Essays on behavioral development economics

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Til morfar

Acknowledgments

First and foremost, I would like to thank my supervisor Bertil Tungodden. You have put more time and effort into guiding me through the research process than anyone could expect. Your enthusiasm, thoroughness and impressive knowledge of economics have benefitted my research enormously, and I am truly grateful for your advice and support. Being your PhD student has been a privilege.

I would also like to thank my co-supervisors, Jonas Hjort and Nadja Dwenger, for their input and discussions, and Jonas for inviting me for a research stay at Columbia University.

I owe Odd-Helge Fjeldstad my gratitude for many things. You took me on as your research assistant in 2012, introduced me to the field of taxation and have continuously and generously included me in many of your projects. I have learned so much about research, policies and maneuvering in the field from you. Thank you for your collaboration and mentorship.

I am also grateful to Charlotte Ringdal, who coauthored the first paper of this thesis in an exceptional way. Thank you for inviting me to do the project with you, for all your effort in the practical preparations for the field work and for always pushing forward. I have truly enjoyed, and learned a lot from, our collaboration.

Alexander W. Cappelen, Odd-Helge Fjeldstad, Donald Mmari and Bertil Tungodden coauthored the second paper of this thesis, and deserve many thanks for making the project a fun and enlightening experience. I would also like to thank Cornel Jahari for his invaluable contributions to the project through organization of the data collection in Tanzania.

I am grateful to all the individuals who participated in my studies and to the teams of hard working research assistants at REPOA and ESRF in Tanzania. I would also like to thank the Centre for Ethics and Economics, the Department of Economics and The Choice Lab at the Norwegian School of Economics, Ingegerd and Arne Skaugs Forskningsfond, Norges Banks fond for Økonomisk forskning, Professor Wilhelm Keilhaus Minnefond and UNU Wider in Helsinki for financial support.

Throughout my PhD, I have been extremely lucky to be part of The Choice Lab. I am grateful to all the members of the group for providing a unique research environment of high ambitions, excellent research, enthusiasm and humor. In particular, I would like to thank Erik Ø. Sørensen for patiently answering my many questions, Ingvild Almås, Alexander W. Cappelen, Lars Ivar Oppedal Berge, Kjetil Bjorvatn, and Vincent Somville for their various contributions and advice, and research coordinators Ranveig Falch, Ida Kjørholt and Janina Ramona Juranek for their support. Thanks also to all my colleagues at the Department of Economics for providing an inspiring work environment, and to Christel Florvåg, Dagny D. Kristiansen and Irene Grønningsæter for fantastic administrative support.

I would also like to thank the Centre for Applied Research at NHH (SNF), particularly Svenn-Åge Dahl, and the Norwegian Centre for Taxation (NoCeT), especially Jarle Møen and Guttorm Schjeldrup, who have been incredibly generous and patient with me during the final months of this PhD project.

I am grateful to my second academic home, Chr. Michelsen Institute (CMI), for providing a stimulating and friendly research environment, and for encouraging and supporting me in pursuing a PhD in the first place. In particular, I would like to thank Merima Ali, Steinar Hegre, Magnus Hatlebakk, Ivar Kolstad, Ottar Mæstad, Aslak Orre,

Guri Stegali, Gaute Torsvik, Espen Villanger and Arne Wiig for their help, insights and discussions.

Monica and Svein Olav generously opened their home and their lives to me during many trips to Dar es Salaam, for which I am very grateful. My field work would not have been half as enjoyable and fun without the two of you. Thank you for your hospitality and friendship.

Charlotte, Ingar, Ranveig and Sebastian have been extremely helpful in sharing their insights, experiences and thoughts, which has made my work easier and better. It is greatly appreciated. Antonio, Luca, Thor Andreas, and Serhat: I cannot imagine my PhD-life without you. Thank you for your company, humor, help and countless meals and coffees. My PhD-life at NHH would also have been very sad without, among others, Agnes, Felix, Ida, Ingvild, Janina, Kristina, Sandra, Simen, Teis, Timothy, Øivind and Xu.

I would also like to thank my friends. Anne-Lise, Ingeborg, Inger, Signe A. and Signe K. for monthly dinners and Flax. A particular thanks to Signe K. for our running routine, and to Anne for always being there. Brita, Ingeborg and Kristine: you are the toughest people I know, and I really do not know what I would do without you. Thank you for your support, and for, each in your own way, inspiring me.

My family also deserves praise for their tolerance and endurance: Kari, Brita, Maja, Andrea and Jacob, Maren, Ragne and Eva, Therese and Pål, and Stein. A particular thanks to my mother, Marianne, for always putting me first, giving me her love and showing me the world. And to my father, Terje, who died too early but gave me so much. I also want to thank my dear grandparents, Margit and Hallstein, who both recently passed away, for their unconditional love and kindness. A special thanks to my grandfather, whom inspired me to study economics: I am thankful for having you in my life for so long, but sorry that you did not live to see me finish this project. This thesis is for you.

Finally, I would like to thank Hallgeir. I am deeply thankful for your patience and love, your infectious enthusiasm for research and for always making me laugh. You make me a better researcher and human being.

Contents

Introduction

This thesis consists of three research papers motivated by policy questions in development economics. These questions are addressed from a behavioral economics perspective, building on insights from economics as well as psychology and other behavioral sciences. Each paper employs a different experimental methodology. The first uses a lab-in-the-field experiment, where Tanzanian couples are invited to the lab to make decisions about intra-household resource allocation. The second conducts a large-scale field experiment that surveys corruption beliefs and behaviorally measures willingness to engage in corrupt behavior in Tanzania. The third conducts an experiment where American participants make allocation and punishment decisions.

While the questions asked and the practical implementations of the three studies are very different, they all rely on the principle of randomization to identify causal effects. Random assignment of participants to different experimental groups ensures that there are no systematic differences between these groups other than the experimentally controlled variation in the decision environment between them. Thus, an observed group difference in attitudes or behavior can be interpreted as a causal effect of the experimental variation. In the three studies, the environment in which the participants make their decisions and express their attitudes is carefully controlled in a way that is difficult to do using observational data: the experimental treatments turn on and off different institutional features, types of motivation and information, making it possible to identify the separate effects of different factors influencing attitudes and behavior. In this way, the experimental methods employed in this thesis allow me to both identify causal effects and investigate their underlying mechanisms. When seen in combination with observational data, this type of research can provide a better understanding of the phenomena in question by addressing the "how" and "why" questions that are often difficult to answer using observational data alone.

The first paper is coauthored with Charlotte Ringdal and addresses the research question: *Does money in the hands of women lead to better outcomes for children than money in the hands of men?* It is frequently assumed that increasing women's intra-household bargaining power increases spending on goods and services that benefit children, and most cash transfer programs therefore target women rather than men. However, the empirical and theoretical evidence for the positive effect of female empowerment are mixed. In this paper, we conduct a novel between-subject lab-in-the-field experiment where couples in an urban area in Tanzania are invited to the lab to make decisions about intra-household resource allocation. We exogenously increase the wife's control over a household endowment and study whether this causes couples to allocate more to their child. The results provide no evidence that it does. Increasing the wife's control over resources does, however, lead to more gender-equal allocations to children. We also find that the effect of increasing the wife's bargaining power depends on the difference in time-preferences between spouses. It is better for the child that the most patient spouse has more relative bargaining power. Our results challenge the general view among policy makers that female empowerment leads to higher household spending on children, and suggest that what matters are the attributes of the main decision-maker (time preferences and gender preferences), not gender itself.

The second paper is coauthored with Alexander W. Cappelen, Odd-Helge Fjeldstad, Donald Mmari and Bertil Tungodden and considers the research question: *Do expectations about future gas revenues affect expectations about corruption and willingness to*

engage in corrupt behavior? A comprehensive economic and political economy literature shows that countries rich in natural resources often perform worse in terms of social and economic development compared with countries that have less abundant natural resources, and corruption appears to be an important driver behind this relationship. In this paper, we conduct a large-scale field experiment with a sample largely representative of Tanzanian society. We use different versions of an informational video to create exogenous variation in expectations about future gas revenues and investigate how these affect expectations about future corruption and willingness to engage in corrupt behavior. Our main finding is that providing information about the discovery of natural gas in Tanzania and estimates of total revenues that might accrue to the government significantly increases people's expectations about future corruption. Although we find this relationship across subgroups, the effect is particularly pronounced among older respondents. We do not find any effect of this information on the willingness to engage in corrupt behavior. We believe that our results may shed some light on the underlying mechanisms of the resource curse.

The third paper investigates the question *Does taxation cause citizens to have a greater demand for accountability in government spending?* The so-called *Rentier State Hypothesis* in the political economy literature claims that taxation promotes government accountability. The argument is that citizens demand more accountability for spending of tax than of windfall revenue (such as natural resource revenue or aid). This higher demand for accountability is in turn argued to make governments more accountable. In this paper, I conduct a between-subject experiment to causally test how taxation affects the demand for accountability and the underlying mechanisms that might explain this relationship. The design focuses on two main features distinguishing tax from windfall revenue: tax revenue is produced by citizens' work and was in their possession before being collected. I theorize that these features increase the salience of fairness considerations in government spending, because they entail active contribution to government revenue. Higher salience is, in turn, hypothesized to increase citizens' demand for accountability in government spending. The main finding is that taxation causes a greater demand for accountability when both features of taxation are present. This result is evidence in support of the Rentier State Hypothesis.

I Household bargaining and spending on children: Experimental evidence from Tanzania

Household bargaining and spending on children: Experimental evidence from Tanzania*

Charlotte Ringdal & Ingrid Hoem Sjursen†

Abstract

It is frequently assumed that money in the hands of women leads to better outcomes for their children than money in the hands of men. However, empirical and theoretical evidence are mixed. We conduct a novel between-subject lab-in-the-field experiment to study whether increasing the wife's control over resources causes a couple to allocate more to their child. The paper provides two main insights. First, increasing the wife's bargaining power does not increase the share allocated to the child, but leads to more gender-equal allocations to children. Second, time preferences are important in explaining household decision-making; it is better for the child that the most patient spouse has more relative bargaining power. Our results highlight the importance of taking a broader set of preferences into account when studying household decision-making, and suggest that policy aimed to increase spending on children should target the spouse with preferences most aligned with such spending.

Keywords: Intra-household allocation, Female bargaining power, Tanzania
JEL Classification: C92, D13, J13, O12

*We would like to thank Jean Marie Baland, Guilhelm Cassan, and Pierre-André Chiappori for their invaluable comments. We also thank ESRF (Economic and Social Research foundation) and especially Richard Ngilangwa and Juda Lyamai for their help in the preparation and organization of the experiment, and research assistants Nicholas Lusingu, Swalehe Manture, Veila Makundi, Mbonisewa Mtambalike, Ramlath Katunzi, Irene Urassa and Rahma Salim for impeccable conduction of the experiment, The Choice Lab (particularly Bertil Tungodden, Ingvild Almås, Alexander Cappelen, Kjetil Bjorvatn, Erik Sørensen, Ingar Haaland, Ranveig Falch and Ida Kjørholt), Ivar Kolstad, Siri Lange, Vincent Somville, Espen Villanger, Arne Wiig, participants at the "Gender and Development" workshops, University of Namur 2015 and UNU WIDER Helsinki 2016, Henning Mueller, Astrid Grasdal, Anne-Lise Breivik, Anna Welander, Ben D'Exelle, Kashi Kafle and numerous seminar participants for valuable feedback at various stages of the project. We are also grateful for financial support from The Choice Lab, the Department of Economics at the Norwegian School of Economics and the Gender and Development research project at UNU-WIDER in Helsinki. The experiment is registered in the Registry for Randomized Controlled Trials operated by the American Economic Association: RCT ID AEARCTR-0000770.

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1 Introduction

Since the UN Millennium Development Goals (MDGs) were launched in year 2000, there has been an increased focus on female empowerment in international development aid strategies. Female empowerment is undoubtedly a goal of great intrinsic importance, but the policy debate has also focused on other reasons for empowering women. In particular, it has been argued that increasing women's intra-household bargaining power increases spending on goods and services that benefit children.[1] The assumed positive externalities of female empowerment are also reflected in implemented policies; most conditional cash transfer programs that aim to improve living conditions for children target women (Fiszbein and Schady 2009).

The empirical and theoretical evidence for the positive effect of female empowerment on spending on children are, however, mixed. In this paper, we present evidence from a novel between-subject lab experiment where we exogenously vary the relative bargaining power between the husband and the wife. The design allows us to causally identify whether an increase in the wife's bargaining power affects how much a couple allocates to their child. We also investigate the role of time, risk, and gender preferences, factors that have previously received little attention in the household decision-making literature.

The experiment was conducted with married couples in Dar es Salaam, Tanzania. The main outcome of interest is how the couples distribute a fixed endowment between the wife, the husband, and one of their children. The amount allocated to the child is an investment in his or her education in the form of tutoring. In the experiment, we change the wife's bargaining power by exogenously varying her control over the allocation of the endowment in four treatments. The first treatment is a dictator game where the husband is the dictator and makes the allocation decision. The second and third treatments are Rubinstein shrinking-pie bargaining games; the husband makes the first proposal for the allocation decision in the second treatment, and the wife makes the first proposal in the third treatment (Rubinstein 1982). Finally, the fourth treatment is a dictator game where the wife is the dictator and makes the allocation decision. The treatments are designed to capture a gradual increase in the wife's bargaining power. In the first treatment, the husband has complete bargaining power. In the second and third treatments, the bargaining power is shared between the spouses, where the first proposer has the upper hand through a first-mover advantage. Thus, the wife has less bargaining power in the second than in the third treatment. In the fourth treatment, the wife has complete bargaining power.

The paper offers two main insights. First, we find no evidence that increasing the wife's bargaining power causes a larger allocation to the child. To the contrary, we observe a significant reduction (≈ 10 percentage points from a base of 35%) in the allocation to the child in the bargaining treatment where the wife has the first-mover advantage compared to the treatment where the husband is the dictator. This result challenges the common assumption that targeting the wife is beneficial to children. On the other hand, increasing the wife's bargaining power benefits gender equality among children; girls receive as much as boys when the wife has some bargaining power (treatments 2 - 4). This finding suggests that increasing the wife's bargaining power may lead to a more gender-equal society over time. Second, we find that the effect of an increase in bargaining power depends on

[1] See, e.g. Thomas (1990; 1993), Phipps and Burton (1998), Attanasio and Lechene (2002), Brown (2003), Duflo (2003), Duflo and Udry (2004), Khandker (2005), Doss (2006), Gitter and Barham (2008), Rubalcava et al. (2009), and Browning et al. (2014).

the difference in time preferences between spouses. When the wife is less patient than the husband, giving her full bargaining power decreases the allocation to the child by 13.7 percentage points (from 38% when the husband is the dictator to 24.3% when the wife is the dictator). This result illustrates the importance of time preferences in the decision-making process in the household.

Our study relates to the growing literature on household decision-making in developing countries. Earlier empirical studies such as Thomas (1990; 1993), Kennedy and Peters (1992), Lundberg et al. (1997), and Case and Deaton (1998) are typically based on survey data, and suggest that wives allocate more resources towards children's human capital and clothing than men do. In the last two decades, a large strand of the household decision-making literature has focused on studying cash transfer programs. Attanasio and Lechene (2002; 2010) and Rubalcava et al. (2009) find that conditional cash transfers to women in Mexico (Oportunidades) increase the families' budget share spent on food and children's clothing, and decrease the share spent on alcohol compared to households that did not receive a transfer. However, because the transfers were given to women only, these studies do not shed light on the importance of the receiver's gender for spending on children. Yoong et al. (2012) find that when transfers are unconditional, targeting women does not guarantee positive outcomes for the family's welfare.[2] This finding is also supported by more recent randomized controlled trials that exogenously vary the gender of the receiver (Benhassine et al. 2015; Akresh et al. 2016; Haushofer and Shapiro 2016).[3]

Another strand of the household decision-making literature uses lab experiments to test household models, including efficiency and cooperation within the household. This literature suggests that women do not always make choices that are in the best interest of the household. Iversen et al. (2011), Kebede et al. (2014), and Munro et al. (2014) use public good games and find that the wife contributes less to the common pool than the husband does. In this context the wife's decision reduces the household income more than the husband's decision does. Similarly, Jakiela and Ozier (2016) find that women are willing to conceal their initial endowment, even though it reduces their potential earnings in the experiment. Finally, Castilla and Walker (2013) and Hoel (2015) find evidence of inefficiencies and hiding of income when the wife is the decision-maker. We contribute to the household decision-making literature by (i) providing a clean causal test of the effect of an increase in female bargaining power on real investments in children, and (ii) shedding light on the effect of time, risk, and gender preferences.

The paper is organized as follows: Section 1 presents a conceptual framework. Section 2 describes the experimental design. Section 3 discusses the empirical strategy and Section 4 provides the results. Section 5 discusses the results and concludes.

2 Conceptual framework

This section introduces a simple conceptual framework to guide our empirical analysis. The framework is based on the collective household model, as developed by Chiappori (1992). We first address the question of bargaining power. Second, we consider underlying

[2]Welfare is broadly defined and includes "material standards of living as well as human capital and social relationships" (Yoong et al. 2012, 2).

[3]An exception is a recent study by Armand et al. (2016) who find that female recipients spend significantly more on food (especially meat, fish, and dairy products) compared to male recipients.

mechanisms (time, risk, and gender preferences) that may explain how bargaining power affects household decisions.

Assume that each spouse cares about his or her own consumption and spending on the child. Let $w =$ wife and $h =$ husband, then spouse $s = w,h$'s utility function can be expressed as:

$$u_s = \ln q_s + \alpha_s \ln Q \tag{1}$$

where q_s is spending on private goods, Q is spending on the child, and $\alpha_s \geq 0$ is the weight assigned to the child by spouse s.

First, we consider intra-household bargaining power. In this framework, a spouse's bargaining power is defined as how much weight is assigned to his or her utility in the household utility function (Browning et al. 2014).

$$\max_{q_w,q_h,Q} \mu u_w + (1-\mu)u_h \tag{2}$$

where $\mu \in (0,1)$ denotes the wife's bargaining power. When prices are normalized to 1, and household income is denoted by $Y = Q + q_w + q_h$, we obtain the following relationship between the wife's bargaining power and spending on the child:

$$\frac{dQ}{d\mu} = \frac{\alpha_w - \alpha_h}{(\alpha_w \mu + \alpha_h(1-\mu)+1)^2} Y \tag{3}$$

From Equation (3), we observe that if the husband and the wife assign the same weight to the child in their utility function, a change in bargaining power does not affect spending on the child. If, however, the wife assigns a higher weight to the child than the husband ($\alpha_w > \alpha_h$), an increase in the wife's bargaining power increases spending on the child.

To address the underlying mechanisms, we consider the factors determining the weight assigned to the child by spouse s, α_s. Previous literature has mainly thought of α_s as capturing how much the spouse cares about the child, where the common assumption is that the wife cares more about the child than the husband does. This assumption has support in evolutionary biology theory through the fact that women's fertility is constrained, whereas men's fertility is not (Eswaran and Kotwal 2004). We argue that a broader set of factors may shape α_s, including time, risk, and gender preferences.[4]

Time preferences may be important in determining the weight assigned to the child because spending on children (particulary on children's education, which is the focus of this paper) requires a long-term perspective as it involves delayed benefits (such as higher wages for the child and security in old age for the parents). Thus, we hypothesize that spouses that are more patient assign a higher weight to the child in their utility function than less patient spouses.

The weight assigned to the child can also be affected by the risk preferences of the spouse. A priori, the effect of risk preferences is unclear. On the one hand, as the future is uncertain, a more risk-averse spouse may be more likely to have a lower weight assigned to the child than a less risk-averse spouse. On the other hand, a child may represent

[4]In this paper we have chosen to focus on the spouse's preferences. Another important factor is knowledge. The better knowledge the spouse has of the value of education, the more likely he or she is to assign a higher weight to the child. A proxy for knowledge is level of education, and it has been shown that children with parents with a high level of education are more likely to receive a high level of education themselves (Black et al. 2005). Other factors influencing the weight could include social norms and social networks.

an insurance mechanism and education can therefore be more valuable to a risk-averse spouse than to a less risk-averse spouse (Wölfel and Heineck 2012).

Finally, gender preferences may influence the weight assigned to the child. In Asia, there is a clear preference for sons (Qian 2008; Guilmoto 2012), but this is not common elsewhere (Norling 2016). Some studies from Africa and the US show that parents favor children of their own gender (Raley and Bianchi 2006; Dahl and Moretti 2008; Dizon-Ross and Jayachandran 2015), whereas others do not find any gender-biasedness (Norling 2016). If the spouse is gender-biased, he or she will assign a higher weight to a child of one gender than to a child of the other gender.

To summarize, our conceptual framework shows that bargaining power only matters if the husband and the wife assign different weights to the child in their utility function. The weight assigned to the child depends on several factors, including caring preferences, time preferences, risk preferences, and gender preferences.

3 Sample and experimental design

3.1 Sample and setting

The experiment was conducted with 287 couples in Dar es Salaam, Tanzania. The couples were recruited by distribution of invitation letters (see Appendix B.1) to pupils in four different primary schools in a relatively poor ward. The couples signed up for participation in the study by returning a slip with their name and contact information to their child's teacher. They were then called by one of the research assistants to schedule a session.

Each spouse received a TZS5,000 show-up fee (approx. USD2.3 at the time of the study), and had the opportunity to earn more during the experiment. All sessions took place in the afternoon between 1 pm and 5 pm, and each session consisted of between 15 and 30 couples. On average, each household earned TZS40,000 (approx. USD18.6), including the show-up fee. This corresponded to more than two days' worth of wages for low-paying jobs.[5] In addition, we provided one child in each household with an average of 3.4 weeks of tutoring (worth TSZ17,000/USD7.8).

Table 1 provides background characteristics for participants by gender. The average participant is close to 39 years old, and the men are on average eight years older than the women. The couples care for an average of 3.2 children of whom 1.4 are in primary school. Comparing our sample to the Tanzania Demographic Household Survey (DHS), our households are larger than the average in urban Tanzania (5.2 members vs. 4.3 members) (TNBS and ICF Macro 2016, p. 37). Most of the respondents have completed primary school or a higher level of education. Men are more educated than women, which reflects the gender gap in educational attainment in Tanzania (TNBS and ICF Macro 2016, p. 42–43). In addition, there are large gender differences in employment status. While 41% of women report being unemployed, only 5% of men do the same. This is comparable to the DHS data (TNBS and ICF Macro 2016, p. 69–72).

[Table 1 about here.]

[5]The minimum daily wage for trade, communications, and domestic services was around TZS5,000, and for construction around TZS10,000 (http://www.africapay.org/tanzania/home/salary/minimum-wages).

3.2 Experimental set-up and conditions

The sequence of events is described in Figure 1. At arrival, we conduct a background survey with both spouses present. Couples are subsequently randomized to one of the four treatments, and the husband and the wife are placed in separate rooms according to their treatment. They then face three incentivized tasks. All the tasks are choices of how to allocate a monetary endowment. To illustrate their choice, the participants receive laminated pictures of TZS500 and TZS1,000 notes. They are asked to place the money in different cups illustrating their choice and the research assistants record the answers. By simplifying the tasks in this manner, we ensure that literacy is not a requirement to participate in the study.

To understand the underlying mechanisms behind the couple's decision, we elicit time and risk preferences using two separate tasks. In both tasks the participants are explicitly told that their spouse will not be informed about their decision.[6] We base the time-preference task on Angerer et al. (2015), and the risk-preference task on Gneezy and Potters (1997) because of their simplicity.[7] In the time-preference task, the participants allocate TZS3,000 between the day of the experiment and three weeks later.[8] Any amount they choose to receive after three weeks is doubled. Earnings from the time-preference task are paid out as transfers to mobile phones through M-Pesa.[9,10]

In the risk-preference task, the participants decide how much of TZS3,000 they want to keep and how much they want to invest in a risky option. After their decision, the participants draw a card from a bag to determine whether the invested money is tripled (green card) or reduced to nothing (red card). They are informed that the probability of winning and losing is the same. Note that risk-neutral (and risk-seeking) individuals should invest the entire TZS3,000 endowment in the risky option. Thus, the risk-preference task can be thought of as a measure of the degree of risk aversion. Earnings from this task are paid out in cash at the end of the experiment.

In the third task, the couples allocate a TZS15,000 endowment between the wife, the husband, and their child. If a couple has more than one child in primary school, one is randomly selected. The name of the chosen child is communicated to the parents before they make the allocation decision. For every TZS1,500 allocated to the child, the child receives one week of tutoring. The couples can allocate amounts of TZS0, TZS1,500, TZS3,000, ..., or TZS15,000, and the maximum possible amount of tutoring is ten weeks. The husband and wife's earnings from the distributive task are paid out in cash. The allocation to the child is paid out as a certificate for tuition.

[Figure 1 about here.]

The structure of the distributive task is determined by the treatment to which the couples were allocated:

[6] Instructions for the tasks are provided in Appendix B.2.

[7] The time-preference task is a simplification of the task used by Andreoni and Sprenger (2012).

[8] The participants can allocate TZS0, TZS500, TZS1,500,..., or TZS3,000 to the future (this also applies to the risk-preference task described below).

[9] M-Pesa is an SMS-based money-transferring system allowing individuals to deposit, withdraw, and transfer money with their phone. The receiver could easily liquidate this money, or use it to pay bills such as phone and electricity bills.

[10] To ensure that allocations to the day of the experiment do not reflect a preference for cash over mobile money, both payments in the time-preference task are made using M-Pesa.

Husband Dictator: dictator game with the husband as dictator.

Husband Bargaining: Rubinstein shrinking-pie bargaining with the husband as first proposer.

Wife Bargaining: Rubinstein shrinking-pie bargaining with the wife as first proposer.

Wife Dictator: dictator game with the wife as dictator.

In Husband Dictator, the husband decides how to allocate the endowment. He indicates his allocation by dividing the total endowment between three cups: one with a picture of a woman, one with a picture of a man, and one with a picture of a child. He knows that his wife will be informed about his decision. In Husband Bargaining and Wife Bargaining, the first proposer makes a proposal of how to allocate the endowment. The proposal is then shown to the spouse, who can either agree or disagree. If the spouse agrees, the proposal is implemented. Otherwise, the endowment is reduced by TZS500, and he or she makes a counter-proposal. The couples can go back and forth until an agreement is reached or there is no money left. Wife Dictator is similar to Husband Dictator, but the wife has the role of dictator.

The treatments are designed to exogenously increase the wife's bargaining power in the experiment. When the husband is the dictator, the wife has no bargaining power. In the two bargaining treatments, the bargaining power is shared between the spouses, but the first proposer has the upper hand through a first-mover advantage. Finally, in the fourth treatment, the wife has complete bargaining power. We will refer to the increase in the wife's bargaining power as "small" when comparing Husband Dictator to Husband Bargaining, as "intermediate" when comparing Husband Dictator to Wife Bargaining, and as "large" when comparing Husband Dictator to Wife Dictator.

Theoretically, the comparison of Husband Dictator to Wife Dictator yields information about whether the weights assigned to the child are different in the husband's and the wife's utility function, respectively.[11]

4 Empirical strategy

A pre-analysis plan was registered at the American Economic Association Randomized Controlled Trials Registry before we collected the data.[12] This plan specifies the empirical strategy, including the hypotheses to be tested, the regression approach, and the dimensions to be studied in the heterogeneity analysis.

4.1 Main analysis

We first investigate whether an increase in the wife's bargaining power increases the share allocated to the child by estimating the following regression:

$$\begin{aligned} y_c = \alpha &+ \beta_{HB}\text{Husband Bargaining}_c \\ &+ \beta_{WB}\text{Wife Bargaining}_c + \beta_{WD}\text{Wife Dictator}_c + \delta_S S + \delta_X X_c + \varepsilon_c, \end{aligned} \tag{4}$$

[11] When comparing Husband Dictator with any of the bargaining treatments, confounding factors make it difficult to disentangle the spouses' preferences from bargaining effects.

[12] https://www.socialscienceregistry.org/trials/770.

where y_c is the share of the endowment allocated to the child for couple c, α is a constant, Husband Bargaining$_c$, Wife Bargaining$_c$, and Wife Dictator$_c$ are treatment dummies taking the value 1 if couple c is in Husband Bargaining, Wife Bargaining, and Wife Dictator, respectively, S is a set of indicator variables for each session, X_c is a vector of background variables, and ε_c is the error-term. X_c consists of child and parent background variables as well as intra-household differences in education and time and risk preferences (the variables are defined in Table 2 for definition of these variables). The inclusion of X_c allows us to control for initial (observable) differences between couples in the different treatments, and for any imbalance between treatments (see Table A.1 in Appendix A). We first estimate the regression with no controls. Then, we sequentially add session fixed effects, child background variables, parent background variables and intra-household difference variables. All regressions are estimated with robust standard errors. When discussing the results, we focus on the full specification.

Husband Dictator is the reference category in Equation (4), and we interpret the estimated treatment effects relative to a situation where the husband has complete bargaining power. From Equation (4), we obtain estimates of the causal effect of a small (β_{HB}), intermediate (β_{WB}), and large (β_{WD}) increase in the wife's bargaining power on y_c.

We also estimate Equation (4) for y_{Hc}, the share allocated to the husband, and for y_{Wc}, the share allocated to the wife, respectively.[13]

4.2 Heterogeneity analysis

To shed light on the underlying mechanisms affecting the allocation to the child, we study heterogeneity in the treatment effect. To do this, we use the elicited preferences and background data collected in the survey. We focus on time, risk and gender preferences. In particular, we test whether the treatment effect is different for couples where (i) the husband is more patient, (ii) the husband is less risk averse, and (iii) the chosen child is a boy. These differences may shed light on differences in the weight spouses assign to the child in the utility function.[14]

We estimate the following regression for each of the three respective preference variables and the three treatments, separately:

$$y_c = \alpha + \beta_T \text{Treatment}_c + \beta_{Var} \text{Var}_c + \theta_T \text{Treatment} \times \text{Var}_c + \delta_S S + \delta_X X_c + \varepsilon_c. \quad (5)$$

Treatment$_c$ is an indicator variable for each of the three treatments, Husband Bargaining, Wife Bargaining, and Wife Dictator, Var$_c$ is an indicator variable for couples where the husband is more patient or less risk averse, and couples where the chosen child is a boy, and Treatment $*$ Var$_c$ is an interaction term between the background indicator variables and the treatment indicator variables.[15] In all heterogeneity regressions, Husband Dictator is the reference category.

On the basis of these regressions, we study whether there are significant differences in treatment effects between subgroups. The estimated subgroup difference in the causal effect of increasing female bargaining power is given by θ_T. As an illustration, if Var$_c$ is an indicator variable for the husband being more patient than the wife, then the estimate

[13] As these regressions were not specified in the pre-analysis plan, they should be considered exploratory.

[14] The analysis of the pre-specified heterogeneity dimensions not reported in the main analysis is reported in Table A.7 in Appendix A.

[15] In this regression, X_c includes all background variables except the variable captured by Var$_c$.

θ_T, shows whether the effect of an increase in female bargaining power is different for couples where the husband is more patient than the wife and couples where he is not.

4.3 Robustness checks

We focus on the first proposal in the main analysis. As we do not know if the share allocated to the child is constant with income, it may be problematic to use the final proposal.[16] Furthermore, the receiver's decision to accept the proposal or not may be influenced by the presence of other participants in the room waiting for everyone to finish. It is therefore cleaner to consider the first proposal. As a robustness check, we run Equations (4) and (5) with the final proposal in the two bargaining treatments.

We also conduct the heterogeneity analysis of time and risk preferences differences using a stricter definition where we exclude all couples where the spouses have the same time or risk preferences. This analysis can be considered as a robustness check for whether the heterogenous treatment effects hold for different definitions of the preference variables.

The robustness checks are reported in Tables A.2 - A.6 in Appendix A.

5 Results

We first provide an overview of the couples' allocation decisions in the experiment, and descriptive statistics on time and risk preferences. We then turn to the main analysis of the treatment effects on the share allocated to the child, and on the share allocated to the wife and the husband, respectively. Finally, we discuss heterogeneous treatment effects.

5.1 Descriptive statistics

Figure 2 illustrates the distribution of the share allocated to the child, the wife, and the husband, for the whole sample. The majority of couples allocate shares between 0.20 and 0.40 of the endowment to their child (mean share allocated is 0.34), but there is significant heterogeneity in the distributive behavior. There is also substantial heterogeneity in the distributions of shares allocated to the wife and the husband. The mean share allocated to the husband, 0.29, is significantly smaller than the mean share allocated to the wife, 0.37 ($p < 0.000$).

[Figure 2 about here.]

Next, we consider time and risk preferences. We measure patience as the share of TZS3,000 allocated to the future (the higher the share allocated to the future, the more patient the spouse), and risk aversion as the share of TZS3,000 allocated to the risky option (the higher the share, the lower the risk aversion). On average, the husbands in our sample are significantly less risk averse ($p < 0.000$) and significantly more patient ($p < 0.094$) than the wives.[17]

In Figure 3 we display intra-household differences in patience and risk aversion. Couples are sorted into three categories: husband most patient/least risk averse, husband

[16] Only 8 of 97 receivers rejected the first proposal.

[17] See Figure A.1, Appendix A, for a graphical illustration of the distribution of time and risk preferences.

and wife equally patient/risk averse, and wife most patient/least risk averse. The figure illustrates that there is large variation in the differences in time and risk preferences between spouses. In about 84% of the couples, the husband and the wife have different time preferences, and about 80% have different risk preferences.[18]

[Figures 3 and 4 about here.]

Figure 4 reports the average share allocated to the child, the wife, and the husband in each of the four treatments. The upper panel illustrates our first finding; an increase in the wife's bargaining power does not cause higher allocations to the child. More specifically, a small or large increase in the wife's bargaining power does not cause significant changes in the allocation to the child. An intermediate increase in the wife's bargaining power, however, causes a significant *reduction* in the allocation to the child from 36% to 26%. To obtain a more complete picture of the couples' decisions, we investigate the allocation to the wife and the husband in the middle and lower panels of Figure 4. First, the middle panel shows that an intermediate or large increase in the wife's bargaining power gives her a higher allocation. Second, the lower panel shows that a large increase in the wife's bargaining power reduces the husband's allocation. Third, comparing the middle and lower panels we find that in Wife Bargaining and Wife Dictator, the wife proposes/allocates equally much to herself. However, looking at the upper and lower panels, we find that when the husband has the opportunity to reject the wife's proposal in Wife Bargaining, she proposes a higher allocation to him and a smaller allocation to the child than when she has full bargaining power in Wife Dictator. The overall picture from Figure 4 is that a small increase in the wife's bargaining power does not affect allocations to child, wife, or husband and the endowment is split approximately equally between the three. An intermediate increase in the wife's bargaining power increases the allocation to the wife and reduces the share allocated to the child. A large increase in the wife's bargaining power increases the share allocated to the wife and reduces the share allocated to the husband.

5.2 Main analysis

We now turn to a regression analysis of how the share allocated to the child is affected by the treatments. We also provide regressions for the share allocated to the wife and the husband, respectively.

Table 2 reports regressions for comparisons of Husband Dictator with the three other treatments.[19] In Column (1) we only include the treatment indicator variables Husband Bargaining, Wife Bargaining, and Wife Dictator. In Columns (2) to (5), we sequentially add session fixed effects and background variables.

We focus on the full specification in Column (5) and, consistent with the descriptive analysis, do not find a significant effect of a small or a large increase in the wife's bargaining power. However, an intermediate increase in the wife's bargaining power significantly reduces the share allocated to the child.[20]

[18] If there is assortative matching in the marriage market, the correlation in preferences between spouses should be high. In our sample, we find no evidence of assortative matching (the correlation coefficient is -0.050 for time preferences and 0.031 for risk preferences).

[19] See Tables A.8 - A.11 in Appendix A for extended regression tables.

[20] These results hold when we run the same regression with the final share allocated to the child in the two bargaining treatments. This regression is reported in Table A.2 in Appendix A. Note that only

In terms of background variables, we find a positive effect of the husband's age and a negative effect of the wife's age. Furthermore, couples where the husband is less risk averse than the wife allocate less to the child. The last finding may be an indication that the husbands consider investments in children's education as non-risky.

[Table 2 about here.]

Based on this regression, we formulate the following main result:

Result 1: Increasing the wife's bargaining power relative to Husband Dictator does not increase the allocation to the child ($\beta_{HB} = 0.022$, $p = 0.576$, $\beta_{WB} = -0.079$, $p = 0.044$, $\beta_{WD} = 0.003$, $p = 0.933$, see Column (5), Table 2). If anything, we find evidence of the opposite; an intermediate increase in the wife's bargaining power causally decreases the allocation to the child ($\beta_{WB} = -0.079$, $p = 0.044$, see Column (5), Table 2).

Result 1 suggests that increasing the wife's bargaining power does not causally increase the allocation to the child. In fact, an intermediate increase in the wife's bargaining power causally *reduces* the allocation. As there is no significant difference between Husband Dictator and Wife Dictator, this is likely not a consequence of differences in the weight assigned to the child between the husband and the wife, but rather due to some other aspects of the bargaining situation (see Section 6 for a discussion).

Next, we consider the effect of increasing the wife's bargaining power on the share allocated to the wife and the husband in Table 3. As in Table 2, both columns show the full specification where all background variables and the indicator variables are defined. A large increase in the wife's bargaining power increases the share allocated to her and decreases the share allocated to the husband. The share allocated to the husband is not affected by a small or intermediate increase in the wife's bargaining power. An intermediate increase in the wife's bargaining power increases the share allocated to her, but the effect is not robust to the specification using the final share allocated to the wife (see Table A.3 in Appendix A).

[Table 3 about here.]

Based on these regressions we formulate the following result for the allocation to husband and wife:

Result 2: A large increase in the wife's bargaining power increases the allocation to her and reduces the allocation to the husband ($\beta_{WD} = 0.091$, $p = 0.001$, see Column (1), Table 3, and $\beta_{WD} = -0.102$, $p = 0.001$, see Column (2), Table 3). An intermediate increase in the wife's bargaining power increases the allocation to her, but does not affect the allocation to the husband ($\beta_{WB} = 0.066$, $p = 0.039$, see Column (1), Table 3, and $\beta_{WB} = 0.003$, $p = 0.922$, see Column (2), Table 3).

Result 2 shows that giving the wife full bargaining power benefits her. Together, Results 1 and 2 indicate, in our study, that female empowerment benefits women, but not children.

eight of 97 couples rejected the first proposal. All counter-proposals were accepted.

5.3 Heterogeneity analysis

In this subsection, we investigate whether different types of couples are affected differently by an increase in the wife's bargaining power. We focus on difference in time and risk preferences between the husband and the wife, and on the gender of the child.[21]

Columns (1) to (3) in Table 4 consider whether the effect of increasing the wife's bargaining power on the allocation to the child is different between couples where the husband is more patient than the wife and couples where the wife is at least as patient as the husband. Columns (1), (2) and (3) report the difference in effect for a small, intermediate and large increase in the wife's bargaining power, respectively. We find that when the husband is more patient than the wife, an intermediate or large increase in the wife's bargaining power causally decreases the allocation to the child. Similarly, when the wife is at least as patient as the husband, a large increase in bargaining power increases the share allocated to the child.[22] Based on these regressions, we formulate the following result for differences in time preferences between the husband and the wife:

Result 3: The effect of an increase in the wife's bargaining power is dependent on the intra-household difference in time preferences. When the husband is more patient than the wife, increasing the wife's bargaining power *reduces* the allocation to the child ($\theta_{WB} + \beta_{WB} = -0.133$, $p = 0.053$, see Column (2), and $\theta_{WD} + \beta_{WD} = -0.137$, $p = 0.007$, see Column (3), Table 4).

