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Effort and Redistribution: Better Cousins Than One Might Have Thought *

Claudia M. Buch† / Christoph Engel‡

Abstract

In this paper, we analyze the link between effort and preferences for redistribution. If individuals hold standard preferences, those with higher ability exert more effort. Higher effort leads to a higher income. Individuals with a higher income oppose redistribution. Yet, under non-standard preferences, the link between effort and redistribution is not clear-cut. If aversion to inequity is sufficiently strong, even individuals with high ability may support redistribution. In a lab experiment, we indeed find that participants with higher ability are willing to help the needy if earning income becomes more difficult for everybody. To check whether this finding is externally valid, we use data from the *World Value Survey*. We do not find a significant positive effect of preferences for effort on preferences for redistribution, but we also do not find the significant negative effect predicted by standard theory. Also, in the field, those who have to pay for redistribution are not more likely to be opposed than the recipients.

Keywords: Effort, redistribution, ability, experiment, survey data, simultaneous equation model

JEL: C31, C91, D31, J28

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1 Motivation

Increasing economic welfare by providing conditions for economic growth while, at the same time, ensuring a level of income equality which is accepted by society are two main goals of governments. In trying to reach these goals, governments face a tradeoff: If governments tax income more heavily, everything else held constant, there will be greater scope for redistributing income. This may be desirable to meet fairness concerns. However, the higher the tax rate, the lower the incentives of those with a particularly high ability to work hard. Ultimately, a higher tax rate may mean less money for redistribution. Empirically, we observe that the degree of redistribution has been growing in many countries (Organisation for Economic Cooperation and Development 2011:chapter 7). The standard explanation would be that the majority of voters with lower income expropriate their compatriots with a higher income. This interpretation might, however, be overly simple. If sufficiently many individuals hold social preferences, there might be support for redistribution even among many of those who have to pay for it.

In this paper, we investigate the relationship between support for redistributive policies and effort, both theoretically and empirically. If individuals hold standard preferences as, for instance, in Persson, Tabellini et al. (2000), support for redistribution and effort are inversely related. Individuals with higher than average ability exert more effort, therefore earn a higher income, and vote against redistribution. If redistribution is imposed, they reduce effort. If, in contrast, individuals have social preferences as in Fehr and Schmidt (1999), and are sufficiently averse against inequity, even those with high ability support redistribution. Individuals are even more likely to do so if inequity aversion is sensitive to fluctuations of earning possibilities over time. We thus have competing predictions.

We use two complementary approaches to test these predictions. The first empirical approach closely maps the theoretical model. In a lab experiment, we measure ability, match participants by ability such that groups are heterogeneous, and then (a) manipulate tax/redistribution rates and elicit effort choices, or (b) impose effort levels and elicit redistribution votes. The higher the degree of redistribution, the lower is effort. Yet, the more difficult it becomes to earn an income, the more individuals with high ability are willing to support redistribution, despite the fact that they have to pay for it.

The main advantage of the experimental method results from random assignment. Identification is not an issue. Yet, we test students on an artificial task. To explore whether our key experimental finding is externally valid, we complement the experimental evidence with data from the *World Value Survey*, as in Alesina and Fuchs-Schündeln (2007) or Alesina and Giuliano (2011). In many respects, the field data are less clean. Our model makes predictions for effort and redistribution *choices*, while the survey informs us about effort and redistribution *preferences*. For effort preferences, we must work with a proxy: do respondents list the possibility to show initiative as important when they characterize their job environment? Arguably, we face a problem of reverse causality: effort preferences might determine redistribu-

tion preferences, and redistribution preferences might determine effort preferences, not the least because both might depend on (unobserved) ability. We, therefore, have to instrument either independent variable, and we face the usual debate about the validity and strength of our instruments. We are ready to acknowledge all these limitations. But we also believe in the value of triangulation. We deem it important to double check the external validity of the experimental evidence, even if the available evidence is much less clean, and in that way much less perfect, than the evidence we were able to generate in the lab.

With the survey data, we replicate the negative effect of redistribution on effort. We do not find that individuals who express a high preference for effort also express a high preference for redistribution. Yet, remarkably, we also do not find the negative effect predicted by standard theory. Individuals who express a high preference for effort do not express a preference *against* redistribution.

Our findings shed new light on the political process determining the degree of redistribution: Even a substantial fraction of those who have to pay the bill support redistribution. Yet, we also find that the willingness to exert effort declines as the degree of redistribution increases. This preference pattern confronts policy makers with a hard choice: According to our data, a substantial majority supports greater redistribution. But, in the future, all may be worse off due to the negative effect on effort.

In the following Second Part, we explain in which ways our paper goes beyond what has already been done. In the Third Part, we sketch a theoretical model that shows the critical role of social preferences for understanding the relationship between effort choices and support for redistribution. In Part Four, we use a lab experiment to test the predictions of the model. In Part Five, we use survey data from the *World Value Survey* to explore the external validity of the experimental findings. Part Six concludes.

2 Earlier Findings

2.1 Experimental Evidence

2.1.1 Redistribution Choices

A number of experimental papers have analyzed redistribution choices. In a first set of papers, individuals show their willingness to support redistribution at a point of time when their exogenous income is known. Hence, "effort" is not manipulated. Durante, Putterman et al. (2014) have groups of 21 participants. All but one participant are assigned the equivalent of a 20^{th} fraction of the US income distribution in the year 2000, either randomly or reflecting their performance in a quiz. The randomly selected 21^{st} participant is a "dictator", deciding on a proportional tax. The proceeds are redistributed equally among all group members. The mean tax is close to 50% in the random assignment condition, and some 37% in the quiz con-

dition. Tyran and Sausgruber (2006) randomly give 2 group members high, 2 medium, and 1 low earnings. Knowing their income, participants can vote for redistribution such that the high earners bail out the one low earner. Decision is by majority, implying that the low and the 2 medium earners can impose redistribution on the high earners. Almost all low and most medium earners vote for this scheme, as does a third of the high earners. Different from our setting, in both experiments, income is assigned, not earned, and it is unrelated to ability.

In the next experimental step, individuals choose their income risk for a given level of redistribution. Hence, the redistribution choice is not modeled. Cabrales, Nagel et al. (2012) have participants interact for 50 announced rounds in fixed groups of 9. In the first stage of each period, each participant decides independently whether to receive a fixed income or to buy a lottery with an expected value above the fixed income, but the risk of ending up with a lower payoff. In the second stage, knowing the realizations of the lotteries, and using various voting schemes, participants decide whether to redistribute all period income equally. The authors find that participants are more likely to vote in favor of redistribution if they have low income. In the final rounds, no group combines a willingness to buy lotteries with a high degree of redistribution. Davidovitz and Kroll (2004) have subjects choose between a risk-free and a risky asset. Individual choices define the probability with which the risky asset is chosen. If it is, in the baseline, all participants have the same realization of the lottery, while in the treatment, realizations for all participants are individual (but from the same distribution). Higher equality motivates participants to take more risk. These experiments are related to ours, in that we use redistribution (exclusively) as a safeguard against risk. But the tradeoff with effort is not investigated.

The next step is letting participants decide upon a redistribution scheme *before* they know in which way they will be affected by an income lottery. Yet, earnings do not result from effort, and they are unrelated to ability. Selten and Ockenfels (1998) give one or two of three players a chance to earn 10 Deutsche Mark (DM), while the remaining players earn 0. Before earnings are randomly assigned, participants can commit to compensating the losers. On average, winners are willing to transfer 3 DM, irrespective of the number of losers. This shows a willingness to give when earnings (exclusively) depend on luck.

2.1.2 Differences in Effort and Ability

In the previously reported experiments, ability is not a treatment variable. This changes in several papers that focus on redistribution preferences (but do not manipulate effort). It is shown that differences in effort are seen as a justification for income differences, whereas differences in (innate) ability are not (Schokkaert and Overlaet 1989, Schokkaert and Capeau 1991, Konow 2000). Checchi and Filippin (2004) experimentally test the “prospect of upward mobility hypothesis”. They find that less affluent individuals indeed oppose redistribution if they have reason to expect that they will become disproportionately more prosperous in the future. In contrast to our experimental set up, these authors do not measure effort. Beckman,

Formby et al. (2004) essentially design an experiment about distribution, not about *re*distribution as we do. Participants decide in groups of five how to split a pie. The group chooses with majority between two unequal distributions. In the baseline, when they vote, participants know how much each scheme gives them. In the treatment, they decide under the veil of uncertainty. If participants do not know their individual share, they oppose redistribution the more intensely the higher the efficiency loss. This holds no longer true if they decide knowing how this will affect them individually. Again, no effort decisions are elicited (further, less closely related experiments are reported by Tausch, Potters et al. 2010).

2.1.3 Redistribution and Effort

The closest analogue to our approach in the experimental literature is a paper by Frohlich and Oppenheimer (1990). Knowing the redistribution scheme, participants have to engage in a real effort task: They form groups of five and have one condition where participants decide on a redistribution scheme under the veil of ignorance. In the other condition, it is imposed that average income is maximized, but with a floor constraint. The marginal pay rate has considerable returns to scale. When they can choose, almost all groups choose the same scheme as is imposed on the other groups. Productivity is not negatively affected by redistribution, and it actually increases when the scheme is self-selected. In their task, there is considerable room for learning, which could explain these results. Our design differs in that we not only test effort conditional on imposed redistribution, but, in a fully symmetric design, also support for redistribution conditional on imposed effort. Moreover, we separately measure effort and ability. Using the strategy method, we explore a full range of effort and redistribution levels. Finally, our task is unaffected by learning. In earlier papers, Frohlich, Oppenheimer et al. (1987a), Frohlich, Oppenheimer et al. (1987b) had shown that the redistribution principle they use in this experiment is the most preferred (also see Herne and Suojanen 2004).[1]

Essentially, what we contribute to the experimental literature is a direct test of the prediction derived from the assumption that tax payers hold social preferences. Such individuals should favor (some) redistribution, even if they do not benefit individually. Yet this does not ensure that their effort choices remain unaffected by the resulting decrease in the productivity of labor. With our design, we are able to elicit both choices, of effort and of a redistribution level, from the same individual.

1 Krieger and Traub (2008) also combine survey evidence with an experiment, yet have a different research question. They study policy preferences for pension schemes. Neustadt and Zweifel (2010) use contingent valuation to elicit preferences for income redistribution in a telephone survey. Klor and Shayo (2010) find that social identity tilts votes for a redistribution scheme in favor of the group of which the subjects happen to be a member, an issue that we do not consider here.

2.2 Survey Evidence

Previous work has used survey data similar to ours to analyze the determinants of preferences for redistribution. Fong (2001) uses data from a Gallup survey to test whether redistribution preferences result from selfish motives, implying that those who believe in a greater need for help to themselves are also the main supporters. She finds a significant effect of income, as a plausible proxy, but this effect is small. There is an independent, strong effect of beliefs about the role of effort, luck, and opportunity in life outcomes. Social preferences turn out the best explanation for redistribution preferences.

Alesina and Fuchs-Schündeln (2007) use German reunification as a natural experiment to analyze people's redistribution preferences. Their data come from the *Socio-Economic Panel* (SOEP), and they use region-time interactions to model exogenous variations of preferences. They show that East Germans are more in favor of redistribution than West Germans. Alesina and Giuliano (2011) use data from multiple sources, including the *World Value Survey*, to analyze redistribution preferences. They include fairness preferences and stated willingness to work hard as control variables, but they do not analyze the reverse causality of these variables on redistribution preferences. Their main explanatory variables are individual characteristics, and they control for the macroeconomic environment during respondents' youth. They find that historical experiences, cultural factors, and personal histories affect preferences for equality.

