
	Low				High				Total			
	Entitlement Distribution											
Risk	SL	SH	RL	All	SL	SH	RL	All	SL	SH	RL	All
NR	65.78	72.88	72.82	70.49	71.54	71.48	66.82	69.95	68.66	72.18	69.82	70.22
	4.86	4.39	4.44	2.63	4.13	4.43	4.28	2.46	3.18	3.10	3.08	1.80
	50	50	50	150	50	50	50	150	100	100	100	300
ER	70.34	68.95	71.59	70.29	66.24	65.16	64.98	65.46	68.29	67.06	68.29	67.88
	3.14	3.15	2.99	1.78	3.27	3.20	3.17	1.85	2.26	2.24	2.19	1.29
	100	100	100	300	100	100	100	300	200	200	200	600
SRL	56.52	55.18	57.92	56.54	48.66	54.22	49.24	50.71	52.59	54.70	53.58	53.62
	5.20	5.59	5.27	3.07	5.08	4.85	5.09	2.88	3.64	3.68	3.67	2.11
	50	50	50	150	50	50	50	150	100	100	100	300
SRC	58.08	64.02	68.24	63.45	61.26	61.58	50.68	57.84	59.67	62.80	59.46	60.64
	5.25	4.84	4.37	2.79	5.10	4.76	4.90	2.85	3.65	3.38	3.39	2.00
	50	50	50	150	50	50	50	150	100	100	100	300
All	64.21	66.00	68.43	66.21	62.79	63.52	59.34	61.88	63.50	64.76	63.89	64.05
	2.19	2.15	2.04	1.23	2.16	2.08	2.13	1.23	1.53	1.50	1.49	0.87
	250	250	250	750	250	250	250	750	500	500	500	1500

Table notes. First row: mean of redistribution parameter λ by mortality risk, replacement ratio, and entitlement distribution, second row: standard deviation, third row: case number.

B Mean Vote vs. Random Dictator

Figure 5 shows a histogram of the chosen redistribution parameter λ by payoff rule. The figure suggests that subjects' choices are more extreme in the Random Dictator (RD) treatment than in the Median Vote (MV) treatment. In fact, there is absolutely no treatment effect with respect to the number of $\lambda = 0$ choices ($p = 1.000$, χ^2 test), but the number of $\lambda = 100$ choices is significantly larger in RD than in MV ($p = 0.003$, χ^2 test). Generally, RD induced subjects chose higher levels of redistribution: The means for λ are 70.22 (MV) and 78.39 (RD), respectively ($p = 0.009$, two-tailed t test), the medians are 78% and 100%, respectively ($p = 0.002$), Mann-Whitney test). Under the Random Dictator treatment, subjects on average chose a higher level of redistribution, and egalitarian choices were more frequent than under the Median Voter treatment.

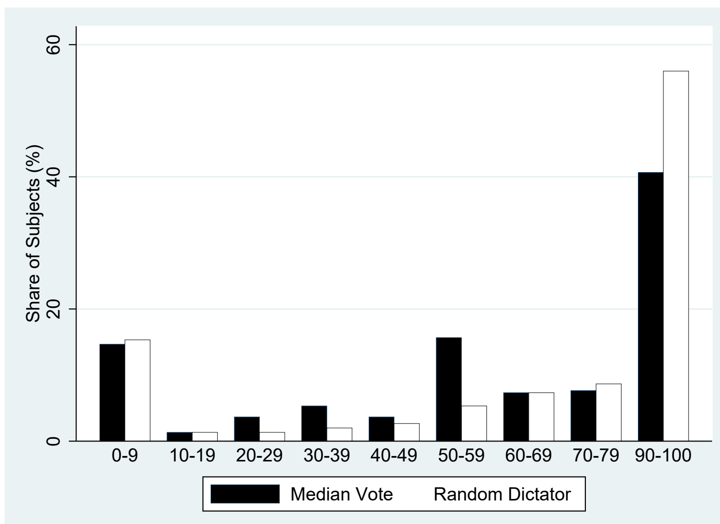

Figure 5: Histograms of the Chosen Redistribution Parameter λ by Payoff Rule Treatment (Median Vote versus Random Dictator). Share of subjects choosing a λ within the respective bracket in percent (Median Vote: $n = 300$; Random Dictator: $n = 150$.