[Table 4 about here.]

We next consider difference in risk preferences between the husband and the wife in Columns (4) to (6). As above, Columns (4) to (6) respectively investigate a small, an intermediate, and a large increase in the wife's bargaining power. We find that when the husband is less risk averse than the wife, a small increase in the wife's bargaining power increases the share allocated to the child, but the difference in risk preference between the husband and the wife is generally found to be of little importance for the effect of an increase in the wife's bargaining power.[23] The findings on differences in risk preferences can be summed up as follows:

Result 4: The intra-household difference in risk preferences makes no difference to the effect of an intermediate or large increase in the wife's bargaining power ($\theta_{WB} + \beta_{WB} = -0.064$, $p = 0.245$, and $\theta_{WD} + \beta_{WD} = -0.013$, $p = 0.758$, see Columns (5) and (6), Table 4). For a small increase in the wife's bargaining power, the share allocated to the child

[21] Table A.7 in Appendix A reports the heterogeneity analysis for education level differences and number of children in the household.

[22] In the above discussion, we have used a definition where "H most patient" is equal to 1 when the husband is more patient than the wife, and 0 otherwise. Thus, in 0, we include couples where the husband and the wife are equally patient. To check if these results are sensitive to the definition of the time-preference difference, we estimate regressions where we restrict the sample to couples where one of the spouses is more patient than the other in Table A.6 in Appendix A. We find that the negative effects of increasing the wife's bargaining power when the husband is more patient than his wife are robust to the stricter definition, but that the positive effect when the wife is more patient is not.

[23] Table A.6 in Appendix A reports the results when we restrict the sample to couples where one spouse is less risk averse than the other and find that the positive effect of an increase in the wife's bargaining power is not robust to the stricter definition of risk-preference difference. Table A.4 and A.5 in Appendix A reports the results for the final share allocated to the child.

increases if the husband is less risk averse than the wife ($\theta_{HB} + \beta_{HB} = 0.097$, $p = 0.075$, see Column (4), Table 4). However, this finding is not robust to the use of final share allocated to the child.

In Columns (1) to (4) in Table 5 we consider the gender of the child. First, we find that when the wife has no bargaining power, significantly more is allocated to boys than to girls. Second, in all situations where the wife has some bargaining power, at least as much is allocated to girls as to boys. This latter finding is illustrated in Column (4) where we compare the situation where the husband has complete bargaining power to all three situations where the wife has some bargaining power. Based on these regressions, we formulate the following result about the spouses' gender preferences:

Result 5: An increase in the wife's bargaining power leads to more equal allocations to boys and girls. When the husband has complete bargaining power, he allocates significantly more to boys ($\beta_{var} = 0.120$, $p = 0.009$, see Column (4), Table 5). When the wife has some bargaining power, at least as much is allocated to girls as to boys ($\beta_{HB} = 0.157$, $p = 0.003$, see Column (1), $\beta_{WB} = 0.006$, $p = 0.916$, see Column (2), and $\beta_{WD} = 0.032$, $p = 0.470$, see Column (3), Table 5).

[Table 5 about here.]

Result 3 provides evidence that the time preferences of the spouse with the upper hand in the bargaining situation are important, whereas Result 1 showed that gender is less so. Result 4 shows that risk preferences are not an important attribute in determining the allocation to the child. Finally, Result 5 shows that increasing the wife's bargaining power makes allocations to boys and girls more equal.

6 Discussion and conclusion

Our paper studies the effect of an increase in the wife's bargaining power on couples' spending on children. We do not find any evidence that such a change in relative bargaining power increases the share allocated to the child. This finding challenges not only earlier studies such as Thomas (1990; 1993), but also the general view among policymakers that female empowerment leads to higher household spending on children. Our results further suggest that it is the attributes of the main decision-maker (time preferences and gender preferences), not the gender itself, that matter.

Result 1 indicates that increasing the wife's bargaining power does not increase spending on children and might even reduce it: an intermediate increase in the wife's bargaining power causally reduces the allocation to the child. The share allocated to the child is not significantly different between the two dictator treatments, suggesting that, on average, the husband and the wife assign the same total weight to the child in their utility function. Thus, the effect of an intermediate increase in the wife's bargaining power cannot be explained by a difference in weights assigned to the child.

To further understand how the change in bargaining power affects household decisions, we investigate the couples' allocations to the husband and the wife. An intermediate and a large increase in the wife's bargaining power leads to larger allocations to the wife (Result 2). Comparing the allocations in Wife Dictator to the allocations in Wife Bargaining, we observe changes in the child's and the husband's share, but not in the share to the wife's.

Assuming that the outcome in Wife Dictator reflects her preferences, the wife seems unwilling to forego money in order to keep the allocation to the child constant in Wife Bargaining.[24] Rather, she increases the husband's allocation. A possible explanation for this is that she wants to avoid that the husband rejects her proposal, and that she underestimates his preferences for allocation to the child. Thus she gives more to the husband and less to the child than in Wife Dictator. This explanation is in line with previous studies showing that the wives tend to underestimate the husbands' preferences for a public good (Kebede et al. 2014).

Result 3 suggests that time preferences play an important role in household decision-making.[25] In particular, when one spouse has complete bargaining power, it is better for the child that it is the most patient spouse. This finding is in line with previous studies; Ahiakpor and Swaray (2015) find a positive association between male household head's patience and investments in children's education in rural Ghana. Tanaka and Yamano (2015) also find that the more patient the household head is, the higher are the educational expenditures in Uganda. In our sample, men tend to be more patient than women, implying that, on average, it is more beneficial for the child if the husband is the main decision-maker.[26]

Result 5 indicates that husbands have *stronger* preferences for allocating money to boys than to girls. Wives, on the other hand, do not display any gender preferences and allocate the same amount to boys and girls. The result is partly consistent with previous studies; Dizon-Ross and Jayachandran (2015) find that, in rural Uganda, men favor boys, but also that women favor girls, and Raley and Bianchi (2006) find that, in the US, men spend more time with boys than with girls, whereas women spend as much time with boys as they spend with girls. Including women in the decision-making process by increasing their bargaining power gives a more gender-equal allocation to the children in our study and, in the long run, female empowerment may consequently lead to societies becoming more gender-equal.

To summarize the result for the underlying mechanisms, our study suggests that the weight assigned to the child depends on the parents' time preferences, but not on their risk preferences. Furthermore, the husband's weight assigned to the child also depends on the gender of the child. In particular, the husband displays a stronger preference for boys. Even though the equal allocations to the child in Husband Dictator and Wife Dictator suggest that the husband and the wife on average assign the same total weight to the child, the underlying mechanisms suggest that these weights consist of different elements. These elements differ systematically between women and men in our sample.

The results presented in this paper point to several avenues for future research. First, studying the spouses' preferences, such as time preferences and risk preferences, seems to be important in future research in order to increase our understanding of the under-

[24]We do not know how the spouses planned to spend the amount they allocated to themselves, and cannot rule out that either of them prefers to spend their money on other goods for their children such as clothing and food. Furthermore, we do not know what happens in the interaction between the spouses after the experiment. We do not have reason to believe that any behavior after the experiment is correlated with treatment, and thus this cannot explain any of the results discussed.

[25]This is in line with Schaner (2015) who finds that couples who have similar time preferences are more likely to choose the most efficient savings account than couples who have different time preferences.

[26]Carlsson et al. (2012) and Yang and Carlsson (2012) find that women are more patient than men in China. Our finding is in line with the general finding in Falk et al. (2015), who study time preferences in 75 countries. Overall, they find that men are slightly more patient than women, even though this gender difference is not found in Tanzania (mail correspondence with Armin Falk and Benjamin Enke).

lying mechanisms determining household behavior. Second, considering other types of spending on children, such as nutrition and health, is important in order to understand the generalizability of our study. Finally, while random assignment of couples to different treatments ensures internal validity, the sample is not necessarily representative. Newer randomized controlled trials have taken a step in the right direction towards testing the generalizability of our and other experimental results, but have, to our knowledge, not studied the role of time and gender preferences.

Our study suggests that increased spending on children is not an instrumental reason for targeting women with cash transfers, but gender equality (among both children and adults) is. Thus, if the aim of a policy is to increase spending on children, targeted cash transfers to women are not necessarily the most efficient instrument.

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Figures and tables

Figure 1: Diagram of Experimental design

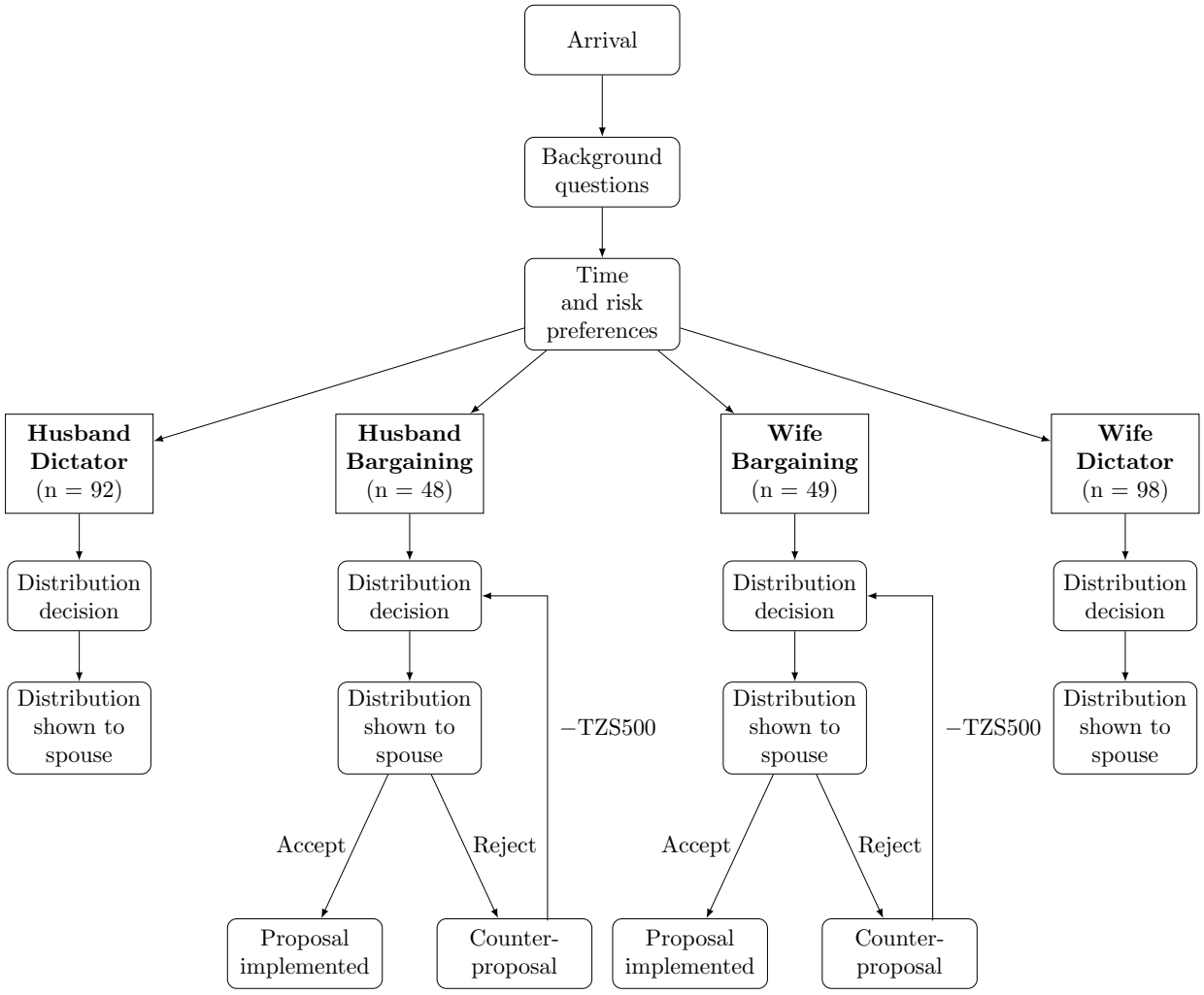
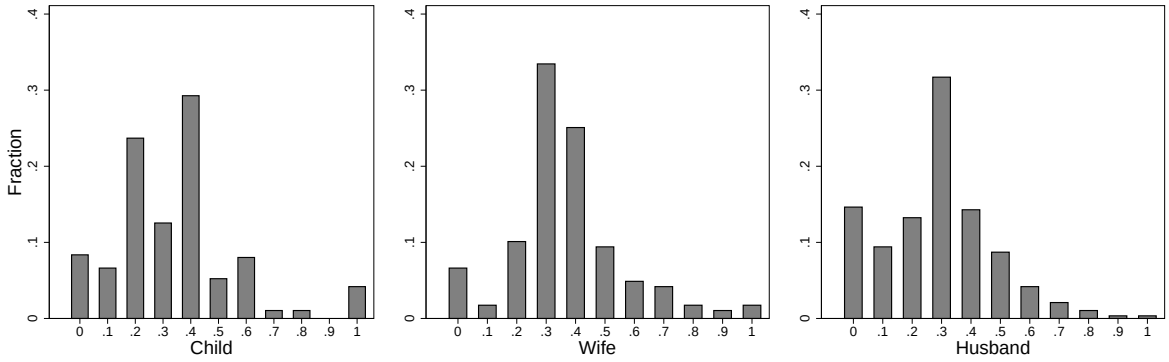
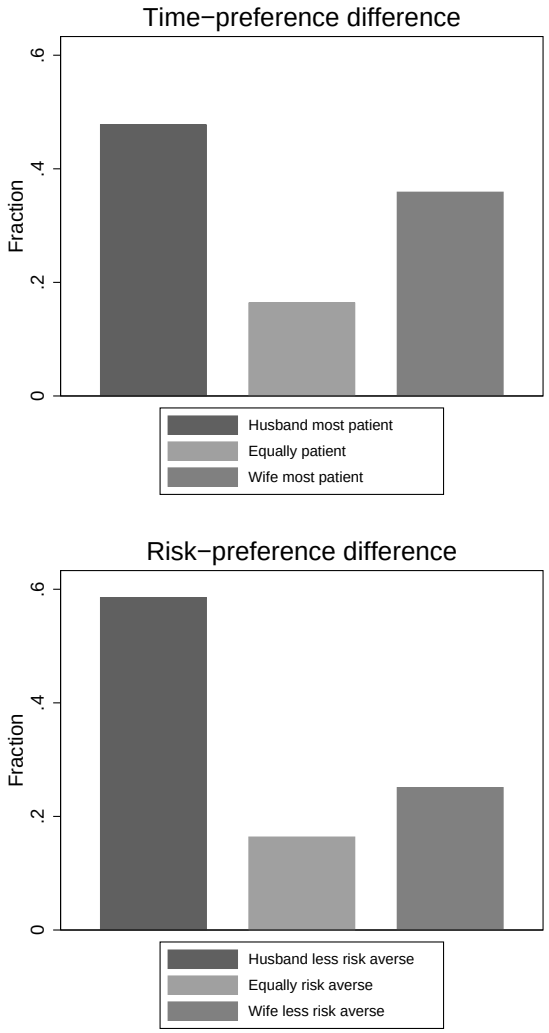


Figure 2: Share allocated to the child, the wife, and the husband



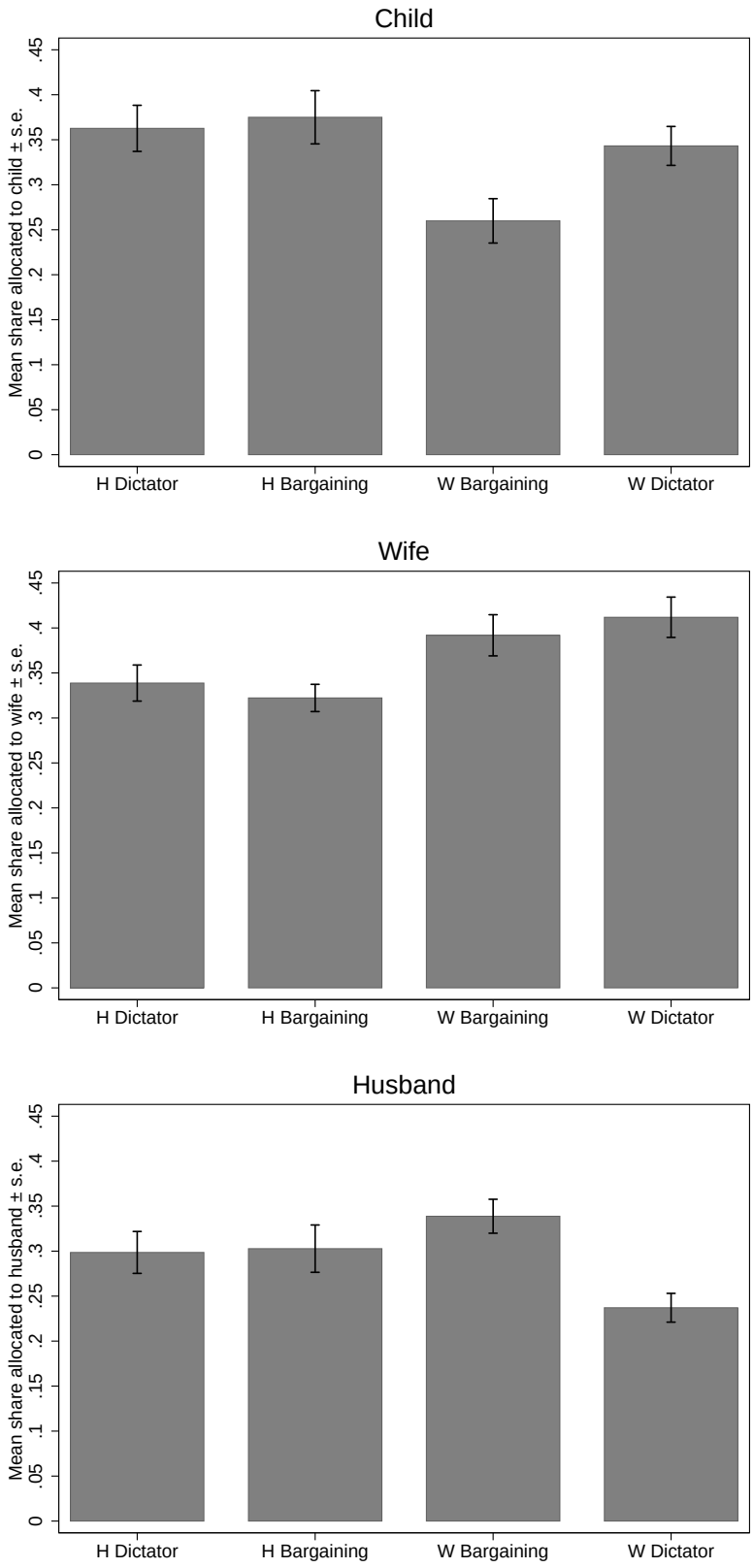
Note: The figure displays the distribution of the share allocated to the child, the wife, and the husband, respectively. The left panel shows the share allocated to the child in the dictator treatments (Husband Dictator and Wife Dictator) and the share proposed to the child in the first proposal in the bargaining treatments (Husband Bargaining and Wife Bargaining). The middle panel shows the share allocated to the wife by herself in Wife Dictator and by the husband in Husband Dictator, and the share proposed to herself in Wife Bargaining and the share proposed to be allocated to her by the husband in Husband Bargaining. The right panel shows the share allocated to the husband by himself in Husband Dictator and by the wife in Wife Dictator, and the share proposed to himself in Husband Bargaining and the share proposed to be allocated to him by the wife in Wife Bargaining.

Figure 3: Time and risk preferences between husband and wife



Note: The figure provides a simplified illustration of differences in time and risk preferences between the husband and the wife. Couples are divided into three categories: husband most patient/least risk averse, husband and wife equally patient/risk averse, and wife most patient/least risk averse. Time preferences are measured by the share allocated to the future and the fraction of couples in each of the three categories is illustrated in the upper panel. Risk preferences are measured by the share allocated to the risky option and the fraction of couples in each of the three categories is illustrated in the lower panel.

Figure 4: Share allocated to the child, the wife, and the husband, by treatment



Note: The figure reports mean share allocated to the child (upper panel), the wife (middle panel), and the husband (lower panel) and standard error for Husband Dictator, Husband Bargaining, Wife Bargaining, and Wife Dictator.

Table 1: Background characteristics by gender

	Wife	Husband	Total	P-value, t-test
A. Background				
Age	34.95	42.66	38.80	0.000***
	(0.45)	(0.59)	(0.41)	
Number of children	-	-	3.17	
			(0.07)	
Children in primary	-	-	1.40	
			(0.03)	
B. Education				
No/some/completed primary	0.38	0.35	0.36	0.244
	(0.03)	(0.03)	(0.02)	
Some secondary	0.50	0.39	0.44	0.005***
	(0.03)	(0.03)	(0.02)	
Completed secondary or more	0.13	0.26	0.19	0.000***
	(0.02)	(0.03)	(0.02)	
C. Employment status				
Unemployed	0.41	0.05	0.23	0.000***
	(0.03)	(0.01)	(0.02)	
Self-employed	0.52	0.67	0.60	0.000***
	(0.03)	(0.03)	(0.02)	
Individuals	287	287	574	

Mean coefficients; standard error of mean in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports descriptive statistics for parents (age, education, employment status) and households (number of children, number of children in primary school). Column (1) reports means for wives, Column (2) reports means for husbands, Column (3) reports means for the total sample, and Column (4) reports p-values for two-sided t-test of difference in means between husband and wife. In panel A, we report background variables for the household. "Age": participant's reported age. "Number of children": total number of children the couple cares for. "Children in primary": total number of children the couple is caring for that are currently attending primary school in Dar es Salaam. In panel B, we report education variables. "No/some/completed primary": share of participants who have no formal schooling, some primary school, or completed primary school as their highest obtained level of education. "Some secondary": share of participants with some secondary school as their highest obtained level of education. "Secondary completed or more": share of participants with completed secondary school or higher as their highest obtained level of education. In panel C, we report occupation variables. "Unemployed": share of unemployed participants. "Self-employed": share of self-employed participants. Remaining participants are employed in the formal sector (public or private).

Table 2: Effect of increasing the wife's bargaining power on the allocation to the child

	(1)	(2)	(3)	(4)	(5)
Husband Bargaining	0.012	0.016	0.021	0.026	0.022
	(0.039)	(0.039)	(0.040)	(0.038)	(0.039)
Wife Bargaining	-0.103^{***}	-0.100^{***}	-0.096^{***}	-0.080^{**}	-0.079^{**}
	(0.036)	(0.035)	(0.035)	(0.040)	(0.039)
Wife Dictator	-0.019	-0.019	-0.015	0.001	0.003
	(0.034)	(0.033)	(0.034)	(0.032)	(0.032)
Male child			0.020	0.038	0.037
			(0.026)	(0.026)	(0.026)
Chosen child's standard			0.001	0.006	0.005
			(0.007)	(0.007)	(0.007)
Age husband				0.003^{**}	0.003^{**}
				(0.002)	(0.002)
Age wife				-0.004^{*}	-0.004^{*}
				(0.002)	(0.002)
H most patient					0.050
					(0.045)
H least risk averse					-0.069^{*}
					(0.042)
Session FE	No	Yes	Yes	Yes	Yes
Child background	No	No	Yes	Yes	Yes
Parent background	No	No	No	Yes	Yes
Parent difference	No	No	No	No	Yes
Couples	287	287	287	286	286
R^2	0.031	0.115	0.123	0.196	0.208

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the share allocated to the child (with possible discrete values of $0, 0.1, 0.2, ..., 0.9, 1$) on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining), "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator), and a set of explanatory variables. "Session FE": indicator variables for each of the 11 different sessions of the experiments. "Child background" is: "Male child": indicator variable taking the value 1 if the child is a boy, "Chosen child's standard": variable taking values corresponding to the chosen child's school standard between 1 and 7 and "Children total": indicator variable for couples with two or more children. We also include indicator variables for which of the four schools the child is attending. "Parent background" is: "Age$_i$" ($i = H, W$, H=husband, W=wife): count variable for individual i's reported age, "Self-employed$_i$": indicator variable taking the value 1 if i is self-employed, "Highest level of education$_i$": discrete variable taking the following values: 0 = No formal education, 1 = Some primary school, 2 = Primary school completed, 3 = Some primary school, 4 = Secondary school completed, 5 = More than secondary school, "Share allocated to future$_i$": share allocated to the future by i, and "Share invested in risky option i": share allocated to the risky option by i. "Parent difference" variables are: "H most educated": indicator variable taking the value 1 for couples where the husband is more educated than the wife, "H most patient": indicator variable taking the value 1 for couples where the husband allocates more to the future than the wife, and "H least risk averse": indicator variable taking the value 1 if the husband allocates more to the risky option than the wife.

Table 3: Effect of increasing the wife's bargaining power on the allocation to the wife and the husband

	Allocation to wife	Allocation to husband
Husband Bargaining	−0.017	−0.007
	(0.031)	(0.035)
Wife Bargaining	0.066**	0.003
	(0.032)	(0.035)
Wife Dictator	0.091***	−0.102***
	(0.028)	(0.030)
Male child	0.004	−0.040*
	(0.025)	(0.023)
Chosen child's standard	−0.004	−0.001
	(0.006)	(0.006)
Age husband	−0.000	−0.003**
	(0.001)	(0.001)
Age wife	0.003	0.001
	(0.002)	(0.002)
H most patient	0.038	−0.075*
	(0.037)	(0.039)
H least risk averse	0.035	0.038
	(0.040)	(0.039)
Session FE	Yes	Yes
Child background	Yes	Yes
Parent background	Yes	Yes
Parent difference	Yes	Yes
Couples	286	286
R^2	0.226	0.186

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports a regression of the share allocated to the wife (with possible discrete values of $0, 0.033, 0.67, 0.1, ..., 0.933, 0.967, 1$) in Column (1), and a regression of the share allocated to the husband (with possible discrete values of $0, 0.033, 0.67, 0.1, ..., 0.933, 0.967, 1$) in Column (2) on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining), "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator), and a set of explanatory variables. See Table 2 for definition of "Session FE", "Child background", "Parent background", and "Parent difference".

Table 4: Heterogeneity in time- and risk-preference difference

	Var = H most patient			Var = H least risk averse		
	HB	WB	WD	HB	WB	WD
Treatment	0.060	−0.039	0.072*	0.013	−0.024	−0.016
	(0.101)	(0.053)	(0.043)	(0.063)	(0.068)	(0.053)
Treatment X var	0.014	−0.094	−0.209***	0.084	−0.040	0.003
	(0.113)	(0.089)	(0.064)	(0.082)	(0.079)	(0.067)
Var	0.102*	0.095*	0.104**	−0.018	−0.005	−0.069
	(0.053)	(0.050)	(0.048)	(0.057)	(0.053)	(0.053)
Treatment (var)	0.073	−0.133*	−0.137***	0.097*	−0.064	−0.013
	(0.049)	(0.068)	(0.050)	(0.054)	(0.055)	(0.044)
Session FE	Yes	Yes	Yes	Yes	Yes	Yes
Child background	Yes	Yes	Yes	Yes	Yes	Yes
Parent background	Yes	Yes	Yes	Yes	Yes	Yes
Parent difference	Yes	Yes	Yes	Yes	Yes	Yes
Couples	139	140	189	139	140	189
R^2	0.305	0.336	0.321	0.335	0.344	0.288

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Columns (1) to (3) in the table report regressions of the share allocated to the child (with possible discrete values of $0, 0.1, 0.2, ..., 0.9, 1$) on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining) in Column (1), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining) in Column (2), and "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator) in Column (3), the indicator variable "Husband most patient" (indicator variable taking the value 1 for couples where the husband allocates more to the future than the wife), "Treatment X H most patient", an interaction variable between the treatment indicator variables and "H most patient", and a set of explanatory variables. Columns (4) to (6) in the table report regressions of the share allocated to the child on the treatment variables "Husband Bargaining", "Wife Bargaining", and "Wife Dictator", respectively, the indicator variable "H least risk averse" (indicator variable taking the value 1 for couples where the husband allocates more to the risky option than the wife), interaction variables between the treatment indicator variable and "H least risk averse", and a set of explanatory variables. See Table 2 for definition of "Session FE", "Child background", "Parent background", and "Parent difference".

Table 5: Heterogeneity in gender preference

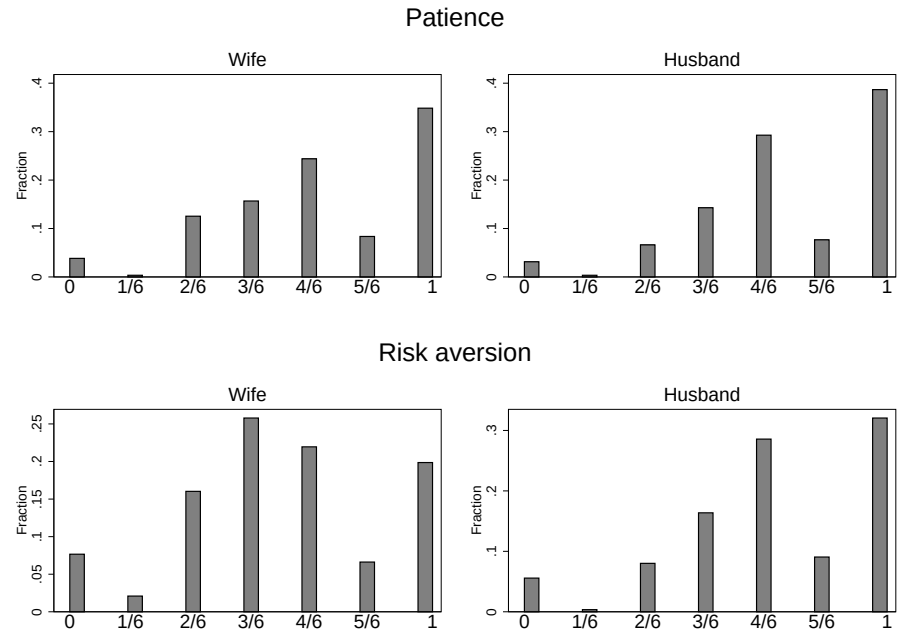
	Var = Male child			
	HB	WB	WD	WP
Treatment	0.157***	0.006	0.032	0.048
	(0.051)	(0.054)	(0.044)	(0.035)
Treatment X var	−0.240***	−0.126	−0.114*	−0.131**
	(0.083)	(0.086)	(0.062)	(0.056)
Var	0.139***	0.119**	0.124***	0.120***
	(0.045)	(0.046)	(0.047)	(0.046)
Treatment (var)	−0.083	−0.120*	−0.083	−0.084*
	(0.067)	(0.071)	(0.051)	(0.045)
Session FE	Yes	Yes	Yes	Yes
Child background	Yes	Yes	Yes	Yes
Parent background	Yes	Yes	Yes	Yes
Parent difference	Yes	Yes	Yes	Yes
Couples	139	140	189	139
R^2	0.305	0.336	0.321	0.335

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the share allocated to the child on the treatment variables "Husband Bargaining", "Wife Bargaining", "Wife Dictator", "Wife some bargaining power" (indicator variable taking the value 1 for couples in Husband Bargaining, Wife Bargaining or Wife Dictator), respectively, the indicator variable "Male child" (indicator variable taking the value 1 if the child is a boy), interaction terms between the treatment indicator variable and "Male child", and a set of explanatory variables. "Treatment (H most patient)": sum of estimated parameters for the treatment indicator variable and "Treatment X H most patient". "Treatment (H least risk averse)": sum of estimated parameters for the treatment indicator variable and "Treatment X H least risk averse". "Treatment (Male child)": sum of estimated parameters for the treatment indicator variable and "Treatment X Male Child". See Table 2 for definition of "Session FE", "Child background", "Parent background", and "Parent difference".

Appendix A Additional figures and tables

Figure A.1: Distribution of time and risk preferences



Note: The upper panel illustrates the distribution of time preferences (measured as share of endowment, TZS3,000, allocated to the future) for wives (left) and husbands (right), respectively. The lower panel illustrates the distribution of risk preferences (measured as share of endowment, TZS3,000, allocated to the risky option) for wives (left) and husbands (right) respectively.

Table A.1: Balance regressions

	Husband Dictator vs. Husband Bargaining	Husband Dictator vs. Wife Bargaining	Husband Dictator vs. Wife Dictator
Age husband	−0.551	−0.272	−0.451
	(1.937)	(1.551)	(1.494)
Age wife	−0.026	−1.958	−0.860
	(1.357)	(1.254)	(1.173)
Some secondary or more H	−0.069	0.145*	0.029
	(0.088)	(0.078)	(0.067)
Some secondary or more W	0.101	0.144*	−0.010
	(0.084)	(0.077)	(0.069)
Self-employed H	−0.014	−0.132	−0.060
	(0.080)	(0.084)	(0.069)
Self-employed W	0.044	0.095	0.083
	(0.085)	(0.087)	(0.073)
Children not in primary	−0.343	−0.158	−0.252
	(0.236)	(0.278)	(0.218)
Children in primary	0.181*	0.170	0.155*
	(0.108)	(0.108)	(0.088)
Male child	−0.157*	0.033	−0.039
	(0.083)	(0.084)	(0.072)
Standard chosen child	−0.092	−0.074	0.120
	(0.343)	(0.344)	(0.287)
Chosen child attends A	0.085*	0.042	−0.026
	(0.048)	(0.057)	(0.041)
Chosen child attends B	−0.051	−0.105	−0.001
	(0.080)	(0.075)	(0.067)
Chosen child attends C	−0.047	0.046	−0.005
	(0.033)	(0.050)	(0.037)
Share invested in future H	0.013	−0.262***	−0.176***
	(0.046)	(0.037)	(0.033)
Share invested in future W	0.008	0.136***	0.126***
	(0.038)	(0.052)	(0.037)
Share invested in risky option H	−0.085*	−0.094**	−0.067*
	(0.049)	(0.044)	(0.039)
Share invested in risky option W	0.131***	0.032	0.104**
	(0.040)	(0.058)	(0.041)
H most patient	0.036	−0.388***	−0.403***
	(0.082)	(0.080)	(0.066)
H least risk averse	−0.237***	0.140	−0.207***
	(0.083)	(0.086)	(0.070)
H most educated	−0.018	0.005	0.091
	(0.070)	(0.072)	(0.062)

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The table reports coefficients for regressions of each of the background characteristics as dependent variable on indicator variables for treatments ("Husband Bargaining" in Column (1), "Wife Bargaining" in Column (2), and "Wife Dictator" in Column (3)). "Age husband": husband's reported age. "Some secondary or more H": indicator variable taking the value 1 if the husband has completed some secondary schooling or more. "Self-employed H": indicator taking the value 1 if the husband is self-employed. "Children not in primary": number of children currently not in primary school. "Children in primary": number of children currently in primary school. "Male child": indicator variable taking the value 1 if the child randomly chosen for tutoring was a boy. "Standard of chosen child": Chosen child's current standard in school. "Chosen child attends A": indicator variable taking the value 1 for children in primary school A. "Chosen child attends B": indicator variable taking the value 1 for children in primary school B. "Chosen child attends C": indicator variable taking the value 1 for children in primary school C. "Share invested in future H": share allocated by husband to the future. "Share invested in risky option H": share allocated by the husband to the risky option. "Share invested in future W": share allocated by the wife to the future. "Share invested in risky option W": share allocated by the wife to the risky option."H most patient": indicator variable taking the value 1 for couples where the husband allocates more to the future than the wife. "H least risk averse": indicator variable taking the value 1 for couples where the husband allocates more to the risky option than the wife. "H most educated": indicator variable taking the value 1 for couples where the husband is more educated than the wife. The purpose of this is to check if participants in Husband Dictator and Husband Bargaining, Husband Dictator and Wife Bargaining, and Husband Dictator and Wife Dictator respectively, are different in terms of socioeconomic characteristics. All regressions include session fixed effects, indicator variables for each of the 11 different sessions of the experiment.

Table A.2: Effect of increasing the wife's bargaining power on the allocation to the child, with final share

	(1)	(2)	(3)	(4)	(5)
Husband Bargaining	−0.001	0.003	0.009	0.013	0.009
	(0.037)	(0.036)	(0.037)	(0.037)	(0.036)
Wife Bargaining	−0.088**	−0.085**	−0.081**	−0.066*	−0.065*
	(0.035)	(0.035)	(0.035)	(0.039)	(0.039)
Wife Dictator	−0.019	−0.019	−0.017	−0.004	−0.000
	(0.034)	(0.033)	(0.033)	(0.032)	(0.032)
Male child			0.021	0.041	0.039
			(0.026)	(0.026)	(0.025)
Chosen child's standard			0.004	0.008	0.006
			(0.006)	(0.007)	(0.007)
Age husband				0.003*	0.003*
				(0.002)	(0.002)
Age wife				−0.003	−0.003
				(0.002)	(0.002)
H most educated					0.030
					(0.042)
H most patient					0.063
					(0.044)
H least risk averse					−0.067
					(0.040)
Session FE	No	Yes	Yes	Yes	Yes
Child background	No	No	Yes	Yes	Yes
Parent background	No	No	No	Yes	Yes
Parent difference (educ, pref)	No	No	No	No	Yes
Couples	287	287	287	286	286
R^2	0.021	0.104	0.114	0.188	0.201

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the **final** share allocated to the child (share allocated to child divided by the final household endowment (TSZ15000 − TSZ500 for every time a proposal is rejected), with possible discrete values of $0, 0.1, 0.2, ..., 0.9, 1$) on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining), "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator), and a set of explanatory variables. See Table 2 for definition of "Session FE", "Child background", and "Parent background".

Table A.3: Effect of increasing the wife's bargaining power on the allocation to the wife and the husband, with final share

	Allocation to wife	Allocation to husband
Husband Bargaining	−0.010	−0.002
	(0.030)	(0.034)
Wife Bargaining	0.045	0.011
	(0.029)	(0.033)
Wife Dictator	0.092***	−0.100***
	(0.028)	(0.030)
Male child	0.002	−0.039*
	(0.024)	(0.023)
Chosen child's standard	−0.005	−0.001
	(0.006)	(0.006)
Age husband	−0.000	−0.003**
	(0.001)	(0.001)
Age wife	0.003	0.001
	(0.002)	(0.002)
H most educated	0.021	−0.041
	(0.036)	(0.033)
H most patient	0.030	−0.080**
	(0.036)	(0.038)
H least risk averse	0.039	0.031
	(0.039)	(0.038)
Session FE	Yes	Yes
Child background	Yes	Yes
Parent background	Yes	Yes
Parent difference (educ, pref)	Yes	Yes
Couples	286	286
R^2	0.218	0.201

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the **final** share allocated to the wife and the husband (share allocated to the wife or the husband divided by the final household endowment (TSZ15000 − TSZ500 for every time a proposal is rejected), with possible discrete values of $0, 0.1, 0.2, ..., 0.9, 1$) in Column (1) and a regression of the **final** share allocated to the husband (with possible discrete values of $0, 0.033, 0.67, 0.1, ..., 0.933, 0.967, 1$) in Column (2) on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining), "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator), and a set of explanatory variables. See Table 2 for definition of "Session FE", "Child background", "Parent background", and "Parent difference (educ, pref)".