Our approach differs from these studies because we are interested in the reciprocal relationship between effort and support for redistribution. Hence, we analyze the feedback between support for redistribution and effort, and we control for the macroeconomic environment. Our results suggest that modeling effort and redistribution preferences simultaneously is indeed important: Stated support for redistribution affects stated effort choices, but not vice versa.

3 Effort and Preferences for Redistribution: Theoretical Motivation

To motivate our empirical analysis, we capitalize on a model of effort choice and the choice of a redistribution level by Persson, Tabellini et al. (2000):chapter 6. We enrich the objective function of that model along the lines of the canonical model by Fehr and Schmidt (1999), to account for the possibility that individuals are inequity averse. We allow for utility to depend on an exogenous reference payoff, to capture the sensitivity of redistribution choices to exogenous (macroeconomic) shocks in earning abilities.

We do not endogenize the political process. This would require fixing the objective function of politicians as well as the fraction of strong and weak individuals in the electorate. We only want to say in which ways effort choices react to exogenously imposed redistribution, and in

which ways support for taxation and hence redistribution reacts to effort choices, given earning ability is heterogeneous.

We proceed in three steps. In the baseline version of the model, there is redistribution, but individuals have standard preferences. In the second version, participants are inequity averse as in Fehr and Schmidt (1999). In the third version, we modify the model by Fehr and Schmidt and make individuals sensitive to deviations from a reference payoff.

Standard Preferences

We are interested in a conflict between individuals of different earning ability with regard to work effort and taxes. Earnings of each individual depend on her own labor effort as well as a redistributive component. Society (a social planner) redistributes income ex post such that pre-tax differences in income are reduced.

To see the resulting conflict, we study a society of two individuals – one with strong (*s*) and one with weak (*w*) earning ability. If the strong individual exerts labor effort l_s, she receives a corresponding labor income. If the weak individual exerts effort l_w, the payoff is multiplied by $\varphi < 1$, reflecting her lower productivity. We thus normalize the strong individual's ability to 1. Consequently, φ measures the ratio of earning abilities. The weaker individual's total payoff is given by

$$\pi_w = \varphi l_w + \tau\left(\frac{\varphi l_w + l_s}{2} - \varphi l_w\right) - \frac{1}{2} l_w^2 \qquad (1)$$

where labor income is given by effort l_w, multiplied by ability $\varphi < 1$. The second term is transfer income, and the third term defines the non-linear disutility of effort. Government transfers income from those with earnings above to those with earnings below the mean. Hence, transfer income is determined as a fraction of the difference between the weak individual's earnings φl_w and the mean earnings of society. The tax rate is given by $\tau < 1$. Because the weak individual has a labor income below the mean, she receives a net transfer.

By analogy, the strong individual earns

$$\pi_s = l_s - \tau\left(\frac{\varphi l_w + l_s}{2} - \varphi l_w\right) - \frac{1}{2} l_s^2 \qquad (2)$$

Because labor income of the strong individual is above the mean, she pays taxes. Individuals have two choice variables: they choose their level of labor supply and a tax rate. We abstract from the political process, including issues of strategic voting, and we investigate which level of taxation the individual in question would find optimal. Optimizing with regard to effort, we obtain optimal effort:

$$l_w^* = \varphi\left(1 - \frac{1}{2}\tau\right), l_s^* = 1 - \frac{1}{2}\tau \tag{3}$$

Equation (3) shows that strong individuals exert more effort than weak individuals, given $\varphi < 1$. Effort of both individuals decreases in the tax rate. For the weak individual, higher taxes imply higher transfers. Hence, she can keep her income constant with lower effort. For the strong individual, higher taxes imply lower net income, hence she prefers to work less.

The model is linear in taxation, which is why we have corner solutions. Individuals either support taxation such that both individuals have the same (gross) income, or they are opposed to any redistribution. The first order conditions (*FOC*) with respect to the tax rate are given by

$$\begin{aligned} FOC_w^{\tau} &= \frac{1}{2}\left(l_s - \varphi l_w\right) \\ FOC_s^{\tau} &= -\frac{1}{2}\left(l_s - \varphi l_w\right) \end{aligned} \tag{4}$$

where the subscript denotes the individual (*s* = strong, *w* = weak), and the superscript denotes the choice variable (here: the tax rate τ). As one should expect, individuals hold opposite tax preferences. The weak individual supports, the strong individual opposes taxation.

In sum, the standard model yields three testable propositions:

> **Hypothesis 1**: *Effort increases in individual ability and decreases in the tax rate.*
>
> **Hypothesis 2**: *Individual support for taxation depends on individual ability relative to other members of the community: individuals with high ability are opposed to taxation. Individuals with low earning ability support a positive tax rate.*
>
> **Hypothesis 3**: *Support for taxation and effort choices are negatively correlated.*

3.2 Inequity Aversion

So far, we have assumed that individuals hold standard preferences. They thus care only about other individuals' choices or payoff to the extent that it affects their own monetary payoff. In the next step, we allow individuals to also care about others and about the distribution of income in a society. Hence, we extend the baseline model to a society of two individuals who hold fairness preferences along the lines of Fehr and Schmidt (1999). In contrast to the model with standard preferences, we now assume that individuals also care about relative income.

Now, in the policy debate over redistribution, the focus is on income differentials, not on payoff differences. The policy debate thus tends to bracket (differences in the) disutility of labor. Since we want to make a contribution to our understanding of this policy debate, we slightly modify the Fehr/Schmidt model and consider inequity in (gross) income, not in (net) payoff. Because we define one individual to be weak, she (potentially) receives disutility only from

disadvantageous inequity ("is my own income lower than the income of the stronger individual?"). Likewise, the strong individual (potentially) receives disutility only from advantageous inequity ("is my own income higher than the income of the weaker individual?").[2]

To ease notation, we define (gross) income of the two individuals as:

$$m_w = \varphi l_w + \tau\left(\frac{\varphi l_w + l_s}{2} - \varphi l_w\right) \tag{5}$$

$$m_s = l_s - \tau\left(\frac{\varphi l_w + l_s}{2} - \varphi l_w\right) \tag{6}$$

Utility is then given by each individual's own payoff and a term that captures inequity aversion:

$$u_w = \pi_w - \alpha(m_s - m_w) \tag{7}$$

$$u_s = \pi_s - \beta(m_s - m_w) \tag{8}$$

Both individuals have lower utility if the payoff for the strong individual is higher than the payoff for the weak individual. The sensitivity of individuals towards inequity differs though. Fehr and Schmidt make the plausible assumption that $\alpha > \beta$: individuals are more sensitive to being worse than being better off.

As before, we find the individually optimal level of effort by taking first order conditions and solving:

$$\begin{aligned} l_w^{*fs} &= \varphi\left(1 - \frac{1}{2}\tau - \alpha\tau + \alpha\right) \\ l_s^{*fs} &= 1 - \frac{1}{2}\tau + \beta\tau - \beta \end{aligned} \tag{9}$$

where superscripts denote that we assume (modified) Fehr-Schmidt preferences. Note a number of implications. For both individuals, there is a direct and an indirect effect of inequity aversion. Through the direct effect, the individual aims at reducing inequity by adjusting effort. This can be achieved if the weak individual increases and the strong individual reduces effort. The indirect effect is conditional on the tax rate. The more the weak individual is averse against inequity, the more she reacts to a higher tax by reducing effort: the transfer income substitutes for earned income. By contrast, the more the strong individual is averse against inequity, the more she supports taxation. Actually, we can directly read off (9) that the critical β is ½. With $\beta > \frac{1}{2}$, the strong individual works harder if the tax is heavier: she increases the amount that can be redistributed.

Support for taxation follows from first order conditions of (7) and (8) with respect to τ:

2 Fehr and Schmidt utility therefore simplifies to a version without max operators.

$$FOC_w^{fs} = \left(\alpha + \frac{1}{2}\right)(l_s - \varphi l_w)$$
$$FOC_s^{fs} = \left(\beta - \frac{1}{2}\right)(l_s - \varphi l_w) \qquad (10)$$

The weak individual always supports taxation ($\varphi < 1$). For the strong individual, support for taxation depends on the degree of inequity aversion. Interestingly, provided $\beta > \frac{1}{2}$, she too supports a positive tax rate.

This leads to an additional hypothesis:

> **Hypothesis 4**: *If strong individuals are sufficiently inequity averse, they too support taxation.*

3.3 Aversion against Income Differing from a Reference Income

In the policy debate, redistribution is often not only motivated by the desire to reduce income differentials. Policy makers are also sensitive to the idea that everybody should dispose of an absolute income sufficient to cover her basic needs. Yet, nations differ widely in their definition of this level. Some of this variation results from differences in policy preferences. But the willingness of those who earn more to help those in need also depends on the standard of living of the representative household, under normal circumstances. We label this the "reference payoff", and one can think of it as the steady state of an economy in the absence of business cycle fluctuations. We cover these political attitudes by a second variant of the model by Fehr and Schmidt (1999). In this variant, sensitivity to inequity is conditional on earning prospects, in comparison with what is characteristic for this population.

Technically, we capture this additional concern by letting (gross) income m for all individuals fluctuate in a symmetric interval $\vartheta \in [1-a, 1+a], a < 1$ such that actual income is given by $m = \vartheta \tilde{m}$, with $\tilde{m}$ being the expected value of income, i.e. at $\vartheta = 1$, and with ϑ being a random draw from a uniform distribution over the entire interval. In this variant of the model, inequity aversion is more pronounced the more earning abilities are below the reference payoff. Inequity aversion is attenuated the easier it is to earn income, compared with the reference income. Hence utility is given by a modified version of (7) and (8):

$$u_w = \pi_w - \frac{\alpha}{\vartheta(m_s - m_w)} \qquad (11)$$
$$u_s = \pi_s - \frac{\beta}{\vartheta(m_s - m_w)} \qquad (12)$$

Proceeding the same way as in the two previous variants of our model, we obtain optimal effort:

$$l_w^{*r} = \varphi\left(1 - \frac{1}{2}\tau - \frac{\alpha\tau}{\vartheta} + \frac{\alpha}{\vartheta}\right)$$
$$l_s^{*r} = 1 - \frac{1}{2}\tau + \frac{\beta\tau}{\vartheta} - \frac{\beta}{\vartheta} \qquad (13)$$

As expected, with $\vartheta = 1$ (13) is identical to (9). Yet, if society is in dire circumstances, i.e. with $\vartheta < 1$, both the direct and the indirect effect of inequity aversion are affected since then $\frac{\beta}{\vartheta} > \beta$. The direct effect induces the strong individual to reduce effort, and thereby the inequality. At the same time, her effort is less easily deterred by taxation, since $\left(\frac{\beta}{\vartheta} - \frac{1}{2}\right)\tau$ is more likely to be positive. The opposite pattern holds for the weak individual. Compared with (9), the direct channel becomes more important. Since $\frac{\alpha}{\vartheta} > \alpha$, the weak individual increases effort even more, to reduce the undesired inequity. However her own effort is even more strongly deterred by the transfer income.

In similar ways, fluctuation of earning possibilities affects support for taxation. Compared with (10), the only change in (14) is, in both equations, the first term, which is now divided by ϑ. Since $\frac{\beta}{\vartheta} > \beta$, strong individuals are even more likely to support taxation:

$$FOC_w^r = \left(\frac{\alpha}{\vartheta} + \frac{1}{2}\right)(l_s - \varphi l_w)$$
$$FOC_s^r = \left(\frac{\beta}{\vartheta} - \frac{1}{2}\right)(l_s - \varphi l_w) \qquad (14)$$

This leads to

> **Hypothesis 5**: *Individuals with high earning ability are more likely to support taxation if they are averse against situations in which individuals with low earning ability fall below a reference payoff.*

With predictions on the link between effort and support for taxation and hence redistribution under standard and social preferences at hand, we now turn to empirical tests. We begin with experimental evidence from the lab since it directly maps the theoretical model. To assess the external validity of the key experimental finding, we complement this by survey data.