C Instructions

C.1 Part 1

General Instructions

Welcome to the experiment and thank you for your participation. If you read the instructions carefully and follow all the rules, you can earn money in this experiment. You will receive a fixed payment of **5 Euro**. Depending on your decisions and on the decisions of other participants, you can **earn additional money**. After the experiment, the money will be paid out to you immediately in cash. During the entire experiment, we will not refer to Euro, but to points. These will be converted according to the following exchange rate:

100 points = 2.50 Euro

Talking with other participants is not allowed at any time during the experiment. Should you have any questions, please address these questions solely to us. We are happy to answer your questions individually. Compliance with this rule is very important. Otherwise, the findings from this experiment will be scientifically compromised.

Please take your time reading the explanations and making your decisions. You cannot influence the duration of the experiment by a quick decision, since you always have to wait for the other participants.

This experiment consists of 3 parts, whereby each part will be explained one at a time. You can earn money in each of the 3 parts. The experiment is expected to last 60 minutes. In the following, part 1 of the experiment will be explained.

Detailed Instructions for Part 1 of the Experiment

In the first part of the experiment, we would like you to choose between two options, option A and option B, in 10 different situations. This means that you have to decide between option A and option B 10 times. Option A is always a sure payment at a specific amount. Option B is always the same lottery.

The table below shows the 10 situations and the options A and B available in each situation. Table 1 will be displayed either as shown in Figure 1 or in reverse order. A random selection determines how the table is presented.

Figure 1: Decision screen for choosing between a secure payout and a lottery

Example

Option A in the 9th line reads: 112.5 points for sure. Option B in the 9th line is: with 5/10: 125 points and with 5/10: 0 points. If you choose option A on the 9th row, you are guaranteed a payout of 112.5 points. If you choose option B on the 9th row, you will receive 125 points in 5 out of 10 cases (50%) and 0 points in 5 out of 10 cases (50%).

In the following, we ask you to choose between options A and B for each of the 10 situations. Please compare options A and B row by row and decide for each row by clicking A or B.

Calculation of Your Payout from Part 1

Your payout from this part of the experiment is determined as follows: The computer randomly selects one of the 10 situations. Your decision in this situation is relevant for your payout. For example, if you have chosen option B on row 2, the lottery will be played and you will receive 125 points with a probability of 5 out of 10 cases (50%) and 0 points with a probability of 5 out of 10 cases (50%). You can imagine playing this lottery with an urn filled with 5 white and 5 black balls. If someone blindfolded reaches into the urn and pulls out a white ball, you will receive a payout of 125 points. If the drawn ball is black, you will receive 0 points. In the experiment, the ‘drawing of the balls’ is automated and performed by the computer.

The points will be converted into euros using the following exchange rate: 10 points = 0.25 Euro (100 points = 2.50 Euro).

Should you have any further questions, please raise your hand. Someone will come to you and will answer your question. Should you have no further questions, you may start making your decisions on the computer screen.

C.2 Part 2

Instructions for Part 2 of the Experiment

Thank you. The first part of the experiment is finished. In the second part of the experiment, you can again earn money. The second part of the experiment has no effect on your payment from the first part of the experiment.

In the second part of the experiment, we would like to ask you to make 10 decisions. In each of these 10 decisions, you form a group of 2 with an ‘other participant”. The ‘other participant’ remains anonymous like you. In each of the 10 decisions, the ‘other participant’ is chosen randomly.

In the decisions, you as an ‘active decision maker’ must always decide between Left and Right, whereby the options Left and Right are always associated with a payout for yourself and a payout for the ‘other participant’. The following figure is an example of the first five decisions.