Table A.4: Heterogeneity in time- and risk-preference difference, with final share

	Var = H most patient			Var = H least risk averse		
	HB	WB	WD	HB	WB	WD
Treatment	−0.007	−0.018	0.072*	−0.017	−0.006	−0.016
	(0.074)	(0.052)	(0.043)	(0.054)	(0.068)	(0.053)
Treatment X var	0.085	−0.113	−0.209***	0.119	−0.051	0.003
	(0.087)	(0.089)	(0.064)	(0.075)	(0.078)	(0.067)
var	0.092*	0.098*	0.104**	−0.027	−0.004	−0.069
	(0.051)	(0.050)	(0.048)	(0.055)	(0.053)	(0.053)
Treatment (var)	0.078*	−0.131*	−0.137***	0.102*	−0.056	−0.013
	(0.047)	(0.069)	(0.050)	(0.054)	(0.055)	(0.044)
Session FE	Yes	Yes	Yes	Yes	Yes	Yes
Child background	Yes	Yes	Yes	Yes	Yes	Yes
Parent background	Yes	Yes	Yes	Yes	Yes	Yes
Parent difference	Yes	Yes	Yes	Yes	Yes	Yes
Couples	139	140	189	139	140	189
R^2	0.333	0.319	0.321	0.349	0.327	0.288

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Columns (1) to (3) in the table report regressions of the **final** share allocated to the child (share allocated to child divided by the final household endowment (TSZ15000 − TSZ500 for every time a proposal is rejected), with possible discrete values of $0, 0.1, 0.2, ..., 0.9, 1$) on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining) in Column (1), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining) in Column (2), and "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator) in Column (3), the indicator variable "Husband most patient" (indicator variable taking the value 1 for couples where the husband allocates more to the future than the wife), "Treatment X H most patient", an interaction variable between the treatment indicator variables and "H most patient", and a set of explanatory variables. Columns (4) to (6) in the table report regressions of the **final** share allocated to the child on the treatment variables "Husband Bargaining", "Wife Bargaining", and "Wife Dictator", respectively, the indicator variable "H least risk averse" (indicator variable taking the value 1 for couples where the husband allocates more to the risky option than the wife), interaction variables between the treatment indicator variable and "H least risk averse", and a set of explanatory variables. See Table 2 for definition of "Session FE", "Child background", "Parent background", and "Parent difference".

Table A.5: Heterogeneity in gender of child, with final share

	Var = Male child			
	HB	WB	WD	WP
Treatment	0.127***	0.023	0.032	0.042
	(0.046)	(0.054)	(0.044)	(0.034)
Treatment X var	−0.209***	0.119	−0.051	0.003
	(0.079)	(0.085)	(0.062)	(0.055)
var	0.066**	0.121***	0.124***	0.119**
	(0.045)	(0.046)	(0.047)	(0.046)
Treatment (var)	−0.079	−0.114	−0.083	−0.083
	(0.067)	(0.071)	(0.051)	(0.045)
Session FE	Yes	Yes	Yes	Yes
Child background	Yes	Yes	Yes	Yes
Parent background	Yes	Yes	Yes	Yes
Parent difference	Yes	Yes	Yes	Yes
Couples	139	140	189	286
R^2	0.383	0.347	0.304	0.208

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the **final** share allocated to the child on the treatment variables "Husband Bargaining", "Wife Bargaining", "Wife Dictator", and "Wife some power", respectively, the indicator variable "Male child" (indicator variable taking the value 1 if the child is a boy), interaction terms between the treatment indicator variable and "Male child", and a set of explanatory variables. "Treatment (H most patient)": sum of estimated parameters for the treatment indicator variable and "Treatment X H most patient". "Treatment (H least risk averse)": sum of estimated parameters for the treatment indicator variable and "Treatment X H least risk averse". "Treatment (Male child)": sum of estimated parameters for the treatment indicator variable and "Treatment X Male Child". See Table 2 for definition of "Session FE", "Child background", "Parent background", and "Parent difference".

Table A.6: Heterogeneity in time- and risk-preference difference, strict definition

	Var = H most patient 2			Var = H least risk averse 2		
	HB	WB	WD	HB	WB	HD
Treatment	−0.114	−0.038	0.101	−0.040	0.029	0.047
	(0.102)	(0.064)	(0.061)	(0.096)	(0.103)	(0.085)
Treatment X var	0.212*	−0.096	−0.238***	0.122	−0.065	-0.049
	(0.113)	(0.096)	(0.079)	(0.110)	(0.113)	(0.102)
var	0.075	0.091	0.114*	−0.062	−0.029	−0.069
	(0.067)	(0.062)	(0.062)	(0.084)	(0.086)	(0.086)
Treatment (var)	0.098***	−0.133*	−0.138**	0.082	−0.036	−0.002
	(0.048)	(0.067)	(0.055)	(0.055)	(0.059)	(0.047)
Session FE	Yes	Yes	Yes	Yes	Yes	Yes
Child background	Yes	Yes	Yes	Yes	Yes	Yes
Parent background	Yes	Yes	Yes	Yes	Yes	Yes
Parent difference (educ, pref)	Yes	Yes	Yes	Yes	Yes	Yes
Couples	116	120	152	110	115	146
R^2	0.435	0.430	0.369	0.406	0.395	0.333

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: **All couples where the husband and wife are equally patient and all couples where the husband and wife are equally risk averse are dropped**. Columns (1) to (3) in the table report regressions of the share allocated to the child (with possible discrete values of $0, 0.1, 0.2, ..., 0.9, 1$) on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining) in Column (1), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining) in Column (2), and "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator) in Column (3), the indicator variable "Husband most patient 2" (indicator variable taking the value 1 for couples where the husband allocates more to the future than the wife, and 0 if the wife allocates more to the future than the husband), "Treatment X H most patient 2", an interaction variable between the treatment indicator variables and "H most patient 2", and a set of explanatory variables. Columns (4) to (6) in the table report regressions of the share allocated to the child on the treatment variables "Husband Bargaining", "Wife Bargaining", and "Wife Dictator", respectively, the indicator variable "H least risk averse 2" (indicator variable taking the value 1 if the husband allocates more to the risky option than the wife and 0 if the wife allocates more to the risky option than the husband), interaction variables between the treatment indicator variable and "H least risk averse 2", and a set of explanatory variables. "Treatment (H most patient 2)": sum of estimated parameters for the treatment indicator variable and "Treatment X H most patient 2". "Treatment (H least risk averse 2)": sum of estimated parameters for the treatment indicator variable and "Treatment X H least risk averse 2". See Table 2 for definition of "Session FE", "Child background", and "Parent difference".

Table A.7: Heterogeneity in education level differences and number of children

	Var = H most educated			Var = Child total		
	HB	WB	WD	HB	WB	WD
Treatment	0.078	−0.048	−0.011	0.063	−0.058	0.021
	(0.048)	(0.051)	(0.038)	(0.064)	(0.066)	(0.043)
Treatment X var	−0.031	−0.001	−0.041	0.015	0.016	−0.066
	(0.099)	(0.088)	(0.083)	(0.086)	(0.074)	(0.061)
var	0.044	0.148*	0.004	0.028	0.045	0.060
	(0.077)	(0.081)	(0.083)	(0.045)	(0.044)	(0.042)
Treatment (var)	0.047	−0.049	−0.052	0.077	−0.042	−0.046
	(0.091)	(0.081)	(0.078)	(0.059)	(0.053)	(0.049)
Session FE	Yes	Yes	Yes	Yes	Yes	Yes
Child background	Yes	Yes	Yes	Yes	Yes	Yes
Parent background	Yes	Yes	Yes	Yes	Yes	Yes
Parent difference (educ, pref)	Yes	Yes	Yes	Yes	Yes	Yes
Couples	139	140	189	139	140	189
R^2	0.349	0.346	0.272	0.348	0.346	0.295

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Columns (1) to (3) in the table report regressions of the share allocated to the child (with possible discrete values of $0, 0.1, 0.2, ..., 0.9, 1$) on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining) in Column (1), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining) in Column (2), and "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator) in Column (3), the indicator variable "Husband most educated" (indicator variable taking the value 1 for couples where the husband has obtained a higher level of education than the wife), "Treatment X H most educated", an interaction variable between the treatment indicator variables and "H most educated", and a set of explanatory variables. Columns (4) to (6) in the table report regressions of the share allocated to the child on the treatment variables "Husband Bargaining", "Wife Bargaining", and "Wife Dictator", respectively, the indicator variable "Child total" (indicator variable taking the value 1 for couples that currently care for two or more children), interaction variables between the treatment indicator variable and "Child total', and a set of explanatory variables. "Treatment (H most educated)": sum of estimated parameters for the treatment indicator variable and "Treatment X H most educated". "Treatment (Child total)": sum of estimated parameters for the treatment indicator variable and "Treatment X Child total". See Table 2 for definition of "Session FE", "Child background", "Parent background", and "Parent difference".

Table A.8: Effect of increasing the wife's bargaining power on the allocation to the child, extended

	(1)	(2)	(3)	(4)	(5)
Husband Bargaining	0.012	0.016	0.021	0.026	0.022
	(0.039)	(0.039)	(0.040)	(0.038)	(0.039)
Wife Bargaining	−0.103***	−0.100***	−0.096***	−0.080**	−0.079**
	(0.036)	(0.035)	(0.035)	(0.040)	(0.039)
Wife Dictator	−0.019	−0.019	−0.015	0.001	0.003
	(0.034)	(0.033)	(0.034)	(0.032)	(0.032)
Male child			0.020	0.038	0.037
			(0.026)	(0.026)	(0.026)
Chosen child's standard			0.001	0.006	0.005
			(0.007)	(0.007)	(0.007)
More than 2 children			0.022	0.028	0.031
			(0.027)	(0.026)	(0.026)
School A			−0.003	−0.003	−0.004
			(0.045)	(0.043)	(0.043)
School B			0.031	0.035	0.036
			(0.032)	(0.031)	(0.031)
School C			0.000	−0.009	−0.011
			(0.064)	(0.064)	(0.064)
Age husband				0.003**	0.003**
				(0.002)	(0.002)
Age wife				−0.004*	−0.004*
				(0.002)	(0.002)
Self-employed H				−0.004	0.002
				(0.029)	(0.029)
Self-employed W				0.017	0.014
				(0.026)	(0.026)
Highest level of H				0.015	0.005
				(0.014)	(0.020)
Highest level of W				0.018	0.028
				(0.018)	(0.021)
Share invested in future H				0.119*	0.083
				(0.066)	(0.079)
Share invested in future W				0.044	0.107
				(0.048)	(0.072)
Share invested in risky option H				0.012	0.085
				(0.058)	(0.066)
Share invested in risky option W				0.052	−0.026
				(0.048)	(0.067)
H most educated					0.032
					(0.043)
H most patient					0.050

					(0.045)
H least risk averse					−0.069*
					(0.042)
Constant	0.363***	0.387***	0.331***	0.018	0.016
	(0.026)	(0.083)	(0.097)	(0.127)	(0.127)
Session FE	Yes	Yes	Yes	Yes	Yes
Couples	287	287	287	286	286
R^2	0.031	0.115	0.123	0.196	0.208

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the share allocated to the child (with possible discrete values of $0, 0.1, 0.2, ..., 0.9, 1$) on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining), "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator), and a set of explanatory variables. "Session FE": indicator variables for each of the 11 different sessions of the experiments. See table notes of Table 2 for definition of variables.

Table A.9: Effect of increasing the wife's bargaining power on the allocation to the wife and the husband, extended

	Allocation to wife	Allocation to husband
Husband Bargaining	−0.017	−0.007
	(0.031)	(0.035)
Wife Bargaining	0.066**	0.003
	(0.032)	(0.035)
Wife Dictator	0.091***	−0.102***
	(0.028)	(0.030)
Male child	0.004	−0.040*
	(0.025)	(0.023)
Chosen child's standard	−0.004	−0.001
	(0.006)	(0.006)
More than 2 children	−0.021	−0.006
	(0.026)	(0.025)
School A	0.010	0.000
	(0.047)	(0.041)
School B	−0.038	0.001
	(0.024)	(0.025)
School C	−0.022	0.016
	(0.046)	(0.038)
Age husband	−0.000	−0.003**
	(0.001)	(0.001)
Age wife	0.003	0.001
	(0.002)	(0.002)
Self-employed H	−0.019	0.016
	(0.024)	(0.023)
Self-employed W	−0.010	−0.005
	(0.023)	(0.022)
Highest level of H	0.001	−0.016
	(0.018)	(0.016)
Highest level of W	−0.007	−0.014
	(0.020)	(0.018)
Share invested in future H	−0.025	−0.075
	(0.063)	(0.062)
Share invested in future W	−0.019	−0.068
	(0.057)	(0.062)
Share invested in risky option H	−0.005	−0.077
	(0.062)	(0.061)
Share invested in risky option W	0.008	0.019
	(0.063)	(0.060)
H most educated	0.006	−0.028
	(0.038)	(0.033)
H most patient	0.038	−0.075*

	(0.037)	(0.039)
H least risk averse	0.035	0.038
	(0.040)	(0.039)
Constant	0.274**	0.724***
	(0.109)	(0.120)
Session FE	Yes	Yes
Couples	286	286
R^2	0.226	0.186

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports a regression of the share allocated to the wife (with possible discrete values of $0, 0.033, 0.67, 0.1, ..., 0.933, 0.967, 1$) in Column (1), and a regression of the share allocated to the husband (with possible discrete values of $0, 0.033, 0.67, 0.1, ..., 0.933, 0.967, 1$) in Column (2), on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining), and "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator), and a set of explanatory variables. See Table 2 for definition of "Session FE", "Child background", "Parent background", and "Parent difference" as well as background variables.

Table A.10: Heterogeneity in time- and risk-preference difference, extended

	Var = H most patient			Var = H least risk averse		
	HB	WB	WD	HB	WB	WD
Treatment	0.060	−0.039	0.072*	0.013	−0.024	−0.016
	(0.101)	(0.053)	(0.043)	(0.063)	(0.068)	(0.053)
Treatment X var	0.014	−0.094	−0.209***	0.084	−0.040	0.003
	(0.113)	(0.089)	(0.064)	(0.082)	(0.079)	(0.056)
H most patient	0.102*	0.095*	0.104**	0.050	0.026	0.016
	(0.053)	(0.050)	(0.048)	(0.067)	(0.065)	(0.055)
H least risk averse	−0.027	−0.022	−0.079	−0.018	−0.005	−0.069
	(0.060)	(0.060)	(0.048)	(0.057)	(0.053)	(0.053)
Male child	0.069	0.074*	0.066**	0.079*	0.081**	0.066**
	(0.042)	(0.040)	(0.031)	(0.040)	(0.041)	(0.031)
Share invested in future H				0.200*	0.215*	0.095
				(0.111)	(0.109)	(0.099)
Share invested in future W				0.039	0.019	0.079
				(0.119)	(0.099)	(0.089)
Chosen child's standard	0.001	0.006	0.018**	0.004	0.005	0.018**
	(0.012)	(0.010)	(0.008)	(0.011)	(0.010)	(0.009)
More than 2 children	0.044	0.050	0.019	0.035	0.056	0.024
	(0.039)	(0.038)	(0.030)	(0.038)	(0.037)	(0.029)
School A	−0.116	−0.035	−0.043	−0.115*	−0.042	−0.036
	(0.077)	(0.060)	(0.053)	(0.068)	(0.056)	(0.052)
School B	−0.015	0.004	0.048	−0.008	0.008	0.054
	(0.045)	(0.042)	(0.039)	(0.043)	(0.042)	(0.040)
School C	0.074	−0.004	0.049	0.026	−0.011	0.016
	(0.085)	(0.074)	(0.075)	(0.086)	(0.074)	(0.081)
Age husband	0.006**	0.004	0.004*	0.005**	0.004	0.004*
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
Age wife	−0.006	−0.006*	−0.006**	−0.004	−0.006*	−0.005*
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Self-employed H	−0.024	−0.011	−0.024	−0.030	−0.012	−0.023
	(0.049)	(0.044)	(0.036)	(0.048)	(0.042)	(0.037)
Self-employed W	0.014	0.077**	0.022	0.008	0.065	0.011
	(0.043)	(0.039)	(0.030)	(0.041)	(0.039)	(0.032)
Highest level of H	0.044	−0.037	0.022	0.028	−0.038	0.021
	(0.036)	(0.033)	(0.026)	(0.033)	(0.033)	(0.029)
Highest level of W	−0.005	0.046	0.027	0.004	0.044	0.033
	(0.032)	(0.030)	(0.027)	(0.032)	(0.031)	(0.028)
Share invested in risky option H	0.090	0.123	0.099			
	(0.106)	(0.087)	(0.074)			
Share invested in risky option W	−0.089	0.010	0.006			
	(0.103)	(0.075)	(0.073)			
H most educated	0.004	0.148**	−0.011	0.032	0.144**	−0.013

	(0.071)	(0.068)	(0.059)	(0.070)	(0.069)	(0.060)
Constant	0.192	0.202	0.093	0.000	0.112	0.041
	(0.203)	(0.200)	(0.151)	(0.205)	(0.195)	(0.158)
Treatment (var)	0.073	−0.133	−0.137	0.097	−0.064	−0.013
	(0.049)	(0.068)	(0.050)	(0.054)	(0.055)	(0.044)
Session FE	Yes	Yes	Yes	Yes	Yes	Yes
Couples	139	140	189	139	140	189
R^2	0.305	0.336	0.321	0.335	0.344	0.288

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Columns (1) to (3) in the table report regressions of the share allocated to the child (with possible discrete values of $0, 0.1, 0.2, ..., 0.9, 1$) on the treatment variables "Husband Bargaining" (indicator variable taking the value 1 for couples in Husband Bargaining) in Column (1), "Wife Bargaining" (indicator variable taking the value 1 for couples in Wife Bargaining) in Column (2), and "Wife Dictator" (indicator variable taking the value 1 for couples in Wife Dictator) in Column (3), the indicator variable "Husband most patient" (indicator variable taking the value 1 for couples where the husband allocates more to the future than the wife), "Treatment X var", an interaction variable between the treatment indicator variables and "var", and a set of explanatory variables. Columns (4) to (6) in the table report regressions of the share allocated to the child on the treatment variables "Husband Bargaining", "Wife Bargaining", and "Wife Dictator", respectively, the indicator variable "H least risk averse" (indicator variable taking the value 1 for couples where the husband allocates more to the risky option than the wife), interaction variables between the treatment indicator variable and "H least risk averse", and a set of explanatory variables. See Table 2 for definition of "Session FE".

Table A.11: Heterogeneity in time- and risk-preference difference and gender preference, extended

	Var = Male child			
	HB	WB	WD	WP
Treatment	0.157***	0.006	0.032	0.048
	(0.051)	(0.054)	(0.044)	(0.035)
Treatment X var	−0.240***	−0.126	−0.114*	−0.131**
	(0.083)	(0.086)	(0.062)	(0.056)
H most patient	0.044	0.038	0.012	0.034
	(0.067)	(0.061)	(0.058)	(0.045)
H least risk averse	−0.070	−0.038	−0.075	−0.073*
	(0.061)	(0.061)	(0.051)	(0.042)
Male child	0.139***	0.119**	0.124***	0.120***
	(0.045)	(0.046)	(0.047)	(0.046)
Share invested in future H	0.258**	0.180	0.083	0.143*
	(0.120)	(0.110)	(0.124)	(0.077)
Share invested in future W	0.098	0.044	0.072	0.080
	(0.114)	(0.099)	(0.098)	(0.072)
Chosen child's standard	0.001	0.006	0.019**	0.006
	(0.011)	(0.010)	(0.008)	(0.007)
More than 2 children	0.037	0.043	0.027	0.027
	(0.038)	(0.037)	(0.029)	(0.026)
School A	−0.123*	−0.051	−0.042	−0.014
	(0.071)	(0.058)	(0.054)	(0.045)
School B	−0.010	0.009	0.045	0.033
	(0.044)	(0.042)	(0.039)	(0.031)
School C	0.034	−0.011	0.014	−0.026
	(0.081)	(0.072)	(0.082)	(0.064)
Age husband	0.005**	0.004	0.004*	0.003*
	(0.002)	(0.003)	(0.002)	(0.002)
Age wife	−0.004	−0.006*	−0.005*	−0.003
	(0.003)	(0.003)	(0.003)	(0.002)
Self-employed H	−0.006	−0.011	−0.018	0.007
	(0.046)	(0.043)	(0.036)	(0.029)
Self-employed W	0.006	0.056	0.012	0.009
	(0.040)	(0.043)	(0.031)	(0.026)
Highest level of H	0.039	−0.034	0.023	0.003
	(0.032)	(0.033)	(0.028)	(0.019)
Highest level of W	−0.011	0.043	0.027	0.024
	(0.033)	(0.030)	(0.029)	(0.020)
Share invested in risky option H	0.106	0.046	0.034	0.069
	(0.097)	(0.091)	(0.091)	(0.067)
Share invested in risky option W	−0.256**	−0.021	0.002	−0.021
	(0.118)	(0.085)	(0.085)	(0.069)

H most educated	0.035	0.145**	−0.022	0.034
	(0.068)	(0.065)	(0.058)	(0.041)
Constant	0.047	0.127	0.022	-0.012
	(0.188)	(0.191)	(0.155)	(0.119)
Treatment (var)	−0.083	−0.120	−0.083	−0.084*
	(0.067)	(0.071)	(0.051)	(0.046)
Session FE	Yes	Yes	Yes	Yes
Couples	139	140	189	286
R^2	0.394	0.361	0.304	0.20

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the share allocated to the child on the treatment variables "Husband Bargaining", "Wife Bargaining", "Wife Dictator" and "Wife some power", respectively, the indicator variable "Male child" (indicator variable taking the value 1 if the child is a boy), interaction terms between the treatment indicator variable and "Male child", and a set of explanatory variables. "Treatment (H most patient)": sum of estimated parameters for the treatment indicator variable and "Treatment X H most patient". "Treatment (H least risk averse)": sum of estimated parameters for the treatment indicator variable and "Treatment X H least risk averse". "Treatment (Male child)": sum of estimated parameters for the treatment indicator variable and "Treatment X Male Child". See Table 2 for definition of "Session FE".

Appendix B Experimental materials

B.1 Invitation letter

Economic and Social Research Foundation (ESRF)

P. O. Box 31226

Dar es salaam

25th May 2015

To parents of ……

REF: INVITATION TO PARTICIPATE IN RESEARCH ON HOUSEHOLD DECISION-MAKING

I have a pleasure to invite you both (father and mother) to participate in a research project about decision-making. Participation in the research project will take about three hours. Each of you will receive a show up fee and some refreshments. Depending on the decisions you make during the study, you may receive an additional amount. The research project will take place between July 8 and August 5. Precise date and venue will be communicated to you later.

Taking part in the study is entirely your decision. You do not have to participate in this study if you do not want to. If you decide to participate in the study, you can still withdraw at any time. All information you give will be completely confidential. We will not be able to trace your answers and decisions back to you.

We would highly appreciate your participation, it is very important to our research.

Coordinator

[Name of coordinator]

If you would like to participate, please fill in your mobile phone numbers in the form provided below and return to us through your child in the next day so that we can call you back. For more details you can reach us through the following numbers:

[Numbers removed for privacy reasons]

CONTACT FORM

Child's name……

Father's name…….Phone numbers (1)…..

(2)……..

Mother's name…….Phone numbers (1).....

(2)…….....

B.2 Instructions

This section provides the instructions for elicitation of time and risk preferences as well as for the distributive decision for dictators and first proposers.

B.2.1 Time preferences

We will now hand out tokens that symbolize Tsh 3,000. Please use these to indicate your allocation. At the end of the study, you will be paid in mobile money.

You have received Tsh 3,000 and you are now asked to choose the amount you want to invest. The rest of the amount will be added to your payment that you receive today and will be paid in mobile money.

The amount you invest will be doubled and you will receive it in 3 weeks. For example, if you choose to invest nothing, you will receive Tsh 3,000 in mobile money today. If you choose to invest all of the Tsh 3,000, you will receive nothing today and Tsh 6,000 in mobile money in three weeks. If you choose to invest Tsh 1,000, you will receive Tsh 2,000 in mobile money today and Tsh 2,000 in mobile money in three weeks.

After three weeks, those of you who decide to invest some of the money will then get the mobile money. Those of you who do not invest, will not get anything after three weeks.

Please raise your hand if you have any questions

We will now come to each of you individually to verify that you have understood the task you have been given.

We now ask you to choose the amount of tokens you want to invest. The tokens you put in the cup with the picture of a calendar is the tokens you choose to invest. The invested amount will be doubled and received in mobile money in 3 weeks. The tokens you choose not to invest will be paid out to you in mobile money today after the session is completed.

Has anyone not made their choice?

My assistants will now come around to record your answers. We then move on to the next part of the session.

B.2.2 Risk preferences

We will now hand out tokens that symbolize Tsh 3,000. Please use these to indicate your allocation. At the end of the study, you will be paid in real money, not mobile money. Your decision will be anonymous.

You have received Tsh 3,000 and you are now asked to choose the amount that you wish to invest in a risky option. The amount you choose not to invest, will be added to your payment.

In the lottery, there is an equal chance that the investment will fail or succeed. If the

investment fails, you lose the amount you invested. If the investment succeeds, you receive 3 times the amount invested.

After you have chosen how much you wish to invest, you will draw a card from a bucket to determine whether you win or lose. If the card is green, you win 3 times the amount you chose to invest. If the card is red, you lose the amount you chose to invest. It is equally likely that the card is green or red.

*For example, if you choose to invest nothing, you will get the Tsh 3,000 for sure. That is, the draw of card will not affect your payment. If you choose to invest all of the Tsh 3,000, then if you draw a green card, you receive Tsh 9,000 in payment, and if you draw a red card you receive nothing in payment. If you chose to invest Tsh 1,500, then if you draw a green card, you receive 6,000 (1,500 + 3*1,500) in payment, and if you draw a red card, you receive 1,500 in payment*

Please raise your hand if you have any questions.

We will now come to each of you individually to verify that you have understood the task you have been given.

We now ask you to choose the amount of tokens you want to invest. The tokens you put in the cup with the picture of a question mark is the tokens you choose to invest and which will triple if you draw a green card, and be reduced to zero if you draw a red card. The tokens you choose not to invest will be paid out to you for sure after the study is completed. The payment will be made in cash, not mobile money.

Has anyone not made their choice?

My assistants will now come around to record your answers and to draw the card. We then move on to the next part of the study.

B.2.3 Distributive choice

Dictator treatments (Husband Dictator and Wife Dictator)
In this part of the study, you will be paired with your spouse. This means that the decisions you make will affect both your own and your spouse's payment.

Your household has received Tsh 15,000 and you have been chosen to decide how the money should be allocated between yourself, your child and your spouse.

We will now hand out tokens that symbolize Tsh 15,000. You will use these to show how you want to split the money between yourself, your child and your spouse. At the end of the study, you will be paid in real money according to the decision you made.

Your spouse will be informed about the task you have been given and the decision you make. However, he or she will not make any decision in this part of the session.

For each Tsh 1,500 you give to your child, this child will receive 1 week of tutoring. The

tutoring is conducted Monday through Friday from 15:00 to 17:00. It includes tuition, a speed test each day and a weekend test. Your child will be taught in groups of 25-40 children. The tutor teaches mathematics, English and Sayansi.

The RAs will now come and tell each of you which of your children has been randomly chosen to receive the tutoring.

Please raise your hand if you have any questions.

We will now come to each of you individually to verify that you have understood the task.

We now ask you to distribute the tokens between the three cups on your desk. Remember that the choice you make here will be implemented. The tokens you put in the cup with the picture of a woman will be paid out to your wife if you are a man and to yourself if you are a woman. The tokens you put in the cup with the picture of a child will be paid out as tutoring for your child. The tokens you put in the cup with the picture of a man will be paid out to yourself if you are a man and to your husband if you are a woman, after the completion of the session.

Has anyone not made their choice?

My assistants will now come and record your answers. They will take your decision to your spouse, so that she can see what you decided to do.

We now move on to the next part of the session.

B.2.4 Bargaining treatments (Husband Bargaining and Wife Bargaining)

In this part of the study, you will be paired with your spouse. This means that the decisions you make will affect both your own and your spouse's payment.

Your household has received Tsh 15,000 and you have been chosen to propose how the money should be allocated between yourself, your child and your spouse.

We will now hand out tokens that symbolize Tsh 15,000. You will use these to show your proposal for how to split the money between yourself, your child and your spouse. At the end of the study, you will be paid in real money.

When you have made your choice, we will reveal it to your spouse. He or she can either agree or disagree with your proposal. If he or she agrees, then your choice is implemented. If your spouse disagrees, he or she will get the opportunity to make a new proposal for the allocation of money and you can agree or disagree with the new proposal. You can do this as many times you like in order to get to an agreement for an allocation, but for each time you disagree the amount is reduced by Tsh 500. For example, if your spouse disagrees with your first proposal he or she will propose an allocation of Tsh 14,500. If

you then disagree with him or her, you will propose a new allocation of Tsh 14,000.

For each Tsh 1,500 you give to your child, this child will receive 1 week of tutoring. The tutoring is conducted Monday through Friday from 15:00 to 17:00. It includes tuition, a speed test each day and a weekend test. Your child will be taught in groups of 25-40 children. The tutor teaches mathematics, English and Sayansi.

The RAs will now come and tell each of you which of your children has been randomly chosen to receive the tutoring.

Please raise your hand if you have any questions.

We will now come to each of you individually to verify that you have understood the task you and your spouse have been given.

We now ask you to propose a distribution of the tokens between the three cups on your desk. The tokens you put in the cup with the picture of a woman is what you propose to give to yourself if you are a woman and to your wife if you are a man. The tokens you put in the cup with a picture of a child is what you propose to give to your child and which will be paid out as tutoring if proposal is accepted. The tokens you put in the cup with the picture of a man is what you propose to give to yourself if you are a man and to your husband if you are a woman.

Has anyone not made their choice?

My assistants will now come and record your answers. They will take your proposals to your spouses so that he or she can see what you propose to do and decide whether he or she agrees or disagrees with you. Please wait patiently while we wait for the response of your spouses.

II Managing the resource curse: A survey experiment on expectations about corruption in Tanzania

Managing the resource curse: A survey experiment on expectations about corruption in Tanzania*

Alexander W. Cappelen, Odd-Helge Fjeldstad, Donald Mmari, Ingrid Hoem Sjursen and Bertil Tungodden†

Abstract

Corruption appears to be an important driver of the resource curse in developing countries. We report on a large-scale field experiment in Tanzania that establishes causal evidence on how expectations about future natural resource revenues shape expectations about corruption and the willingness to engage in corrupt behavior. Our main finding is that providing information about the discovery of natural gas in Tanzania and estimates of the total revenues that might accrue to the government has a significant effect on people's beliefs about future corruption. We find this relationship across sub-groups, but the effect is particularly pronounced among the older respondents. We do not find any effect of this information about gas revenues on the willingness to engage in corrupt behavior. We believe that our results may shed some light on underlying mechanisms of the resource curse.

Keywords: Natural resources, Corruption, Field experiment, Behavioral economics, Political economy, Tanzania

JEL Classification: Q32, Q33, D90, D73, P16

*We would like to thank Assistant Researcher Cornel Jahari for the impeccable organization of the data collection and valuable inputs; Miriam Mganga, Maryam Mnkande, Berrt K. Hurbert, Betty Mjeme, Philbert Karia, Joyce Mamuya, Tumsifu Heriel, Joseph Lucas, Goodluck Nyanda, Albina Kaunda, Segere Mtundi and Sammy Lema for research assistance; Ragnar Torvik, Kalle Moene, Halvor Mehlum, Jørgen Juel Andersen, Gerhard Toews and other staff at Oxford Centre for the Analysis of Resource Rich Economies (OxCarre); James Cust, Oliver Morrissey and various seminar and conference participants for valuable inputs at different stages of the project; and administrative staff at REPOA and the Department of Economics for support. We would also like to thank Anton Fouquet and Seme Nassei for the design of the informational videos. The research was funded by the Royal Norwegian Embassy in Dar es Salaam through the research programme "Tanzania as a future petrostate".

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1 Introduction

A comprehensive economic and political economy literature documents the fact that resource-rich countries often perform poorly in terms of social and economic development compared with countries that are less abundant in natural resources (Ross 2015; Venables 2016). Natural resource wealth is associated with less democracy (Aslaksen 2007; Andersen and Aslaksen 2013; Ramsay 2011), more corruption (Leite and Weidmann 2002; Arezki and Brückner 2011; Vicente 2010; Sala-i-Martin and Subramanian 2013; Andersen et al. 2013; Brollo et al. 2013; Caselli and Michaels 2013) and a higher likelihood of violent conflicts (Collier and Hoeffler 1998; Ross 2004). These phenomena are commonly referred to as the *the resource curse*, a term first proposed by Auty (1993). Although there seems to be a consensus that a resource curse often exists, the empirical literature faces greater challenges in establishing *why* natural resource wealth is often associated with undesirable outcomes, because cross-country comparisons are plagued with endogeneity issues (Cust and Poelhekke 2015).

The motivation of this paper is to take an alternative approach and study one possible micro-founded mechanism for the resource curse, using a controlled field experimental setting in which we focus on corruption, which is often considered to be a key explanation of the resource curse (Torvik 2002; Svensson 2005; Serra 2006; Campos and Pradhan 2007; Kolstad and Wiig 2009; Olken 2015). The mechanism that we have in mind is that expectations about natural resource rent in a country cause people to expect an increase in corruption in the future, which in turn increases their willingness to engage in corrupt activities. To study this mechanism, we take advantage of the fact that Tanzania has recently discovered large reservoirs of offshore natural gas, but has not yet commenced production or revenue generation.[1] In this context, we implement a controlled field experiment, in which respondents are randomized to watch different versions of an *informational* video to create exogenous variations in expectations about future gas revenues, and they then respond to survey questions and take part in a behavioral experiment. This design allows us to causally identify how expectations about natural resource wealth shape people's expectations about corruption and their willingness to engage in corrupt behavior (Ross 2012; 2015).

The large-scale study, involving about 3,000 respondents, was conducted in the commercial capital of Tanzania, Dar es Salaam, and in the two gas regions, Mtwara and Lindi, in the south-eastern part of the country. Our main result is that we find support for the hypothesis that expectations about a future natural resource rent increases expectations about future corruption. The effect is not large, about 0.07 standard deviations, but it appears across almost all sub-groups in our sample and is robust to the inclusion of a large set of controls. Given that our experimental manipulation is subtle and cleanly identifies the effect of providing more information (where possible confounds are removed by the fact that the control group watched almost the same video), we argue that the result points to an important mechanism that may contribute to explaining the resource curse. An interesting part of our analysis, which was not pre-specified, is that we find a

[1] These large reservoirs of natural gas have been discovered off the southern coast of Tanzania from 2010 (URoT 2013a). The size of the total confirmed gas reserves is currently standing at more than 57 trillion cubic feet and it is expected to increase further in the years to come. International oil companies have already invested heavily in the exploration phase: the Tanzania Petroleum Development Corporation estimates that overall investments amount to almost USD 5 billion so far. A final decision about investments in extraction facilities and liquefied natural gas infrastructure to facilitate gas export has not yet been made.

particularly strong effect of the information on expectations about future corruption for older respondents in Dar es Salaam. We suggest that this finding is explained by these respondents being more likely to have experienced the mining boom and the associated increase in corruption in Tanzania in the 1990s (Lange 2011), and therefore, they update their beliefs about future corruption based on this personal experience, in line with the learning mechanism identified in Malmendier and Nagel (2016).

In contrast to our pre-specified hypothesis, however, we do not find a corresponding effect on the willingness to engage in corrupt activities, both in terms of the survey measure and the behavioral measure of the corruption norm. The survey measure involves responses to a question on the appropriateness of engaging in corruption, the majority of which express a strong norm against corruption. The behavioral measure is based on an incentivized experiment where the respondent self-reports the number of tails from six coin flips. In contrast to the survey measure, we observe extensive dishonest behavior among the respondents, particularly among the males. In both cases, however, the measures are not affected by our treatment manipulation. A possible explanation for this finding is that it takes some time for a change in beliefs to translate into a change in behavior, but it may also be explained by corrupt behavior being affected more by the present level of corruption in society than by expectations about future corruption. Overall, therefore, we find only limited evidence for our specific hypothesis that expectations about a natural resource rent contribute to the resource curse by increasing expectations about corruption in society in the future, which, consequently, increases people's present willingness to engage in corrupt activities.

Our study relates to a growing literature that focuses on political and institutional explanations of the resource curse. A central theme in this literature is that natural resource booms affect the incentives and behavior of both the political elite and ordinary citizens (Treisman 2000; Leite and Weidmann 2002; Andersen and Aslaksen 2013; Brollo et al. 2013; Caselli and Michaels 2013; Paler 2013; Cust and Poelhekke 2015) and that the extent to which agents can act on bad incentives depends on the quality of institutions (Mehlum et al. 2006; Bhattacharyya and Hodler 2010). On the government side, the argument is that natural resource revenues, particularly those arising from petroleum, increase the value to the ruling politicians of staying in power, because it gives them direct access to large rents. At the same time, these petroleum rents provide an opportunity for the elite to spend money on activities that aim to increase their chances of staying in power. Examples of such activities are increased patronage spending (for instance, increased employment in the public sector), vote buying and reduced non-resource taxation (Robinson et al. 2006; Ross 2008; 2012; Andersen and Aslaksen 2013). However, the problem of corruption and rent-seeking is not confined to the political elite, but is also likely to apply to ordinary citizens. When the rents available for grabbing are large, it becomes more profitable for individuals to engage in political lobbying and corruption to appropriate a share of the wealth (Mehlum et al. 2006; Busse and Gröning 2013). We contribute to this literature by establishing causally that expectations about a natural resource rent, which is likely to make corruption more profitable, increase expectations about future corruption in a society with weak institutions and a history of extensive corruption. This finding is in line with Vicente (2010), who, in a natural experiment comparing Sao Tome and Principe to Cabo Verde, finds that the announcement of oil discoveries increased perceived corruption in public services.

The paper also relates to a large experimental literature studying lying in settings without strategic interactions. In a meta-analysis of 90 studies, involving more than

44,000 respondents from 47 countries, Abeler et al. (2017) find that on average, people are willing to forgo 75% of a potential monetary pay-off to avoid lying. The majority of these studies are conducted on students, or other specific population groups, and in Europe and the US, although with some notable exceptions (Banerjee et al. 2016; Heldring 2016; Lowes et al. 2017). Thus, the behavioral experiment we conduct as part of this study represents the largest study of dishonest behavior in a development context, where the respondents are largely representative of their society. We observe that our respondents are slightly less honest than the average respondent in Abeler et al. (2017); in our sample, the respondents forgo about 67% of a potential monetary pay-off to avoid lying. However, comparing our results to previous studies from Tanzania, our sample is more honest (Abeler et al. 2017; Di Falco et al. 2016). We also find large heterogeneities in dishonest behavior between sub-groups of the sample, which highlights the importance of moving beyond student samples in studies of dishonest behavior. Finally, the paper contributes to a growing body of studies using variation in information provided to respondents in surveys to identify causal effects on beliefs and preferences (Jensen 2010; Card et al. 2012; Cruces et al. 2013; Kuziemko et al. 2015).

The rest of the paper is structured as follows. Section 2 describes the experimental design and provides an overview of the sample and the data. Section 3 explains the empirical strategy and Section 4 provides a descriptive analysis of the key outcomes of interest and reports on main analysis, regarding the effect of providing information about gas revenues on expected corruption. Finally, Section 5 discusses the results and their policy implications and concludes the paper.