4 Experimental Evidence

4.1 Design

Even in the lab, we cannot standardize or induce those determinants of ability that a participant has acquired at birth or during her education. But we can measure this ability (Phase 1). We have participants act in groups. Each group is composed of one individual from each ability quartile. In those groups we fix effort and elicit redistribution choices (Phase 2), and we

fix tax/redistribution rates and elicit effort choices (Phase 3). The general set up of our experiment is given in Tables 1a-1c.

4.1.1 Phase 1: Measuring Ability

To measure ability, we use a task developed by Mazar, Amir et al. (2008). In tables of different size, participants are asked to find the one pair of numbers that add up to 10 (Table 1a). Participants see one problem at a time on a computer screen and have to tick with the mouse the two cells that add up to 10. In each problem, only two cells match in this way. Participants earn money only if the answer is correct. Participants have announced 10 minutes to solve as many problems as they can. Problems are presented in the sequence of easy (2x2 tables), normal (3x3 tables), and difficult (4x4 tables) problems.

The first phase gives us an individual-specific measure of ability, i.e. the number of problems a participant has solved correctly. We can, of course, not exclude that some participants are more motivated than others to do well on this task. The term "ability" should therefore not be read narrowly as something like "mathematical literacy". Rather we mean, and measure, a combination of a cognitive (how easy is it for the participant to find the solution?) and a motivational (how much energy is the participant willing to put in?) determinant of individual heterogeneity.

Additionally, Phase 1 of the experiment gives participants a chance to familiarize themselves with the task so that they can make meaningful choices in the later parts of the experiment.

4.1.2 Phase 2: Elicit Redistribution Choices

In the second phase, we elicit redistribution choices by asking participants to fill in Table 1b. We randomly compose groups of four. Participants know that each group has one member from each of the ability quartiles. They are reminded of their own performance in the first phase. They further learn to which of the four ability classes they belong, and they are informed about the average performance of all four members of their group in the first phase.

Redistribution is financed from the proceeds of a tax that is proportional to income. Each group member receives one quarter of the amount collected through the tax. The tax rate and thereby the size of the lump-sum transfer is determined by the median of the statements by the four group members. Technically, for each cell, we use the mean between the second and the third highest percentage, in the respective group.

We use the strategy (vector) method (Selten 1967). Each row in Table 1b represents the size of the matrix, and thereby the difficulty of the task. Through randomly determining the difficulty of the task, we induce a handicap. Within the framework of the theoretical model, the random choice of table size has the interpretation of an exogenous shock that shifts mean ability upwards (if size is 2x2, $\vartheta > 1$ in the model) or downwards (if size is 4x4, $\vartheta < 1$ in the

model). Each column indicates how many problems of this type the participant will have to solve, should this cell be randomly selected at the end of the experiment to be payoff-relevant. Effort is fixed in percent of the number of problems this participant has correctly solved in the first phase, in the range [30%, 120%] and in steps of 10%. To illustrate: if the individual had solved 10 problems correctly in phase 1, and the 60% level is randomly selected to be payoff-relevant, in phase 2 she has to solve 6 problems correctly. We have chosen these parameters to have sufficient variation in our explanatory variable and to reflect a macro-environment that makes earning the same amount of money as before easier (think of positive growth effects or technology shocks) or more difficult (think of negative growth effects or skill-specific technological progress which reduces relative earnings). Participants know they will have to exert the assigned effort in the cell singled out at the end of the experiment if they do not want to lose their entire income from the experiment.

4.1.3 Phase 3: Elicit Effort Choices

In the third phase, we elicit effort choices by asking participants to fill in Table 1c. Using the same task and the same procedure, we fix a tax rate. Again, each group member receives a quarter of total tax revenue, irrespective of her own effort and income. We now vary tax rates in the range [0%, 45%], in steps of 5%, where the upper limit is intended to reflect marginal tax rates observed in the real world. We now ask participants to commit to a number of problems they are prepared to solve (correctly) for each tax rate and difficulty of the task (with the maximum fixed at 50 problems). Feedback from redistribution choices is withheld until all participants have also taken effort choices, which is why the order in which participants have taken these decisions cannot play a role. Again, participants are informed that, after they have taken all choices, the computer will randomly determine one of the cells to be payoff-relevant. For this cell, participants are requested to exert the effort to which they have committed. All participants did.

Note that our design directly matches the theoretical model. The number of problems a participant solves in the first part of the experiment informs us about ability acquired by birth and education. This allows us to measure φ. In the second part of the experiment, we exogenously impose effort l_i. In the third part of the experiment, we manipulate the tax rate τ.

4.1.4 Conducting the Experiment

The experiment was conducted at the Bonn EconLab in December 2011. 96 student subjects of various majors (55% female) were invited using the *Online Recruitment System for Economic Experiments* (ORSEE) (Greiner 2004). The experiment was fully computerized, using the *Zurich Toolbox for Readymade Economic Experiments* (zTree) (Fischbacher 2007). With a series of computerized control questions, we made sure that all participants understood the tasks. Since phases 2 and 3 of the experiment might be more difficult to understand, we had separate control questions preceding each of those parts. Participants were given example

cells and choices, and were asked to indicate what this meant for their own effort, for redistribution, and for their income. If answers were wrong, the computer pointed this out to participants, and asked them to correct the answer. Participants were allowed to participate in either phase of the experiment only after they had answered all control questions correctly. To make sure that choices were not driven by imperfect recall, before they make choices, both in phases 2 and 3 of the experiment, participants were reminded how many problems they had correctly solved in phase 1.

The experiment lasted approximately 2 hours. On average, participants needed 14 minutes 51 seconds to complete the tasks resulting from their choices in Parts 2 and 3. The first participant left after 1 minute 16 seconds (because this participant had to solve only a very small number of easy tasks). The last participant left after 49 minutes 28 seconds (because this participant had chosen to solve the maximum of 50 problems in the third part of the experiment, and tasks were taken from 4x4 cells in both parts of the experiment). Participants received a piece rate of 40 Cents per problem solved. On average they earned 26.36 € (approximately 34.14 US-$), range [9.75, 52.64 €].

4.2 Descriptive Statistics

As expected, participants' ability was quite heterogeneous. In the first part, for which they were given 10 minutes, they solved between 5 and 44 problems (mean: 23.02, median 22). The mean in the lowest class (quartile) was 12.96, in the second class 19.79, in the third class 25.42, and in the best class 33.92.

Redistribution votes were strongly left-skewed (Graph 1a). 23 of all 96 participants did not want any redistribution. 15 participants wanted on average at least 5% redistribution. Only 4 participants wanted on average 50% or more redistribution. By contrast, effort choices were spread out over the entire range, with peaks at all prominent numbers (Graph 1b). Graph 1c shows that very high redistribution choices are associated with low effort choices, and vice versa. Ability (graphically displayed by membership in one of the four ability classes) has a strong effect on effort preferences, but it is not systematically associated with redistribution preferences.

While this is interesting in its own right, in the following we focus on the effect of exogenously manipulated effort on redistribution votes, and of exogenously manipulated tax/redistribution rates on effort choices. These manipulations make it possible to unequivocally identify causal effects.

4.3 Regression Results

To analyze the results of the lab experiment, we revert to regression analysis because this gives us the possibility to control for confounding factors. When they vote for a tax/redistribution rate, participants choose for 10 different levels of effort, and 3 levels of difficulty of tasks. In Phase 2, we thus have 30 choices from each participant. Likewise when participants choose an effort level, they decide for 10 different tax/redistribution rates, and again for 3 levels of difficulty of tasks. We thus have another 30 choices from each participant. This implies that we have panel data. Moreover, when they make redistribution and effort choices, participants are aware of the mean ability of their group, they know to which ability class they belong individually, that one participant from each quartile of the distribution is in their group, and that redistribution will take place within their specific group. For all these reasons, choices of individuals are nested within groups.

We match this data-generating process by a mixed effects model, with a separate error term for individuals, and another error term for groups. This statistical model assumes that all error terms are uncorrelated with the explanatory variables. We test this assumption with a Hausman test that compares coefficients from the mixed-effects model with an alternative model that has individual fixed effects only.[3] The test never turns out to be significant. This justifies using the more efficient random effects model. The random effects model also allows estimating coefficients for explanatory variables that do not vary within participants.

4.3.1 Explaining Effort Choices

Table 2 shows the determinants of effort choices. We find a significant effect of ability throughout and in the expected direction. The more problems a participant has solved in the first phase, the more problems she is also willing to solve in the third phase, despite the fact that this may involve redistribution. This willingness is not conditional on the mean effort level in the group (models 2 and 3). Participants want to solve more problems if tasks are easy and less problems if tasks are difficult (model 4). Even conditional on all these explanatory variables, the higher the imposed degree of redistribution, the lower the willingness to exert effort (model 5). We thus fully support **Hypothesis 1** (*Effort increases in individual ability and descreases in the tax rate.*). The dampening effect of redistribution on effort, however, is not dramatic. The maximum redistribution rate is 0.45. Even for that rate, the statistical model predicts a reduction of effort only from about 23 to 18 problems, i.e., a reduction by 21% (model 5).

3 Because individuals are nested in groups, these fixed effects automatically capture any non-random effects at the group level. For the first three models, we do not have a "time"-variant regressor, which is why we cannot perform the Hausman test. To make the test possible, we re-run these models and additionally control for task difficulty, which is the equivalent of time in our data-generating process.

4.3.2 Explaining Redistribution Choices

When analyzing redistribution choices we get a different picture (Table 3).[4] We find a significantly weaker preference for redistribution if earning money is easy, and a significantly stronger preference for redistribution if earning money is difficult (model 4). Recall that effort is imposed as a percentage of the problems this participant has correctly solved in phase 1. This variable has a significant positive effect (model 5). If everybody has to exert higher effort, the willingness to redistribute increases. The two significant effects both suggest: if the community is in dire circumstances, all stand together and help each other; if all can easily fend for themselves, all see much less urge for ex post corrections of income through redistribution. This stands in clear contradiction to a model with standard preferences (**Hypothesis 3:** *Support for taxation and effort choices are negatively correlated.*).

By contrast, our data directly support **Hypothesis 5** (*Individuals with high earning ability are more likely to support taxation if they are averse against situations in which individuals with low earning ability fall below a reference payoff.*): On average, individuals with strong earning ability care for individuals with weaker earning ability falling below a reference payoff.

We further consider the effect of ability on redistribution preferences. In none of the linear mixed effects models (models 1-5) do we find a significant effect. This changes only with a different choice of functional form. In model 6, we estimate a random effects Tobit model, with censoring from below.[5] We now find the significant negative effect predicted by the theoretical model: the more a participant outperformed the remaining members of her group in the first phase, the less she is in favor of redistribution, and vice versa. The Tobit model assumes that some of those participants who have voted for zero redistribution actually would have preferred a negative redistribution rate. This is intuitive. Such participants care about relative payoffs, and they would want society to pay a premium to high performers. With this qualification, we support **Hypothesis 2** (*Individual support for taxation depends on individual ability relative to other members of the community: individuals with high ability are opposed to taxation. Individuals with low earning ability support a positive tax rate.*).

We have a final noteworthy result. Our model is linear in the tax rate. Participants know, and are reminded of, their relative ability. The model predicts that participants with ability below average prefer taxation such that earnings are equalized through redistribution. This would require a tax rate of 100%. Our voting scheme would give them the possibility to vote for very high taxes, and thereby push the tax rate closer to this individually most profitable level. As Graph 1c shows, not a single participant votes for this tax rate. There is one outlier at 70%. All other participants from the lowest ability quarter vote for fairly modest tax rates. As our

4 Because we did not allow participants to choose more than 50 problems, we also re-estimated all models as random effects Tobit models, with upper censoring. Coefficients and significance levels are very similar. These additional estimates are available from the authors upon request.