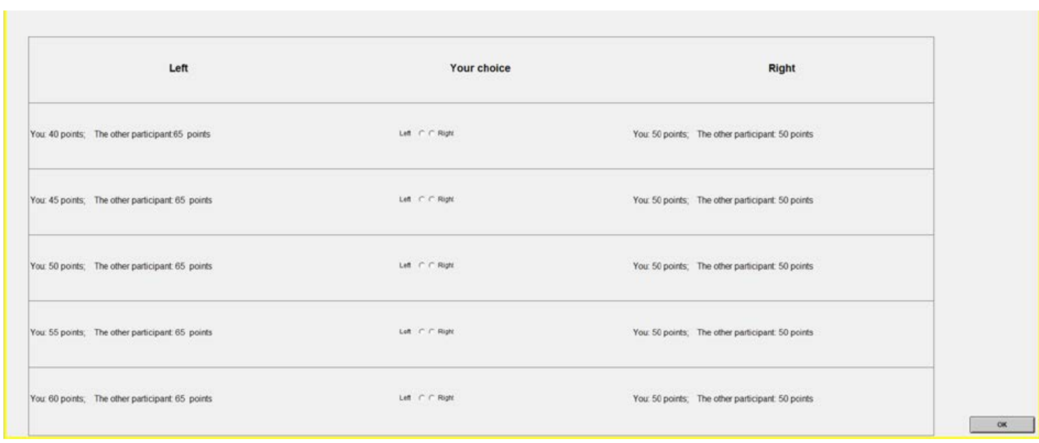

Figure 1: Decision screen for selecting different distributions

Example

The option Left in the second line is: You 45 points, the ‘other participant’ 65 points. The option Right in the second row is: You 50 points, the ‘other participant’ 50 points. This means that if, for example, you select Left in the second row and this situation is randomly drawn as relevant for the payout, you will receive a payout of 45 points and the ‘other participant’ will receive a payout of 65 points.

In the following, we ask you to choose between the options Left and Right for each of the 10 situations, which are presented in two blocks of 5 situations. Compare the options Left and Right row by row and choose each row by clicking Left or Right.

Calculation of Your Payout from Part 2

Your payout from this part of the experiment results from two partial payouts:

Payout as ‘active decision maker’

At the end of the second part of the experiment, one of the 10 decision situations is randomly selected. For this decision situation, your left-right selection determines the payout for yourself as well as for the ‘other participant’ assigned to you. According to the example in figure 2 you would receive 45 points and the ‘other participant’ 65 points.

Payout as ‘other participant’

Following the same rules, another participant in the experiment uses her left-right decisions to determine how high your payout as the randomly assigned ‘other participant’ should be, without you being able to influence it yourself. However, it has been ensured that there is no decision-making situation in which you and the ‘other participant’ in the experiment are both ‘active decision-makers’ or both ‘other participants’.

Your total payout from the second part of the experiment results from adding the payouts as an ‘active decision-maker’ and an ‘other participant’.

The points will be converted into Euro using the following exchange rate: 10 points = 0.25 Euro (100 points = 2.50 Euro).

Should you have any further questions, please raise your hand. Someone will come to you and will answer your question. Should you have no further questions, you may start making your decisions on the computer screen.

C.3 Part 3

Thank you. Part 1 and Part 2 of the experiment are finished. In Part 3 of the experiment you can again earn money. Part 3 of the experiment has no consequences for your payouts from the two other parts of the experiment.

Part 3 of the experiment consists of 6 rounds. Each round consists of the same decision task. The 6 rounds differ from each other, however. You can see one possible round in Figure 1.

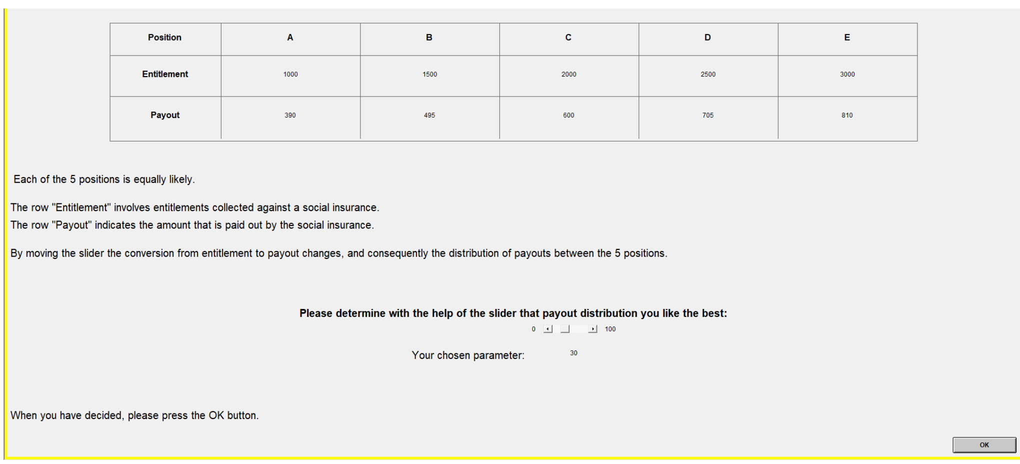

Figure 1: Decison screen for a decision task

In each round you will see 5 positions (position A to position E).

- Each position has collected entitlements to a social insurance due to his/her employment, which is displayed in the row 'Entitlement'.
- The 'Payout' row indicates the actual social insurance benefit associated with the entitlement of the respective position.