2 Sample and experimental design

In this section, we provide a discussion of the sample and the experimental design of the survey.

2.1 Sample

The study was conducted in July and August, 2015, in three regions in Tanzania: Dar es Salaam, Lindi and Mtwara. Dar es Salaam was chosen because it is the commercial capital. Mtwara and Lindi were chosen because they are the regions closest to the offshore gas reservoirs, and they are also the regions where a planned liquefied natural gas processing plant will be located. In the analysis, we refer to Dar es Salaam as the "non-gas region" and Mtwara and Lindi as the "gas regions".[2]

In each region, three districts/municipalities were selected. All municipalities in Dar es Salaam were included, as it possesses three districts. Both Lindi and Mtwara have more than three districts and thus, we undertook a sampling of districts in these regions. In Lindi, we selected the only urban district in the region to ensure urban representation, and randomly selected two of the rural districts. In Mtwara, we selected the urban district situated along the coast because it is the closest to the gas reservoirs, and randomly selected two rural districts.[3] Within each of the nine districts, three wards were randomly

[2]The geographical locations of the three regions are shown in Figure A.1 in Appendix A. In Tables A.3, A.4 and A.5, we provide the main analysis separately for each of the three regions.

[3]The Dar es Salaam districts at the time of the study were Ilala, Temeke and Kiniondoni. The Mtwara districts selected were Masasi Vijijini, Mtwara Manisipaa and Newala, and the Lindi districts were Lindi, Lindi Manisipaa and Nachingwea.

selected using data from the 2012 Population and Household Census (URoT 2016a;c;b). In the field, three villages/streets within each of the 27 wards were randomly selected and within each of the approximately 81 villages/streets, between 35 and 40 households were randomly interviewed. In total, we surveyed 3,004 households. From each household, we randomly selected one person above 18 years of age and alternated between interviewing a man and a woman.

Table 1 provides an overview of the respondents' background variables for the sample as a whole, as well as for each of the three regions, together with comparable statistics from the 2012 Population and Household Census (URoT 2013b; 2015; 2016a;c;b). A direct comparison with the national census data is difficult in relation to age, education and marital status because our sample covers only those aged 18 years and above, whereas in the national census, the education level is measured for all individuals above five years old, and marital status is recorded for individuals above 15 years old. We observe, however, that our data is comparable to the national census in terms of occupation and gender. In the comparison between the non-gas region and the gas regions, we note that the main differences relate to education levels and occupations: respondents in the non- gas region are much more likely than those in the gas region to have completed higher education and to be self-employed.

[Table 1 about here.]

2.2 Survey and experimental design

First, we provide an overview of the structure of the survey, before turning to a more detailed discussion of the treatment variation and the main outcome variables.

General structure. The survey was conducted in Swahili, the official language of Tanzania. It lasted approximately 15 minutes and consisted of five parts (see Appendix B.1 for the English wording of the survey). In the first part, respondents answered background questions about their age, marital status, region of origin, region they visit most frequently, education and occupation. The second part entailed the experimental part of our research design: respondents were randomly assigned to watch one of two versions of an informational video on the enumerator's tablet, where one version contained information about gas discoveries and revenue estimates for Tanzania, whereas the other did not mention gas revenues at all. In the third part, we asked our pre-specified main outcome questions on corruption, trust and taxation, and additional questions that could provide a greater understanding of the mechanisms driving the responses to these questions.[4] In the fourth part, respondents were randomized to take part in one of two incentivized experiments, intended to measure behaviorally their willingness to engage in corrupt activities and their trust level. The respondents were paid upon completion of the experimental task, and the interview was then terminated. At the end, the enumerator recorded information about the gender of the respondent, the region, district, ward and village where the interview was conducted. The data were collected using tablets and the Qualtrics Offline Surveys app, allowing us to randomize the treatment at the enumera-

[4]Even though corruption, taxation and trust are related topics, we consider that they raise different questions and relate to different literatures. Therefore, we focus on corruption in the present paper; taxation and trust will be analyzed in separate papers.

tor level.[5] A schematic representation of the research design is provided in Figure 1 below.

[Figure 1 about here.]

The treatment. The respondents were randomly assigned to watch an informational video with or without gas information (see Figures B.1 - B.14 in Appendix B.2 for screenshots).[6] To make the comparison between the two groups as clean as possible, the video shown to the no gas information group was also part of the version providing gas information.

The no gas information sequence contains only general information about Tanzania. It describes the size of the population (49 million), the number of regions (30) and the gross national income (81 trillion Tanzanian shillings (TZS)/USD 41 billion) of the country. Importantly, this general information features components displayed in the gas information sequence that could affect expectations about corruption, such as a map of Tanzania and its regions, the Tanzanian flag, a picture of a TZS 10,000 note and the mention of a large sum of money. Because these components are shown to respondents in both the gas and the no gas information groups, we assume that they cannot explain any observed treatment differences.

The gas information video also contains a sequence explaining that natural gas has been discovered in Tanzania and indicating the location of the offshore reservoirs, off the coast of Mtwara and Lindi. Further, it describes that the gas can be extracted and sold, and that it can yield an estimated TZS 106 trillion in total revenue.[7]

The videos were made in collaboration with DJPA Tanzania and contained simple animations as well as written text and a voice-over in Swahili.[8] The respondents watched the video on the enumerator's tablet, with a headset to hear the voice-over. Before the main data collection, the videos were tested in focus group discussions with Dar es Salaam residents to ensure that they were clear and understandable.

Overall, the experimental design creates exogenous variation between respondents regarding whether they were informed about the gas revenues, before they provide answers on the main outcome variables. The presence of a control video ensures that there is no variation in other components. Thus, the present design provides for a clean identification of the effect of being informed about the likelihood of natural resources yielding large revenues to Tanzania in the future. Even though our treatment design is subtle, and one should not expect it to generate large effects, we believe that it may trigger two mechanisms that could affect how the respondents answer the questions that follow. First, for respondents who are aware of the potential gas revenues, the information may cause them to update the value of this resource rent upwards or downwards. Second, for all

[5] As shown in Table A.1, the sample is balanced both for all respondents and within the gas region and non-gas regions.

[6] As a robustness check, we introduced four variations of this video in which we randomly varied how we illustrated the size of the revenue estimates. Specifically, we varied whether the revenue estimates were presented in terms of total value/annual real return and in terms of all Tanzanians/per capita. As shown in Tables A.8, A.9 and A.10 in Appendix A, we do not find significant differences across these sub-treatments. We aimed to allocate an equal share of the respondents to each of the five versions of the video, but a software problem created some deviations. Overall, as shown in Table A.2, around 23% of the respondents were in the control group with no gas information and about 77% of the respondents were in the treatment group with gas information.

[7] This estimated total value is based on IMF (2014).

[8] DJPA webpage: http://www.djpa.co.tz/

respondents, the information about gas revenues increases the salience of this revenue. To shed some light on the extent to which these mechanisms shape the following responses, immediately after the video we asked all respondents whether the information was new to them, as follows:

- *Novelty of information*: How much of this information was new to you? (All of it - most of it - some of it - almost none of it - none of it)

In addition, for the treated respondents, we asked whether the estimated total gas revenues were larger than they had expected.

The main survey outcome variables. We were interested in whether information about future gas revenues causes people to expect more corruption in society and weaken the social norm whereby corruption is considered to be unacceptable. To study these two dimensions, we asked the respondents two main questions on corruption after they had seen the informational video:

- *Expected future corruption*: In the years to come, I expect the extent of corrupt activities to: (Decrease a lot - decrease - stay the same - increase - increase a lot)

- *Corruption norm*: People should never engage in corrupt activities (Strongly agree - agree - neither agree nor disagree - disagree - strongly agree)

Our prior expectation was that information about future gas revenues would cause individuals to expect more corruption if they updated their estimates of the resource rent upwards. Further, we expected this information to make the presence of a large resource rent salient, which might remind respondents of the extensive corruption involved in historical cases of national resource rent extraction in Tanzania (Lange 2011). Finally, building on the prior expectation that the information video would make respondents expect more corruption, we also expected the information to weaken the corruption norm because, as well established in the literature, the strength of a corruption norm depends importantly on the level of corruption in society (Andvig and Moene 1990; Treisman 2000; Paldam 2002; Fisman et al. 2007; Cameron et al. 2009; Barr and Serra 2010).

The behavioral outcome variable. To supplement the survey response on the corruption norm, we conducted an incentivized experiment to measure people's willingness to become involved in corrupt activities, in which we relied on the standard definition of corruption as "the abuse of entrusted power for private gain". To capture this aspect, we conducted a standard flip-of-a-coin experiment (Fischbacher and Föllmi-Heusi 2013), in which the respondent was asked to flip a coin six times without the enumerator observing the outcomes. Then, the respondent was asked to report how many heads he/she obtained, with a payment of 1,000 TZS per tail reported. The payment scheme was announced before the respondent flipped the coin.

The idea behind this experimental task was that the enumerator entrusted power to the respondent to report the correct outcomes, but the respondent could, without any fear of detection, abuse this power to benefit economically by misreporting the number of heads and tails. Our experimental design allows us to identify whether information about future gas revenues makes it more likely that the respondent abuses their power and engages in corrupt activity for a private gain.

3 Empirical strategy

We study the causal effect of providing information about gas on the respondents' responses by estimating the following linear ordinary least squares regression, as specified in the pre-analysis plan:[9]

$$y_i = \alpha + \beta_{GI} GI_i + \delta X_i + \varepsilon_i, \tag{1}$$

where y_i is the standardized version of the relevant outcome measure for individual i (expected corruption, corruption norm and novelty of information), GI_i is a treatment indicator variable that takes a value of one if respondent i was exposed to the gas information version of the video and X_i is a vector of individual characteristics: age, gender, occupation, education, marital status and type of region (gas or non-gas region). We estimate Equation (1) with robust standard errors and control for round fixed effects.[10] We also report the corresponding regressions without control variables. As respondents were randomly assigned to watch one of the two versions of the video, β_{GI} provides an estimate of the causal effect of providing information about gas on expectations about future corruption and on the corruption norm.

To investigate whether the gas information affected sub-groups of the sample differently, we also estimate regressions with interaction terms. We focus on age, education, gender and employment status, and estimate the following regression with indicator variables for the respective dimensions:[11]

$$y_i = \alpha + \beta_{GI} GI_i + \gamma Var_i + \theta GI_i \times Var_i + \delta X_i + \varepsilon_i, \tag{2}$$

where Var_i is an indicator variable taking a value of one if respondent i is older than the median age, has completed lower secondary school or a higher level of education, is male, is self-employed or is a farmer, and $GI_i \times Var_i$ is an interaction term between GI_i and Var_i. Then, the estimated effect on respondents of providing information about gas is given by β_{GI} (younger, less educated, females, employed in the formal sector) and $\beta_{GI} + \theta$ (older, more educated, males, self-employed, farmers) and the estimated difference in causal effect between the two respective sub-groups is given by θ.

4 Analysis

First, we provide some descriptive statistics of the responses of the respondents before turning to the main analysis of the average treatment effects and heterogeneous effects on sub-groups in our sample.

[9] The pre-analysis plan was registered with the American Economic Association's registry for randomized controlled trials: AEARCTR-0000768.

[10] The round fixed effects are included because, initially, owing to a technical problem, we allocated too many respondents to the treatment group. To address this problem and ensure that we reached the planned targets for the different groups, we divided the data collection into five rounds. In the first round, 90% of respondents were allocated to the gas information video, whereas in rounds 2–5, the corresponding share was between 69% and 72%.

[11] Although we did not pre-specify the age dimension in our pre-analysis plan, we included it because we found some interesting patterns that fit well with the findings of related literature.

4.1 Descriptive statistics

Here, we provide an overview of how the respondents answered the main questions of interest.

First, as shown in Figure 2, we observe that the majority of respondents found that the information video provided some new information (85% of respondents answered that some, almost all or all information was new to them). Further, we observe that this share is slightly larger in the gas regions than in the non-gas region (87% versus 81%, respectively, $p = 0.000$), which is in line with expectations, given that the level of education is higher in the non-gas region than in the gas regions.

[Figure 2 about here.]

Further, to shed light on how the gas information affected respondents in the treatment group, we asked them whether the estimated total gas revenues presented in the video were larger than expected. For the overall sample, we find that 65% of the sample did so, which provides evidence that, on average, the information caused the treated respondents to update the natural resource rent upwards. As shown in Figure 3, the pattern applies across all pre-specified sub-samples (with the majority in each sub-group answering "Yes" to this question). In particular, we note that the less educated are much more likely to find the estimated total revenues larger than expected.

[Figure 3 about here.]

Figure 4 shows the distribution of expected future corruption in the sample. We note that there is large variation in the respondents' beliefs. The majority (60%) expect corruption to increase or increase a lot in the years to come, but a significant share of the respondents (30%) expect a decrease in corruption. The patterns are not significantly different for the gas regions and non-gas region.

[Figure 4 about here.]

In Figure 5, we present an overview of the responses on both the survey measure and the behavioral measure of the corruption norm. In terms of the survey measure, we observe a strong norm against engaging in corruption, with about 60% of respondents strongly agreeing with this norm in both the gas and non-gas regions. In contrast, we observe that a significant share of the respondents are willing to engage in a corrupt activity in the behavioral experiment.[12] In the overall sample, on average, the respondents report four tails, which is significantly larger than the benchmark of three tails that would be the expected outcome from honest reporting.[13] We observe that dishonest reporting is more prevalent in the non-gas region than in the gas regions (4.6 tails versus 3.7 tails, $p = 0.000$) and, in particular, we note that among males in the non-gas region,

[12] We also asked them the non-incentivized question of how likely they believed it was that others would engage in corrupt behavior. The responses to this question are in line with what we observe in the coin flipping task.

[13] Compared to the average in the meta analysis conducted by Abeler et al. (2017), our sample is more dishonest (our sample was willing to forgo 67% of the potential monetary pay-off to avoid lying, whereas the corresponding percentage in the meta-analysis was 75%). However, compared with other studies from Tanzania (Abeler et al. 2017; Di Falco et al. 2016), we find relatively less dishonest behavior.

the average number of reported tails is very high, at 4.8.[14]

[Figure 5 about here.]

4.2 Treatment analysis

In this part of the paper, we analyze how providing information about gas revenues causally affected the respondents' expectations about future corruption and the corruption norm.

Table 2 reports ordinary least squares regressions for which the dependent variable is expectations about future corruption. In line with our pre-specified hypothesis, as shown in column (1), we find a significant positive causal effect of providing information about gas revenue on expected future corruption, equal to about 0.07 standard deviations (two-sided test, $p = 0.080$). In addition, in column (2), we observe that this effect is robust to the inclusion of control variables. In columns (3) and (4), we report the corresponding analysis separately for the non-gas regions and the gas region. In both regressions, we observe the same positive effect (even though the point estimates are now less precise, owing to a smaller number of observations). In terms of control variables, we observe systematically that males expect more corruption in the future than do females.

[Table 2 about here].

When evaluating the size of the estimated causal effect on beliefs about future corruption, it is important to keep in mind that the experimental manipulation is subtle in order to cleanly identify the relationship between beliefs about the resource rent and beliefs about corruption. In the informational video shown to the treatment group, we only added information about the estimated total gas revenues. Our first main finding is that this information caused the respondents to expect more corruption in the future.

Result 1: We find a significant causal effect of providing information about the estimated size of the natural resource rent on beliefs about corruption in the future.

In Table 3, we report regressions for the estimated effect of providing information about gas revenues on the corruption norm, as measured by the survey question and the behavioral experiment. Surprisingly, given the positive effect on expectations about future corruption, we do not find any effect on the corruption norm. As shown in columns (1) and (4), we estimate a relatively precise null effect for the whole sample on both the survey measure and the behavioral measure. This also occurs when we run the regressions separately for the non-gas region and the gas regions (columns (2)–(3) and (5)–(6), respectively).[15]

[14] Consistent with Abeler et al. (2017), we also find that, overall, men are more dishonest than women (4.3 tails versus 3.6 tails, $p = 0.000$) and younger respondents are more dishonest than older respondents (4.4 tails versus 3.6 tails, $p = 0.000$).

[15] We also observe the same finding if we consider the alternative survey measure on the corruption norm, see Table A.11.

[Table 3 about here.]

Result 2: We do not find a causal effect of providing information about the estimated size of the natural resource rent on people's willingness to endorse or engage in corrupt activities.

The null effect on the corruption norm may reflect that the acceptance of and willingness to engage in corrupt activities is related more to the present level of corruption in society than to expectations about future corruption.

To shed further light on the underlying mechanism driving the causal effect of providing information about total revenues on expected corruption, in Table 4 we investigate whether providing information about gas revenues affected the perceived novelty of the informational video. Surprisingly, as shown in columns (1) and (2), although we do not find a treatment effect on novelty for the whole sample, this null effect hides two opposing patterns in the non-gas region and in the gas regions, as shown in columns (3) and (4). In the non-gas region, we find the expected strong positive effect of providing information on perceived novelty, whereas we find a significant negative effect in the gas regions. A possible interpretation of the negative effect in the gas regions is that the local population in this area is quite well informed about the possible revenues from the gas fields, given their location closer to the fields and the prominence of this issue in the local debates. As a result, the informational video may have appeared less novel when this sequence was added to the video. In contrast, the potential for revenues from gas-field production has figured less prominently in the non-gas region and, thus, the sequence with information about expected total revenues may appear more novel to this population.

[Table 4 about here.]

We find very different patterns in terms of how the respondents view the novelty of information in the non-gas regions and the gas region, but the same effect on expectations about corruption. This suggests that providing information on total revenues not only operates through updating the respondents' beliefs about the natural resource rent, but also through making gas production a salient issue before they answer the questions on corruption in the survey.

4.3 Heterogeneity analysis

Here, we investigate whether different sub-groups of the population are affected differently by the gas information, with a focus on the effect on expectations of corruption.[16]

[Table 5 about here]

In Table 5, we report the heterogeneity analysis for the non-gas region and the gas regions separately. We observe that for almost all sub-groups, the estimated causal effect is positive, which may be seen as evidence of information about total revenues systematically causing the respondents to expect more corruption in the future. We should also

[16]In Table A.6 and Table A.7, we show the corresponding heterogeneity analysis for the effect on the corruption norm. Table A.12 shows the heterogeneity analysis for an alternative measure of the corruption norm.

note that the point estimates are not precisely measured and, for many of the groups, they are not statistically significant. However, we find a strong and highly significant effect among the older respondents in the non-gas region: the information about the total revenues causes an increase in their expectations of future corruption by about 0.3 standard deviations ($p = 0.002$). Older respondents are more likely to have experienced the mining boom and the associated increase in corruption in the 1990s in Tanzania (Lange 2011). This personal experience may have influenced how older respondents updated their beliefs about future corruption, in line with the learning mechanism observed in the context of expectations about future inflation in Malmendier and Nagel (2016). We consider the finding for the older respondents to be explorative because we did not prespecify this hypothesis, and we note that it is less strong among the older respondents in the gas regions. Nevertheless, we find it important and worthy of further investigation because it may shed light on the persistence of corruption in many developing countries.

Result 3: We find that providing information about the estimated size of the natural resource rent increases people's expectations about future corruption in most sub-groups, particularly among the older respondents in the non-gas region.

In Table 6, we report results for the heterogeneity analysis of how gas information affected the perceived novelty of information. Interestingly, we observe systematic, but opposite, patterns in the non-gas region and the gas regions. In almost all sub-groups in the non-gas region, the information has a strong positive causal effect on perceived novelty, whereas in almost all sub-groups in the gas regions, it has a strong negative effect (although not always statistically significant). Thus, these patterns strongly suggest that the information manipulation worked differently in the non-gas regions and the gas regions; in the gas regions, the effect on beliefs about future corruption primarily seems to have been driven by the natural resource issue being made salient for the respondents.

In light of Result 3, we note that the information has a strong positive effect on perceived novelty equal to about 0.3 standard deviations for the older respondents in the non-gas region, which is in line with the effect on future corruption for this group. Nevertheless, the effect on perceived novelty is not significantly stronger than for most of the other sub-groups in the non-gas region, which suggests that the particularly strong effect on beliefs about future corruption for this group operated through the mechanism of their beliefs being updated differently to those of other groups; in particular, this arises because the older respondents are more likely to have experienced the mining boom and the corresponding increase in corruption.

[Table 6 about here.]

5 Conclusions

It is highly important to gain a better understanding of the underlying mechanisms of the resource curse, which exists in many developing countries. In this paper, we report from a large-scale field experiment in Tanzania that offers causal evidence on how information about a natural resource rent shapes people's beliefs about future corruption. We introduce a clean experimental design that controls for a host of potential confounds

by minimally manipulating an informational video also shown to the control group. We find a significant effect of our information manipulation on the respondents' beliefs about future corruption, particularly among the older respondents. We believe that this result points to a mechanism that may play an important role in generating the resource curse: the presence of a natural resource rent makes people expect more corruption and the increased expectations about corruption may become self-fulfilling by making people more willing to engage in corrupt activity. However, in our study, we only find limited evidence for this mechanism because our treatment manipulation does not change people's willingness to engage in corrupt behavior.

We believe that several interesting research avenues arise from the present study. First, more research is needed to understand the mechanisms driving corrupt behavior, and particularly how it relates to people's beliefs about corruption in society. We do not find evidence that beliefs about future corruption shape people's normative views on corruption or their behavior, which is suggestive of corrupt behavior instead being driven by people's beliefs about the existing level of corruption in a society. Second, the strong effect of the information manipulation on older respondents is intriguing. We interpret this finding in the light of the learning framework of Malmendier and Nagel (2016), who show that belief updating is shaped by personal experiences. In our study, this may suggest that the effect on the older respondents is driven by their knowledge about the extensive corruption in the mining sector in Tanzania. This hypothesis was not pre-specified and, thus, more research is needed to understand how personal experiences of this kind shape people's beliefs about corruption. More generally, we believe that the learning framework represents a fruitful approach for development research because it introduces an interesting view on how historical experiences may shape the development process. Finally, we believe that our experimental design offers a new approach to the study of the resource curse that can be used in a variety of settings. In particular, we believe that it would be of great interest to study how politicians respond to information about a natural resource rent, in terms of both their beliefs about future corruption and their willingness to engage in corrupt behavior.

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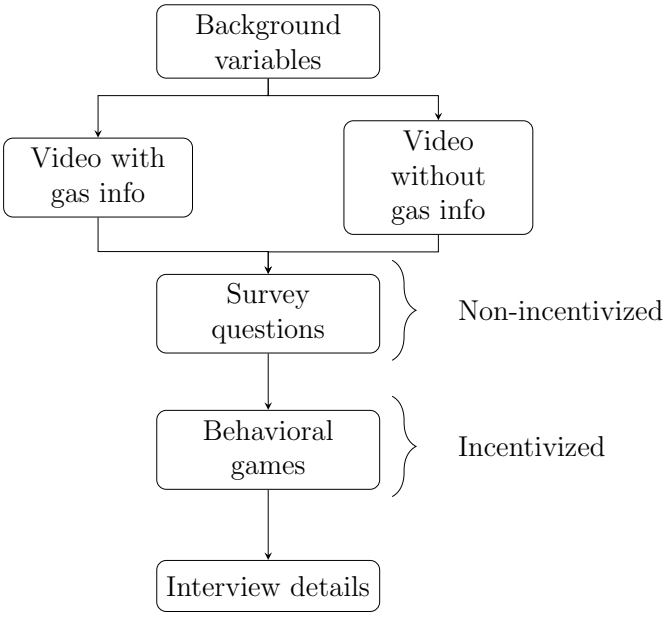
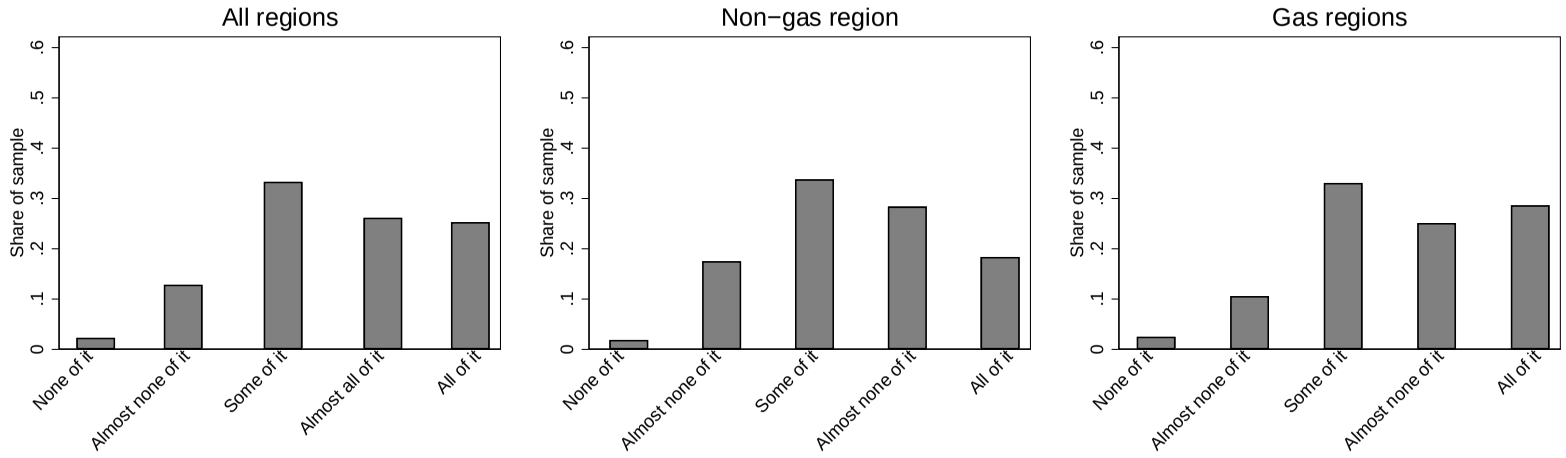
Figures and tables

Figure 1: Research design



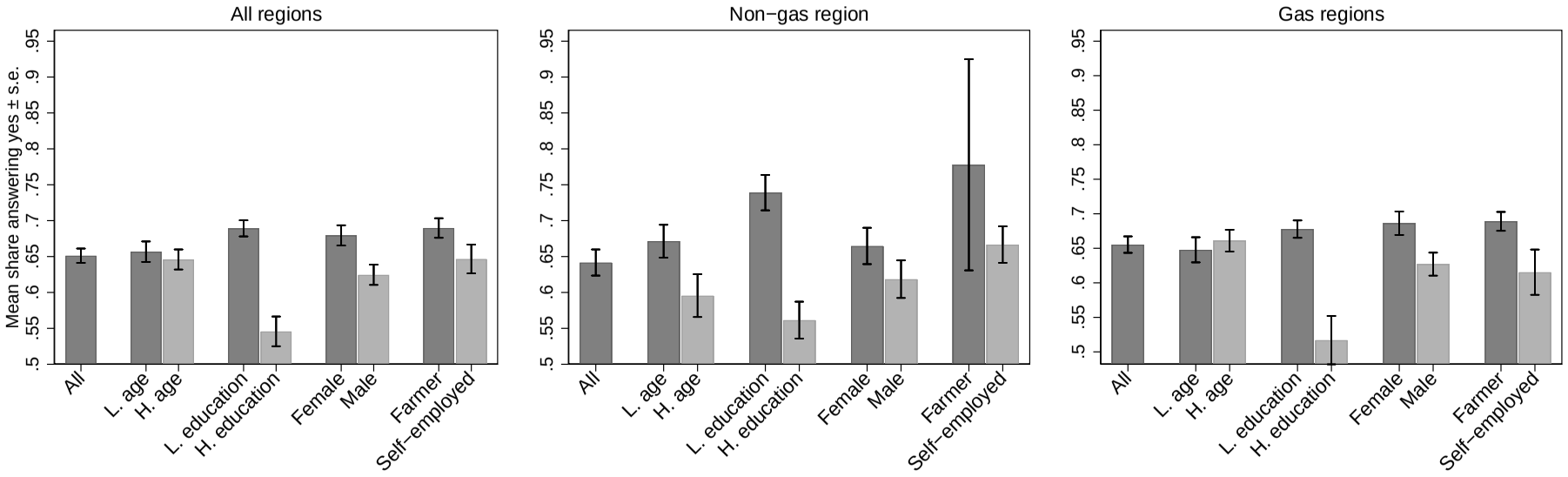
Note: The figure illustrates the sequence of the survey.

Figure 2: Perceived novelty of information, by total, non-gas and gas regions



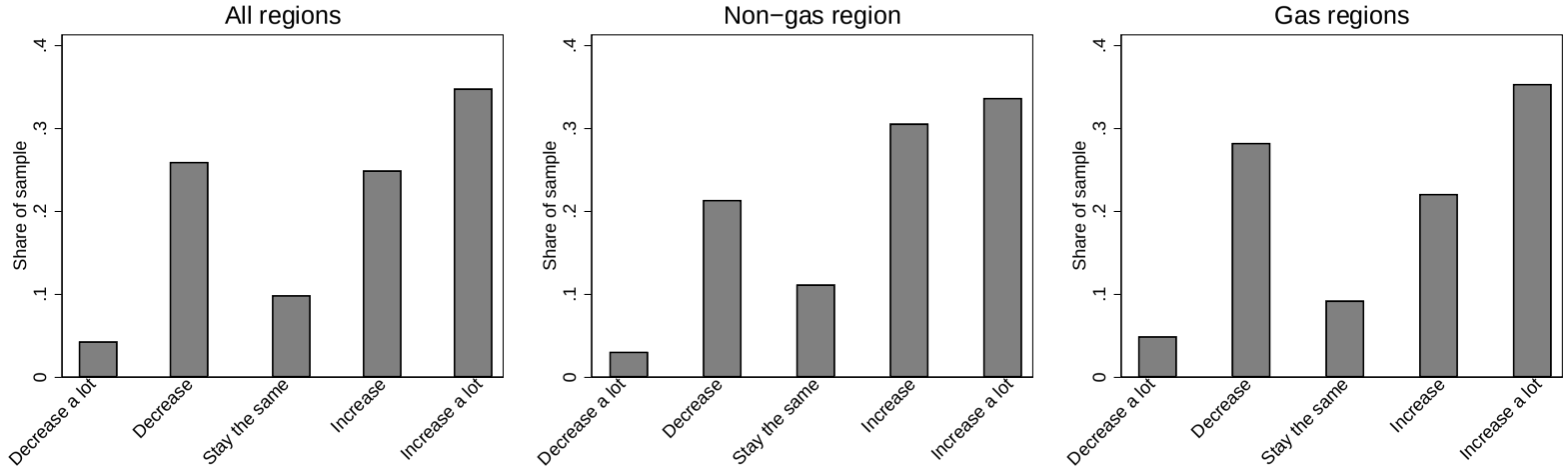
Note: The figure illustrates the distribution of responses to the question "How much of this information was new to you?" for all regions (left panel), the non-gas region (middle panel) and the gas regions (right panel).

Figure 3: Did you find the estimated total gas revenues to be larger than expected?



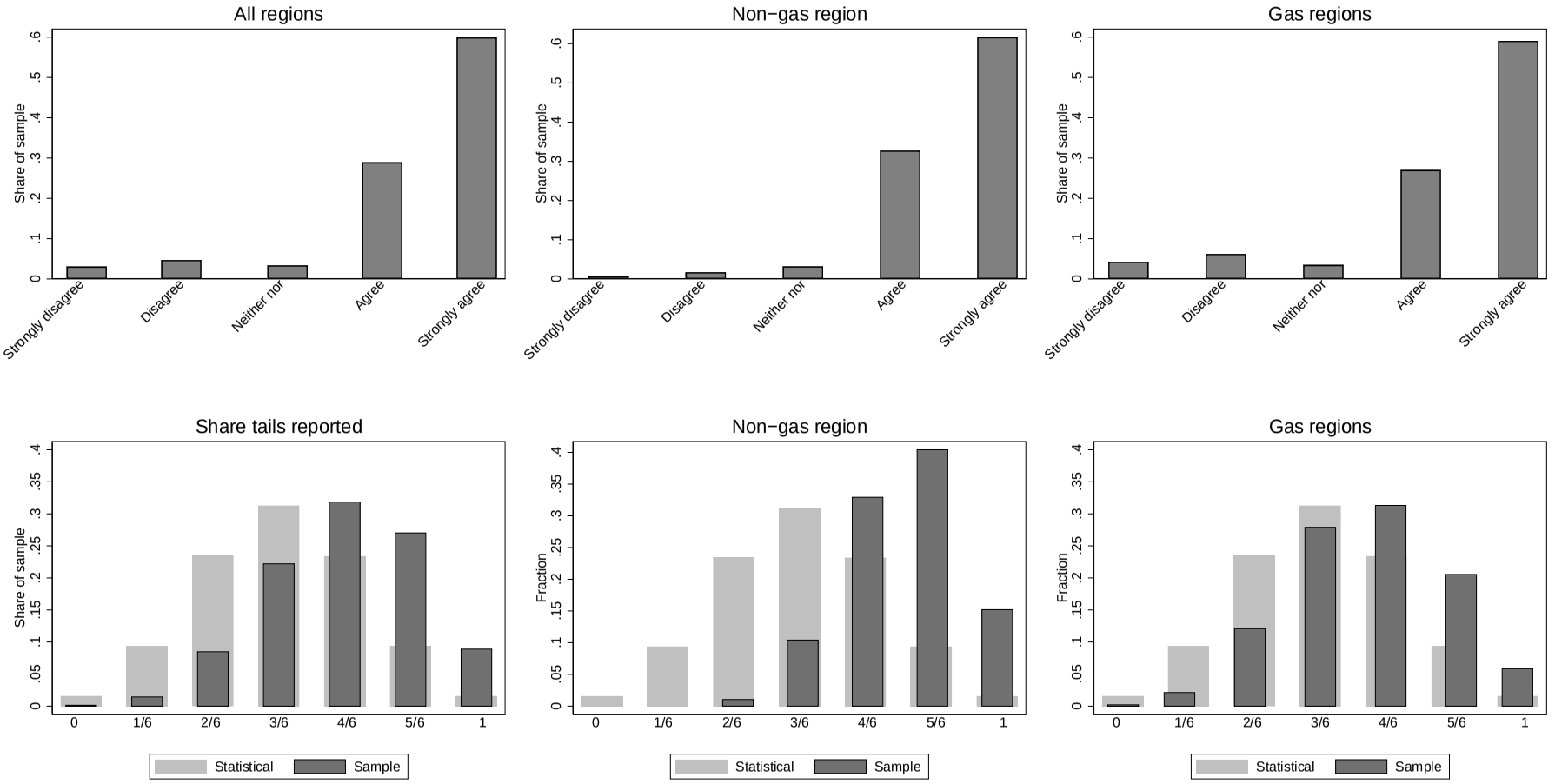
Note: The figure illustrates the share of respondents answering "yes" to the question "Did you find the estimated total gas revenue larger than you had expected?" for all sub-groups, for younger vs. older respondents, for less vs. more educated respondents, for females vs. male respondents and for farmers vs. self-employed respondents. The left panel shows results for the total sample, the middle panel shows results for the non-gas region and the right panel shows results for the gas regions.

Figure 4: Distribution of expectations about future corruption by total, non-gas and gas regions



Note: The figure illustrates the distribution of responses to the question "In the years to come, I expect the extent of corrupt activities to: decrease a lot - decrease - stay the same - increase - increase a lot" for the total sample (left panel), the non-gas region (middle panel) and the gas regions (right panel).

Figure 5: Distribution of corruption norm, by total, non-gas and gas regions



Note: **Upper panel:** The figure illustrates the distribution of responses to the question "People should never engage in corrupt activities" for the total sample (left panel), for the non-gas region (middle panel) and the gas regions (right panel). **Lower panel:** The figure illustrates the distribution of the share of tails reported in the coin flipping task (dark grey) and the statistically expected distribution for the share of tails flipped in the task (light grey) for the total sample (left panel), for the non-gas region (middle panel) and the gas regions (right panel).

Table 1: Background characteristics by region for sample and census data

	Total		Non-gas region		Gas regions	
	Sample	Census	Sample	Census	Sample	Census
Median age	34		32		36	
Higher education	0.26	0.19	0.53	0.34	0.13	0.10
	(0.01)		(0.02)		(0.01)	
Male	0.52	0.49	0.49	0.48	0.53	53
	(0.01)		(0.02)		(0.01)	
Self-employed	0.27	0.19	0.49	0.48	0.16	0.09
	(0.01)		(0.02)		(0.01)	
Farmer	0.46	0.62	0.01	0.04	0.69	0.88
	(0.01)		(0.00)		(0.01)	
Married	0.64	0.51	0.53	0.44	0.69	0.53
	(0.01)		(0.02)		(0.01)	
Observations	3004		1001		2003	

Mean coefficients; standard error of the mean in parentheses

Sample definitions: "Median age" is the median age in the sample, "Higher education" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Male" is an indicator variable taking a value of one if the respondent is a male,, "Self-employed" is an indicator variable taking a value of one for respondents who are employed are self-employed in the non-agricultural sector, "Farmer" is an indicator variable taking a value of one for respondents whose primary occupation is farmer, "Married" is an indicator variable taking a value of one if the respondent is married and zero otherwise. *Census definitions:* "Male" is the share of males in all age groups, "Lower sec or more" is the share of the population above five years of age who have completed lower secondary school or more, "Self-employed" is the share of individuals who are 10 years or older and self-employed in the non-agricultural sector, "Farmer" is the share of individuals 10 years or older occupied in agriculture, "Married" is the share of individuals 15 years or older who are married. The median age in Tanzania is 17.7 years.

Table 2: Effect on expected future corruption of providing information

	(1) All	(2) All	(3) Non-gas region	(4) Gas regions
Gas info	0.077*	0.070*	0.086	0.057
	(0.044)	(0.041)	(0.059)	(0.056)
Above median age		–0.024	0.020	–0.039
		(0.037)	(0.065)	(0.045)
Higher education		–0.021	–0.013	–0.016
		(0.046)	(0.061)	(0.071)
Male		0.113***	0.111**	0.110***
		(0.033)	(0.056)	(0.043)
Self-employed		0.128*	0.094	0.176
		(0.067)	(0.078)	(0.133)
Farmer		0.013	–0.090	0.036
		(0.077)	(0.247)	(0.129)
Married		–0.079**	–0.076	–0.082*
		(0.038)	(0.068)	(0.048)
Gas regions		–0.016		
		(0.075)		
Enumerator FE	No	Yes	Yes	Yes
Observations	2998	2984	995	1989
R^2	0.010	0.180	0.201	0.175

Robust standard errors are shown in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: "In the years to come, I expect the extent of corrupt activities to: decrease a lot - decrease - stay the same - increase - increase a lot", standardization of five-point scale. *Treatment variable & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34 years, "Higher education" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (where the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators. See Table A.3 in Appendix A for separate regressions for the Mtwara and Lindi regions. Six respondents refused to answer the question about expected future corruption and, therefore, the number of observations in column (1) in the table is 2998.