5 Because there is no generally acknowledged mixed-effects Tobit estimator, we add group fixed effects to the model with a participant random effect.

model demonstrates, these choices cannot be explained by inequity aversion. Even with 100% taxation, "poor" individuals will never outperform "rich" individuals; they would just break even. This suggests that even participants with low ability have some respect for the fact that high ability participants deserve a higher final profit. Apparently, participants balance fairness of outcomes with fairness of desert (on this fairness norm see Gill and Stone 2010).

5 Check of External Validity

The prime advantage of experimental data is identification. By randomly selecting the payoff-relevant combination of task difficulty and effort level we may be sure that any combination of these independent variables actually *causes* participants' redistribution choices (Phase 2). By randomly selecting the combination of task difficulty and a tax/redistribution rate, we may be sure that any combination of these independent variables actually causes participants' effort choices (Phase 3). Internal validity is not an issue. Yet, we study students who may at worst leave the lab with less money than their peers. While the task requires actual effort, it is only analogous to effort choices in a labor relationship. While using a levy that is proportional to gross income to finance a lump-sum payment is a key feature of a tax/redistribution scheme, this too is only analogous to government collecting taxes, and parliament setting up a social security system. As is standard, the external validity of the lab experiment is limited.

5.1 Empirical Strategy Using Survey Data

5.1.1 Data from the World Value Survey

These inevitable limitations inherent in the experimental method motivate our attempt at double checking our key finding with data from the field: Is there evidence that those who have to pay the bill support redistribution? To answer this question, we revert to data from the *World Value Survey*. Details on the data definitions are given in the Appendix, Table 4.

The *World Value Survey* (WVS) has been used frequently to test preferences for redistribution (see, e.g., Alesina and Giuliano 2011). It contains information about respondents' preferences about work, which at least provides us with a proxy for individuals' willingness to exert effort. It is a repeated cross-sectional survey of values and attitudes which was conducted in a large number of countries in five waves over a time span of more than 25 years (1981-2008). We restrict our analysis to OECD countries in order to work with a sufficiently homogenous country sample, while providing heterogeneity with regard to institutional structures. Given the structure of the data, we cannot exploit individual-level dynamics, and we cannot include individual-specific fixed effects to account for unobserved heterogeneity. But we can analyze preferences for redistribution and effort for a large number of individuals in many countries and years.

As a proxy for the individual's willingness to exert effort (l_i), we use the answer to the question whether an individual considers it important to have an opportunity to use initiative at work.[6] This question is a 0/1-answer to a list of features that the individual considers important at the work place. Respondents were free to mention multiple features. We are ready to acknowledge that this is not a direct measure of effort choices, nor of willingness to exert effort. Arguably though individuals who list this feature among the aspects of the workplace they care about are more interested in exerting high effort than individuals who list other features. We thus believe that, although imperfect, this answer is a plausible proxy for willingness to exert effort. We use probit to estimate this binary variable.

There is no direct question in the survey asking about preferences for redistribution either. Yet respondents are asked to indicate a number on a scale ranging from "*1 = Incomes should be made more equal.*" to "*10 = We need larger income differences as incentives*". The question is embedded in a section of the survey which asks about respondents' political preferences. Although the question could also be understood as referring to the desirability of high or small income dispersion of market incomes, respondents are likely to take it as a statement about governmental redistribution as well. Both variables are scaled such that a higher value indicates stronger preferences towards effort and redistribution, respectively. In our estimation, we treat this variable as continuous, and use OLS. Yet we checked that results are robust to using ordered probit instead.

Following previous work by Alesina and Fuchs-Schündeln (2007) or Alesina and Giuliano (2011), we control for observed individual-specific characteristics: age and age squared, gender, marital status (omitted category: "single or never married"), employment status (omitted category: "other"), income group (omitted category: "high income"), and church membership. Inter alia, these variables capture individual employment records and the probability of becoming unemployed or of being out of work.

5.1.2 Macroeconomic Environment

Macroeconomic conditions can have an impact on the preferences for protection through the social security system and the incentives to work. GDP growth is used as a general proxy for the macroeconomic environment. High GDP growth may induce individuals to increase effort because effort pays off, but it may also increase demands for redistribution. We additionally include information on top marginal income tax rates as a general measure of the degree of redistribution via the tax system. Country and year fixed effects are included in all regressions.[7] In order to account for the fact that country-year characteristics are identical for all

6 To check the robustness of our results, we have additionally used answers to the question whether hard work brings success (to measure effort preferences), whether higher pay for higher effort is considered fair, and whether job security is considered important (to measure redistribution preferences). Qualitative results are similar and are available upon request.

7 Note that the macro-variables and year*country fixed effects would be perfectly collinear. Since we rely on macro-variables for instrumentation, we refrain from adding year*country fixed effects.

individuals in a given year in a given country, we cluster standard errors at the country-year-level.

5.1.3 Instrumentation Strategy

Identifying the impact of effort preferences on preferences for redistribution (and vice versa), while accounting for the potential endogeneity of the regressors, requires finding appropriate instruments. We use the following variables: For effort, we expect a dummy for the respondent being protestant to have a positive impact. This would be in line with the work by Becker and Wössmann (2009) who show that, historically, protestantism was associated with economic prosperity and with better education.[8] Also, we expect a relation between willingness to exert effort and the individual's perception of and attitude towards earning a living in the economy. In an environment where people may safely assume that higher effort pays, they should be more likely to engage in effort. We proxy this expectation by the stated willingness to "trust". On the normative side, people should be more inclined to exert high effort if they believe that a high income *should* result from higher effort, not from criminal activity. The willingness to engage in high effort and the statement that it is justifiable to accept a bribe (as one source of income unrelated to effort) should therefore be correlated negatively.

As regards preferences for redistribution, we have three main variables which are expected to affect only this variable, but not effort choices. The first is measured at the individual level, and it describes the *characteristics of the neighborhood*. In the long run, individuals of course choose to move into specific neighborhoods, which would lead to a selection effect. Yet due to the fixed costs of moving, these characteristics can be considered exogenous for the individual in the short to medium run. When asked about the characteristics of their neighborhood, respondents can answer whether neighbors have a different race or a different religion, whether they are drug addicts, alcoholics, whether they belong to a militant minority, or whether they have a criminal record. We create a dummy variable which equals one if one of these conditions is fulfilled. The intuition is that a more homogenous and less adverse neighborhood increases the probability that people favor redistribution. We therefore expect that this variable is negatively correlated with preferences for redistribution.

The second variable that should affect preferences for redistribution (but not effort) measures the tightness of *employment protection legislation*. This variable is not exogenous for the entire population: politicians have reason to be sensitive to the median voter's preferences. Yet all we need is exogeneity for the stated redistribution preferences of *individual* respondents. Specifically, we draw on OECD data which provide an index running from 1 to 5, and a higher value indicates stricter employment protection legislation. Arguably redistribution preferences are influenced by living in a context where redistribution is more generous. We would

8 It of course is the point of their paper to show that the effect of Protestantism becomes insignificant once one controls for literacy. They argue that Protestants are more likely to build human capital, which is critical for the effect. Yet all we need for our instrument is the association between Protestantism and effort, even if it follows from better education making higher effort more profitable.

thus expect to find a positive link between employment protection legislation and individual preferences for redistribution.

Finally, high *growth volatility* indicates that macroeconomic risks are high. We therefore expect this variable to have a positive effect on redistribution preferences. GDP growth volatility is calculated as the standard deviation of GDP growth over a five year period.

Our behavioral model not only suggests that effort preferences are endogenous in a regression that explains redistribution preferences, and redistribution preferences are endogenous in a regression that explains effort preferences. Our behavioral model posits that both preferences are *jointly determined* by ability, which we cannot observe in the survey data. We react to this challenge by a statistical model that accounts for simultaneity. This would be straightforward if both dependent variables were continuous (Zellner and Theil 1962). Yet one of our dependent variables is dichotomous. This is why we revert to the more involved procedure developed by Maddala (1983) and use the Stata implementation by Keshk (2003).

5.1.4 Limitations

At the outset, we readily acknowledge a number of new limitations. With the survey data, we can address only **Hypothesis 3** regarding the relationship between effort and redistribution. We cannot address Hypotheses 1 and 2 because we do not have a reliable, exogenous measure of ability, Hypothesis 4 because we do not have information on individuals' social preferences, and Hypothesis 5 because the data are cross-sectional. Our theory predicts an effect of effort *choices* on redistribution *choices*, and vice versa. In the survey, we have data about effort and redistribution *preferences*. We thus must make the identifying assumption that preferences translate into choices. Moreover, the survey instrument does not directly ask for effort and redistribution preferences. This forces us to work with proxies. Finally, in the field, effort and redistribution preferences are likely to be determined simultaneously, not the least by unobserved ability. We therefore face an endogeneity problem and must instrument either explanatory variable. As usual, our instruments are not beyond any doubt. For all these reasons, we offer the survey data only as an external validity check of the key finding from the experiment. Yet, since our key result is potentially highly important for redistribution politics, we believe it important to double check it, even if the evidence from the field is less than ideal.

5.2 Results

Descriptive statistics reported in Graph 2 show that preferences for effort and redistribution are not constant over time. According to the *World Value Survey*, the average proportion of respondents mentioning that it is important to have the opportunity to use initiative at work ("effort") increased from 44% to 55% over the four waves along which the survey was conducted (1981-84 versus 1999-2004). At the same time, support for greater income equality

strengthened. Across all countries, this would suggest a positive correlation between effort and redistribution preferences.

Because participants in our experiment reported in Section 4 have been recruited in Germany, it is instructive to compare the responses of German respondents in the *World Value Survey* to those from other countries. Generally, the opportunity to use initiative at work is considered important by about 55% of the respondents in Germany. This share is above-average but, in contrast to other countries, there is a declining trend over time. At the end of the time period, this ratio was similar for Germany as for the other countries. As regards preferences for redistribution, German respondents prefer somewhat higher degrees of redistribution at the end of the sample period. There has been an increasing trend for this variable in Germany, unlike in most other countries.

For reasons explained in the previous section, the results from a regression, reported in Table 6, that account for simultaneity are most reliable. Yet, we also report regressions that separately explain either variable with the instrumented other variable (Table 5).[9] In both specifications, we find a significant negative effect of redistribution (preferences) on effort (preferences): the more an individual deems equalizing income important, the less this same individual is likely to list the possibility to show initiative among the features of her job she cares about. In this respect, we support **Hypothesis 3** that was derived assuming standard preferences. Yet, in either specification, the coefficient of our proxy for effort preferences in the equation explaining redistribution preferences is positive, not negative as predicted by Hypothesis 3, and insignificant. In the survey data, we do thus not fully replicate the significant *positive* effect of higher effort choices on higher redistribution votes from the experiment. Yet, at least we see no signs that those who have to pay for redistribution are opposed. This is a remarkable finding.