A parameter determines how the collected entitlements are converted into payouts. The parameter can take on a value between 0 and 100 and can be adjusted with the help of the slider. Depending on the level of the parameter, the payout per position changes along with the distribution of payouts between the 5 positions.

- A parameter of 0 means that each position receives a payout according to her collected entitlement in a fixed, proportional ratio.
- A parameter of 100 means that the sum of all collected entitlements is distributed equally among all positions.
- A parameter between 0 and 100 means that the payout per position is the sum of a fixed basic component and a flexible share that depends on the collected entitlement of the position.

We would like to ask you to determine with the help of the slider for each round the payout distribution that you like the best. As the collected entitlements and the conversion change in each round, please check anew in each round which parameter you like best.

Calculation of your payout from part 3

At the end of the 6 rounds you will be randomly assigned to a group. This group consists of 5 persons. You will be randomly assigned to a position within this group (position A, B, C, D or E). Also, your 4 group members will be randomly assigned a position within this group. Each position is assigned exactly once to a person. The probability of each position is the same at 1/5.

At the same time, the computer will randomly choose one of the six rounds for your group and compare the 5 parameters that each of the 5 group members liked the best for that particular round (5 group members = 5 parameters). Out of these 5 parameters the median parameter is automatically chosen for payout. The median parameter is the parameter that is in the middle when all 5 parameters are sorted in order of size, and that will therefore prevail in a vote.

Example:
The computer has randomly chosen the round that is presented in figure 1 as the payout relevant round. Group member 1 has stated for this round that she likes the parameter of **12** the best. Group member 2 has stated a parameter of **30**, group member 3 a parameter of **26**, group member 4 a parameter of **55** and group member 5 a parameter of **49**. Because the parameter of 30 is exactly in the middle of all 5 parameters (when sorted according to their size: **12, 26, <u>30</u>, 49, 55**), the parameter of 30 is the payout relevant

parameter.
Furthermore, you have been assigned to position A. You therefore receive (according to the example in figure 1) a payout of 390 points. Position B receives a payout of 495 points, position C 600 points, position D 705 points and position E 810 points.

Thus, your payout depends on your position, on the randomly chosen round, as well as on the payout relevant parameter for this particular round. Each round can be the payout relevant round. The parameter which is the middle of all 5 parameters in this round is the payout relevant parameter.

You will be informed about your payout from part 3 of the experiment at the end of the 6 rounds.

The points will be converted into Euro using the following exchange rate:
10 points = 0.25 Euro (100 points = 2.50 Euro).

You will be informed about your payouts from part 1 and part 2 of the experiment and also about your total payout after all participants have finished part 3 of the experiment. After that, a short questionnaire will follow. Thereafter, the payment in cash will take place.

Should you have any further questions, please raise your hand. Someone will come to you and will answer your question. Should you have no further questions, you may start making your decisions on the computer screen.

Thank you very much for your participation.

C.4 Post-Experimental Questionnaire (PTR Score)

Please rate the following 6 statements and indicate whether you agree or disagree with these statements.

1. I think the world is generally fair.
2. I believe that people, by and large, get what is justly theirs.
3. I am sure that justice will over and over prevail in the world.
4. I am convinced that at some point everyone will be compensated for injustice suffered.
5. In my view, injustice is the exception rather than the rule in all areas of life (e.g., work, family, politics).
6. I think that when important decisions are made, all parties involved strive for justice.

How would you rank your view on the following scale?[20]
1 means you completely agree with the statement on the left; 10 means you completely agree with the statement on the right; and if your view is somewhere in between, you can choose any number in between.

Statement on the left:
In the long run, hard work usually brings a better life.
Statement on the right:
Hard work doesn't generally bring success - it's more a matter of luck and connections.

Finally, please read through the following situation description.

It is feared that old-age poverty (i.e. poverty in old age) will increase in the coming years. As people enter retirement, it will become increasingly difficult for them to make a living because their income is too low. In this context, a phenomenon can be observed that people affected by poverty have an increased mortality rate. This means that people with a lower income have a lower life expectancy than people who have a higher income.

[20] Question 110, World Values Survey Wave 7 (2017-2020)—Master Questionnaire, English version. Available at: https://www.worldvaluessurvey.org/WVSDocumentationWV7.jsp

Please indicate the extent to which the following statements apply to your thoughts and feelings about the situation described above.

1. The situation described above triggers real compassion.
2. There is not much hope that the situation described above will improve.
3. Many of the people affected by the situation described above are themselves responsible for their situation.
4. It is not fair that people with lower incomes have lower life expectancies.