Table 3: Effect on corruption norm of providing information

	Survey			Behavior		
	(1) All	(2) Non-gas region	(3) Gas regions	(4) All	(5) Non-gas region	(6) Gas regions
Gas info	–0.019	0.016	–0.043	–0.033	–0.049	–0.016
	(0.037)	(0.045)	(0.053)	(0.048)	(0.070)	(0.063)
Above median age	0.051	0.109**	0.032	–0.588***	–0.431***	–0.670***
	(0.034)	(0.052)	(0.043)	(0.045)	(0.076)	(0.055)
Lower sec or more	0.061	0.053	0.057	0.011	0.028	–0.002
	(0.041)	(0.048)	(0.070)	(0.056)	(0.069)	(0.089)
Male	–0.022	–0.024	–0.024	0.480***	0.476***	0.497***
	(0.031)	(0.042)	(0.042)	(0.043)	(0.072)	(0.055)
Self-employed	–0.085	–0.069	–0.038	0.081	0.079	0.126
	(0.053)	(0.054)	(0.118)	(0.082)	(0.095)	(0.147)
Farmer	–0.189***	–0.492	–0.137	0.005	0.150	0.033
	(0.065)	(0.301)	(0.115)	(0.095)	(0.231)	(0.142)
Married	0.091**	0.005	0.112**	0.020	0.063	–0.040
	(0.036)	(0.049)	(0.049)	(0.047)	(0.079)	(0.060)
Gas regions	0.122**			–0.140*		
	(0.061)			(0.082)		
Enumerator FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2984	994	1990	1469	479	990
R^2	0.287	0.231	0.321	0.371	0.296	0.305

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variables: Survey = "People should never engage in corrupt activities: strongly disagree - agree - neither nor - agree - strongly agree", standardization of five-point scale and behavior = share of tails reported in the coin flipping game (0, 1/6, 2/6, 3/6, 4/6, 5/6, or 1), standardized values. *Treatment variable & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Higher education" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators. See Table A.4 in Appendix A for separate regressions for the Mtwara and Lindi regions.

Table 4: Effect of providing gas information on perceived novelty of information

	(1) All	(2) All	(3) Non-gas region	(4) Gas regions
Gas info	0.049	0.028	0.224***	–0.113*
	(0.046)	(0.042)	(0.056)	(0.058)
Above median age		–0.069*	–0.165***	–0.030
		(0.037)	(0.061)	(0.045)
Higher education		–0.437***	–0.465***	–0.430***
		(0.043)	(0.055)	(0.069)
Male		–0.094***	–0.040	–0.119***
		(0.034)	(0.051)	(0.042)
Self-employed		0.226***	0.231***	0.236**
		(0.063)	(0.072)	(0.119)
Farmer		0.276***	0.235	0.318***
		(0.075)	(0.217)	(0.120)
Married		–0.027	–0.028	–0.031
		(0.038)	(0.057)	(0.049)
Gas regions		0.096		
		(0.068)		
Enumerator FE	No	Yes	Yes	Yes
Observations	3000	2986	995	1991
R^2	0.014	0.189	0.359	0.142

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: "How much of this information was new to you? None of it - almost none of it - some of it - almost all of it - all of it", standardized five-point scale. *Treatment variable & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Higher education" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators. For separate regressions for the Mtwara and Lindi regions, see Table A.5 in Appendix A.

Table 5: Heterogeneity in effect of gas information on expected future corruption, for non-gas and gas regions

	Non-gas region					Gas regions				
	(1) H. age	(2) H. educ	(3) Male	(4) Self-empl	(5) Farmer	(6) H. age	(7) H. educ	(8) Male	(9) Self-empl	(10) Farmer
Gas info	–0.031	0.159*	0.119	0.109	0.087	0.030	0.041	–0.029	0.057	0.182**
	(0.074)	(0.094)	(0.086)	(0.079)	(0.059)	(0.079)	(0.061)	(0.077)	(0.064)	(0.086)
var	–0.214**	0.080	0.158	0.126	–0.059	–0.081	–0.096	–0.023	0.178	0.207
	(0.109)	(0.105)	(0.100)	(0.115)	(0.358)	(0.098)	(0.137)	(0.096)	(0.134)	(0.162)
Gas info x var	0.325***	–0.133	–0.067	–0.045	–0.044	0.052	0.103	0.164	0.001	–0.211*
	(0.121)	(0.121)	(0.118)	(0.118)	(0.464)	(0.108)	(0.151)	(0.107)	(0.128)	(0.112)
Gas info (var)	0.294***	0.026	0.052	0.063	0.043	0.081	0.144	0.135*	0.058	–0.028
	(0.096)	(0.075)	(0.080)	(0.088)	(0.461)	(0.077)	(0.140)	(0.078)	(0.113)	(0.073)
Enumerator FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Background variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	995	995	995	995	995	1989	1989	1989	1989	1989
R^2	0.206	0.202	0.201	0.201	0.201	0.175	0.176	0.176	0.175	0.177

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: "In the years to come, I expect the extent of corrupt activities to: decrease a lot - decrease - stay the same - increase - increase a lot", standardization of five-point scale. *Treatment variable, interaction & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Gas info x var" is an interaction between "Gas info" and "Above median age" (H. age), "Lower sec or more" (H. educ), "Male", "Self-employed" (Self-empl) and "Farmer" respectively, "Gas info (var)" is the sum of estimated parameters for "Gas info" and the four respective indicator variables, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Lower sec or more" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Table 6: Heterogeneity in the effect of gas information on novelty, for non-gas and gas regions

	Non-gas region					Gas regions				
	(1) H. age	(2) H. educ	(3) Male	(4) Self-empl	(5) Farmer	(6) H. age	(7) H. educ	(8) Male	(9) Self-empl	(10) Farmer
Gas info	0.162**	0.128	0.333***	0.194**	0.211***	–0.112	–0.170***	–0.169**	–0.046	–0.157*
	(0.068)	(0.084)	(0.079)	(0.082)	(0.057)	(0.082)	(0.064)	(0.085)	(0.068)	(0.084)
var	–0.288**	–0.587***	0.116	0.189*	–0.448	–0.030	–0.704***	–0.205*	0.460***	0.258*
	(0.113)	(0.100)	(0.100)	(0.113)	(0.397)	(0.106)	(0.134)	(0.105)	(0.151)	(0.154)
Gas info x var	0.171	0.175	–0.224**	0.060	0.984**	–0.001	0.356**	0.107	–0.312**	0.074
	(0.120)	(0.113)	(0.113)	(0.114)	(0.422)	(0.115)	(0.144)	(0.114)	(0.124)	(0.115)
Gas info (var)	0.333***	0.303***	0.109	0.254***	1.195***	–0.113	0.186	–0.062	–0.358***	–0.083
	(0.099)	(0.075)	(0.080)	(0.078)	(0.417)	(0.082)	(0.130)	(0.079)	(0.103)	(0.079)
Enumerator FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Background variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	995	995	995	995	995	1991	1991	1991	1991	1991
R^2	0.361	0.361	0.362	0.359	0.362	0.142	0.145	0.143	0.145	0.143

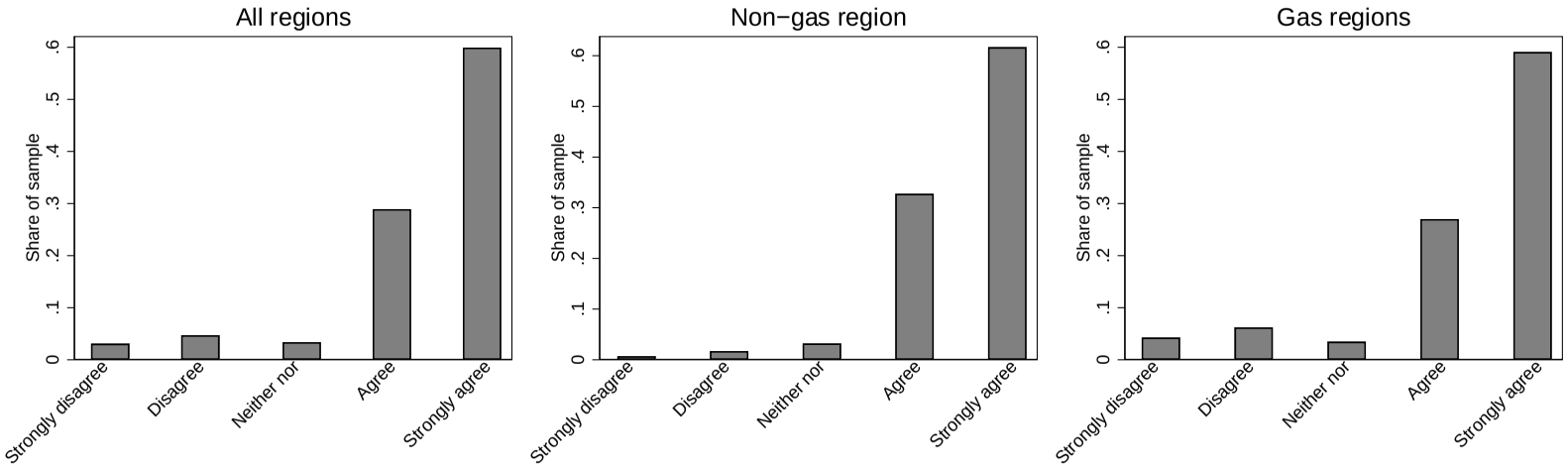
Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: "How much of this information was new to you? None of it - almost none of it - some of it - almost all of it - all of it", standardized five-point scale. *Treatment variable, interaction & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Gas info x var" is an interaction between "Gas info" and "Above median age" (H. age), "Lower sec or more" (H. educ), "Male", "Self-employed" (Self-empl) and "Farmer", respectively, "Gas info (var)" is the sum of estimated parameters for "Gas info" and the four respective indicator variables, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Higher education" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Appendix A Additional figures and tables

Figure A.1: Selected regions

Figure A.2: Perceived corruption of others, by total, non-gas region and gas regions



Note: The figure illustrates the distribution of responses to the question "I believe that my fellow citizens would engage in corrupt activities if they could benefit from it: strongly disagree - agree - neither nor - agree - strongly agree", for the total sample (left panel), the non-gas region (middle panel) and the gas regions (right panel).

Table A.1: Balance regressions

	(1) All	(2) Non-gas region	(3) Gas regions
Above median age	0.004	0.023	–0.005
	(0.016)	(0.034)	(0.018)
Higher education	–0.003	–0.011	0.006
	(0.022)	(0.033)	(0.030)
Male	0.003	0.021	–0.002
	(0.015)	(0.030)	(0.017)
Self-employed	–0.014	0.002	–0.049
	(0.034)	(0.042)	(0.057)
Farmer	0.033	–0.019	0.013
	(0.037)	(0.133)	(0.054)
Married	0.025	0.048	0.013
	(0.017)	(0.034)	(0.020)
Rural region	–0.025		
	(0.039)		
Enumerator FE	Yes	Yes	Yes
Observations	2990	996	1994
R^2	0.054	0.007	0.064

Robust standard errors are in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Regressions performed with "Gas info", an indicator variable taking a value of one for individuals who were exposed to the gas information version of the video, as the dependent variable. *Background variables:* "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Higher education" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator variable taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Table A.2: Observations by treatment

Treatment	Frequency	Per cent
No gas information	687	22.87
Yearly returns/per capita	714	23.77
Yearly return/population	671	22.34
Total value/per capita	519	17.28
Total value/population	413	13.75
Total	3004	100

Notes: The table illustrates the number of observations by treatment. The total/per capita and total value/population treatments have fewer observations because of challenges in undertaking the randomization using the app.

Table A.3: Effect on expected corruption of providing information with separate regressions for Mtwara and Lindi

	(1) All	(2) All	(3) Non-gas region	(4) Gas regions	(5) Mtwara	(6) Lindi
Gas info	0.077*	0.070*	0.086	0.057	–0.012	0.098
	(0.044)	(0.041)	(0.059)	(0.056)	(0.086)	(0.074)
Above median age		–0.024	0.020	–0.039	–0.061	–0.031
		(0.037)	(0.065)	(0.045)	(0.064)	(0.064)
Higher education		–0.021	–0.013	–0.016	0.015	–0.035
		(0.046)	(0.061)	(0.071)	(0.108)	(0.097)
Male		0.113***	0.111**	0.110***	0.052	0.165***
		(0.033)	(0.056)	(0.043)	(0.061)	(0.061)
Self-employed		0.128*	0.094	0.176	0.131	0.213
		(0.067)	(0.078)	(0.133)	(0.189)	(0.184)
Farmer		0.013	–0.090	0.036	0.012	0.062
		(0.077)	(0.247)	(0.129)	(0.188)	(0.178)
Married		–0.079**	–0.076	–0.082*	–0.045	–0.087
		(0.038)	(0.068)	(0.048)	(0.071)	(0.067)
Rural region		–0.016				
		(0.075)				
Enumerator FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2998	2984	995	1989	995	994
R^2	0.010	0.180	0.201	0.175	0.184	0.180

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: "In the years to come, I expect the extent of corrupt activities to: decrease a lot - decrease - stay the same - increase - increase a lot", standardization of five-point scale. *Treatment variable, interaction & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Gas info x var" is an interaction between "Gas info" and "Above median age" (H. age), "Lower sec or more" (H. educ), "Male", "Self-employed" (Self-empl) and "Farmer", respectively, "Gas info (var)" is the sum of estimated parameters for "Gas info" and the four respective indicator variables, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Lower sec or more" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Table A.4: Effect on corruption norm of providing information with separate regressions for Mtwara and Lindi

	Survey					**Behavior**				
	(1) All	(2) Non-gas region	(3) Gas regions	(4) Mtwara	(5) Lindi	(6) All	(7) Non-gas region	(8) Gas regions	(9) Mtwara	(10) Lindi
Gas info	–0.019	0.016	–0.043	–0.074	–0.022	–0.033	–0.049	–0.016	–0.136	0.052
	(0.037)	(0.045)	(0.053)	(0.091)	(0.062)	(0.048)	(0.070)	(0.063)	(0.099)	(0.083)
Above median age	0.051	0.109**	0.032	0.029	0.030	–0.588***	–0.431***	–0.670***	–0.626***	–0.715***
	(0.034)	(0.052)	(0.043)	(0.064)	(0.058)	(0.045)	(0.076)	(0.055)	(0.080)	(0.078)
Lower sec or more	0.061	0.053	0.057	0.135	–0.038	0.011	0.028	–0.002	0.070	–0.033
	(0.041)	(0.048)	(0.070)	(0.102)	(0.093)	(0.056)	(0.069)	(0.089)	(0.129)	(0.121)
Male	–0.022	–0.024	–0.024	–0.052	0.019	0.480***	0.476***	0.497***	0.513***	0.470***
	(0.031)	(0.042)	(0.042)	(0.062)	(0.056)	(0.043)	(0.072)	(0.055)	(0.078)	(0.078)
Self-employed	–0.085	–0.069	–0.038	–0.127	0.054	0.081	0.079	0.126	0.355*	–0.014
	(0.053)	(0.054)	(0.118)	(0.185)	(0.148)	(0.082)	(0.095)	(0.147)	(0.184)	(0.197)
Farmer	–0.189***	–0.492	–0.137	–0.117	–0.127	0.005	0.150	0.033	0.209	–0.216
	(0.065)	(0.301)	(0.115)	(0.181)	(0.147)	(0.095)	(0.231)	(0.142)	(0.186)	(0.191)
Married	0.091**	0.005	0.112**	0.126	0.114*	0.020	0.063	–0.040	–0.061	–0.024
	(0.036)	(0.049)	(0.049)	(0.079)	(0.061)	(0.047)	(0.079)	(0.060)	(0.092)	(0.083)
Rural region	0.122**					–0.140*				
	(0.061)					(0.082)				
Observations	2984	994	1990	996	994	1469	479	990	503	487
R^2	0.287	0.231	0.321	0.324	0.332	0.371	0.296	0.305	0.313	0.341

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variables: Survey = "People should never engage in corrupt activities: strongly disagree - agree - neither nor - agree - strongly agree", standardization of five-point scale, and behavior = share of tails reported in the coin flipping game (0, 1/6, 2/6, 3/6, 4/6, 5/6, or 1), standardized values. *Treatment variable & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Higher education" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Table A.5: Effect of providing information on perceived novelty of information, with separate regressions for Mtwara and Lindi

	(1) All	(2) All	(3) Non-gas region	(4) Gas regions	(5) Mtwara	(6) Lindi
Gas info	0.049	0.028	0.224***	–0.113*	–0.119	–0.091
	(0.046)	(0.042)	(0.056)	(0.058)	(0.092)	(0.075)
Above median age		–0.069*	–0.165***	–0.030	–0.018	–0.036
		(0.037)	(0.061)	(0.045)	(0.065)	(0.062)
Higher education		–0.437***	–0.465***	–0.430***	–0.313***	–0.527***
		(0.043)	(0.055)	(0.069)	(0.113)	(0.088)
Male		–0.094***	–0.040	–0.119***	–0.143**	–0.092
		(0.034)	(0.051)	(0.042)	(0.063)	(0.058)
Self-employed		0.226***	0.231***	0.236**	0.261	0.246
		(0.063)	(0.072)	(0.119)	(0.174)	(0.171)
Farmer		0.276***	0.235	0.318***	0.355**	0.307*
		(0.075)	(0.217)	(0.120)	(0.176)	(0.172)
Married		–0.027	–0.028	–0.031	–0.044	–0.031
		(0.038)	(0.057)	(0.049)	(0.075)	(0.066)
Gas regions		0.096				
		(0.068)				
Enumerator FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3000	2986	995	1991	995	996
R^2	0.014	0.189	0.359	0.142	0.132	0.171

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: "How much of this information was new to you? None of it - almost none of it - some of it - almost all of it - all of it", standardized five-point scale. *Treatment variable, interaction & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Gas info x var" is an interaction between "Gas info" and "Above median age" (H. age), "Lower sec or more" (H. educ), "Male", "Self-employed" (Self-empl) and "Farmer", respectively, "Gas info (var)" is the sum of estimated parameters for "Gas info" and the four respective indicator variables, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Lower sec or more" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Table A.6: Heterogeneity in effect of gas info on corruption norm, survey measure, for non-gas and gas regions

	Non-gas region					Gas regions				
	(1) Age	(2) H. educ	(3) Male	(4) Self-empl	(5) Farmer	(6) Age	(7) H. educ	(8) Male	(9) Self-empl	(10) Farmer
Gas info	–0.059	0.071	0.060	–0.069	0.008	–0.027	–0.057	–0.026	–0.012	–0.077
	(0.056)	(0.069)	(0.060)	(0.062)	(0.045)	(0.077)	(0.058)	(0.071)	(0.062)	(0.068)
var	–0.044	0.123	0.038	–0.191**	–0.933*	0.057	–0.006	0.002	0.065	–0.183
	(0.095)	(0.080)	(0.077)	(0.087)	(0.481)	(0.091)	(0.070)	(0.090)	(0.140)	(0.143)
Gas info x var	0.211**	–0.100	–0.089	0.173*	0.635	–0.031	0.082	–0.032	–0.144	0.056
	(0.098)	(0.091)	(0.090)	(0.090)	(0.588)	(0.100)	(0.115)	(0.100)	(0.108)	(0.100)
Gas info (var)	0.152*	–0.029	–0.029	0.105	0.644	–0.058	0.026	–0.059	–0.156*	–0.020
	(0.079)	(0.060)	(0.067)	(0.065)	(0.586)	(0.069)	(0.123)	(0.075)	(0.090)	(0.075)
Enumerator FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Background variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	994	994	994	994	994	1990	1990	1990	1990	1990
R^2	0.235	0.232	0.232	0.234	0.233	0.321	0.321	0.321	0.321	0.321

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: "People should never engage in corrupt activities: strongly disagree - agree - neither nor - agree - strongly agree", standardization of five-point scale. *Treatment variable, interaction & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Gas info x var" is an interaction between "Gas info" and "Above median age" (H. age), "Lower sec or more" (H. educ), "Male", "Self-employed" (Self-empl) and "Farmer", respectively, "Gas info (var)" is the sum of estimated parameters for "Gas info" and the four respective indicator variables, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Lower sec or more" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator variable taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Table A.7: Heterogeneity in the effect of gas information on corruption norm, behavioral measure, for non-gas and gas regions

	Non-gas region					Gas regions				
	(1) Age	(2) H. educ	(3) Male	(4) Self-empl	(5) Farmer	(6) Age	(7) H. educ	(8) Male	(9) Self-empl	(10) Farmer
Gas info	–0.055	–0.041	–0.112	–0.008	–0.043	–0.022	0.002	–0.029	–0.037	0.012
	(0.089)	(0.116)	(0.113)	(0.099)	(0.071)	(0.086)	(0.070)	(0.095)	(0.073)	(0.092)
var	–0.441***	0.040	0.394***	0.138	0.357	–0.681***	0.079	0.478***	0.056	0.071
	(0.125)	(0.129)	(0.125)	(0.137)	(0.463)	(0.105)	(0.144)	(0.107)	(0.176)	(0.173)
Gas info x var	0.014	–0.016	0.111	–0.080	–0.306	0.013	–0.105	0.024	0.099	–0.047
	(0.146)	(0.144)	(0.142)	(0.140)	(0.507)	(0.122)	(0.167)	(0.125)	(0.141)	(0.125)
Gas info (var)	–0.041	–0.057	–0.001	–0.087	–0.350	–0.009	–0.103	–0.004	0.062	–0.035
	(0.114)	(0.084)	(0.087)	(0.098)	(0.501)	(0.089)	(0.152)	(0.083)	(0.121)	(0.086)
Enumerator FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Background variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	479	479	479	479	479	990	990	990	990	990
R^2	0.296	0.296	0.297	0.296	0.296	0.305	0.305	0.305	0.305	0.305

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Share of tails reported in the coin flipping game, standardized measure. *Treatment variable, interaction & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Gas info x var" is an interaction between "Gas info" and "Above median age" (H. age), "Lower sec or more" (H. educ), "Male", "Self-employed" (Self-empl) and "Farmer", respectively, "Gas info (var)" is the sum of estimated parameters for "Gas info" and the four respective indicator variables, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Higher education" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Table A.8: Effect on expected corruption of providing information, robustness check

	(1) All	(2) All	(3) Non-gas regions	(4) Gas regions
Yearly returns/per capita	0.097*	0.097*	0.105	0.092
	(0.055)	(0.051)	(0.082)	(0.066)
Yearly return/population	0.026	0.018	0.067	–0.009
	(0.056)	(0.051)	(0.080)	(0.068)
Total value/per capita	0.035	0.034	0.024	0.030
	(0.058)	(0.053)	(0.084)	(0.070)
Total value/population	0.166***	0.142**	0.140*	0.139*
	(0.062)	(0.057)	(0.083)	(0.079)
Above median age		–0.024	0.018	–0.038
		(0.037)	(0.065)	(0.045)
Lower sec or more		–0.024	–0.017	–0.016
		(0.046)	(0.061)	(0.071)
Male		0.114***	0.107*	0.114***
		(0.033)	(0.056)	(0.043)
Self-employed		0.129*	0.096	0.178
		(0.067)	(0.078)	(0.134)
Farmer		0.013	–0.086	0.036
		(0.077)	(0.247)	(0.131)
Married		–0.081**	–0.081	–0.083*
		(0.038)	(0.068)	(0.048)
Rural region		–0.011		
		(0.076)		
p-value, F-test	0.101	0.105	0.630	0.161
Observations	2998	2984	995	1989
R^2	0.012	0.182	0.202	0.177

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: "In the years to come, I expect the extent of corrupt activities to: decrease a lot - decrease - stay the same - increase - increase a lot", standardization of five-point scale. *Treatment variables:* "Annual returns/per capita" is an indicator variable taking a value of one for respondents exposed to the annual returns/per capita formulation, "Annual returns/population" is an indicator variable taking a value of one for respondents exposed to the annual returns/population formulation, "Total value/per capita" is an indicator variable taking a value of one for respondents exposed to the total value/per capita formulation, "Total value/population" is an indicator variable taking a value of one for respondents exposed to the total value/population formulation.*Background variables:* "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Lower sec or more" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas regions" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Table A.9: Effect on corruption norm of providing information, robustness check

	Survey			**Behavior**		
	(1) All	(2) Non-gas region	(3) Gas region	(4) All	(5) Non-gas region	(6) Gas region
Yearly returns/per capita	–0.047	–0.015	–0.075	–0.004	0.025	–0.007
	(0.047)	(0.065)	(0.063)	(0.062)	(0.096)	(0.079)
Yearly return/population	–0.018	0.002	–0.037	–0.086	–0.054	–0.087
	(0.047)	(0.059)	(0.066)	(0.063)	(0.092)	(0.081)
Total value/per capita	–0.003	0.039	–0.025	–0.058	–0.093	–0.033
	(0.050)	(0.066)	(0.068)	(0.066)	(0.104)	(0.086)
Total value/population	0.002	0.050	–0.020	0.027	–0.094	0.109
	(0.049)	(0.059)	(0.070)	(0.067)	(0.091)	(0.092)
Above median age	0.053	0.112**	0.033	–0.589***	–0.435***	–0.670***
	(0.034)	(0.052)	(0.043)	(0.045)	(0.076)	(0.055)
Lower sec or more	0.061	0.053	0.056	0.008	0.022	–0.004
	(0.041)	(0.048)	(0.070)	(0.056)	(0.068)	(0.089)
Male	–0.022	–0.024	–0.024	0.480***	0.476***	0.502***
	(0.031)	(0.042)	(0.042)	(0.043)	(0.072)	(0.055)
Self-employed	–0.087	–0.072	–0.039	0.081	0.081	0.123
	(0.053)	(0.055)	(0.119)	(0.083)	(0.096)	(0.147)
Farmer	–0.191***	–0.500*	–0.139	0.002	0.159	0.025
	(0.065)	(0.303)	(0.116)	(0.095)	(0.225)	(0.142)
Married	0.091**	0.004	0.111**	0.018	0.059	–0.044
	(0.036)	(0.049)	(0.049)	(0.047)	(0.078)	(0.061)
Rural region	0.122**			–0.135*		
	(0.061)			(0.082)		
p-value, F-test	0.777	0.756	0.815	0.359	0.697	0.221
Observations	2984	994	1990	1469	479	990
R^2	0.288	0.232	0.321	0.373	0.298	0.308

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variables: Survey = "People should never engage in corrupt activities: strongly disagree - agree - neither nor - agree - strongly agree", standardization of five-point scale, and behavior = share of tails reported in the coin flipping game (0, 1/6, 2/6, 3/6, 4/6, 5/6, or 1), standardized values. *Treatment variables:* "Annual returns/per capita" is an indicator variable taking a value of one for respondents exposed to the annual returns/per capita formulation, "Annual returns/population" is an indicator variable taking a value of one for respondents exposed to the annual returns/population formulation, "Total value/per capita" is an indicator variable taking a value of one for respondents exposed to the total value/per capita formulation, "Total value/population" is an indicator variable taking a value of one for respondents exposed to the total value/population formulation.*Background variables:* "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Lower sec or more" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas regions" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Table A.10: Effect on perceived novelty of providing information, robustness check

	(1) All	(2) All	(3) Non-gas region	(4) Gas regions
Yearly returns/per capita	0.049	0.050	0.257***	–0.094
	(0.056)	(0.051)	(0.076)	(0.068)
Yearly return/population	0.128**	0.073	0.260***	–0.064
	(0.056)	(0.052)	(0.071)	(0.070)
Total value/per capita	0.011	–0.020	0.181**	–0.163**
	(0.061)	(0.055)	(0.080)	(0.072)
Total value/population	–0.022	–0.013	0.178**	–0.156**
	(0.064)	(0.056)	(0.076)	(0.079)
Above median age		–0.071*	–0.169***	–0.032
		(0.037)	(0.061)	(0.045)
Lower sec or more		–0.435***	–0.465***	–0.426***
		(0.043)	(0.055)	(0.069)
Male		–0.095***	–0.038	–0.121***
		(0.034)	(0.052)	(0.042)
Self-employed		0.231***	0.236***	0.240**
		(0.063)	(0.073)	(0.119)
Farmer		0.283***	0.246	0.326***
		(0.075)	(0.217)	(0.120)
Married		–0.026	–0.026	–0.029
		(0.038)	(0.058)	(0.049)
Rural region		0.095		
		(0.068)		
Enumerator FE	Yes	Yes	Yes	Yes
p-value, F-test	0.068	0.233	0.626	0.390
Observations	3000	2986	995	1991
R^2	0.016	0.190	0.360	0.144

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: How much of this information was new to you? None of it - almost none of it - some of it - almost all of it - all of it", standardized five-point scale. *Treatment variables:* "Annual returns/per capita" is an indicator variable taking a value of one for respondents exposed to the annual returns/per capita formulation, "Annual returns/population" is an indicator variable taking a value of one for respondents exposed to the annual returns/population formulation, "Total value/per capita" is an indicator variable taking a value of one for respondents exposed to the total value/per capita formulation, "Total value/population" is an indicator variable taking a value of one for respondents exposed to the total value/population formulation. *Background variables:* "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Lower sec or more" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas regions" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Table A.11: Effect on corruption beliefs of providing information

	(1) All	(2) Non-gas regions	(3) Gas regions
Gas info	0.008	0.007	0.000
	(0.034)	(0.052)	(0.044)
Above median age	–0.081***	–0.002	–0.113***
	(0.029)	(0.061)	(0.034)
Lower sec or more	0.005	–0.007	–0.011
	(0.039)	(0.056)	(0.057)
Male	–0.035	0.110**	–0.101***
	(0.027)	(0.049)	(0.033)
Self-employed	0.055	0.064	–0.022
	(0.056)	(0.064)	(0.114)
Farmer	0.057	–0.047	0.021
	(0.062)	(0.140)	(0.108)
Married	–0.040	–0.020	–0.040
	(0.031)	(0.059)	(0.038)
Rural region	0.062		
	(0.054)		
Observations	2981	993	1988
R^2	0.477	0.514	0.473

Robust standard errors are in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: "I believe that my fellow citizens would engage in corrupt activities if they could benefit from it: strongly disagree - agree - neither nor - agree - strongly agree", standardization of five-point scale. *Treatment variable & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Higher education" is an indicator taking a value of one if the respondent has completed lower secondary school or a higher level of education, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects(FE):* indicator variables for each of the 10 enumerators.

Table A.12: Heterogeneity in effect of gas information on corruption beliefs, for non-gas and gas regions

	Non-gas region					Gas regions				
	(1) H. age	(2) H. educ	(3) Male	(4) Self-empl	(5) Farmer	(6) H. age	(7) H. educ	(8) Male	(9) Self-empl	(10) Farmer
Gas info	0.036	–0.014	0.095	–0.000	0.001	0.015	–0.011	–0.125**	–0.031	0.133**
	(0.067)	(0.078)	(0.069)	(0.073)	(0.052)	(0.064)	(0.048)	(0.062)	(0.051)	(0.063)
var	0.056	–0.035	0.236***	0.054	–0.378*	–0.091	–0.063	–0.294***	–0.128	0.202
	(0.101)	(0.094)	(0.089)	(0.096)	(0.198)	(0.076)	(0.103)	(0.075)	(0.128)	(0.127)
Gas info x var	–0.081	0.039	–0.181*	0.015	0.478**	–0.027	0.068	0.239***	0.146	–0.224***
	(0.105)	(0.104)	(0.104)	(0.103)	(0.232)	(0.084)	(0.117)	(0.083)	(0.098)	(0.085)
Gas info (var)	–0.044	0.025	–0.086	0.015	0.479**	–0.012	0.057	0.114*	0.115	–0.091
	(0.081)	(0.069)	(0.077)	(0.073)	(0.226)	(0.059)	(0.108)	(0.059)	(0.084)	(0.059)
Enumerator FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Background variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	993	993	993	993	993	1988	1988	1988	1988	1988
R^2	0.514	0.514	0.515	0.514	0.514	0.473	0.473	0.475	0.473	0.475

Robust standard errors are in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: "I believe that my fellow citizens would engage in corrupt activities if they could benefit economically from it: strongly disagree - agree - neither nor - agree - strongly agree", standardization of five-point scale. *Treatment variable, interaction & background variables:* "Gas info" is an indicator variable taking a value of one for respondents who were exposed to gas information, "Gas info x var" is an interaction between "Gas info" and "Above median age" (H. age), "Lower sec or more" (H. educ), "Male", "Self-employed" (Self-empl) and "Farmer", respectively, "Gas info (var)" is the sum of estimated parameters for "Gas info" and the four respective indicator variables, "Male" is an indicator variable taking a value of one if the respondent is a male, "Above median age" is an indicator variable taking a value of one for respondents who are older than 34, "Higher education" is an indicator variable taking a value of one for respondents who have completed lower secondary schooling or more, "Self-employed" is a dummy taking a value of one for respondents who are self-employed in the non-agricultural sector (the reference category is a formal sector employee), "Farmer" is an indicator variable taking a value of one for respondents who are farmers (the reference category is a formal sector employee), "Married" is an indicator taking a value of one if the respondent is married and zero otherwise and "Gas region" is an indicator variable taking a value of one for respondents residing in Mtwara and Lindi (the reference category is Dar es Salaam). *Enumerator fixed effects (FE):* indicator variables for each of the 10 enumerators.

Appendix B Supplementary materials

B.1 Survey

Good day. My name is NN and I am from REPOA, an independent research organisation based in Dar es Salaam. I do not represent the government or any political party. We are studying the views of citizens in Tanzania. We would like to discuss these issues with a member of your household. The information obtained here will be treated strictly confidentially. The answers to these questions will be an important input when it comes to prescribing policies to improve the system.

First, we want to know a little bit about you.

Q1.3 What is your marital status?

- Married
- Widow/Widower
- Unmarried
- Divorced

Q1.4 How old are you?

Q1.5. What is your "home" region/region of origin?

Q1.6 To which region do you go most frequently to visit relatives?

Q1.7 What is the highest level of schooling you have completed?

- No formal schooling
- Some primary school
- Primary school completed
- Lower secondary (form 1-4)
- College (after lower secondary)
- Upper secondary (form 5-6)
- College (after upper secondary)
- Vocational/adult education classes
- Some university or university completed
- Don't know

Q1.8 What is your main occupation?

- Central government employee
- Local government employee
- Private company employee, international company
- Private company employee, domestic company
- Self-employed (non-agriculture)
- Employed in NGO/CSO
- Unemployed
- Farmer
- Student
- Retired
- Don't know
- Other (specify in English) _____

[App randomizes respondent to gas info or non-gas info version of video]

I will now show you a video with some information about Tanzania on my tablet. The video has both pictures and sound. When the video starts playing, please let me know if you have problems seeing the pictures or hear the sound. [Hand tablet and headset to respondent and help with adjustment of headset]. Press play when you are ready. Please pay careful attention.

Thank you watching the video. Let us now continue with the rest of the questions.

Q2.3 Did you find the estimated gas revenues larger than expected? (Only gas information group)

- Yes
- No

Q7.1 How much of this information was new to you?

- All of it
- Almost all of it
- Some of it
- Almost none of it
- None of it

Q8.1 For each of the following statements, please complete / whether you agree or disagree.

Q8.2 In order for Tanzania to achieve social and economic development in the years to come, the taxes paid by ordinary Tanzanians should

- Decrease a lot
- Decrease
- Stay the same
- Increase
- Increase a lot

Q8.3 If a political party advocates an increase in taxes paid by ordinary Tanzanian citizens my support for that party will

- Decrease a lot
- Decrease
- Stay the same
- Increase
- Increase a lot

Q8.4 In the years to come, I expect the provision of public services, such as schooling, health services and roads to

- Worsen a lot
- Worsen
- Stay the same
- Improve
- Improve a lot

Q8.5 Difference in income between rich and poor in Tanzania should

- Decrease a lot
- Decrease
- Stay the same
- Increase
- Increase a lot

Q8.6 If a political party advocates a reduction in differences in income between rich and poor my support for that party will

- Decrease a lot
- Decrease
- Stay the same
- Increase
- Increase a lot

Q8.7 In the years to come, I expect differences in income between rich and poor to

- Decrease a lot
- Decrease
- Stay the same
- Increase
- Increase a lot

Q8.8 In the years to come, I trust the government to do what is right for Tanzania

- Strongly disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Q8.9 Generally, I trust my fellow citizens

- Strongly disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Q8.10 The well-being of my fellow citizens is important to me

- Strongly disagree
- Disagree
- Neither Agree or Disagree
- Agree
- Strongly agree

Q8.11 The well-beeing of future generations is important to me

- Strongly disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Q8.12 People should never engage in corrupt activities

- Strongly disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Q8.13 I believe that my fellow citizens would engage in corrupt activities if they could benefit economically from it

- Strongly disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Q8.14 In the years to come, I expect the extent of corrupt activities to

- Decrease a lot
- Decrease
- Stay the same
- Increase
- Increase a lot

[App randomizes respondent to play trust OR cheating game]

Trust game

As part of this research project, we also study how Tanzanians make economic choices. We will therefore ask you to make an economic choice that has real consequences. In this part of the study, you will be paired with a randomly selected Tanzanian citizen. We have already asked this Tanzanian citizen what he or she would do in the situation we are now going to present to you and we have pre-registered his or her response. As we told this person, we will use his or her response to determine the payment to a number of the people we interview, but in the following instructions we simplify the presentation and only describe how this will work for you.

The money paid to you in this part of the study is determined by your decsions and comes without any obligations or conditions. The sole purpose of the payments is to study economic decisions.

I will now give you Tsh 5000. [Give the respondent Tsh 5000 in Tsh 500 notes]. You can choose between keeping the entire amount to yourself, sending the whole amount to the random Tanzanian citizen, or spilt the amount between the two of you in any way that you want (in portions of Tsh 500). If you choose to send any money to the Tanzanian citizen, the amount you send will be tripled in size, meaning that for every Tsh 1000 you send, your Tanzanian citizen will receive Tsh 3000.

Just to make sure that you have understood the task, I will ask you two questions.

Q58 If you send Tsh 2000 to the randomly selected Tanzanian, how much will he or she receive?

[If respondent answers Tsh 6000, please proceed to the next question].

If respondent answers anything else than Tsh 6000, please say the following:

Your answer is not correct. I will explain one more time. The amount you send will be tripled in size, meaning that for every Tsh 1000 you send to your Tanzanian citizen, he or she will receive Tsh 3000. I will ask the question once again. If you send Tsh 2000 to the randomly selected Tanzanian you have been paired with, how much will he or she receive? Repeat this until the respondent answer correctly, Tsh 6000. Then proceed to the second question]

That is correct. Let me ask you the question in a different way.

For every Tsh 1000 you send to the randomly selected Tanzanian, how much will he or she receive?

[If the respondent answers Tsh 3000, please proceed to the allocation decision]

[If respondent answers anything else than Tsh 3000, say the following: Your answer is not correct. I will explain one more time. The amount you send will be tripled in size, meaning that for every Tsh 1000 you send, your Tanzanian citizen will receive Tsh 3000. I will ask the question once again. For every Tsh 1000 you send to the randomly selected Tanzanian you have been paired with, how much will he or she receive? Repeat this until the respondent answer correctly, Tsh 3000. Then proceed to the allocation decision]

Q60 I would now like you to tell me how much, if anything, you would like to send to your Tanzanian citizen. Please take this amount from the Tsh 5000 and give it to me.

[Respondent hands money over to you. Write down the amount given to you and check the payment table to determine the amount you should give to the respondent]

Thank you for your decision. The randomly selected Tanzanian citizen has told us that if receiving this amount of money, he or she returns Tsh XXX back to you.

[Hand Tsh XXX to the respondent and note down the amount in the box below. Amount sent and sent back should also be noted down on your separate payment sheet]

Cheating game

As part of this research project, we also study some economic situations that have real consequences. I now invite you to perform a task. First, I will demonstrate what I want you to do.

[Show respondent a Tsh 200 coin]

This coin has two sides. One with the picture of KARUME and one with the picture of a LION. I would like you to flip the coin like this

[Flip the coin, grab it and put it on top of your wrist. Holding the other hand on top of the coin. Then lift your upper hand to look at which side of the coin is up, but make sure that the coin is only visible to you, and not to the respondent] and to repeat this 6 times. I will ask you to do the flipping of the coin in privacy, and then come back and report the number of times the LION side was up. When you have completed the task, I will pay you Tsh 1000 for each LION.