6 Concluding Remarks

The global financial crisis and the European sovereign debt crisis have had severe repercussions on the real economy. They have also triggered policy discussions on the tradeoff between redistribution and growth. On the one hand, the crises have shown the fragility of insurance systems relying on financial markets, as private investors have suffered substantial losses. The ability of governments to shield their electorates from the perils of international

9 For the model reported in columns (1) and (2) of Table 5, the qualitative results are robust with regard to estimating the model using 2SLS or GMM and with regard to different options for clustering the errors. The Durbin-Hausman-Wu test rejects that "effort" is endogenous, but this result is somewhat sensitive to the specific choice of instruments. The Hansen Test is insignificant, which implies that the overidentification restriction is valid. However, when additionally including the instruments which we conjecture to be important for redistribution preferences, these are significant as well: employment protection legislation has a negative and significant impact on effort; the heterogeneity of the neighborhood has a positive impact. Adding these variables causes the Hansen Test to become significant, though, implying that in this specification the overidentification restriction is not valid.

markets has been called into question as well. Many workers have experienced increased labor market risks, and they demand greater protection by their governments. On the other hand, governments have little room for maneuver as public households have to deal with the increasing burden of public debt. Hence, a key question is how policymakers can align redistributive policies and fiscal consolidation without jeopardizing future economic growth.

The tradeoff between redistribution and growth is a core concern of macroeconomic policy. We investigate this tradeoff from the perspective of individual choices by analyzing the link between individual effort and redistribution choices. Our empirical investigation is motivated by a simple theoretical framework using both, standard preferences and preferences incorporating inequity aversion. If all individuals hold standard preferences, the model predicts that those who have high ability will exert more effort and will be opposed to redistribution. Policies which increase redistribution have negative implications for effort. If individuals are averse against inequity, however, results are less clear cut. Provided they are sufficiently averse to advantageous inequity, even stronger individuals favor redistribution. Our model suggests that this is particularly likely if stronger individuals are averse against weaker individuals' income falling below what they had in the past and thus a reference payoff.

We have tested the predictions made by this model using experimental and survey data, and our research has three main findings.

First, both in the survey and in the lab, we support the predicted negative effect of redistribution on effort. The more income is redistributed, i.e. the higher the tax rate, and the higher the degree of redistribution financed from this tax, the more the willingness to exert effort declines.

Second, we find evidence for the predicted negative relationship between ability and redistribution choices only if we use a Tobit model that allows for the possibility of society even paying a premium for high performance.

Third, we qualify the link between redistribution and effort choices as predicted by a model with standard preferences. In the lab, we find a significant effect of effort choices on redistribution choices, but it is *positive*, not negative as predicted by standard theory. If the design of the experiment forces (all) participants to exert high effort, on average even those with high ability are in favor of more redistribution. The effect is even more pronounced if an exogenous shock makes earning money more difficult for everybody. This suggests that the standard theoretical model misses a "solidarity" motive. Experimental participants apparently do see redistribution less as an opportunity for equalizing income, and more as a technology for giving everybody a "fair" minimum income if the economy is in dire circumstances. In the survey, the effect of effort preferences on redistribution preferences is positive as well, but insignificant. We thus do not fully replicate the surprising experimental result. But we at least do also find no sign that those who have to pay for redistribution are opposed to it. With that qualification, the experimental finding also turns out to be externally valid.

Nonetheless, the results of our empirical exercises cannot directly be transferred outside the boundaries of our survey and experimental set-ups. Drawing policy lessons from the survey data is subject to changes in the environment and thus to the Lucas critique, and experiments never capture all effects that might matter in reality. Still, we believe that our results could be potentially relevant for the current policy debate in the following sense: In the years since the outbreak of the world financial crisis, a series of severe shocks has hit the world economy. The labor market responses to this shock will depend on preferences for redistribution. Our data suggest that even many of those with high earning ability, and of those who currently exert high effort, would be in support of helping those who have been hit by the crisis. Yet if the degree of income redistribution increases, this risks having a negative feedback effect on effort and growth.

Through this channel, in the long run, more redistribution may even be bad for growth *and* fairness. For the higher the redistributive burden, the smaller the fraction of income an individual may influence by working harder. If income is at least partly determined by luck, the portion of income inequality resulting from luck becomes the more important the less effort matters (Alesina and Giuliano 2011). The resulting distribution of incomes would be considered less “fair”. Both our survey and our lab evidence point to an additional, more direct channel. If there is more redistribution, the willingness to exert effort decreases. The degree of redistribution directly and negatively affects effort. This poses a hard choice for policy makers. When the decision in favor of more redistribution has to be taken, there might be little opposition, if not positive support even by those with high ability, effort and income. Yet, later on, the economy will suffer from the fact that the higher burden of redistribution dampens the willingness to exert more effort. In this sense, policy preferences can be considered short-sighted. The electorate seems to suffer from inconsistency in its preferences for redistribution.

References

ALESINA, ALBERTO AND NICOLA FUCHS-SCHÜNDELN (2007). "Good-bye Lenin (or not?). The Effect of Communism on People's Preferences." *The American Economic Review* **97**(4): 1507-1528.

ALESINA, ALBERTO AND PAOLA GIULIANO (2011). Preferences for Redistribution. *Handbook of Social Economics*. J. Benhabib, A. Bisin and M. O. Jackson. Amsterdam, Elsevier**:** 93-131.

BECKER, SASCHA O. AND LUDGER WÖSSMANN (2009). "Was Weber Wrong? A Human Capital Theory of Protestant Economic History." *Quarterly Journal of Economics* **124**(2): 531-596.

BECKMAN, STEVEN R., JOHN P. FORMBY AND JAMES W. SMITH (2004). "Efficiency, Equity and Democracy. Experimental Evidence on Okun's Leaky Bucket." *Research on Economic Inequality* **11**: 17-42.

CABRALES, ANTONIO, ROSEMARIE NAGEL AND JOSÉ V. RODRIGUEZ MORA (2012). "It is Hobbes, not Rousseau. An Experiment on Voting and Redistribution." *Experimental Economics* **15**: ***.

CHECCHI, DANIELE AND ANTONIO FILIPPIN (2004). "An Experimental Study of the POUM Hypothesis." *Research on Economic Inequality* **11**: 115-136.

DAVIDOVITZ, LIEMA AND YORAM KROLL (2004). "On the Attitude Towards Inequality." *Research on Economic Inequality* **11**: 137-147.

DURANTE, RUBEN, LOUIS PUTTERMAN AND JOEL J. VAN DER WEELE (2014). "Preferences for Redistribution and Perception of Fairness. An Experimental Study." *Journal of the European Economic Association* ***: ***.

FEHR, ERNST AND KLAUS M. SCHMIDT (1999). "A Theory of Fairness, Competition, and Cooperation." *Quarterly Journal of Economics* **114**: 817-868.

FISCHBACHER, URS (2007). "z-Tree. Zurich Toolbox for Ready-made Economic Experiments." *Experimental Economics* **10**: 171-178.

FONG, CHRISTINA M. (2001). "Social Preferences, Self-interest, and the Demand for Redistribution." *Journal of Public Economics* **82**(2): 225-246.

FROHLICH, NORMAN AND JOE OPPENHEIMER (1990). "Choosing Justice in Experimental Democracies with Production." *The American Political Science Review* **84**(2): 461-477.

FROHLICH, NORMAN, JOE OPPENHEIMER AND CHERYL L. EAVEY (1987a). "Choices of Principles of Distributive Justice in Experimental Groups." *American Journal of Political Science* **31**(3): 606-636.

FROHLICH, NORMAN, JOE OPPENHEIMER AND CHERYL L. EAVEY (1987b). "Laboratory Results on Rawls's Distributive Justice." *British Journal of Political Science* **17**(01): 1-21.

GILL, DAVID AND REBECCA STONE (2010). "Fairness and Desert in Tournaments." *Games and Economic Behavior* **69**(2): 346-364.

GREINER, BEN (2004). An Online Recruiting System for Economic Experiments. *Forschung und wissenschaftliches Rechnen 2003*. K. Kremer and V. Macho. Göttingen**:** 79-93.

HERNE, KAISA AND MARIA SUOJANEN (2004). "The Role of Information in Choices over Income Distributions." *Journal of Conflict Resolution* **48**(2): 173.

KESHK, OMAR M.G. (2003). "CDSIMEQ. A Program to Implement Two-stage Probit Least Squares." *The Stata Journal* **3**(2): 1–11.

KLOR, ESTEBAN AND MOSES SHAYO (2010). "Social Identity and Preferences Over Redistribution." *Journal of Public Economics* **94**: 269-278.

KONOW, JAMES (2000). "Fair Shares. Accountability and Cognitive Dissonance in Allocation Decisions." *American Economic Review* **90**(4): 1072-1091.

KRIEGER, TIM AND STEFAN TRAUB (2008). Back to Bismarck? Shifting Preferences for Intragenerational Redistribution in OECD Pension Systems.

MADDALA, GANGADHARRAO SOUNDALYARAO (1983). *Limited-dependent and Qualitative Variables in Econometrics*, Cambridge Univ Pr.

NEUSTADT, ILJA AND PETER ZWEIFEL (2010). Economic Well-Being, Social Mobility, and Preferences for Income Redistribution. Evidence from a Discrete Choice Experiment.

ORGANISATION FOR ECONOMIC COOPERATION AND DEVELOPMENT (2011). *Divided We Stand. Why Inequality Keeps Rising*. Paris, OECD.

PERSSON, TORSTEN, GUIDO TABELLINI AND ISABELLE BROCAS (2000). *Political Economics*, MIT press.

SCHOKKAERT, ERIK AND BART CAPEAU (1991). "Interindividual Differences in Opinions about Distributive Justice." *Kyklos* **44**(3): 325-345.

SCHOKKAERT, ERIK AND BRUNO OVERLAET (1989). "Moral Intuitions and Economic Models of Distributive Justice." *Social Choice and Welfare* **6**(1): 19-31.

SELTEN, REINHARD (1967). Die Strategiemethode zur Erforschung des eingeschränkt rationalen Verhaltens im Rahmen eines Oligopolexperiments. *Beiträge zur experimentellen Wirtschaftsforschung*. E. Sauermann. Tübingen, Mohr**:** 136-168.

SELTEN, REINHARD AND AXEL OCKENFELS (1998). "An Experimental Solidarity Game." *Journal of Economic Behavior & Organization* **34**(4): 517-539.

TAUSCH, FRANZISKA, JAN POTTERS AND ARNO RIEDL (2010). Preferences for Redistribution and Pensions. What Can We Learn from Experiments?

TYRAN, JEAN-ROBERT AND RUPERT SAUSGRUBER (2006). "A Little Fairness May Induce a Lot of Redistribution in Democracy." *European Economic Review* **50**(2): 469-485.

ZELLNER, ARNOLD AND H. THEIL (1962). "Three-stage Least Squares. Simultaneous Estimation of Simultaneous Equations." *Econometrica* **30**(1): 54-78.

Tables

Table 1: Experimental Design

(a) Real Effort Task

Participants have to click on the two cells that add up to 10.

4.67	4.81	3.05
5.82	5.06	4.28
6.36	5.19	4.57

(b) Elicitation of Redistribution Preferences

Columns are percentages of the number of tasks this individual has correctly solved in part 1 of the experiment. Participants could enter percentages (expressed as integers)

%	30	40	50	60	70	80	90	100	110	120
2x2										
3x3										
4x4										

(c) Elicitation of Effort Preferences

Columns are percentages of total group income to be collected and redistributed in equal shares. Participants could enter the number of problems they committed to solve if the respective cell was determined to be payoff-relevant.

%	0	5	10	15	20	25	30	35	40	45
2x2										
3x3										
4x4										

Table 2: Explaining Effort Choices in the Experiment

The dependent variable measures effort choices, conditional on imposed degree of redistribution and difficulty of task. Results from a linear mixed effects model, with random effects for individual and group. *Mean ability* = mean number of problems solved within the group of 4, *easy task* = 2x2 tables, *difficult task* = 4x4 tables, reference category: 3x3 tables; *imposed redistribution* = percentage of group income redistributed equally, *time for leisure* = total time this participant took for actually solving the tasks from phases 2 and 3. The number of observations (*N*) is 2,880. Hausman test insignificant on all models. *** p < .001, ** p < .01, * p < .05. Standard error in parenthesis.