The money paid to you in this part of the study is determined by the way you toss the coin and comes without any obligations or conditions. The sole purpose of the payments is to study economic situations.

Just to make sure that the task is understood, I will ask you two questions:

Q63 If you get LION 5 times, how much will I pay you?

[If respondent answers Tsh 5000, proceed to second question.]

[If respondent answers anything else than Tsh 5000, say the following:

Your answer is not correct. Let me explain again. For every LION you get, I will pay you 1000 Tsh. Let me ask the question again. If you get LION 5 times, how much will I pay you? Repeat this until the respondent answer correctly, Tsh 5000. Then proceed to the second question]

Q64 That is correct. Let me ask you in a different way. How much will I pay you for each LION?

[If respondent answers Tsh 1000, proceed to second demonstration.]

[If respondent answers anything else than Tsh 1000, say the following:
Your answer is not correct. Let me explain again. For every LION you get, I will pay you 1000]

[Proceed to second demonstration]

I will demonstrate once more before you can proceed to flip the coin.

[Repeat demonstration of coin flipping, and hand the coin over to the respondent]

Please flip the coin 6 times and count how many times the LIONS side is up. You will do the coin flips in privacy. Please step away while you complete the task and return to me when you are done.

[Wait for the respondent to complete and call him/her back]

Q66 Thank you for completing this task for me. How many LIONS did you get?

[Note down the number of LIONS in the box below. Also note the amount paid to the respondent on the separate payment sheet. Complete the survey by saying:]

All participants
This was the final part of the interview. Thank you for completing this task for me and for answering my questions. Your input is of great value to our research!

[Fill in the next section after the interview has been completed]

Q9.2 Gender of respondent

- Man
- Woman

Q9.3 District

1. Ilala (Dar es Salaam) (1)
2. Temeke (Dar es Salaam) (2)
3. Kiniodoni (Dar es Salaam) (3)
4. Lindi (Lindi) (4)
5. Lindi Manispaa (Lindi) (5)
6. Nachingwea (Lindi) (7)
7. Masasi Vijijini (Mtwara) (10)
8. Mtwara Manispaa (Mtwara) (12)
9. Newala (Mtwara) (15)

Q9.4 County/ward (specify)

Q9.5 Local / Village (specify)

Q10.1 Name of interviewer

Q10.2 Age of interviewer

Q10.3 Sex of interviewer

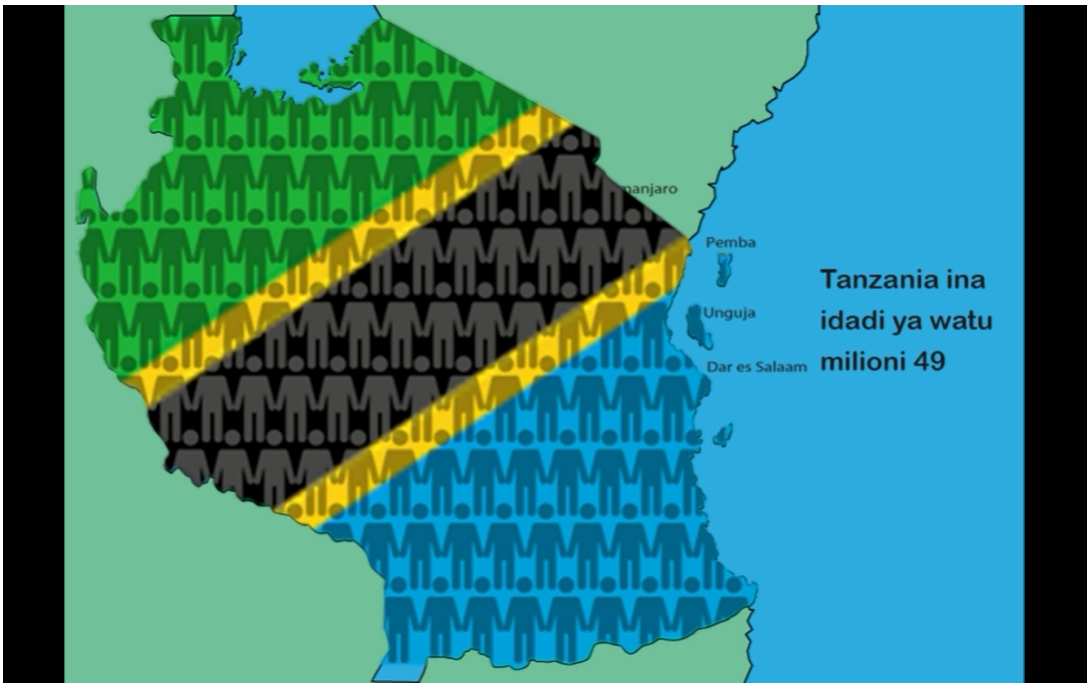
- Man
- Woman

B.2 Videos

Figure B.1: Slide 1 of video, general information (all respondents)

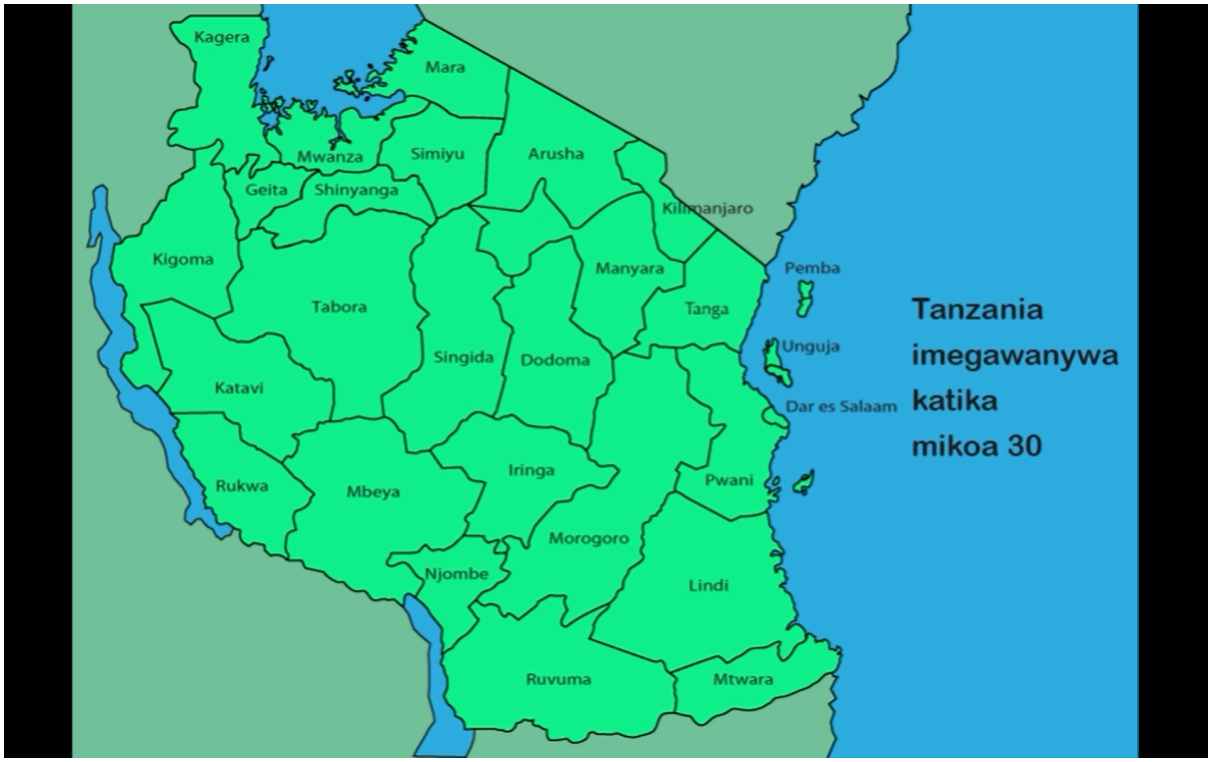
Note: The figure illustrates the first slide in the general information part of the video. The text (and sound) translates to: "This video will give you some information about Tanzania".

Figure B.2: Slide 2 of video, general information (all respondents)



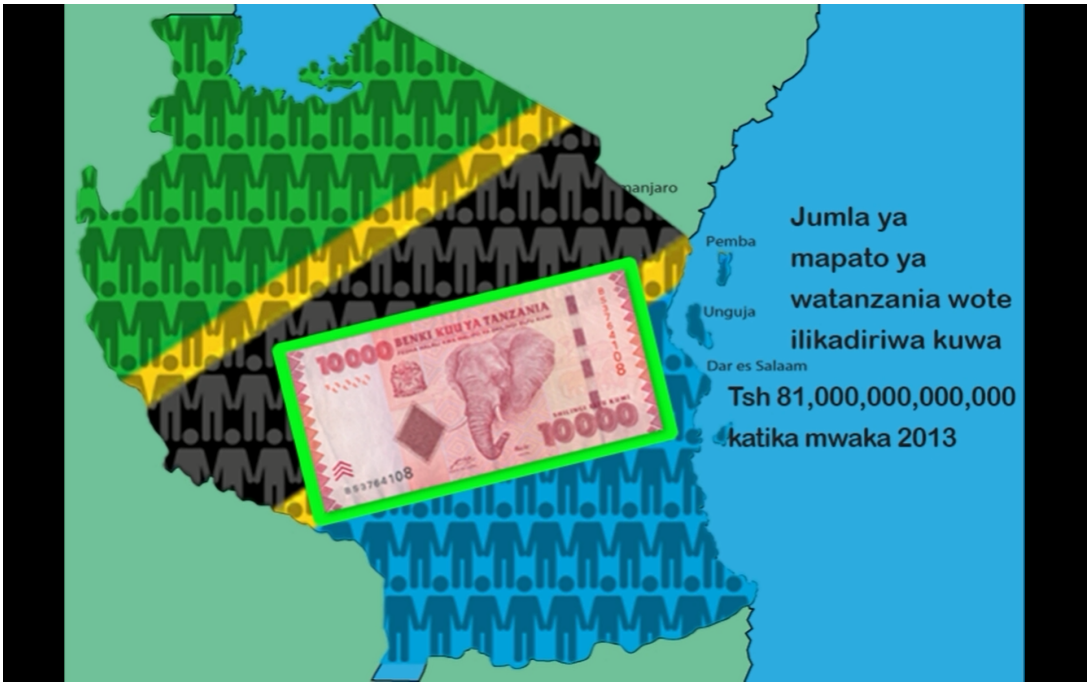
Note: The figure illustrates the second slide in the general information part of the video. The text (and sound) translates to: "Tanzania has a population of 49 million".

Figure B.3: Slide 3 of video, general information (all respondents)



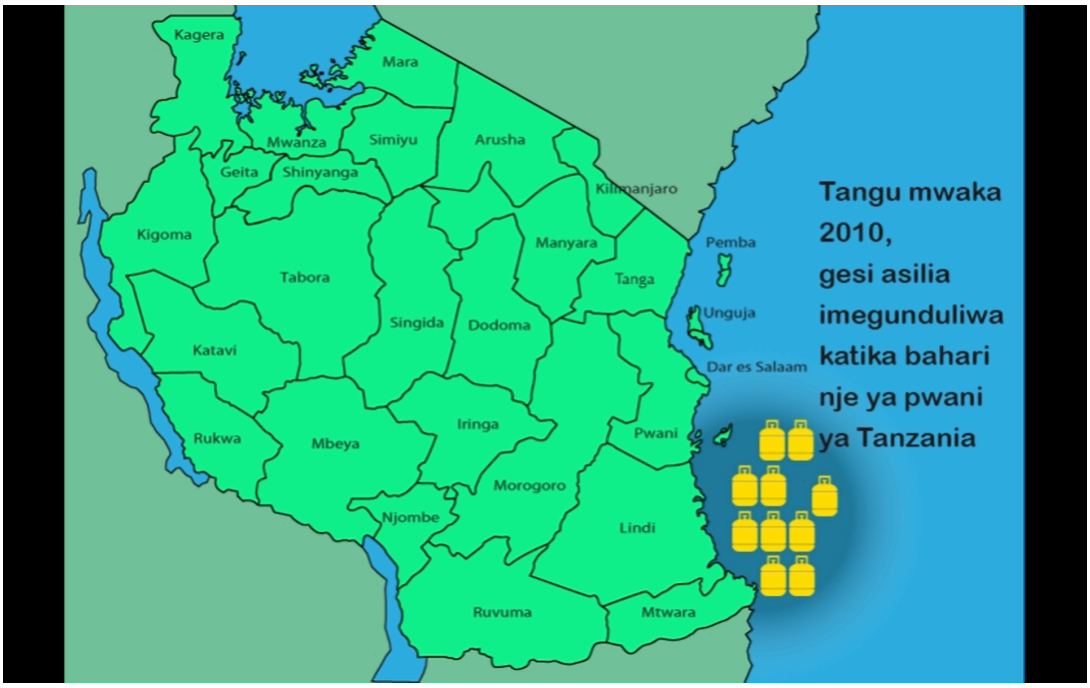
Note: The figure illustrates the third slide in the general information part of the video. The text (and sound) translates to: "Tanzania is divided into 30 regions".

Figure B.4: Slide 4 of video, general information (all respondents)



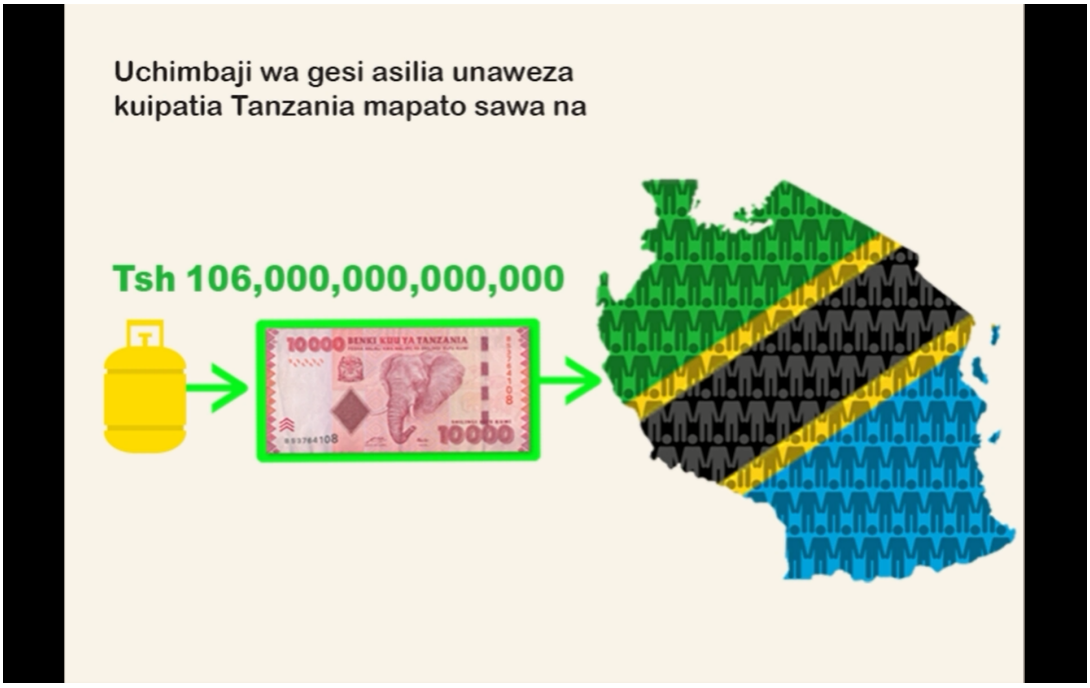
Note: The figure illustrates the fourth slide in the general information part of the video. The text (and sound) translates to: "Total revenue for all Tanzanians was estimated to be 81 trillion Tanzania shillings in 2013".

Figure B.5: Slide 5 of video, gas information (gas information group only, all formulations)



Note: The figure illustrates the first slide in the gas information part of the video. The text (and sound) translates to: "Since the year 2010, natural gas has been discovered in the ocean offshore of the Tanzania coast".

Figure B.6: Slide 6 of video, gas information (gas information group only, all formulations)

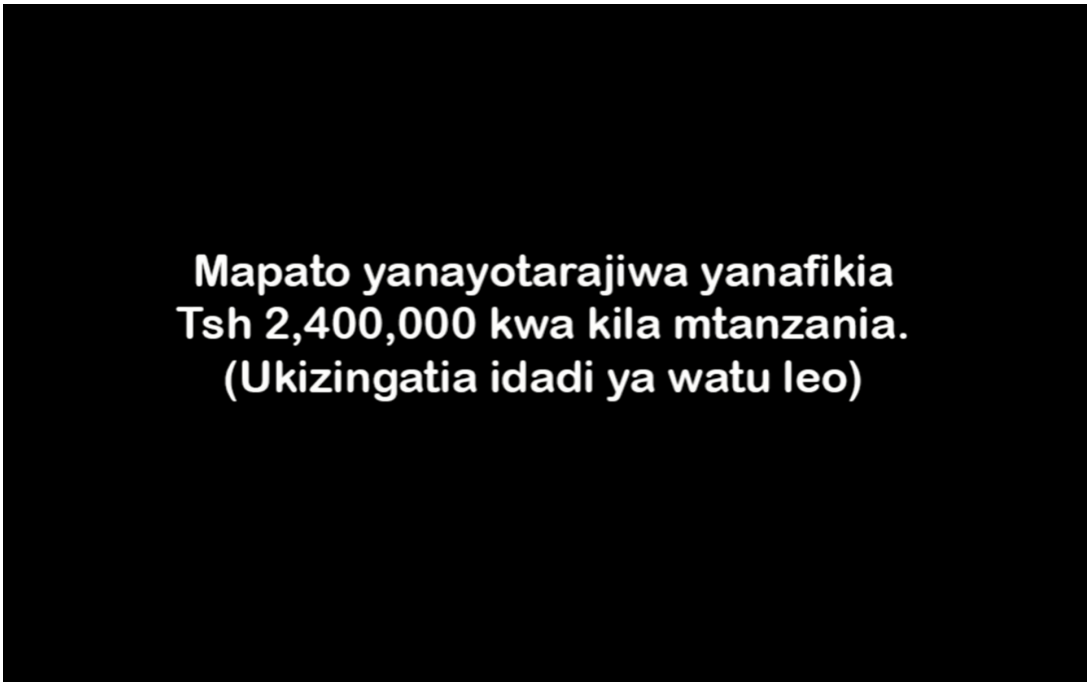


Note: The figure illustrates the second slide in the gas information part of the video. The text (and sound) translates to: "This gas can be sold and yield Tanzania a total revenue of TZS 106 trillion".

Figure B.7: Slide 7 of video, gas information (Total value/per capita, yearly return/per capita and yearly return/population formulations)

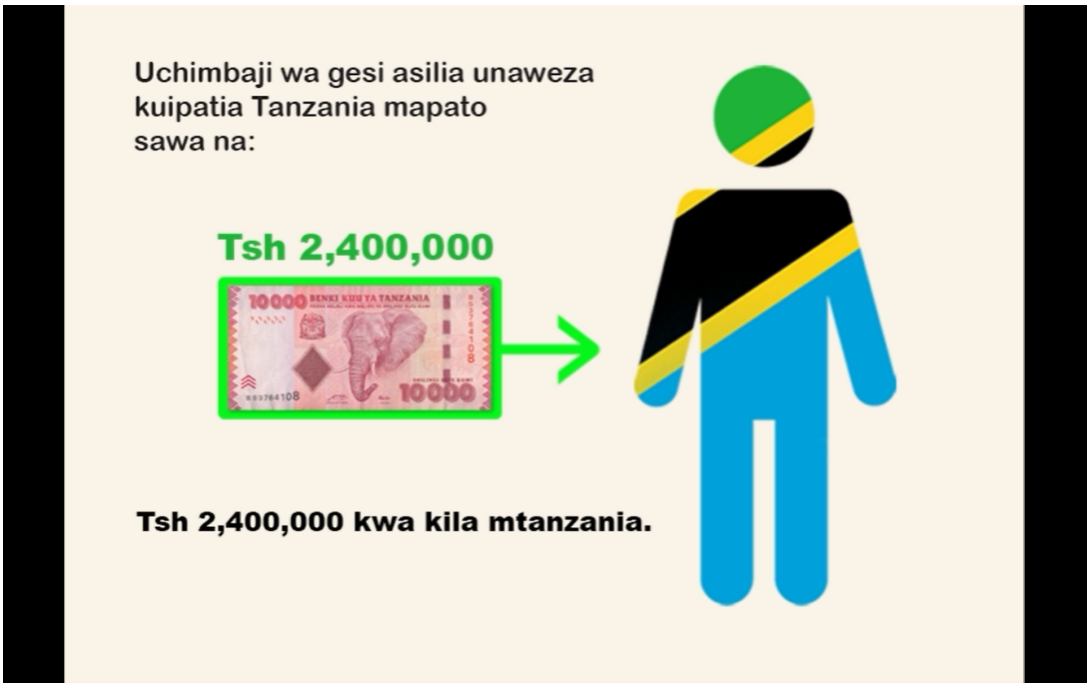
Note: The figure illustrates the second slide in the gas information part of the video. The text (and sound) translates to: "Now, let us look at this revenue in a different way".

Figure B.8: Slide 8 of video, gas information, total value/per capita formulation



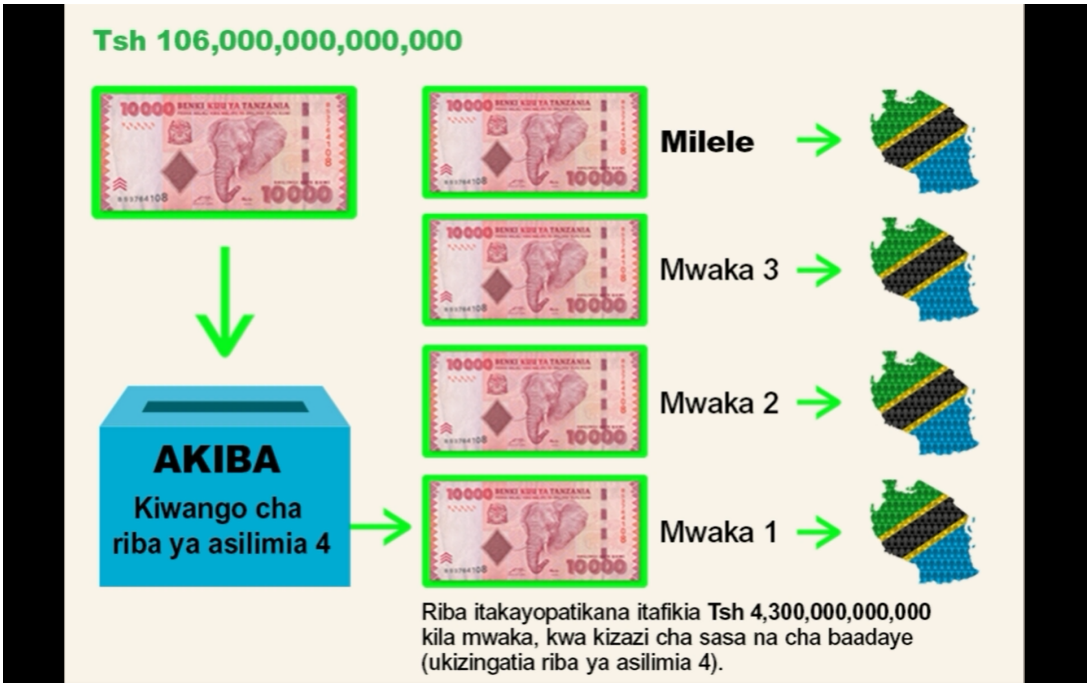
Note: The figure illustrates the first slide in the total value/per capita formulation version of the gas information. The text (and sound) translates to: "The expected revenue amounts to TZS 2.4 million per Tanzanian (considering the population today)".

Figure B.9: Slide 9 of video, gas information, total value/per capita formulation



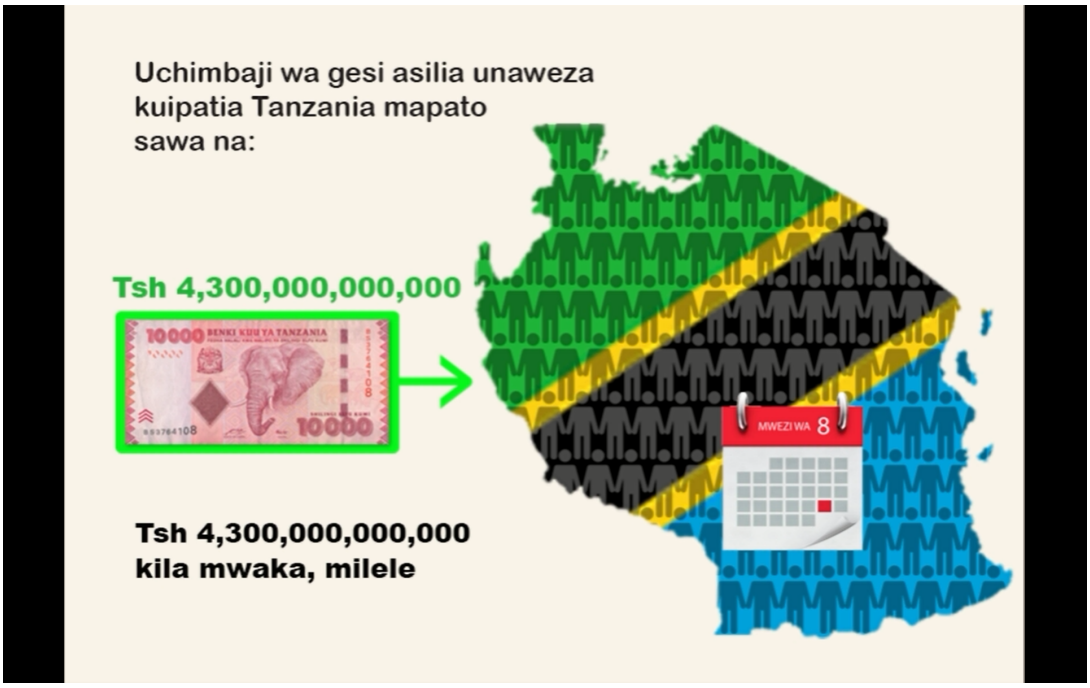
Note: The figure illustrates the second slide in the total value/per capita formulation version of the gas information. The text (and sound) translates to: "The extraction of natural gas can yield Tanzania a revenue equal to TZS 2.4 million to each Tanzanian".

Figure B.10: Slide 8 of video, gas information, yearly return/population formulation



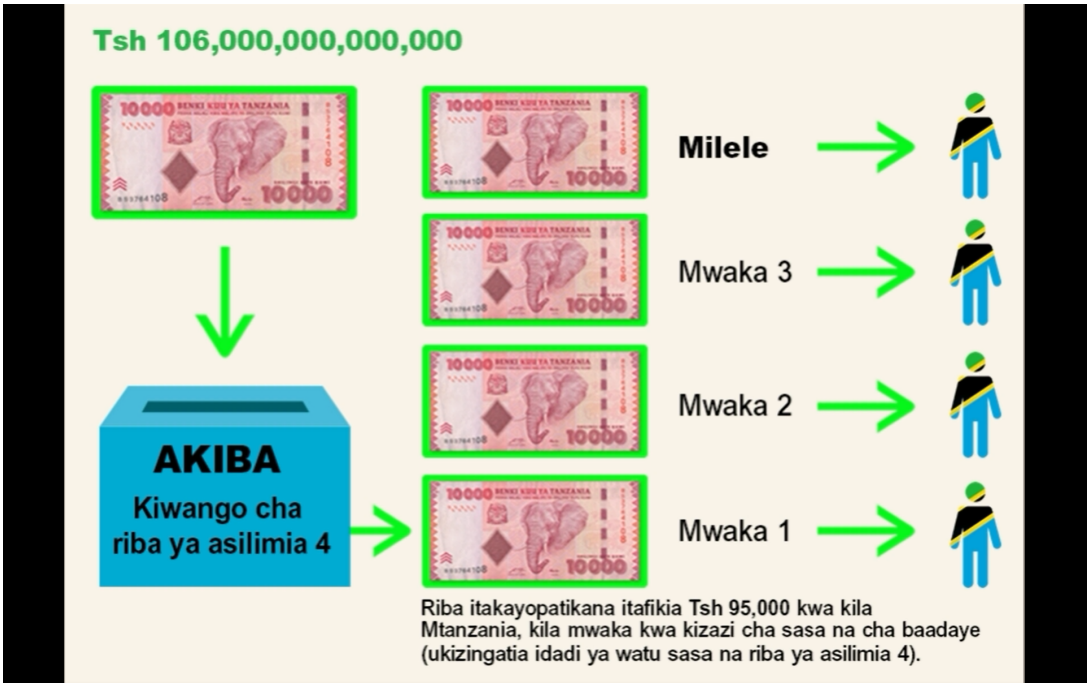
Note: The figure illustrates the first slide in the yearly return/population formulation version of the gas information. The text (and sound) translates to: "If we, as a nation, take the revenues expected from the sale of natural gas; and deposit them at an interest rate of 4%, the interest obtained will amount to TZS 4.3 trillion each year for the present and future generations".

Figure B.11: Slide 9 of video, gas information, yearly return/population formulation



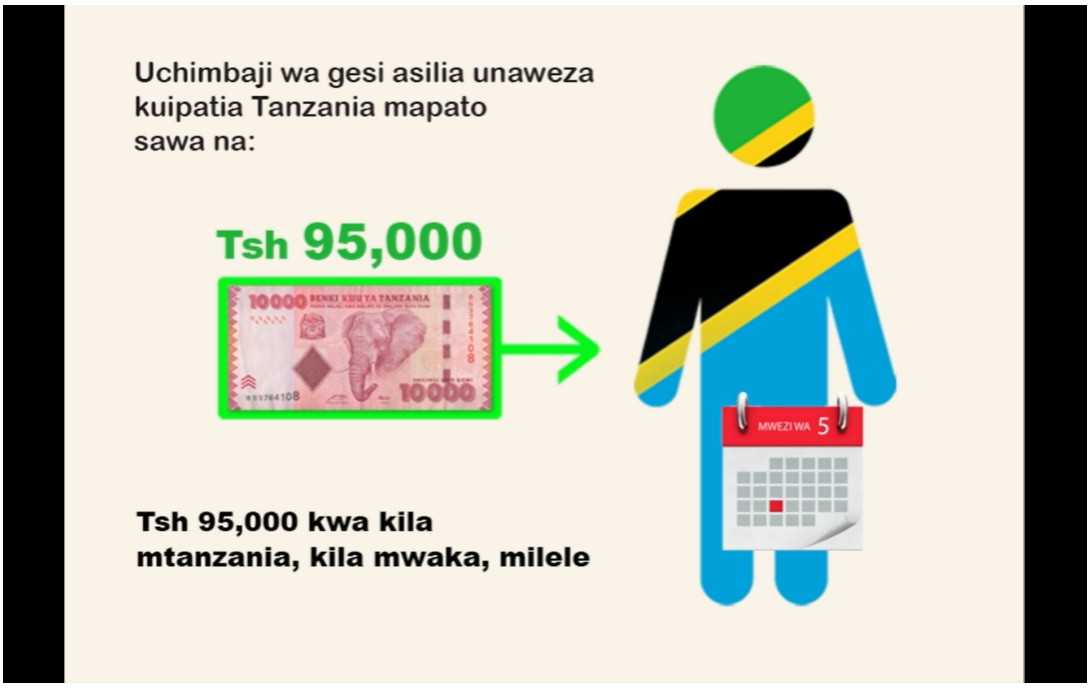
Note: The figure illustrates the second slide in the yearly return/population formulation version of the gas information. The text (and sound) translates to: "The extraction of natural gas can yield Tanzania revenue equal to TZS 4.3 trillion each year, forever".

Figure B.12: Slide 8 of video, gas information, yearly return/per capita formulation



Note: The figure illustrates the first slide in the yearly return/population formulation version of the gas information. The text (and sound) translates to: "If we take these revenues expected from the sale of natural gas; and deposit them at an interest rate of 4%, the interest obtained will amount to TZS 95,000 for each Tanzanian each year for the present and future generations, considering the present population".

Figure B.13: Slide 9 of video, gas information, yearly return/per capita formulation



Note: The figure illustrates the second slide in the yearly return/population formulation version of the gas information. The text (and sound) translates to: "The extraction of natural gas can give Tanzania the revenue equal to TZS 95,000 for each Tanzanian, each year for ever".

Figure B.14: Last slide of video (all respondents)

Note: The figure illustrates the last slides of all videos. The text (and sound) translates to: "Thank you for listening carefully, we would now like to ask you some questions" .

III Accountability and taxation: Experimental evidence

Accountability and taxation: Experimental evidence*

Ingrid Hoem Sjursen†

Abstract

The Rentier State Hypothesis states that taxation promotes government accountability. The argument is that citizens demand more accountability for spending of tax revenue than for spending of windfall revenue (e.g., natural resource revenue). This paper presents evidence from a between-subject experiment that tests the effect of taxation on demand for accountability and the underlying mechanisms explaining this effect. The design focuses on two main features that distinguish tax from windfall revenue: Tax revenue is produced by citizens' work and has been in their possession before being collected as tax. These features are theorized to increase the salience of fairness considerations in public service provision, and this increased salience of fairness is in turn hypothesized to increase demand for accountability. The main finding is that taxation causes a higher demand for accountability when both features of taxation are present. This result is evidence in support of the Rentier State Hypothesis.

Keywords: Taxation, experiment, fairness, behavioral economics, accountability
JEL Classification: H27, C91, D63, D90

*I am grateful to Bertil Tungodden for invaluable advice and inputs. I would also like to thank Alexander Cappelen, Erik Sørensen, Kjetil Bjorvatn, Ingvild Almås, Vincent Somville, Lars Ivar Oppedal Berge, Odd-Helge Fjeldstad, Ivar Kolstad, Arne Wiig, Björn Bartling, Uri Gneezy, Hallgeir Sjåstad, Ranveig Falch, Sandra Halvorsen and Charlotte Ringdal for valuable inputs. Thanks to participants at various seminars and conferences for useful feedback, and to Sebasitan Fest for letting me use an adapted version of his picture categorization task. I am thankful to the Center of Ethics and Economics and The Choice Lab at the Norwegian School of Economics, and Ingegerd and Arne Skaugs Forskningsfond for economic support.

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1 Introduction

Corruption and mismanagement of public revenue are a widespread and serious obstacle to social and economic development in many poor countries (Ferraz and Finan, 2011; Lederman et al., 2005; UNDP, 2008). The so called *Rentier State Hypothesis*, coined by Borge et al. (2015), states that when governments are financed through taxation, as opposed to through windfalls such as natural resources revenue or aid, citizens demand more accountability in government spending. This, in turn, is argued to make politicians more accountable to citizens' demands (Borge et al., 2015; Bräutigam et al., 2008; Karl, 2007; Mahdavy, 1970; Paler, 2013; Ross, 2001). Thus, the Rentier State Hypothesis suggests that financing public revenue through taxing citizens may promote political accountability and development.

Despite the popularity of the Rentier State Hypothesis, we lack causal evidence for the positive effect of taxation on accountability, and for the underlying mechanisms explaining this relationship. The focus of this paper is on the first part of the Rentier State Hypothesis: The effect of taxation on citizens' demand for accountability.[1] Accountability can be defined as "The quality of being accountable; liability to account for and answer for one's conduct, performance of duties, etc. (...); responsibility."(OED, 2017). Demand for accountability is typically thought to consist of willingness to i) monitor the behavior of the government and ii) impose a cost on the government when its behavior is not accountable, i.e., when the government's actions are not responsible and in the best interest of the citizen, possibly at a cost. The focus of this paper is on the willingness to impose a cost on the government. As an example, citizens may sacrifice time and transportation costs to participate in a demonstration calling on politicians to be more accountable, imposing a political cost on the government as punishment for not being accountable.

The present paper reports results from a between-subjects experiment where the participants are randomly assigned to a group with another participant and to the role as a "leader" or a "citizen". It is the task of the leader to decide how much of an endowment given to the group to invest in a common pool and how much to keep for him or herself. The citizen can costly punish the leader's decision by reducing his or her payoff, but has no monetary incentives to do so. The citizen's willingness to punish the leader thus captures the main features of, and is used as a proxy for, demand for accountability in the experiment. The experiment exogenously varies how the group endowment is financed in order to capture two major differences between tax and windfall revenue. First, the money on which citizens are taxed is *earned* by their work, whereas windfall revenue is not related to citizens' effort and is *unearned*. Second, tax revenue initially accrues to citizens and is subsequently collected as tax, whereas windfall revenue accrues directly to the government. These two distinguishing features of tax revenue are theorized to increase the salience of fairness considerations to citizens, because the features entail that citizens actively contribute to the financing of revenue. Increased salience of fairness is, in turn, hypothesized to make citizens care more about how resources are distributed and increase their willingness to punish the government for unfair behavior.

The experiment has two treatments designed to capture these differences between tax and windfall revenue. In the "Rentier State" treatment, the group endowment is windfall and non-tax. In the "Tax State" treatment, the group endowment is produced by the work

[1]From now on, the term "Rentier State Hypothesis" will be used to refer to the effect of taxation on demand for accountability.

of the citizen and the leader, and financed through a tax on earnings. The Rentier State treatment can be thought of as a stylization of the situation in a Rentier State, where government revenue is windfall revenue and taxation is low, and the Tax State treatment can be thought of as a stylization of a situation in a Tax State, where government revenue is produced by citizens' work and collected through taxation. Comparing punishment behavior in the two treatments provides a causal test of the effect of taxation on demand for accountability, and thus of the Rentier State Hypothesis.

The experiment also includes two treatments designed to shed light on the underlying mechanisms explaining the Rentier State Hypothesis. In the "Hard Earned & Non-Tax" treatment, the group endowment is produced by the work of the citizen and the leader, but is not collected as tax, and in the "Windfall & Tax" treatment, the group endowment is windfall, but is financed through taxation. Together with the main treatments, these additional treatments enable causal tests of the separate effect of the revenues i) being hard earned ("Hard Earned mechanism") and ii) having been in the possession of the citizen before being collected as tax ("Possession mechanism").

The paper offers three main findings. First, taxation causes a significant increase in citizens' demand for accountability. Demand for accountability is proxied by citizens' willingness to punish, and is measured as the highest investment for which the citizens punish the leader. Figure 1 shows the means and standard errors for citizens' willingness to punish in the two main treatments. It shows that when the group endowment is produced by the citizens' work and financed through taxation (Tax State treatment), citizens have a 0.19 standard deviation higher willingness to punish than when the group endowment is windfall and non-tax. This result provides evidence in support of the Rentier State Hypothesis. The finding is robust across different subgroups of the sample (gender, age, education, employment status, income, political view and political engagement).

[Figure 1 about here.]

Second, while the Hard Earned and the Possession mechanism increase citizens' willingness to punish when working in combination, neither has a separate significant effect. Thus, both the Hard Earned and the Possession mechanism are important in explaining the effect of taxation on willingness to punish. Third, the effect of taxation on willingness to punish can be partly explained by taxation causing citizens to have stronger negative emotions when the leader is unfair. Citizens in the Tax State treatment report that they would be more upset than citizens in the Rentier State treatment do if the leader invests less than what they perceive to be fair, and willingness to punish is strongly correlated with negative emotions.

The paper also investigates the effect of taxation on the leaders' decisions. The results show that leaders invest more in the common pool (i.e., are more accountable) when the group endowment is produced by work than when it is windfall revenue.