	Model 1	Model 2	Model 3	Model 4	Model 5
Ability	0.442**	0.492**			
	(0.144)	(0.147)			
Mean ability		-0.935			
		(0.637)			
Ability – mean ability			0.492**	0.492**	0.492**
			(0.147)	(0.147)	(0.147)
Easy task				9.447***	9.447***
				(0.306)	(0.298)
Difficult task				-6.939***	-6.939***
				(0.306)	(0.298)
Imposed redistribution					-10.562***
					(0.846)
Constant	11.367**	31.742*	21.549***	20.713***	23.089***
	(3.538)	(14.313)	(1.198)	(1.211)	(1.255)
N	2,880	2,880	2,880	2,880	2,880
p model	.0022	.0028	.0008	<.0001	<.0001

Table 3: Explaining Redistribution Choices in the Experiment

The dependent variable measures each participant's votes on the chosen percentage of redistribution for 30 combinations of imposed effort and difficulty per participant. Model 1-5 are linear mixed effects models, with error terms for individual and group; model 6 is a random effects Tobit, with group fixed effects, censoring from below at 0. *Ability* = number of problems solved in phase 1, *mean ability* = mean number of problems solved within the group of 4, *easy task* = 2x2 tables, *difficult task* = 4x4 tables, reference category: 3x3 tables, *imposed effort* = percentage of problems solves in phase 1. The number of observations (*N*) is 2,880. Hausman test insignificant on all models. *** p < .001, ** p < .01, * p < .05. Standard error in parenthesis.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Ability	-0.276	-0.280				
	(0.185)	(0.190)				
Mean ability		0.074				
		(0.824)				
Ability – mean ability			-0.280	-0.280	-0.280	-.751*
			(0.190)	(0.190)	(0.190)	(0.333)
GEasy task				-1.796***	-1.796***	-3.009***
				(0.424)	(0.417)	(0.645)
Difficult task				3.347***	3.347***	4.944***
				(0.424)	(0.417)	(0.635)
Imposed effort					5.697***	9.344***
					(0.593)	(0.912)
Constant	19.066***	17.451	12.713***	12.196***	7.923***	2.376
	(4.529)	(18.528)	(1.547)	(1.566)	(1.628)	(12.975)
N	2,880	2,880	2,880	2,880	2,880	2,880
p model	.1356	.3270	.1409	<.0001	<.0001	<.0001

Table 4: *World Value Survey* Data: Summary Statistics

This Table shows the summary statistics for the variables used in the regressions. The number of observations differs from those reported in the following Tables because not all questions have been asked in all countries in all survey waves.

Variable	Observations	Mean	Std. dev.	Minimum	Maximum
Age	139,583	43.390	17.096	15.000	101.000
Age squared (/10^3)	139,583	2.175	1.631	0.225	10.201
Children (0/1)	129,403	0.755	0.430	0.000	1.000
Church member (0/1)	131,541	0.235	0.424	0.000	1.000
Divorced (0/1)	140,857	0.044	0.205	0.000	1.000
Full time (0/1)	137,647	0.410	0.492	0.000	1.000
GDP growth (annual %)	140,254	2.323	3.827	-14.570	11.350
GDP volatility (%)	114,306	1.845	1.491	0.211	8.808
Hard work brings success	75,285	6.432	2.698	1.000	10.000
Higher pay for higher effort considered unfair	117,248	0.194	0.395	0.000	1.000
House wife (0/1)	137,647	0.140	0.347	0.000	1.000
Incomes should be made more equal	104,863	5.395	2.861	1.000	10.000
Log trade share	138,463	3.847	0.497	2.606	5.249
Low income (0/1)	120,785	0.348	0.476	0.000	1.000
Male (0/1)	142,229	0.477	0.499	0.000	1.000
Married (0/1)	140,857	0.643	0.479	0.000	1.000
Medium income (0/1)	120,785	0.375	0.484	0.000	1.000
Part time (0/1)	137,647	0.081	0.272	0.000	1.000
Retired (0/1)	137,647	0.170	0.376	0.000	1.000
Self-employed (0/1)	137,647	0.072	0.259	0.000	1.000
Separated (0/1)	140,857	0.015	0.122	0.000	1.000
Use initiative at work (0/1)	124,094	0.500	0.500	0.000	1.000
Student (0/1)	137,647	0.058	0.234	0.000	1.000
Top marginal tax rate in respondent's country	132,933	0.465	0.143	0.115	0.930
Unemployed (0/1)	137,647	0.054	0.226	0.000	1.000
Union member (0/1)	127,691	0.172	0.377	0.000	1.000
Widowed (0/1)	140,857	0.072	0.258	0.000	1.000

Table 5: Determinants of Effort and Preferences for Redistribution in the *World Value Survey* (IV Estimates)

	(1) Equality, 2nd stage	(2) Equality, 1st stage (dep. var.: initiative)	(3) Initiative, 2nd stage	(4) Initiative, 1st stage (dep. var: equality)
Incomes should be made more equal			-0.117***	
			(0.045)	
Important in job: use initiative (0/1)	0.219			
	(0.379)			
Age	0.019***	0.002***	0.013***	0.018***
	(0.006)	(0.001)	(0.003)	(0.005)
Age squared (/10^3)	-0.198***	-0.036***	-0.153***	-0.176***
	(0.062)	(0.010)	(0.027)	(0.054)
Male (0/1)	-0.266***	0.034***	0.035*	-0.309***
	(0.033)	(0.005)	(0.021)	(0.028)
Children (0/1)	0.011	-0.026***	-0.097***	0.031
	(0.047)	(0.008)	(0.019)	(0.039)
Low income (0/1)	0.951***	-0.106***	-0.230***	0.872***
	(0.057)	(0.007)	(0.051)	(0.034)
Medium income (0/1)	0.592***	-0.073***	-0.150***	0.569***
	(0.043)	(0.006)	(0.035)	(0.029)
Full time (0/1)	-0.145	0.032	0.067	-0.229**
	(0.119)	(0.020)	(0.050)	(0.105)
Part time (0/1)	-0.141	0.003	-0.015	-0.128
	(0.125)	(0.021)	(0.052)	(0.111)
Self-employed (0/1)	-0.458***	0.045**	0.082	-0.540***
	(0.128)	(0.022)	(0.060)	(0.113)
Retired (0/1)	0.062	0.014	0.015	-0.053
	(0.123)	(0.021)	(0.051)	(0.110)
House wife (0/1)	-0.038	-0.019	-0.105**	-0.109
	(0.123)	(0.021)	(0.051)	(0.110)
Student (0/1)	-0.267*	0.073***	0.164***	-0.320***
	(0.139)	(0.024)	(0.061)	(0.121)
Unemployed (0/1)	0.056	-0.022	-0.073	0.092
	(0.132)	(0.022)	(0.055)	(0.118)
Married (0/1)	-0.054	0.010	-0.026	-0.103**
	(0.053)	(0.010)	(0.023)	(0.045)
Divorced (0/1)	0.005	0.054***	0.065*	-0.064
	(0.085)	(0.015)	(0.035)	(0.071)
Separated (0/1)	-0.033	0.060***	0.06	0.006
	(0.124)	(0.021)	(0.049)	(0.106)
Widowed (0/1)	0.047	-0.018	-0.120***	-0.098
	(0.078)	(0.014)	(0.034)	(0.071)
Church member (0/1)	-0.081**	0.038***	0.091***	-0.142***
	(0.036)	(0.006)	(0.017)	(0.030)
GDP growth (annual %)	0.186***	-0.008**	-0.025**	0.157***
	(0.022)	(0.004)	(0.011)	(0.026)
Top marginal tax rate	4.491***	-0.649***	-0.315	1.880**
	(0.665)	(0.107)	(0.413)	(0.877)

	(1) Equality, 2nd stage	(2) Equality, 1st stage		(3) Initiative, 2nd stage	(4) Initiative, 1st stage
Instruments					
Trust (0/1)		0.052**	Neighbors different		-0.197***
		(0.005)			(0.031)
Protestant (0/1)		0.015**	Employment protection legislation		0.803***
		(0.008)			(0.106)
Bribe		-0.009***	Growth volatility		0.226***
		(0.002)			(0.053)
Leisure		-0.029***			
		(0.003)			
Observations	40,806			45,713	45,713
(Pseudo) R^2	0.079				
Durbin-Wu-Hausmann endogeneity test	2.32		Wald test of exogeneity	2.76	
Hansen J	1.94		Probability exogenous	0.09	
Minimum eigenvalue statistic	55.42				
Shea's partial R^2	0.005				

Table 1 shows the determinants of effort and redistribution preferences based on data from five waves of the World Value Survey using data for OECD countries. Second stage models are estimated using maximum likelihood. A full set of year and country (but not year*country) fixed effects is included. Column (1) shows the 1st stage regression for an instrumental variables regression (`ivregress`) using the variable "Incomes should be made more equal (Scale 1-10)" as the dependent variable. Instruments for "effort" are trust, protestant, leisure important, and accepting a bribe. Column (2) has the corresponding 2nd stage regressions. Column (3) shows the 1st stage regressions for an instrumental variable regression (`ivprobit`) using the variable "Important to use initiative at work (0/1)" as the dependent variable. Instruments for "equality" are employment protection legislation, neighbors are different and growth volatility. Column (4) has the corresponding second stage regression. The omitted categories for employment status is the category "other", for family status "single or never married", and for income "high income". The constant term is not reported. ***, **, * = significant at the 1%, 5%, 10%-level. Standard errors in parenthesis.

Table 6: Simultaneously Modelling Effort and Preferences for Redistribution in the *World Value Survey*

This table shows the determinants of effort and redistribution preferences based on data from five waves of the World Value Survey using data for OECD countries. A full set of year and country (but not year*country) fixed effects is included. Panel (a) presents the results for the first stage regressions (control variables omitted); panel (b) for the second stage regressions. Estimates in columns (1) and (2) of Panel (b) are based on the simultaneous equation model proposed by Maddala (1983) and implemented by Keshk (2003). The variables "Important to use initiative" and "Incomes should be made more equal" are the predicted values from the first stage regressions described in the main body of the text. The omitted categories for employment status is the category "other", for family status "single or never married", and for income "high income".

(a) First stage regression

	Dependent variable: Equality (1-10)			Dependent variable: Initiative (0/1)		
	Coef.		Std. Err.	Coef.		Std. Err.
Neighbors different	-0.150	***	0.037	0.041	***	0.018
Employment protection legislation	0.466	***	0.105	-0.110	**	0.051
Growth volatility (%)	0.153	***	0.064	0.004		0.031
Trust (0/1)	0.015		0.030	0.133	***	0.015
Protestant (0/1)	-0.036		0.044	0.052	**	0.022
Accepting a bribe	-0.007		0.011	-0.030	***	0.005

(b) Second stage regressions

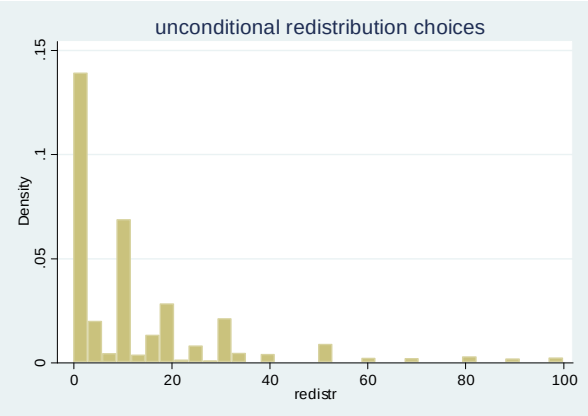
	(1) Simultaneous equation model	(2)
	Equality	Initiative
Initiative (0/1)	0.100	
	(0.184)	
Equality (1-10)		-0.240**
		(0.087)
People can be trusted (0/1)		0.136***
		(0.016)
Protestant (0/1)		0.044*
		(0.023)
Accepting a bribe		-0.032***
		(0.006)
Neighbors different	-0.154***	
	(0.038)	
Employment protection legislation	0.477***	
	(0.107)	
Growth volatility	0.150**	
	(0.065)	
GDP growth (annual %)	0.069**	-0.030**
	(0.034)	(0.014)
Top marginal tax rate	5.877***	0.815
	(0.815)	(0.706)
Age	0.018**	0.011**
	(0.006)	(0.004)
Age squared (/10^3)	-0.182**	-0.154***
	(0.067)	(0.038)
Male (0/1)	-0.274***	0.022
	(0.036)	(0.029)

Children (0/1)	0.037	-0.080**
	(0.051)	(0.026)
Low income (0/1)	0.928***	-0.096
	(0.073)	(0.081)
Medium income (0/1)	0.598***	-0.082
	(0.055)	(0.054)
Full time (0/1)	-0.218*	0.06
	(0.125)	(0.067)
Part time (0/1)	-0.181	-0.03
	(0.131)	(0.071)
Self-employed (0/1)	-0.572***	0.024
	(0.137)	(0.085)
Retired (0/1)	-0.064	0.037
	(0.128)	(0.068)
House wife (0/1)	-0.11	-0.092
	(0.128)	(0.068)
Student (0/1)	-0.344**	0.137*
	(0.151)	(0.081)
Unemployed (0/1)	0.032	-0.05
	(0.138)	(0.073)
Married (0/1)	-0.103*	0.004
	(0.056)	(0.031)
Divorced (0/1)	-0.026	0.131**
	(0.092)	(0.046)
Separated (0/1)	0.009	0.111*
	(0.128)	(0.066)
Widowed (0/1)	0	-0.046
	(0.082)	(0.043)
Church member (0/1)	-0.072*	0.092***
	(0.042)	(0.019)
Constant	1.078**	0.952***
	(0.352)	(0.200)
Observations	32,647	32,647
(Pseudo) R^2	0.085	0.047

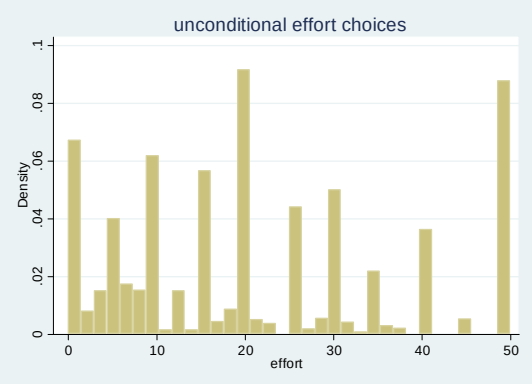
Graphs

Graph 1: Descriptive Statistics Lab Experiment

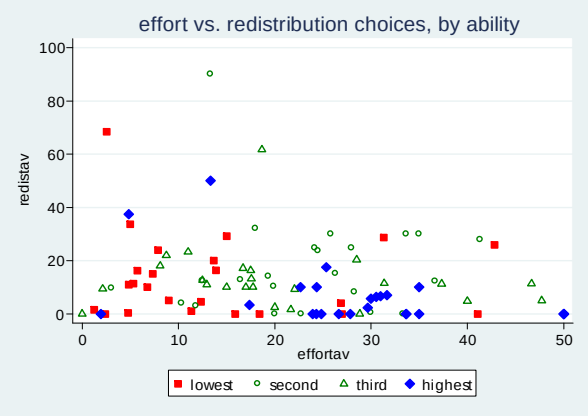
(a) Distribution of Redistribution Choices



(b) Distribution of Effort Choices



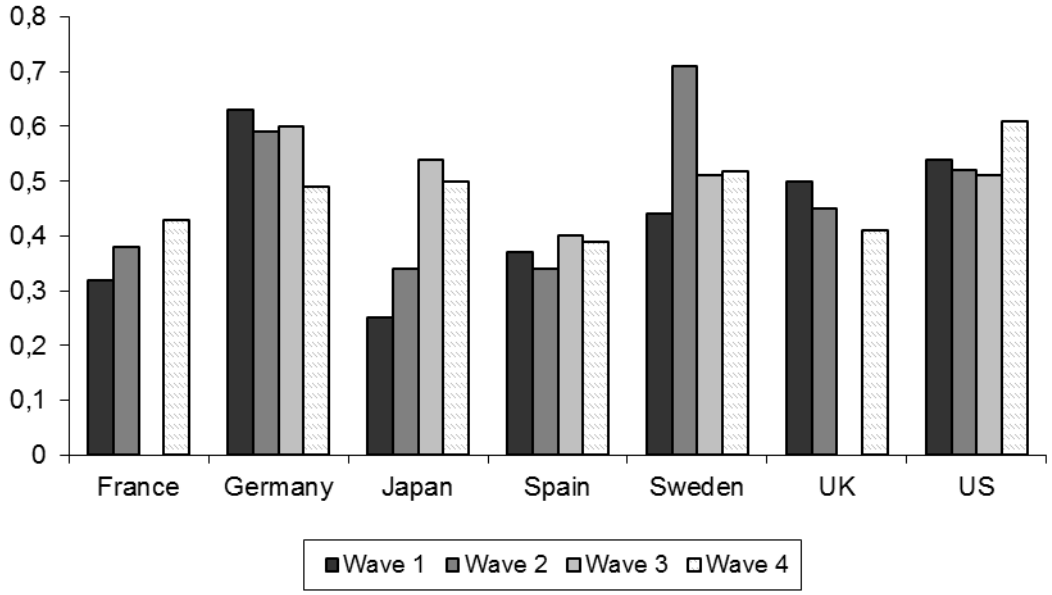
(c) Redistribution Preferences Conditional on Effort Preferences



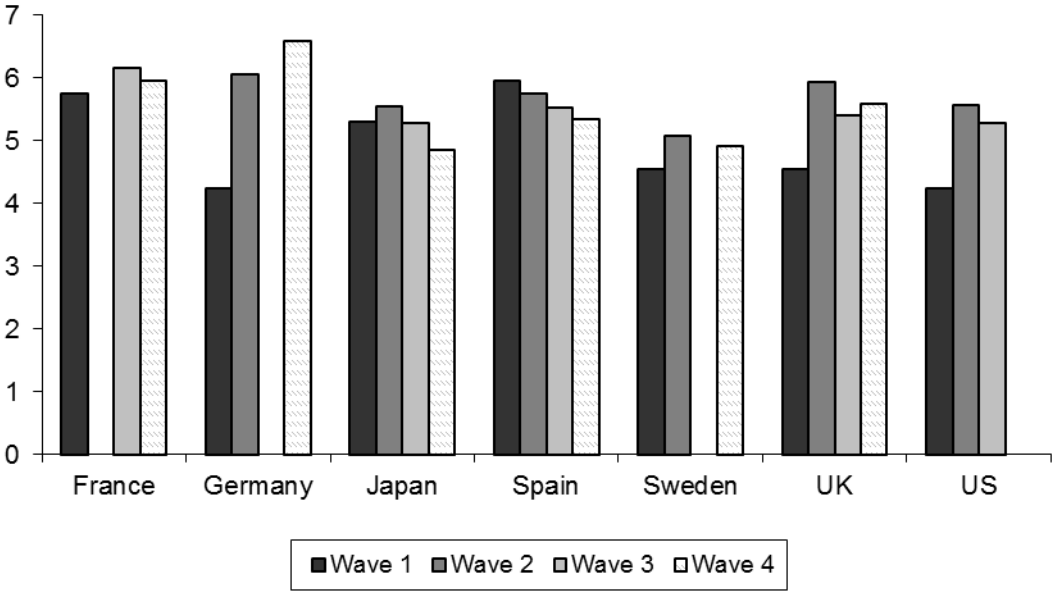
Graph 2: Stated Preferences for Redistribution and Effort

This table shows the mean responses to the questions "Opportunity to use initiative" (0/1) and "Incomes should be made more equal" (10-1) of the World Value Survey. The four waves capture the years 1981-84, 1989-93, 1994-99, and1999-2004. Not all questions have been asked in all countries in each wave.

(a) "Opportunity to use initiative" (0/1)



(b) "Incomes should be made more equal" (1-10)



Appendix

A1. Instructions for the Experiment

General Instructions for Participants

Welcome to our experiment!

If you read the following instructions carefully, you can earn a substantial amount of money, depending on your decisions. It is therefore very important that you read these instructions carefully.

During the experiment, any communication with the other participants is strictly forbidden. Disobeying this rule will lead to exclusion from the experiment and from all payments. If you have any questions, please raise your hand. We will come to you.

In the first three parts of the experiment, we shall speak not of Euro, but instead of Taler. Your income is hence initially calculated in Taler. What you earn is converted into Euro at the end of the experiment, at the rate of

1 Taler = 40 Cent

The sum you have earned in the course of the experiment will be paid to you **in cash** and in Euro.

In this experiment, you will make decisions. The consequences of these decisions depend not only on your own behavior, but also on chance. We shall explain in more detail further on what role chance plays. How the other participants in the experiment behave is not relevant for your payments in the first part of the experiment.

The experiment consists of five parts. We will explain each part separately.

Part One

In the first part of the experiment, we will show you a number of tables on your screen, which look like this:

4.67	4.81	3.05
5.82	5.06	4.28
6.36	5.19	4.57

Your task is to click on the two cells that add up to 10. In every table, there is always only one single pair that adds up exactly to 10. You have one try each time. If your answer is correct, you will receive one Taler.

The tables differ in size. We will present the tables to you in the following order:

2 x 2

3 x 3

4 x 4

Your income does not depend on the number of cells. For every task solved correctly, you will hence receive one Taler.

This part of the experiment lasts exactly 10 minutes.

Part Two

In the second part of the experiment, you have exactly the same task as in the first part. For each table in which you correctly define the number pair that adds up to 10, you will once again receive payment of one Taler. Here, however, you are only shown tables of one particular size. The computer will determine – at random and with the same likelihood for each case – whether your tasks consist of tables with size 2 x 2, 3 x 3, or 4 x 4. All participants are shown tables of the same size.

The computer will also determine randomly how many tasks all experiment participants have to solve in this part of the experiment. Only once you have completed as many tasks as the computer has determined will you receive a payoff for this part and the other parts of the experiment. We will show you these tasks at the end of the experiment. There is no time limit. As soon as the first participant has solved all of the required tasks, we will begin with the payoff. You do not have to wait for the last participant to finish. We will determine the number of tasks according to, and depending on, the statistics from the first part of the experiment. The required number of correctly solved tasks lies between 30 and 120 % of the number of tasks you have correctly solved in the first part. If the number was low, the number required in this part of the experiment will hence also be lower. If it was high, the number required in this part of the experiment will also be higher. If the result is not a whole number, we will choose the next smallest whole number.

In this part of the experiment, you are part of a group of 4 participants. We form this group according to the following principle: We use the results from the first part to divide all participants in the lab into 4 classes. The 25% who did worst are placed in the first class. The 25% who did best are placed in the second class. All remaining participants make up the last two classes. From each class, we randomly assign one participant to each group. We will tell you which class you belong to and how many tasks all 4 participants in your group solved correctly on average in the first part.

Each group can adjust the participants' income. In order to do this, each participant determines what percentage of the income shall be used for this purpose. We will show you the following table in return:

%	30	40	50	60	70	80	90	100	110	120
2x2										
3x3										
4x4										

For each percentage of tasks and for each number of cells, please write in this table what percentage of the income should be retained and equally distributed among all 4 group members.