Overall, the results suggest that taxation is not only a means to generate government revenue, but may also increase citizens' demand for accountability, which is often assumed to enhance social and economic development through more accountable government spending. The results also imply that, if the government's goal is to increase demand for accountability, the tax system should: i) focus on taxing earned revenues such as labor income rather than unearned income such as prize money from lotteries or inheritance, and ii) collect taxes in arrears, not as withholding, because this increases the salience of fairness considerations.

The paper relates to the empirical literature investigating how the source of public revenue affects the political behavior of citizens and governments. A large strand of this literature uses cross- and within-country variation in observational data to investigate the relationship between reliance on tax or windfall revenue and governance indicators such as democratization, provision of public goods, and corruption (Andersen and Aslaksen, 2013; Aslaksen, 2007; Arezki and Brückner, 2011; Besley and Persson, 2013; 2014; Brollo et al., 2013; Caselli and Michaels, 2013; Gadenne, 2017; Leite and Weidmann, 2002; Martínez, 2016; Prichard et al., 2014; Ross, 2004; Sala-i-Martin and Subramanian, 2013). The studies largely show that good governance is positively associated with reliance on tax revenues and negatively associated with reliance on windfall revenues, with some notable exceptions (Haber and Menaldo, 2011; Herb, 2005). However, most of these studies do not identify a causal relationship between tax or windfall revenue and accountability, and do not provide evidence for the underlying mechanisms explaining it. The present study contributes to this literature by providing a test of the first part of the suggested causal chain of the Rentier State Hypothesis, namely the effect of taxation on demand for accountability. Another contribution of the paper is to propose and test a new mechanism for the effect of taxation on demand for accountability, namely that it increases the salience of fairness considerations in government spending. This, in turn, is hypothesized to increase citizens' willingness to punish unfair spending.

The paper also relates to a handful of experimental studies that show mixed results for the effect of taxation on demand for accountability. In a lab experiment in Uganda, Martin (2016) finds that individuals have a higher willingness to punish a dictator when the group endowment is collected as tax from them, compared to when it is given directly to the dictator. Bosman et al. (2005) report results from lab experiments in the Netherlands and Austria and find that individuals are *less* willing to punish a second party appropriating some of their endowment when this endowment is hard earned compared to when it is windfall. Paler (2013) uses games to prime citizens to think about local government revenues as tax or windfall revenues in a field experiment in Indonesia. She finds that the tax priming leads to a higher stated willingness to monitor the government, but does not significantly affect participatory behavior. Finally, Weigel (2017) randomizes tax collection in a field experiment in D.R. Congo and finds that citizens residing in taxed areas have a higher demand for accountability, measured as attendance in town hall meetings about taxation and likelihood of submitting a suggestion card to the government. The present experiment contributes to this experimental literature in three ways. First, the present design rules out information as an alternative explanation, by holding it constant across treatments. Other papers have argued that taxation increases demand for accountability through *information* because the citizen is typically aware of how much he or she pays in tax, but not of how much the government earns from natural resource exports or receives in aid (see for instance Gadenne (2017), Paler (2013) and Sandbu (2006)). Second, the present study implements an experimental design that allows for the identification of the interaction effect between the Hard Earned and the Possession mechanism. Third, the experiment cleanly identifies the effect of taxation on how much citizens care about the leader investing a fair share by keeping the level of investment that is perceived as fair constant.

Finally, the paper relates to the large literature on social norms and human cooperation. Using public good and ultimatum games, this literature has established that individuals are willing to punish norm violators, even when such punishment is costly and yields no material gains (de Quervain et al., 2004; Fehr and Gächter, 2000; 2002;

Fehr et al., 2002; Fehr and Fischbacher, 2003; 2004a;b; Henrich et al., 2006; Henrich and Henrich, 2007; Jordan et al., 2016; Rand and Nowak, 2013; Xiao and Houser, 2005). The present paper contributes to this literature by investigating whether and why costly punishment of an investment decision depends on the source of income, and, thus, shedding more light on motivations behind punishment.

The paper is structured as follows: Section 2 describes the experimental design, the sample, and the setting, Section 3 presents the theoretical framework, Section 4 explains the empirical strategy and Section 5 reports the results. Finally, Section 6 provides a discussion of the results and their implications.

2 Experimental design and sample

This section explains the sequence of events, the structure of the experimental task, the treatments, and the setting and sample.[2]

2.1 Sequence of events

In the experiment, the participants play a two-player investment game where the citizen has the opportunity to costly punish the leader for his or her investment decision. The sequence of events is illustrated in Figure 2 and can be described as follows. In the first stage (uppermost panel, Figure 2), the participants are randomly assigned to a treatment, to a pair, and to the role as a either a citizen or a leader. The randomization is done at the individual level.

In the second stage (upper middle panel), the citizen and the leader in each pair independently choose whether they would like to work to earn a reward or not. The payment scheme is announced before the participants make their decisions. Only pairs where both participants choose to work are included in the empirical analysis and the remaining explanation will focus on these. The work consists of a five-minute picture categorization task. In the third stage (middle panel), the group receives a group endowment. How the endowment is financed varies between the experimental treatments and is explained in Subsection 2.2 below. In the Rentier State treatment, the group endowment is made up of unearned revenue that does not accrue to the citizen before the leader makes the investment decision for it (non-tax). The size of the group endowment is constant and equal to \$2 in all treatments.

In the fourth stage (lower middle panel), the leader decides how much of the group endowment to invest in a common pool. The amount invested is multiplied by a factor of 1.5 and subsequently divided equally between the citizen and the leader. The amount not invested in the common pool is kept by the leader. The leader can invest any share of the group endowment he or she likes in the common pool, in portions of 0.1.

In the fifth stage (lowermost panel), the strategy method is used to elicit the citizen's willingness to punish. For every possible investment decision the leader can make, the citizen decides whether to reduce the payoff to the leader by \$0.50 at the cost of \$0.05. The citizen's punishment decisions constitute the main outcome of the experiment. The *willingness to punish* is defined as the largest investment share the citizen punishes and proxies demand for accountability: The more willing the citizen is to punish, the higher

[2]The instructions for the main parts of the study are provided in Appendix G.

is his or her demand for accountability.

[Figure 2 about here.]

In the sixth and last stage (not illustrated in the figure), participants answer a set of non-incentivized questions intended to capture individual preferences and socioeconomic background. The purpose of collecting this information is to investigate heterogeneity in treatment effects and the underlying mechanisms for the effect of taxation on the willingness to punish. After completion of the experiment, the participants receive their $1 participation fee within three days. To determine bonus earnings from decisions made in the experiment, citizens and leaders are randomly matched in pairs. The earnings are paid to the participants within three weeks of the completion of the experiment.

2.2 Experimental treatments

The experimental treatments exogenously vary the way in which the group endowment is financed based on two main differences between tax and windfall revenue. First, tax revenue is produced by the citizens' work and is thus hard *earned*, whereas windfall revenue is not related to the citizens' effort at all. Second, the revenue collected through taxation has been in the citizens' possession, whereas windfall revenue accrues directly to the government. The financing of the group endowment is varied along these two dimensions in a 2×2 design, giving rise to four treatments. An important feature of the design is that the (post-tax) reward for performing the task and the size of the group endowment are constant across treatments.

The structures of the four treatments are illustrated in Figure 3 and can be described as follows. In the first treatment, the citizen and the leader each earns $1 from their work. In addition, they receive a $2 windfall as group endowment. The group endowment can be considered windfall revenue because the group receives it independently of the citizen and the leader's work. In the second treatment, the citizen and the leader each earns $1 from their work. In addition, their work produces a $2 ($1 each) group endowment. The group endowment can be considered hard earned revenue because it is dependent on the citizen and the leader's work. In the third treatment, the citizen and the leader each earns $1 from their work. In addition, each receives a $1 windfall. The citizen and the leader's total earnings are taxed at 50 percent and the tax collected finances the $2 group endowment. The group endowment can be considered tax revenue because it is collected from the citizen and the leader's earnings. In the fourth treatment, the citizen and the leader each earns $2 from their work. Their earnings are taxed at 50 percent and the tax collected finances a $2 group endowment. The group endowment can be considered hard earned revenue because it is produced by the work of the citizen and the leader, as well as financed by tax revenue because it is collected from the citizen and the leader's earnings.[3] The four treatments can be summarized as follows:

Rentier State (T1): Citizen and leader each earn $1. A windfall finances the $2

[3]Please see Appendix A for a description of a robustness treatment. This treatment resembles the Tax State treatment, but manipulates the Hard Earned Mechanism by making the citizen and the leader work longer (ten minutes instead of five) rather than by making work a more productive activity (pay $2 instead of $1). As the regressions in Table A.1 show, manipulating duration does not yield results different from the main manipulation (productivity). The two treatments are therefore pooled in all the analyses presented in the paper unless otherwise specified.

group endowment.

Hard Earned & Non-Tax (T2): Citizen and leader each earn \$1. Their work additionally produces \$1 each, financing the \$2 group endowment.

Windfall & Tax (T3): Citizen and leader each earn \$1. In addition, they each receive a windfall of \$1. Their total earnings are taxed at 50 percent. The \$1 tax collected from each finances the \$2 group endowment.

Tax State (T4): Citizen and leader each earn \$2. Their earnings are taxed at 50 percent. The \$1 tax collected from each finances the \$2 group endowment.

[Figure 3 about here.]

The Rentier State treatment can be thought of as a stylization of the situation in a Rentier State where the government is mainly financed by windfall revenue (aid, natural resource revenue) that is not collected through the tax system. The Tax State treatment can be thought of as a stylization of the situation in a tax state, where government revenues are mainly financed through taxing hard earned income produced by the citizens' work and the tax is paid in arrears. Comparing the willingness to punish in these two treatments provides a causal test of the Rentier State Hypothesis. Comparing the Rentier State to the Hard Earned & Non-Tax treatment, and the Windfall & Tax to the Tax State treatment provides causal tests for the effect of the group endowment being produced by work when it is not financed through taxation and when it is financed through taxation, respectively. These comparisons test the importance of the Hard Earned mechanism in explaining the Rentier State effect. Similarly, comparing the Rentier State to the Windfall & Tax treatment and the Hard Earned & Non-Tax to the Tax State treatment provides causal tests for the effect of the group endowment being financed through taxation when the money is not produced by work and when the money is produced by work, respectively. These comparisons test the importance of the Possession mechanism in explaining the Rentier State effect.

The treatments are designed to keep what is perceived as a fair investment constant: because the citizen and the leader contribute equally much tax and work in all treatments, the fair thing for the leader to do is always to invest the entire group endowment in the common pool (because this ensures equal pay). The post-experimental survey confirms that this is also how the citizens perceive the situation. When asked how much they think it is fair that the leader invests, the citizens on average answer a share of 0.95 or higher in all treatments.

2.3 Sample and setting

The participants in the experiment were recruited from the online labor market platform, Amazon Mechanical Turk (MTurk). In total, 1996 workers (983 citizens and 1013 leaders) participated in the study. Of these, 110 (54 citizens and 56 leaders) chose not to perform the task and were therefore excluded from the sample. Of the 929 citizens that chose to work, 190 answered the punishment question inconsistently and were therefore dropped from the sample.[4] Thus, the main analyses in this paper are based on a sample

[4]A citizen's punishment behavior is defined as inconsistent if, for any level of leader investment, the citizen does not punish that investment, but does punish at least one higher level of investment. There

of 739 citizens. Descriptive statistics for these are reported in Table 1. Columns (1) - (5) show means for background variables for each of the four treatments and for the pooled sample, respectively. Column (5) shows the p-value for testing the hypothesis that there is no difference in the background characteristics between each of treatments T2-T4 and the Rentier State treatment. The table shows that the share of males, and the share of respondents that are more politically conservative than the median of the sample, are significantly different between treatments.[5] The sample is otherwise balanced.

[Table 1 about here.]

Tables B.5 and B.6 in Appendix B show that there are some significant differences in the share of citizens that choose not to work and the share of citizens that are inconsistent punishers between treatments. However, the balance regressions for all the 983 citizens recruited in Table B.2 in Appendix B show that the identified imbalances are not due to non-workers and inconsistent punishers being significantly different from workers and consistent punishers in terms of observable variables. This mitigates the concern that differential selection of consistent punishers between treatments is driving the treatment effects.

3 Theoretical framework

This section describes the theoretical framework guiding the experimental design. First, the citizen's punishment decision is considered. His or her monetary payoff can be formulated as:

$$y_c = R + \frac{3}{4}I - (p \times c), \tag{1}$$

where R is the reward for performing the real effort task, I is the leader's investment in the common pool, $p \in \{0,1\}$ is an indicator variable for the citizen's binary punishment decision that is taking the value of one if the citizen punishes the leader and zero otherwise, and c is the cost of punishing the leader. As Equation (1) shows, there are no monetary incentives to punish in the experiment. Furthermore, the one-shot structure and the anonymity of the participants entail that there are no strategic incentives for punishment. However, a large empirical literature has documented that people are willing to sacrifice monetary payoff to punish unfair behavior, even when they get no monetary or strategic benefits from doing so (Fehr and Fischbacher, 2003; 2004a;b; Henrich et al., 2006; Henrich and Henrich, 2007; Xiao and Houser, 2005). Fehr et al. (2002) refer to such behavior as *strong negative reciprocity*.[6]

To capture strong negative reciprocity, this paper assumes that the citizen derives utility from punishing the leader when the leader is perceived to be unfair. Negative

are no good theoretical reasons for why citizens should not punish low, but punish higher investments, and it is difficult to know how to analyze the data from inconsistent punishers.

[5]Table B.1 in Appendix B provides a more detailed balance check.

[6]Evolutionary theory posits that the existence of strong negative reciprocity is due to cooperative behavior increasing the likelihood for survival, and that natural selection therefore has favored individuals that are intuitively cooperative and trustworthy (Fehr et al., 2002; Fehr and Fischbacher, 2004a; Jordan et al., 2016; Rand and Nowak, 2013).

emotions are one possible mechanism through which this effect might work. Unfair investments may upset citizens, and punishing the leader is a way for them to express their anger to the leaders (Fehr and Gächter, 2002; Hopfensitz and Reuben, 2009; Nelissen and Zeelenberg, 2009; Xiao and Houser, 2005). Based on this, the citizen's punishment decision can be modeled as a tradeoff between monetary payoff and utility from punishing the leader for unfair investments.[7] To formalize ideas, the following simple model of the citizen's utility, inspired by Cappelen et al. (2007), is introduced:

$$V_c = R + \frac{3}{4}I - (p \times c) - \gamma_c\big(m_c - I\big)^2 + (p \times \beta)\big[min\{0, m_c - I\}^2\big]. \tag{2}$$

m_c is the citizen's fairness norm and specifies the investment share that he or she perceives to be fair. Thus, $m_c - I$ indicates how much the leader's investment deviates from the amount the citizen perceives as fair. γ_c is a parameter determining the citizen's non-monetary unconditional utility loss from unfair investments, and β is a parameter determining the citizen's utility from punishing unfair investments. The rest of the parameters are as defined for Equation (1) above. Equation (2) shows that the citizen's utility from punishment depends positively on how much the leader's investment deviates from the fairness norm, $m_c - I$, and on the individual parameter β, and negatively on the cost of punishment, c. It is assumed that the citizen derives negative unconditional utility from both positive and negative deviations from the fairness norm, but only derives utility from punishment of negative deviations. Both the unconditional disutility and the utility from punishment are assumed to be increasing in the size of the deviation from the fairness norm. The citizen's punishment behavior is characterized by:

$$c < \beta\big[min\{0, m_c - I\}^2\big] \qquad \text{Punish} \tag{3a}$$

$$c = \beta\big[min\{0, m_c - I\}^2\big] \qquad \text{Indifferent, randomize} \tag{3b}$$

$$c > \beta\big[min\{0, m_c - I\}^2\big] \qquad \text{Not punish} \tag{3c}$$

Next, the leader's investment decision is considered. It is modeled as a trade-off between expected monetary payoff and non-monetary disutility from deviations from fairness:

$$V_l = R + GE - \frac{1}{4}I - (\phi(I) \times \theta) - \gamma_l(m_l - I)^2, \tag{4}$$

where GE is the group endowment, $\phi(I)$ $(\phi'(I) < 0)$ is the leader's subjective probability for being punished by the citizen as a function of investment, θ is the cost of being punished by the citizen, m_l is the leader's fairness norm for investment, γ_l is a parameter determining the leader's disutility from deviating from fairness, and the other parameters are as defined for Equation (1). $m_l - I$ indicates how much the leader's investment deviates from what he or she perceives as fair. It is assumed that the leader experiences a utility loss from both negative and positive deviations from the fairness norm, and that the disutility is increasing in the size of the deviation. For simplicity, it is also assumed that the leader is risk neutral. Given an interior solution, the leader's optimal investment in the common pool is given by:

$$I^* = m_l - \frac{1}{2\gamma_l}\big[\frac{1}{4} + \phi'(I) \times \theta\big]. \tag{5}$$

[7] An alternative theoretical approach is to model the citizen's non-monetary utility from punishing the leader's investment as *reference dependent*, i.e., determined by his or her reference point for investment. This approach is discussed in more detail in Subsection E.2 in Appendix E.

Thus, the leader's investment depends positively on his or her fairness norm for investment, m_l, the parameter determining disutility from unfair investment, γ_l, and the subjective belief about how sensitive the probability of punishment by the citizen is to a change in investment, $\phi'(I)$.

The theoretical model can now be used to illustrate the effect of taxation on the citizen's punishment behavior. As Equations (3a)-(3c) show, for any given investment level (I), two parameters influence the citizen's punishment in the model; the level of investment the citizen perceives as fair (m_c), and the utility he or she derives from punishment of unfair investments (β). Since we assume that the fairness norms, m_c and m_l, are the same and equal to GE in all treatments, the effects of treatments must work through changes in the utility derived from punishing unfair investments, β.

The basic idea behind the design is that taxation increases the salience of fairness considerations to the citizens. The hypothesis is that, under taxation, citizens actively contribute to the group endowment in two ways; they have worked hard to earn the money that finances it, and they have had the tax money in their possession before it was collected. This active contribution is thought to attract the citizens' attention to the fairness norm, i.e., that the leader should invest everything, which in turn is hypothesized to increase the citizen's utility from punishment (β), leading to higher willingness to punish.[8] In the absence of taxation (Rentier State treatment), neither the citizen nor the leader actively contributes to the group endowment. Even though the citizen's fairness norm is the same as under taxation, the lack of active contribution to the group endowment is hypothesized to make this fairness norm less salient and citizens less willing to punish unfair investments. Accordingly, the theory predicts willingness to punish and investment levels to be higher in the Hard Earned & Non-Tax, Windfall & Tax and Tax State treatments than in the Rentier State treatment.

Next, the model is used to illustrate the effect of taxation on the leader's investment decision. Equation (5) shows that the investment decision is determined by the level of investment the leader perceives as fair (m_l), his or her disutility from unfair investments (γ_l) and the subjective belief about how sensitive the probability of punishment by the citizen is to a change in investment ($\phi'(I)$) for any given level of investment (I). As before, the fairness norm, m_l, is assumed to be constant across treatments, so the effect of treatments must go through disutility from unfair investments (γ_l) and the subjective belief about how sensitive the probability of punishment by the citizen is to a change in investment ($\phi'(I)$). Corresponding to the effect of taxation on the citizen's willingness to punish, the idea is that the leader's active contribution to the group endowment under taxation makes fairness considerations more salient and increases the disutility the leader derives from unfair investments, γ_l. This, in turn, is hypothesized to increase investments

[8]This idea is related to a series of recent theoretical papers showing that alternatives that are more salient, i.e., that stand out more because they are different or unusual, receive more of the decision maker's attention and thus influence their decisions more relative to less salient alternatives. Bordalo et al. (2012) theorize that lotteries with payoffs that stand out are overweighed relative to their objective probabilities in decision-making. Bordalo et al. (2013a) extend this model to demand for risky assets and Bordalo et al. (2013b; 2016) and Köszegi and Szeidl (2013) formulate more general models for salience and choice. These models generally focus on the salience of different alternatives in one particular choice setting. The present argument is slightly different and focuses on how the salience of one particular feature of the choice situation differs between different settings (with and without taxation). The basic mechanism should be the same: When our attention is drawn to a particular product or feature of the choice situation, we care about that product or feature, and put more emphasis on it, compared to when our attention is not drawn to it.

in the common pool. Taxation might also affect the leader's subjective belief about how sensitive the probability of the citizen punishing is to a change in investment, but it is difficult to formulate a theoretical prediction for this effect without further assumptions. Based on this, the theory predicts the leader's investments to be higher in the Hard Earned & Non-Tax, Windfall & Tax and Tax State treatments than in the Rentier State treatment.

To summarize, the theoretical framework predicts that taxation increases the citizen's willingness to punish deviations from the fairness norm through increasing the salience of this norm, and thus increases the utility from punishment of deviations from it. Correspondingly, taxation is predicted to increase the leader's investment in the common pool because it increases the salience of the fairness norm and thus increases the disutility derived from deviating.

4 Empirical strategy

This section describes the empirical strategy for the analysis.[9]

4.1 Main analysis

To investigate the effect of taxation on willingness to punish, the following specification is estimated:

$$y_i = \alpha + \beta^{\mathrm{H}}\mathrm{H}_i + \beta^{\mathrm{T}}\mathrm{T}_i + \theta^{\mathrm{H}\times\mathrm{T}}\mathrm{H}_i \times \mathrm{T}_i + \beta^X X_i + \beta^Z Z_i + \varepsilon_i. \tag{6}$$

y_i is the standardized willingness to punish for the citizen in pair i. α is a constant, H_i is an indicator variable taking the value of one for individuals in the Hard Earned treatments, T2 and T4. T_i is an indicator variable taking the value of one for individuals in the Tax treatments, T3 and T4, and $\mathrm{H}_i \times \mathrm{T}_i$ is and interaction term between H_i and T_i. $\mathrm{H}_i \times \mathrm{T}_i$ takes the value of one for individuals in the Tax State treatment (T4). X_i is a vector of the background variables of the citizen (indicator variables for male, age above median, education above median level, full-time employee and income above median), Z_i is a vector of political view and engagement (indicator variable for above median politically conservative and for above median engaged in political activities) and ε_i is an error term. Three versions of Equation (6) are estimated; one including the treatment variables and their interaction term only; one including the treatment variables, their interaction term and X_i; and one with treatment variables, their interaction term, X_i and Z_i, all OLS regressions with robust standard errors. The Rentier State treatment is the reference category, and the estimation of Equation (6) gives the following main parameters of interest:

> $\beta_T + \beta_H + \theta^{\mathbf{H}\times\mathbf{T}}$**:** causal effect of going from the Rentier State treatment to the Tax State treatment. This tests the Rentier State Hypothesis.

[9]This, and the hypotheses to be tested, were specified in the pre-analysis plan submitted to the American Economic Association Randomized Control Trials Registry before the data collection. https://www.socialscienceregistry.org/trials/2233, registration number AEARCTR-0002233. The paper mainly follows the pre-analysis plan, with some minor deviations and a few additional specifications. Please see Appendix C for an overview.

β_T, $\beta_T + \theta^{\mathbf{H}\times\mathbf{T}}$: causal effect of going from the Rentier State to the Windfall & Tax treatment, and the causal effect of going from the Hard Earned & Non-Tax treatment to the Tax State treatment, respectively. These test the Possession mechanism.

β_H, $\beta_H + \theta^{\mathbf{H}\times\mathbf{T}}$: causal effect of going from the Rentier State treatment to the Hard Earned & Non-Tax treatment, and from the Windfall & Tax treatment to the Tax State treatment, respectively. These test the Hard Earned mechanism.

$\theta^{\mathbf{H}\times\mathbf{T}}$: the difference in causal effect of going from Windfall to Hard Earned treatments between Non-Tax and Tax treatments.

To investigate whether the treatments affect willingness to punish on the intensive or extensive margin, Equation (6) is also estimated for two indicator variables; one for high punishment, taking the value of one for citizens that always punish, or punish investment shares of 0.9, and zero otherwise (intensive margin); and one for positive punishment, taking the value of one for citizens that punish at least one investment share and zero for those who never punish (extensive margin).

To check the robustness of the main results Equation (6) is estimated for an alternative definition of the dependent variable, namely *the lowest share invested for which the citizen does not punish the leader*.

4.2 Heterogeneity analysis

To investigate whether different subgroups of the sample respond differently to the treatments, the following specification is estimated:

$$\begin{aligned} y_i = \alpha + \beta^{\mathrm{H}}\mathrm{H}_i + \beta^{\mathrm{T}}\mathrm{T}_i + \theta^{\mathrm{H}\times\mathrm{T}}\mathrm{H}_i \times \mathrm{T}_i + \beta^{\mathrm{Var}}\mathrm{Var}_i + \theta^{\mathrm{H}}\mathrm{H}_i \times \mathrm{Var}_i + \\ \theta^{\mathrm{T}}\mathrm{T}_i \times \mathrm{Var}_i + \gamma\mathrm{H}_i \times \mathrm{T}_i \times \mathrm{Var}_i + \beta^X X_i + \beta^Z Z_i + \varepsilon_i. \end{aligned} \tag{7}$$

Where Var_i are indicator variables for the subgroups of respondents that are of interest (male, above median age, above median education, full-time employee, above median income, conservative, more than median engaged in political activities, and above median upset). $\mathrm{H}_i \times \mathrm{Var}_i$ is an interaction term between H_i and Var_i, $\mathrm{T}_i \times \mathrm{Var}_i$ is an interaction term between T_i and Var_i, and $\mathrm{H}_i \times \mathrm{T}_i \times \mathrm{Var}_i$ is a term for the triple interaction between H_i, T_i and Var_i.

The reference category is the subgroup for which Var_i takes the value of zero in the Rentier State treatment. To illustrate, if Var_i is the indicator variable for male, the reference category is female (male = 0) in the Rentier State treatment. Then β^{H} is the effect of going from the Rentier State to the Hard Earned & Non-Tax treatment for females, β^{T} is the effect of going from the Rentier State to the Windfall & Tax treatment for females, and so on. Estimating Equation (7) for each background variable gives the following parameters of interest:

$\beta_T + \beta_H + \theta^{\mathbf{H}\times\mathbf{T}}$: causal effect of going from the Rentier State to the Tax State treatment for subgroup $\mathrm{Var}_i = 0$ (for instance females).

$\beta_T + \beta_H + \theta^{\mathbf{H}\times\mathbf{T}} + \theta^{\mathbf{H}} + \theta^{\mathbf{T}} + \gamma$: causal effect of going from the Rentier State to the Tax State treatment for subgroup $\mathrm{Var}_i = 1$ (for instance females).

$\theta^{\mathbf{H}} + \theta^{\mathbf{T}} + \gamma$: difference in effect of going from the Rentier State to the Tax State treatment between $\mathrm{Var}_i = 0$ and $\mathrm{Var}_i = 1$ (for instance between females and males).

4.3 Leader decisions

To investigate the effect of treatments on leaders' investment decisions, Equation (6) is estimated using the standardized share invested in the common pool as the dependent variable.

5 Results

This section reports the results. The first part reports descriptive findings for the citizens' punishment behavior and for self-reported negative emotions. The second part presents the main analysis of the effect of taxation on the willingness to punish and on negative emotions. The third part presents the heterogeneity analysis. Finally, results from the leaders' investment behavior are described in the fourth part.

5.1 Descriptive statistics

The main outcome of interest is the citizens' willingness to pay a cost to punish the leaders' investment decisions by reducing their payoff. The willingness to punish is measured using the strategy method: For every possible investment decision the leader can make, the citizen decides whether he or she would like to punish that decision. The leader can invest as much of the group endowment as he or she likes, in portions of 0.1. Thus, the citizen decides whether to punish an investment share of 0.1, an investment share of 0.2, an investment share of 0.3 and so on up until an investment share of 1. These decisions are used to identify the highest investment level for which the citizen punishes the leader, which is used as a measure for the willingness to punish. The punishment decision that the citizen makes for the leader's actual investment decision is implemented. To illustrate, imagine that a citizen decides to punish the leader if he or she invests a share of 0.5 or less in the common pool. Then the highest investment share for which the citizen punishes, and the measure for his or her willingness to punish (i.e. his or her demand for accountability), is 0.5.

Figure 4 divides citizens into four categories according to their punishment behavior. It shows that a significant share, about 45 percent, never punish the leader. The remaining 55 percent have a positive willingness to punish for at least one level of leader investment, most of whom (about 37 percent of the sample) are willing to punish high investments, meaning that the highest investment share they punish is between 60 and 90 percent. A small share (about 15 percent of the sample) are only willing to punish low investments, meaning that the highest investment share they punish is between 0 and 50 percent. A minority of three percent always punish the leader, even in the case when he or she invests 100 percent of the group endowment. Figure D.1 in Appendix D gives a more detailed description of punishment behavior by illustrating the entire distribution of willingness to punish.

[Figure 4 about here]

To shed more light on why citizens punish, they answer the unincentivized question "How upset would you be if the leader invests less than the fair share, when both of you completed the assignment?" Figure 5 illustrates their answers measured on an 11-point scale from "Not upset at all" to "Very upset". It shows that there is a large variation in

negative emotions associated with unfair leader investments. The figure also shows that the distribution of negative emotions is skewed to the right of the mean upsetness level, indicating that the majority of citizens report that they would be somewhat or more upset if the leader is unfair.

[Figure 5 about here.]

Figure 6 investigates the relationship between negative emotions and punishment behavior. The left panel divides the sample of citizens into two groups according to self-reported emotions; those who report to be less than or equal to the median level of upset (six), and those who report to be more than median upset if the leader is unfair. It illustrates the willingness to punish in these two groups and shows that the more upset punish significantly higher investment shares than the less upset. The magnitude of this difference is equivalent to 0.6 standard deviation and is highly significant ($p = 0.000$). The right panel of the figure illustrates the same relationship for all possible outcomes of the upsetness variable. Each bar illustrates the mean willingness to punish for that level of upsetness and shows that willingness to punish is linearly increasing in the strength of negative emotions reported. These results strongly suggest that negative emotions are an important driver of punishment behavior.

[Figure 6 about here.]

Table 2 reports regressions of willingness to punish on an indicator variable taking the value of one for citizens that are more than median upset if the leader is unfair in Columns (1)-(3) and on the 11-point scale measure of upsetness in columns (4-6). The table shows that the positive correlation between negative emotions and punishment replicates in a regression framework for both measures of upsetness.

[Table 2 about here.]

5.2 Main analysis

As illustrated in Figure 1, the Tax State treatment causes a significant increase in citizens' willingness to punish. Going from a situation where the group endowment is windfall and non-tax to a situation where it is produced by the citizen and the leader's work and financed through taxation, increases the willingness to punish from 0.30 to 0.37 ($p = 0.060$). The magnitude of the effect is equivalent to a 0.19 standard deviation increase in the willingness to punish.

Table 3 investigates how willingness to punish is affected by the Tax and Hard Earned manipulations, their interaction, and background variables, in a regression framework. Columns (1)-(3) report results for willingness to punish measured by a standardized version of the 11-point punishment scale. Column (1) reports estimates of Equation (6) with treatment variables and the interaction term only, Column (2) reports estimates for a specification that includes background variables (gender, age, education, income and occupation) and Column (3) reports results for the full specification where indicators for political view and political engagement are also included. The Rentier State treatment is the reference category in all columns. Focusing on the full specification in Column (3), the table shows that the descriptive finding is replicated in the regression analysis. Going

from the Rentier State to the Tax State treatment significantly increases the willingness to punish (as indicated by the positive and significant coefficient of "Hard Earned + Tax + Hard Earned x Tax", p = 0.058). The table also shows the estimated separate effects of the Hard Earned and Tax manipulations. The coefficients of "Hard Earned" and "Hard Earned + Hard Earned x Tax" test the separate effect of the Hard Earned manipulation when the group endowment is non-tax and when it is collected through taxation, respectively. They show that the Hard Earned effects are positive, but not statistically significant. Similarly, the coefficients of "Tax" and "Tax + Hard Earned + Tax" test the separate effect of the Tax manipulation when the group endowment is windfall and when it is produced by work, respectively. They show that the effects are positive, but not significant. The small and non-significant coefficient of "Hard Earned x Tax" suggests that there is no interaction effect between the two mechanisms on the willingness to punish.

In terms of background variables, only employment status is significantly correlated with punishment; citizens that are employed full-time have a significantly higher willingness to punish than those who are not employed full-time.

[Table 3 about here.]

Columns (4)-(6) report estimates of Equation (6) where the dependent variable is a standardized version of an indicator variable taking the value of one for individuals that punish very high shares invested (0.9 or 1): Column (4) reports estimates from the specification with treatment variables and the interaction only, and Columns (5) and (6) sequentially add the background political variables. The main result from Column (3) holds, and is slightly strengthened, when investigating the effect on the indicator for high willingness to punish in Column (6). For this specification, a significant effect of the Tax manipulation is also identified for the Hard Earned treatments; citizens are more likely to punish high investment shares when the group endowment is hard earned and collected through taxation than when it is hard earned and given directly to the leader.

Based on the regressions in Table 3, the following main results can be formulated:

Result 1 (Rentier State Hypothesis): *The Tax State treatment significantly increases the willingness to punish compared to the Rentier State treatment* ($\beta^H + \beta^T + \theta^{\mathrm{H}\times\mathrm{T}} = 0.186$, p = 0.058, Column (3)).

Result 2 (Mechanisms): *The positive effect of the Tax State Treatment on the willingness to punish is explained by a combination of the Hard Earned and Possession mechanism.* Both the Tax and the Hard Earned manipulations have a positive separate effect on the willingness to punish, but they are not statistically significant (Hard Earned mechanism: $\beta^H = 0.040$, p = 0.715, $\beta^H + \theta^{\mathrm{H}\times\mathrm{T}} = 0.057$, p = 0.595, Possession mechanism: $\beta^T = 0.129$, p = 0.269, $\beta^T + \theta^{\mathrm{H}\times\mathrm{T}} = 0.147$, p = 0.134, Column (3)). There is no interaction effect between the Hard Earned and the Possession mechanism ($\theta = 0.018$, p = 0.907).

Result 1 provides evidence in support of the Rentier State Hypothesis. When the financing of the group fund is characterized by the two distinguishing factors of tax revenue; (i) the money has been in the citizens' possession and then been collected through taxation and (ii) the money is earned income, the citizens have a higher willingness to

punish.[10]

Result 2 shows that both the Hard Earned and the Possession mechanism are needed in order to generate the Rentier State effect. These mechanisms significantly affect the willingness to punish only when working in combination.

To further investigate the effect of taxation on the willingness to punish, Table D.3 in Appendix D reports regression results for an indicator variable taking the value of one if the citizen punishes some investment share. It shows that the treatments have no significant effects on the likelihood of a citizen punishing the leader. Thus, the results in Tables 3 and D.3 indicate that the Tax State treatment increases citizens' willingness to punish very high investments, but does not increase the likelihood of the citizen punishing the leader. Table D.3 also reports the results for a sample that includes the inconsistent punishers in Columns (4)-(6). These regressions show that the two samples give very similar results.

Finally, the treatment effect on negative emotions is investigated in Figure 7. It shows that, on average, citizens in the Tax State treatment report to be more upset than the citizens in the Rentier state treatment do (6.3 vs. 5.9 on a scale from 1 to 11), indicating that the Tax State treatment increases the citizens' negative emotions. The difference in negative emotions reported is equivalent of 0.15 standard deviation, but is not significant at conventional levels of significance ($p = 0.131$). Table 4 reports the corresponding regression analysis where negative emotions are regressed on indicator variables for treatments and their interaction. The table replicates the positive effect of the Tax State treatment on negative emotions. Additionally, it shows that the point estimates of the separate effects of the Hard Earned and the Tax manipulation on negative emotions go in opposite directions.

[Figure 7 about here.]

[Table 4 about here.]

The results show that willingness to punish is highly correlated with negative emotions. They also provide suggestive evidence in support of negative emotions being a mechanism for the effect of taxation on the willingness to punish: Taxation makes the citizen more upset by, and therefore more willing to punish, unfair leader investments.

5.3 Heterogeneity analysis

This section investigates whether subgroups of citizens respond differently to taxation. Figure 8 illustrates the difference in mean willingness to punish between the Rentier State and the Tax State treatment for the different subgroups of respondents. To illustrate, the left bars in the top left panel of the figure show the mean willingness to punish for women in the Rentier State treatment (dark gray) and women in the Tax State treatment (light gray), respectively. The two right bars of the panel show the mean willingness to punish for men in the Rentier State (dark gray) and Tax State (light gray) treatment. The panel illustrates that going from the Rentier State to the Tax State treatment causes men to have a significantly higher willingness to punish, but does not

[10]The estimated regressions for the robustness check of the Hard Earned mechanism are reported in Table A.1 in Appendix A. It shows that there is no significant difference in willingness to punish between citizens in the five- and 10-minute Hard Earned treatments.

affect the punishment behavior of women. Overall, the figure shows that Result 1 is robust across the different subgroups: Willingness to punish is consistently higher in the Tax State than in the Rentier State treatment in all subgroups except non-full-time employees (where the difference between treatments is not significant).

Table 5 reports the estimated regression coefficients for the effect on the willingness to punish of going from the Rentier State to the Tax State treatment for the different subgroups of the sample, as well as the difference in treatment effect between the groups. It shows that the Tax State treatment has a significant effect on the following subgroups: male, younger, more educated, full-time employees, richer, more politically conservative and the more politically engaged citizens, but that the difference in treatment effect is only significantly different between non-full-time and full-time employees. Tables D.1 and D.2 in Appendix D report the full regressions (see Tables D.5 and D.6 for specifications without controls.)

[Figure 8 about here.]

[Table 5 about here.]

Based on Table 5, the following main result for the heterogeneity analysis can be formulated:

Result 3 (Rentier State Hypothesis): *The positive effect of taxation on the willingness to punish is robust across all subgroups of respondents, with the exception of employment status.* Across gender, age, education, income, political view, political engagement and negative emotions, the Tax State treatment increases the willingness to punish compared to the Rentier State treatment ($\beta^T + \beta^H + \theta^{\mathrm{H}\times\mathrm{T}}$ and $\beta^T + \beta^H + \theta^{\mathrm{H}\times\mathrm{T}} + \theta^{\mathrm{H}} + \theta^{\mathrm{T}} + \gamma > 0$, Columns (1)-(3) and (5)-(7)), though not significantly in all groups.

Result 3 shows that Result 1, the Rentier State effect, is robust across the different subgroups. This indicates that the effect of taxation on willingness to punish is a general one and not driven by specific subgroups.

5.4 Leader decisions

This subsection investigates the leaders' decisions for investment in the common pool.[11] Figure 9 illustrates the distribution of leader investment behavior: each bar indicates the share of leaders that invested the given share in the common pool. It shows that the majority of leaders, 60 percent, invest everything. About 25 percent keep the entire group endowment to themselves and 4 percent invest half.

[Figure 9 about here.]

Next, the effect of taxation on leader investments is investigated. Figure 10 illustrates the effect of going from the Rentier State to the Tax State treatment on the share invested by the leader. It shows that the Hard Earned and the Possession mechanism do not significantly affect the leader's investment behavior when working in combination. Table 6 reports the estimated results of Equation (6) taking the standardized value of

[11] Balance tables for leaders are reported in Tables F.1 - F.4 in Appendix F.

the leader's investment as the dependent variable. The regressions replicate the descriptive result from Figure 10 for both the 11-point scale and the binary definition of leader investment (the binary outcome takes the value of one for leaders that invest everything in the common pool and zero otherwise). The regressions furthermore show that when the group endowment is collected as tax, going from the Windfall to the Hard Earned treatment significantly increases the investment share. This is indicative evidence of taxation positively affecting leader behavior through the Hard Earned mechanism.