The computer will then, first of all, determine the number of tasks to be solved, as well as the size of the table. For the chosen situation, the computer will then determine whether and, if so, to what extent the income will be adjusted. The computer will place the four group members' decisions in an order that follows the percentage that group members would be willing to part with. The mean between the second-highest and the third-highest percentage is determined as the adjustment.

The following example sheds some more light on this mechanism:

Let us assume the 4 group members have chosen compensation of 22, 35, 25, and 0 % for the case in question. The second-highest value is 22 %, and the third-highest value is 25 %. The average value between these two values is 23.5 %. In order to finance the adjustment, each participant receives a gross income (100%) minus 23.5 %. In other words, everyone gets 76.5 % of their gross income. The remaining income of all participants is divided by 4 and distributed evenly amongst the participants.

Part Three

In the third part of the experiment, the basic task is the same as in the first and second parts. All decisions and payments are made independently of the decision made in Part Two of the experiment.

For each table in which you correctly determine the pair of numbers that adds up to 10, you will once again receive a payment of one Taler. Just as in the second part of the experiment, you will only see tables of one particular size. The computer will once again decide, randomly and with equal probabilities, whether your tasks will consist of tables of the size 2 x 2, 3 x 3, or 4 x 4. All participants will see tables of the same size in this part of the experiment also. Once again, you will form a group of four players with the same participants you played with in the second part.

In this part of the experiment, the computer determines the amount of the ex-post compensation amongst the group members. It lies between 0 % (no compensation) and 45 %, in equal steps of 5 %. The computer chooses a random percentage. All percentages can occur with equal probabilities. Again, compensation is earned by all members of the group. The entire sum that all members have earned will be distributed evenly between all four group members.

In this part of the experiment, we would ask you please to state – for every compensation rate and for all three table sizes – how many tasks you wish to solve. Please note that the number you enter is binding. You are obliged to comply with your commitment at the end of the experiment, once the computer has completed all random decisions. Only once you fulfill this obligation will you receive your payoff for this part and all other parts of the experiment. There is no time limit. As soon as you have fulfilled your obligations from the second and third part of the experiment, we will begin with the payoff. You therefore do not have to wait for all others to finish. Please make your decisions for every compensation rate and for every table size. We will show you the following table in return:

%	0	5	10	15	20	25	30	35	40	45
2x2										
3x3										
4x4										

Part Four

We are interested in knowing how you rate the other participants' behavior. We have two questions on this.

1. *In your opinion, how many tasks have all participants (including yourself) correctly solved in the first part of the experiment?*

Please give an integer number. If necessary, we will round the actual number. If your estimate does not deviate from the actual (rounded) number by more than +2 or -2 tasks, you will receive an additional 1 €. If your estimate does not deviate from the actual (rounded) average by more than +5 or -5 tasks, you will receive an additional 50 Cent.

2. *In your opinion, what compensation percentage have participants chosen on average if they had to get exactly the same number of tasks right as in the first part, and if the tables had 3x3 cells?*

Please give an integer number once again. If necessary, we will round the actual number. If you have guessed this number exactly, you will receive an additional 1 €. If your estimate does not deviate from the actual (rounded) average by more than +5 or -5, you will receive an additional 50 Cent.

For recapitulation purposes, we will now show you the complete table on your screen. We have marked the cell our question relates to. However, please fill in only the box in which we ask you for your estimate of the average.

%	30	40	50	60	70	80	90	100	110	120
2x2										
3x3								x		
4x4										

Part Five

In the fifth and final part of the experiment, only your decisions count. You do not need to complete any further tasks.

In this part of the experiment, we would ask you please to make a choice between **Options A and B** in **10 different cases**. These 10 cases are shown to you in a list on your screen. Each of the two lotteries consists of **2 possible monetary winnings**, one high and one lower, paid with different probabilities.

Options A and B are presented on the screen as in the following **example**:

Case	**Option A**	**Option B**	Your decision
1	2.00 Euro with a probability of 10% or 1.60 Euro with a probability of 90%	3.85 Euro with a probability of 10% or 0.10 Euro with a probability of 90%	☐ Option A ☐ Option B

The computer uses a random program that will determine exactly your payment according to the given probabilities.

For this example, this means:

With a probability of 10 %, Option A will earn 2 Euro; and with a probability of 90 %, Option A will earn 1.60 Euro.

With a probability of 10 %, Option B will earn 3.85 Euro; and with a probability of 90 %, Option B will earn 0.10 Euro.

On the right-hand side, you now have to click whichever option you have chosen.

Please note that at the end of the experiment only one of these 10 cases is actually paid out to you. All cases are equally probable, and the computer will choose **a payoff-relevant case**.

Following that, there will be a draw to determine whether, for the payoff-relevant case, the **higher winnings** (2.00 Euro or 3.85 Euro) or the **lower winnings** (1.60 Euro or 0.10 Euro) will be paid out.

Questionnaire

Finally, we would ask you please to answer the following questions. Your answers will also remain anonymous.

How old are you?

Are you male or female?

Are you enrolled in a university?

If yes: What subject are you studying?

If no: What is your occupation?

Have you ever been employed full-time?

Have you ever been out of work?

Are you part of a religious community?

If yes: Which one?

What is your family status? (married, in cohabitation, divorced, separated, widowed, single)

Do you have children?

A2: World Value Survey: Data Description

World Value Survey

OECD countries only. Variables "v" refer to most recent waves.

1. Proxy for Effort

"Opportunity to use initiative" (*c016*)

Here are some more aspects of a job that people say are important. Please look at them and tell me which ones you personally think are important in a job? "An opportunity to use initiative"

0 'Not mentioned', 1 'Mentioned '

2. Preferences for Redistribution

"Incomes should be made more equal" (*e035*, *v116*)

1 = incomes should be made more equal, …, 10 = we need larger income differences

Re-scaled such that 10 = incomes should be made more equal, …, 1 = we need larger income differences

Years: 1989, 1990, 1991, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2005, 2006, 2007, 2008

Further individual-specific variables:

Age and age squared (*x003, v237*), Church membership (*a065, a098, v24*), Employment status (*x028, v241*) (omitted category: "other"), Gender (*x001, v235*), Income group (*x047r, v253*) (omitted category: "high income"), Justifiable to accept a bribe (*f117*), Leisure is important (*a003*), Marital status (*x007, v55*) (omitted category: "single or never married"), Neighbors are drinkers (*a126*), Neighbors are drug addicts (*a131*), Neighbors belong to a militant minority (*a137*), Neighbors have a criminal record (*a124*), Neighbors have a different race (*a125*), Neighbors have a different religion (*a135*), People can be trusted (*a165*), Protestant (*f025* = 62)

Country-Level Variables

GDP growth and volatility

World Bank, World Development Indicators, GDP growth volatility is the moving-average standard deviation of GDP growth

Labor market regulations

Data have been compiled by Bassanini and Duval (2006) and are available online. We use the following indicators: (i) *Benefit replacement rates*: percentage of average before tax earnings covered through unemployment and social insurance programs. (ii) *Employment protection legislation* (*EPL*): Index of tightness of employment protection legislation where a higher value indicates tighter legislation.

Top marginal tax rates

Personal income top marginal tax rates.

Sources: Data before 2000 has been taken from Source: World Tax Database, Office of Tax Policy Research. Downloaded from http://www.wtdb.org/index.html on July 16, 2002; data after 2000 are taken from the OECD tax database, www.oecd.org/ctp/taxdatabase

Social Security

Social security contributions as percentage of GDP. Missing data have been linearly extrapolated.

Sources: OECD (2008) Revenue Statistics 1965-2007, downloaded from the OECD tax database, www.oecd.org/ctp/taxdatabase

A3. Statistical Model for Simultaneous Estimation of Survey Data

We employ an instrumental variables estimation using the procedure suggested by Maddala (1983), Keshk (2003) for systems where one of the endogenous variables is dichotomous. Using a two-stage procedure, we create instruments for the endogenous variables, and we substitute them for the endogenous counterparts in the structural equations of interest.

Let preferences for redistribution $\tau_{it} = \tau_{it}^{*}$ be a fully observed variable, and effort preferences be given by $l_{it} = 1$ if $l_{it}^{*} > 0$ and $l_{it} = 0$ otherwise.[10] We estimate a two-stage probit least squares (2SPLS) model. In the first step, the following reduced-form equations are estimated:

$$\tau_{it} = \Pi'_1 \mathbf{X}_{it} + \nu_{1,it} \qquad \text{(A1)}$$

$$l_{it}^{**} = \Pi'_2 \mathbf{X}_{it} + \nu_{2,it} \qquad \text{(A2)},$$

where *i* is a country index and *t* denotes time. Note that $\mathbf{X}_{1,it}$ is a composite vector which includes all exogenous variables included in the first structural equation (A3) ($\mathbf{X}_{1,it}$) and in the second structural equation (A4) ($\mathbf{X}_{2,it}$). Equation (A1) is estimated using OLS, and equation (A2) is estimated using a probit model to obtain the (*K* x 1)-vector of parameter coefficients $\hat{\Pi}'_1$ and $\hat{\Pi}'_2$. The fitted values $\hat{\tau}_{it} = \hat{\Pi}'_{1,it} \mathbf{X}_{it}$ and $\hat{l}_{it}^{**} = \hat{\Pi}'_{2,it} \mathbf{X}_{it}$ from these equations are used as regressors for the second stage regressions. The covariates $\mathbf{X}_{it}$ include all exogenous regressors from both equations in the simultaneous equations model.

Panel (a) of Table 2 shows the results for the first stage regressions, focusing on the variables used as instruments in Table 1. The remaining regressors are included in the model, but are not shown to save space. Qualitatively, the results are the same as before, but they show the problem pointed out earlier: while there are a couple of variables affecting effort, but not preferences, for redistribution, the reverse does not hold.

Step two involves estimating the structural equations of interest:

$$\tau_{it}^{*} = \gamma_1 \hat{l}_{it}^{**} + \beta_1 \mathbf{X}_{1,it} + \varepsilon_{1,it} \qquad \text{(A3)}$$

$$l_{,it}^{**} = \gamma_2 \hat{\tau}_{it}^{*} + \beta_2 \mathbf{X}_{2,it} + \varepsilon_{2,it} \qquad \text{(A4)},$$

where $\mathbf{X}_{1.it}$ and $\mathbf{X}_{2,it}$ are the exogenous explanatory variables affecting effort and redistribution preferences, respectively. Equation (A3) is estimated using OLS, and equation (A4) is estimated using a probit model. Estimation needs to take into account that the standard errors are biased, and Keshk (2003) derives the corresponding adjustment factors. We implement this procedure by invoking the procedure `cdsimeq` in *Stata*. The model would not be identified if the same set of variables was included in vectors $\mathbf{X}_{1.it}$ and $\mathbf{X}_{2,it}$.

[10] The presentation of the empirical model follows (Keshk 2003).

Additional Material for the Referees

Control Questions before Phase 2

1. One participant has correctly solved 20 problems in phase 1. The computer decides that, in the second phase of the experiment, participants must solve 50% of the problems. How many problems must this participant solve in this phase of the experiment?
2. In case they have to solve 50% of the problems from phase 1, the four members of the group have decided to use 0%, 10%, 10% and 20% of the income for income adjustment. How many percent is the adjustment rate in this group?

Control Questions before Phase 3

Assume the computer has choses tasks of size 3x3, and an adjustment rate of 20%. You had entered “10” into the respective cell, the remaining 3 members of your group have entered 15, 15 and 20.

1. How many problems must you solve correctly in this phase of the experiment?
2. Which is your income from solving your own problems (after subtracting your contribution to the adjustment)?
3. How much is added to this amount through adjustment?