[Figure 10 about here.]

In terms of background variables, older and more politically engaged leaders invest more, and full-time employees and more politically conservative leaders invest less in the common pool. Figure F.1 in Appendix F shows that the effect of the Hard Earned treatment on investment share is not driven by beliefs about citizens' punishment, providing suggestive evidence that the effect of taxation on provision of accountability is not driven by beliefs about punishment.

[Table 6 about here.]

Based on the analysis of leader decisions, the following result can be formulated:

Result 4 (Leader investment): *Leaders invest more in the common pool when the group endowment is produced by work, but the effect is only statistically significant when the group endowment is also collected through taxation* ($\beta^H + \theta = 0.167$, p = 0.067 and $\beta^H = 0.050$, p = 0.616, Column (3)).

Result 4 provides suggestive evidence of taxation increasing the share invested by the leader.

6 Discussion and conclusion

This paper studies the effect of taxation on demand for accountability in an economic experiment. The experimental design focuses on two features that distinguish tax from other sources of government revenue, as underlying mechanisms explaining why it is perceived differently; tax revenue is produced by the citizens' work and has been in their possession before being collected as tax. The paper offers three main findings. First, when revenue is tax revenue this causes a higher demand for accountability, measured as citizens' willingness to costly punish the leader's investment decision for the group endowment. Citizens have a significantly higher willingness to punish when the group endowment is produced by work and financed through taxation compared to when it is windfall and non-tax. This finding provides evidence in support of the Rentier State Hypothesis. The heterogeneity analysis shows that the finding is robust across all, but one, subgroups of the sample. Second, the two distinguishing features of tax revenue, that it is hard earned and has been in the citizen's possession before being collected through taxation, do not have separate significant effects on the willingness to punish. Third, the effect of taxation on willingness to punish can be partly explained by negative emotions. Taxation causes citizens to have stronger negative emotions about unfair investments,

and citizens are more willing to punish the stronger their negative emotions are. This finding highlights the importance of emotions in decision-making.

The results provide important implications for our understanding of citizens' accountability behavior and for policy. First, taxing citizens is not only an instrument for generating government revenue, it may also promote demand for accountability, which in turn is generally assumed to increase government accountability. A tax system designed to enhance demand for accountability should have the following features. First, tax should be paid in arrears, not as withholding. Second, tax should mainly be levied on income that is *earned*, such as employment income, not on unearned (windfall) income such as lottery prizes and inheritance. The argument is that when paying taxes in arrears and on earned income, citizens actively contribute to tax revenues, which increases the salience of fairness in resource distribution and that this in turn increases demand for accountability. However, collecting tax in arrears might conflict with other policy goals, such as increasing tax compliance (see for instance Dhami and al Nowaihi (2007) or Engström et al. (2015)). Furthermore, the results imply that if the government's aim is to improve accountability to all groups in the population, the tax base should be broadly defined and also include those who, from a revenue perspective, it is not worth collecting taxes from.

This paper studies the effect of taxation on demand for accountability in an experimental setting that tightly controls for factors that are not the focus of the study, but that might affect demand for accountability. This enables a clean causal test of the effect of taxation on demand for accountability and of the micro-founded mechanisms that might explain it. Testing these mechanisms in a field setting is an interesting topic for future research. Furthermore, testing the causal effect of taxation and the effect of demand for accountability on accountability in government spending will shed more light on the political effects of taxation.

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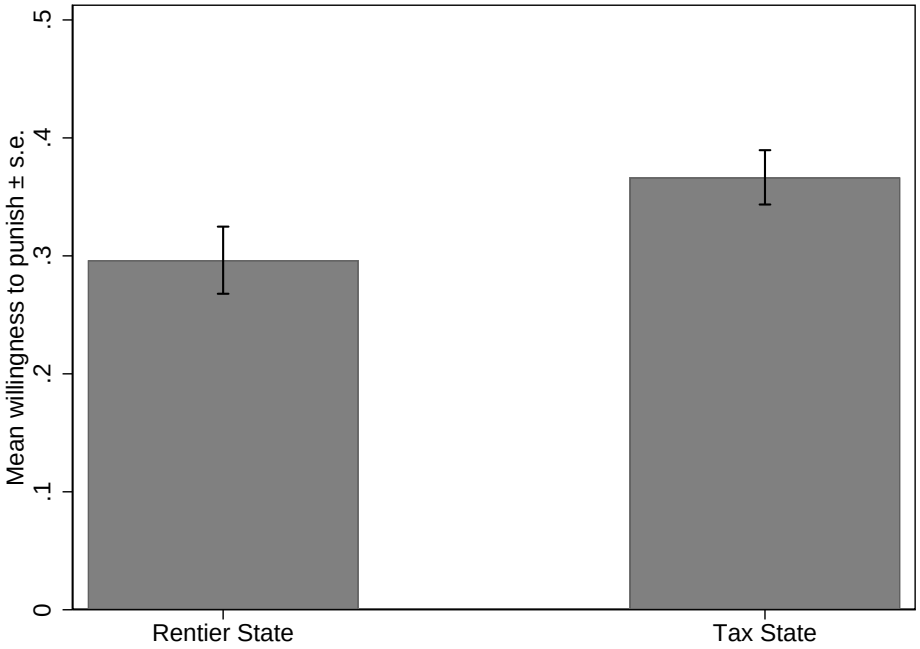
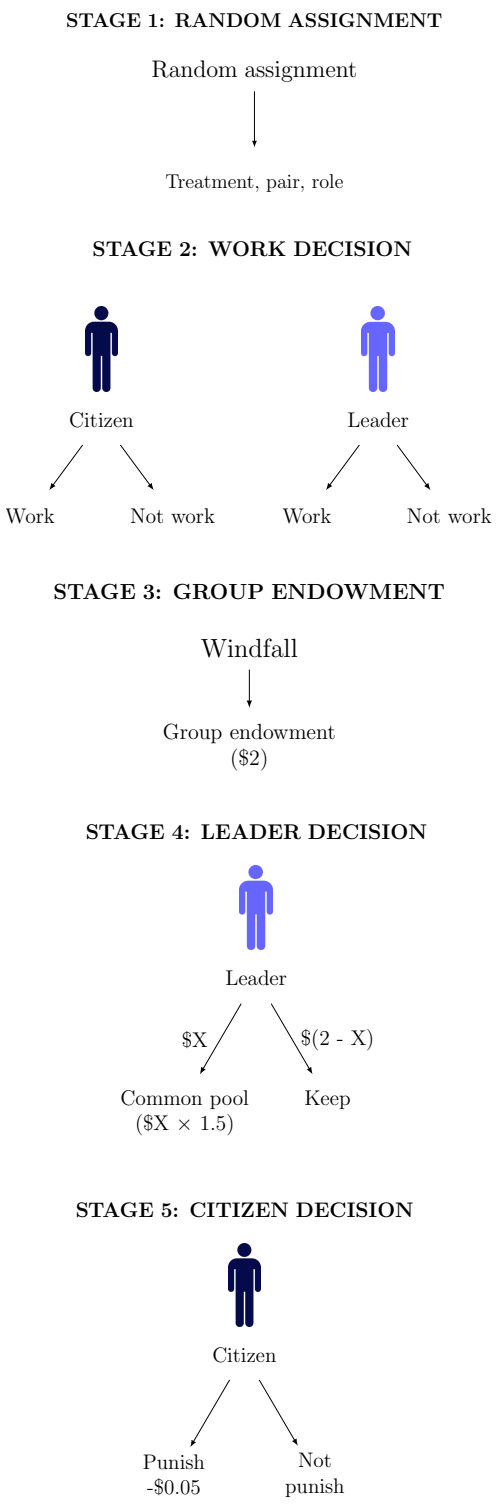
Figures and tables

Figure 1: Effect of taxation on the willingness to punish



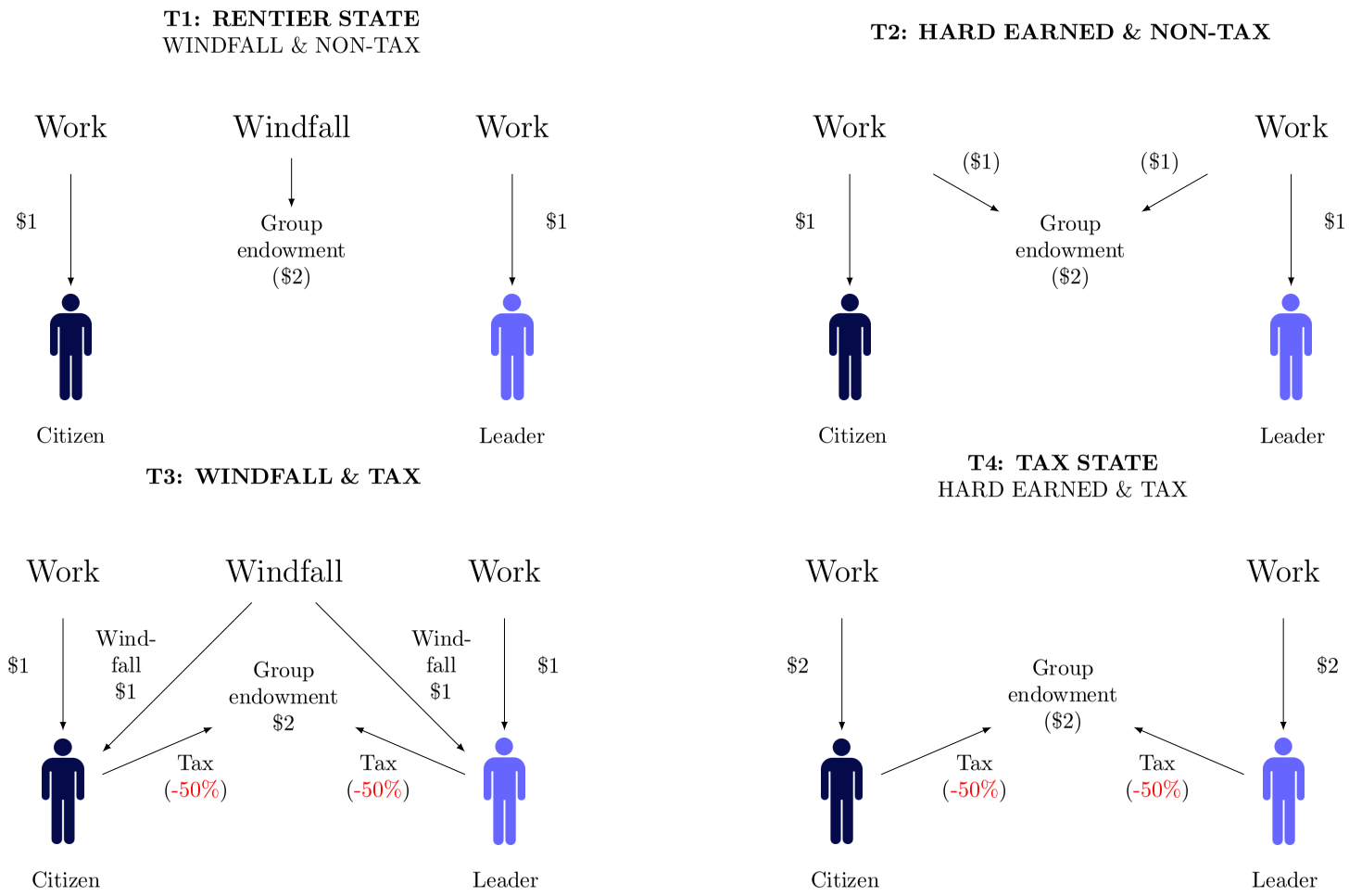
The figure shows the mean willingness to punish for citizens in the Rentier State (group endowment is windfall and non-tax) and Tax State (group endowment is produced by work and financed through taxation) treatments. The estimated standard errors are also indicated.

Figure 2: Sequence of events



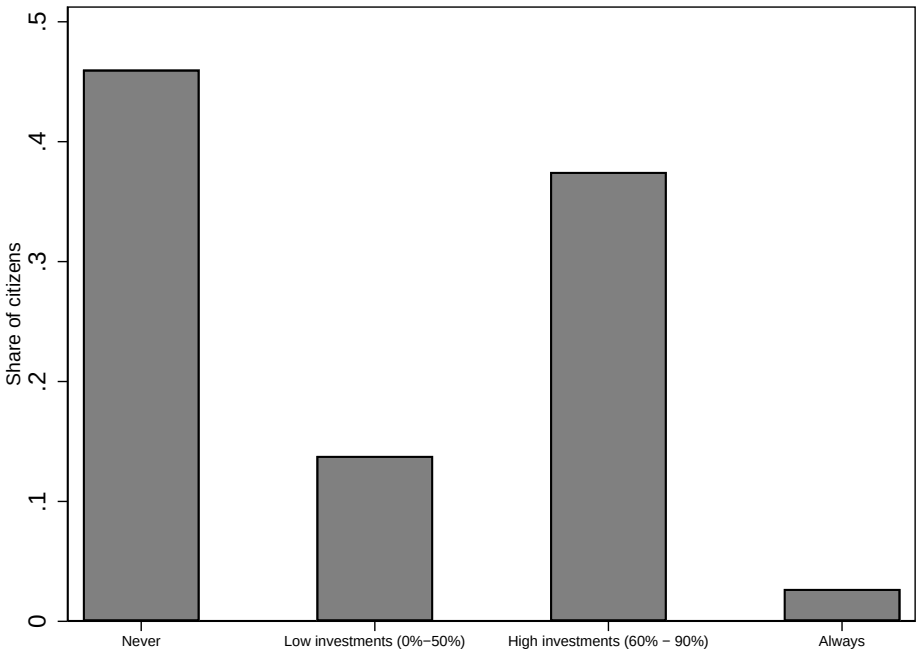
The figure illustrates the sequence of events for the Rentier State treatment.

Figure 3: Treatments: Generation and collection of group endowment



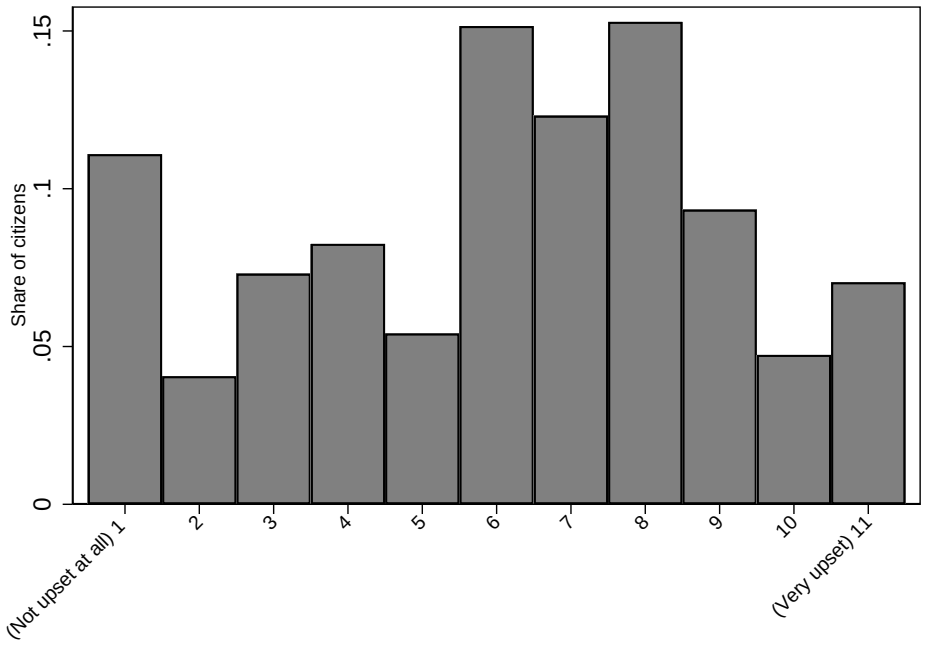
The figure illustrates the production and financing of the group endowment for the four treatments.

Figure 4: Types of punishment behavior



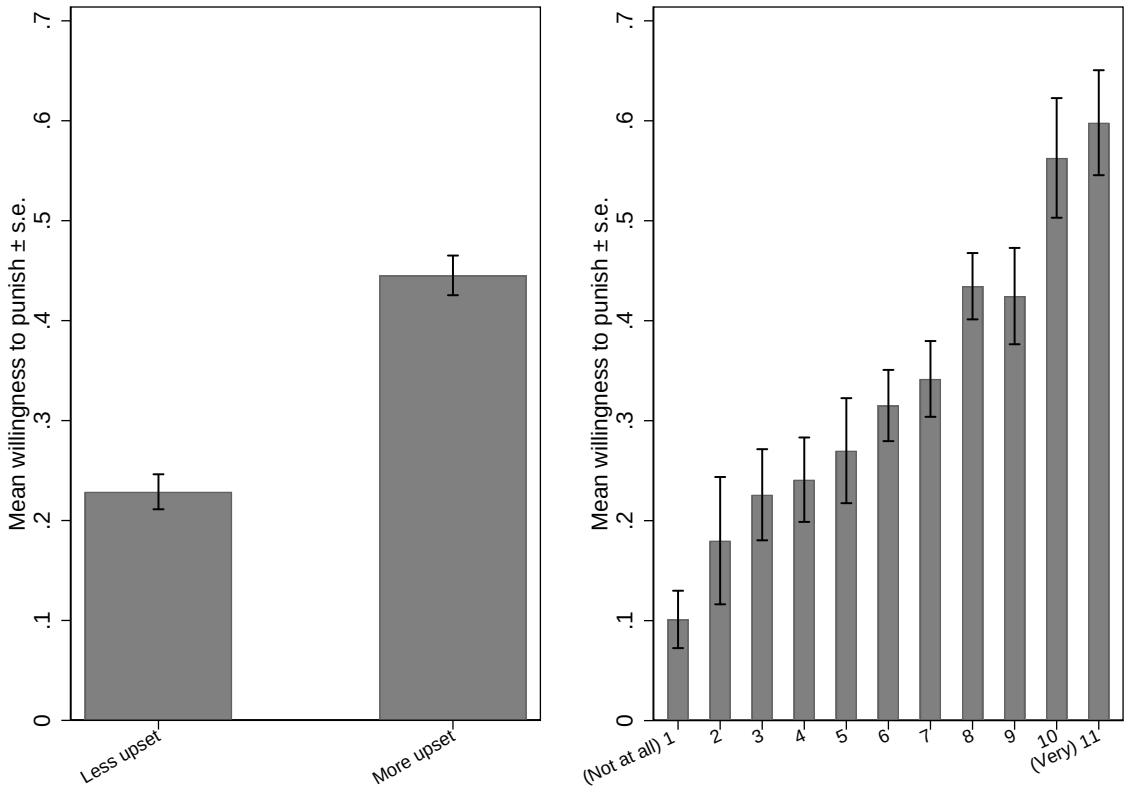
Note: The figure shows the share of citizens characterized by four different types of punishment behavior. "Never": citizens that never punish the leader. "Low investments (0%-50%)": citizens that punish an investment share of between 0% and 50% as the highest. "High investments (60%-90%)": citizens that punish an investment share between 60% and 90% as the highest. "Always": citizens that punish all investment decisions of the leader, even when he or she invests 100%.

Figure 5: How upset would you be if the leader invests less than the fair share?



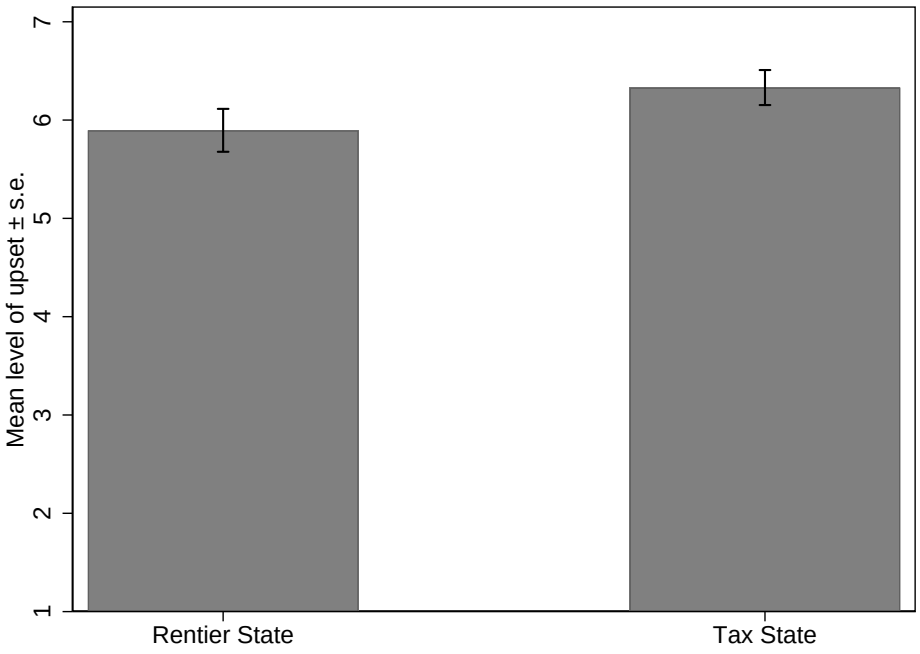
Note: The figure illustrates how citizens answered the question "How upset would you be if the leader invests less than the fair share, when both of you completed the assignment?" on a 11-point scale from "Not upset at all" (1) to "Very upset" (11). Each bar indicates the share of citizens that answered each of the numbers on the scale.

Figure 6: The willingness to punish and negative emotions



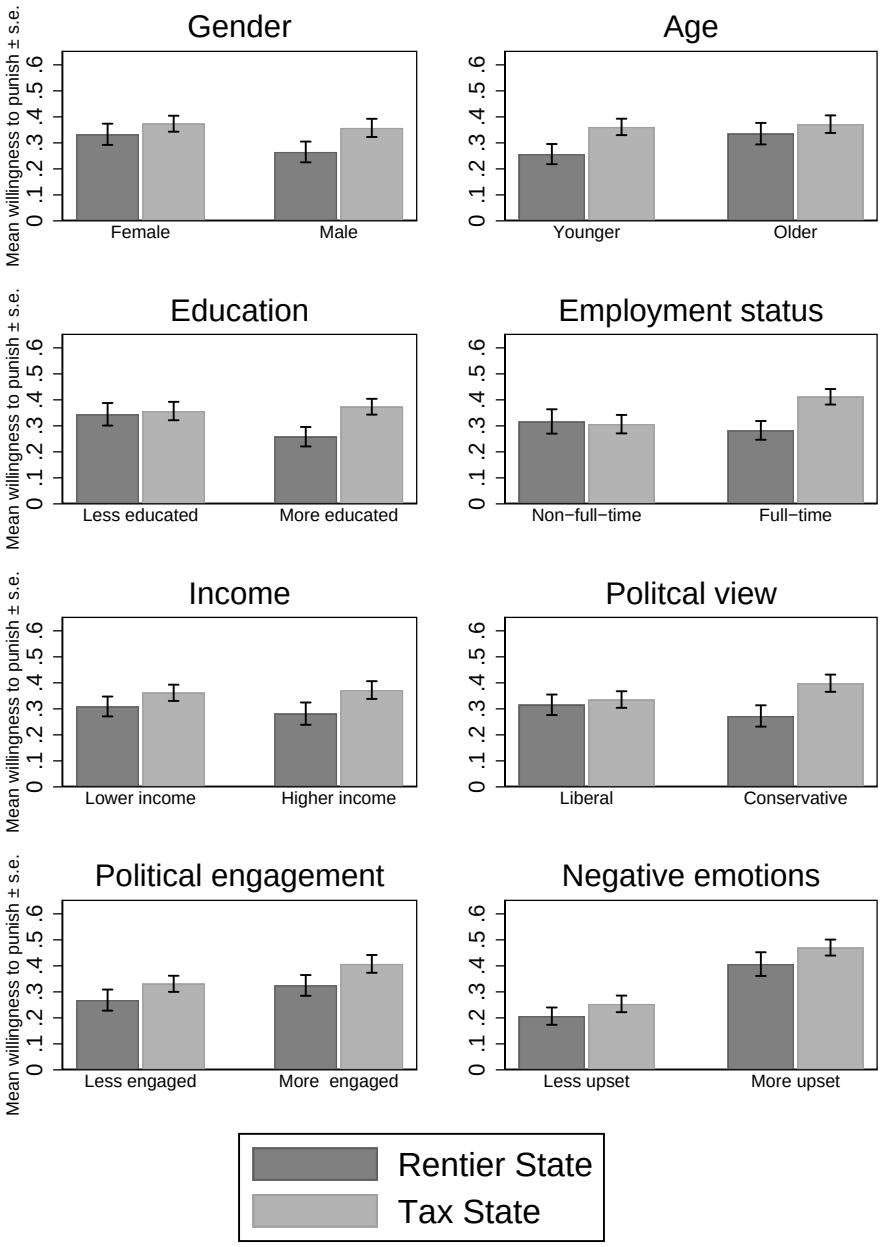
Note: **Left panel:** illustrates the mean willingness to punish and estimated standard error for citizens that would be less than median and citizens that would be more than median upset if the leader invests less than the fair share, respectively. **Right panel** illustrates the mean willingness to punish and estimated standard error for citizens according to their answer to the question "How upset would you be if the leader invests less than the fair share". Each bar illustrates the mean willingness to punish for that level of negative emotions.

Figure 7: Effect of taxation on negative emotions



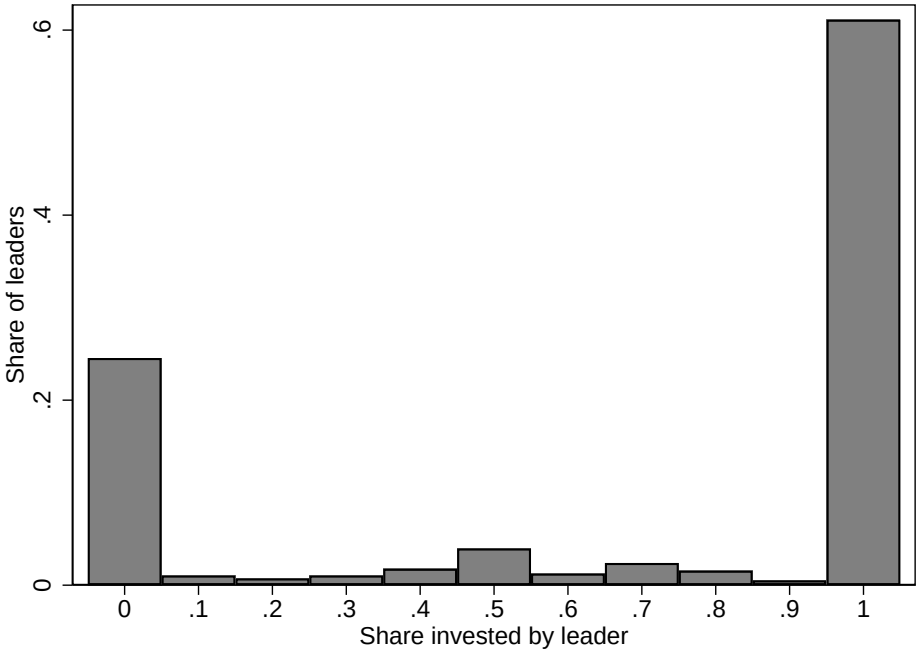
Note: The figure shows the mean values for how upset the citizen would be if the leader invest less than the fair share for the Rentier State and Tax State treatments, respectively. The variable is measured on a scale from 1 (Not upset at all) to 11 (Very upset). The figure also indicates the estimated standard errors.

Figure 8: Effect of taxation on the willingness to punish by subgroup



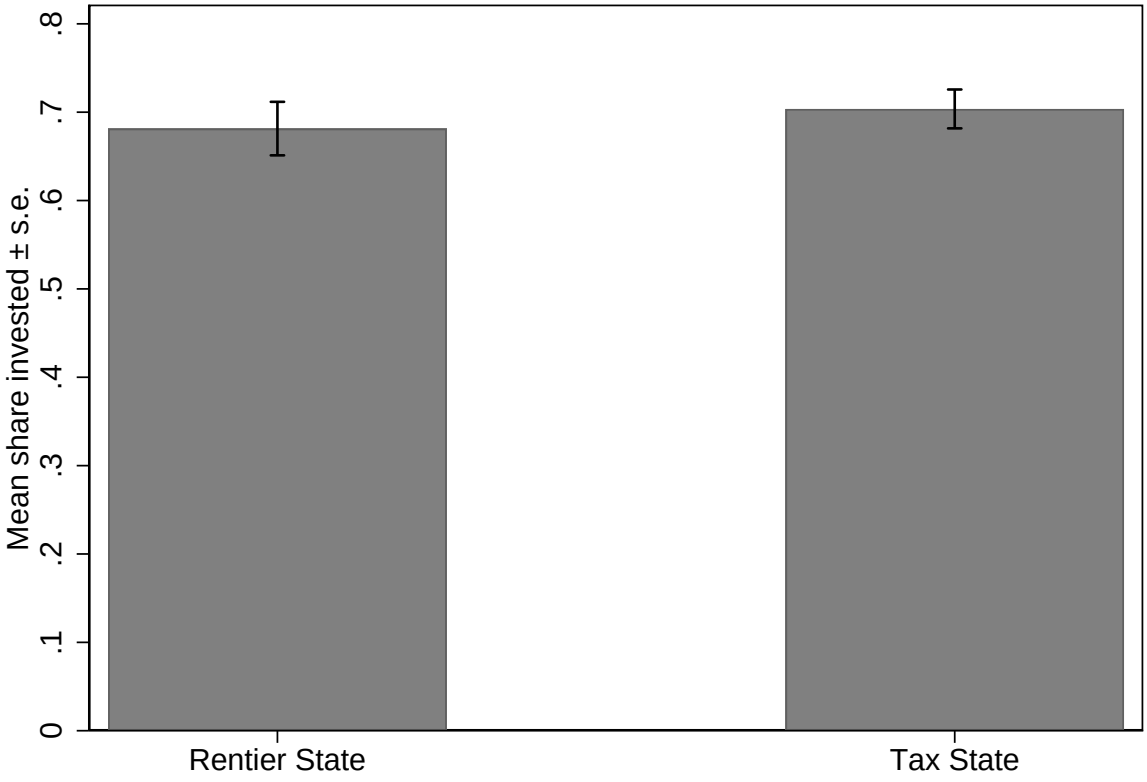
Note: The figure shows the mean willingness to punish and standard error for the Rentier State and Tax Treatments, by subgroups. "Male": indicator variable taking the value of 1 for males, "Above median age" indicator variable taking the value of 1 if individual is older than the median age of the sample (34 years), "Above median education": indicator taking the value of 1 for individuals who have a 4-year degree or higher education, "Employed full-time": indicator variable for individuals who are full-time employees, "Above median income": indicator variable taking the value of 1 for individuals that have an individual yearly income of USD 40 000 or more, "Conservative": indicator variable taking the value of 1 for individuals that rate themselves 6 or higher on a scale from 0 (strongly liberal) to 10 (strongly conservative), "More politically engaged": indicator variable taking the value of 1 for individuals that report to have participated in more than the median number (two) of political activities during the last year, and "More upset": indicator variable taking the value of 1 for individuals who report that they would be higher than median upset if the leader invests less than the fair share.

Figure 9: Distribution of share invested by leaders



Note: The figure shows the distribution of share the leaders invest in the common pool for the total sample. Each bar illustrates the share of leaders that made given investment in the common pool.

Figure 10: Effect of taxation on share invested by leaders



Note: The figure shows the mean share invested by leader and estimated standard errors by Rentier State and Tax State treatments.

Table 1: Background by treatment

	Windfall & Non-Tax	Hard Earned & Non-Tax	Windfall & Tax	Hard Earned & Tax	Total	F-test
Male	0.53	0.47	0.57	0.44	0.49	0.09
	(0.04)	(0.04)	(0.05)	(0.03)	(0.02)	
Above median age	0.50	0.46	0.46	0.49	0.48	0.72
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Above median education	0.56	0.53	0.56	0.57	0.56	0.69
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Employed full-time	0.60	0.58	0.56	0.57	0.58	0.96
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Above median income	0.47	0.51	0.46	0.46	0.47	0.60
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Conservative	0.45	0.41	0.34	0.49	0.44	0.01
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
More politically engaged	0.50	0.42	0.53	0.46	0.47	0.19
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Observations	163	158	134	284	739	

mean coefficients; semean in parentheses

Note: The table provides mean values for background characteristics in the four respective treatments and for the whole sample. The F-test column provides the p-value for an f-test of no difference in means between the four treatments. *Variables:* "Male": indicator variable taking the value of 1 for males, "Above median age" indicator variable taking the value of 1 if individual is older than the median age of the sample (34 years), "Above median education": indicator taking the value of 1 for individuals who have a 4-year degree or higher education, "Employed full-time": indicator variable for individuals who are full-time employees, "Above median income": indicator variable taking the value of 1 for individuals that have an individual yearly income of USD 40 000 or more, "Conservative": indicator variable taking the value of 1 for individuals that rate themselves 6 or higher on a scale from 0 (strongly liberal) to 10 (strongly conservative) and "More politically engaged" is an indicator variable taking the value of 1 for individuals that report to have participated in more than the median number (two) of political activities during the last year.

Table 2: Effect of negative emotions on the willingness to punish

	(1)	(2)	(3)	(4)	(5)	(6)
Above median upset	0.578***	0.572***	0.565***			
	(0.071)	(0.072)	(0.072)			
Upset				0.122***	0.121***	0.120***
				(0.011)	(0.011)	(0.011)
Male		–0.061	–0.059		–0.047	–0.046
		(0.066)	(0.066)		(0.065)	(0.065)
Above median age		0.031	0.028		0.056	0.052
		(0.072)	(0.072)		(0.070)	(0.070)
Above median education		–0.034	–0.037		–0.018	–0.021
		(0.076)	(0.077)		(0.074)	(0.075)
Employed full-time		0.114	0.116		0.111	0.113
		(0.078)	(0.078)		(0.076)	(0.076)
Above median income		–0.015	–0.015		–0.007	–0.008
		(0.080)	(0.080)		(0.077)	(0.077)
Conservative			0.011			0.014
			(0.074)			(0.072)
More politically engaged			0.066			0.059
			(0.073)			(0.071)
Constant	–0.282***	–0.303***	–0.334***	–0.743***	–0.793***	–0.820***
	(0.047)	(0.087)	(0.099)	(0.071)	(0.105)	(0.114)
Observations	739	739	739	739	739	739
R^2	0.084	0.087	0.088	0.127	0.131	0.132

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the standardized willingness to punish on negative emotions and a set of explanatory variables. Columns (1)-(3) include an indicator variable for above median negative emotions, "Above median upset" and Columns (4)-(6) includes "Upset", measured on a scale from 1 (not upset at all) to 11 (very upset). See Table 3 for definitions of background variables.

Table 3: Effect of taxation on the willingness to punish

	Willingness to punish			High punishment dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
Hard Earned	0.034	0.031	0.040	–0.006	–0.006	–0.010
	(0.107)	(0.107)	(0.108)	(0.102)	(0.102)	(0.102)
Tax	0.121	0.133	0.129	0.076	0.077	0.071
	(0.116)	(0.116)	(0.117)	(0.112)	(0.112)	(0.113)
Hard Earned x Tax	0.033	0.019	0.018	0.126	0.118	0.131
	(0.151)	(0.152)	(0.153)	(0.148)	(0.149)	(0.150)
Male		–0.113	–0.108		–0.046	–0.043
		(0.069)	(0.069)		(0.068)	(0.069)
Above median age		0.001	–0.003		0.007	0.013
		(0.074)	(0.074)		(0.075)	(0.075)
Above median education		–0.004	–0.013		0.077	0.070
		(0.080)	(0.080)		(0.081)	(0.083)
Employed full-time		0.137*	0.139*		–0.023	–0.027
		(0.081)	(0.081)		(0.080)	(0.079)
Above median income		0.006	0.007		–0.019	–0.014
		(0.084)	(0.084)		(0.085)	(0.085)
Conservative			0.006			–0.065
			(0.077)			(0.077)
More politically engaged			0.120			–0.013
			(0.076)			(0.075)
Constant	–0.101	–0.125	–0.185	–0.088	–0.087	–0.052
	(0.076)	(0.109)	(0.122)	(0.072)	(0.108)	(0.122)
Hard Earned + Tax + Hard Earned x Tax	0.188*	0.182*	0.186*	0.195**	0.189*	0.192**
	(0.098)	(0.098)	(0.098)	(0.097)	(0.097)	(0.097)
Hard Earned + Hard Earned x Tax	0.066	0.050	0.057	0.120	0.112	0.121
	(0.107)	(0.107)	(0.108)	(0.107)	(0.108)	(0.109)
Tax + Hard Earned x Tax	0.154	0.151	0.147	0.202**	0.195**	0.202**
	(0.097)	(0.097)	(0.098)	(0.097)	(0.097)	(0.097)
Observations	739	739	739	739	739	739
R^2	0.006	0.013	0.017	0.008	0.010	0.011

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the standardized value of willingness to punish on the treatment variables "Hard Earned" (indicator variable taking the value of one for individuals in the Hard Earned treatments (T2 and T4), "Tax" (indicator variable taking the value of 1 for individuals in the Tax treatments (T3 and T4)) and "Hard Earned x Tax" (interaction term between "Hard Earned" and "Tax") and a set of explanatory variables. Columns (1)-(3) show the results for the 11-point scale definition of willingness to punish (takes values 0.0, 0.1, 0.2,...,1). Columns (4)-(6) show the results for a dummy taking the value of one if the individual always punish, or punishes all, but the highest level of investment. "Male": indicator variable taking the value of 1 for males, "Above median age" indicator variable taking the value of 1 if individual is older than the median age of the sample (34 years), "Above median education": indicator taking the value of 1 for individuals who have a 4-year degree or higher education, "Employed full-time": indicator variables for individuals who are full-time employees, "Above median income": indicator variable taking the value of 1 for individuals that have an individual yearly income of USD 40 000 or more, "Conservative": indicator variable taking the value of 1 for individuals that rate themselves 6 or higher on a scale from 0 (strongly liberal) to 10 (strongly conservative) and "More politically engaged": indicator variable taking the value of 1 for individuals that report to have participated in more than the median number (2) of political activities during the last year. "Hard Earned + Tax + Hard Earned x Tax" is the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax". "Tax + Hard Earned x Tax" is the sum of the estimated parameters for "Tax" and "Hard Earned". "Hard Earned + Hard Earned x Tax" is the sum of estimated parameters for "Hard Earned" and "Hard Earned x Tax".

Table 4: Effect of taxation on negative emotions

	(1)	(2)
Hard Earned	–0.077	–0.082
	(0.109)	(0.108)
Tax	0.150	0.148
	(0.113)	(0.114)
Hard Earned x Tax	0.075	0.071
	(0.151)	(0.152)
Male		–0.193***
		(0.069)
Above median age		–0.162**
		(0.074)
Above median education		0.032
		(0.080)
Employed full-time		0.070
		(0.080)
Above median income		0.041
		(0.083)
Conservative		–0.009
		(0.077)
More politically engaged		0.168**
		(0.074)
Constant	–0.068	–0.043
	(0.075)	(0.116)
Hard Earned + Tax + Hard Earned x Tax	0.149	0.137
	(0.096)	(0.096)
Hard Earned + Hard Earned x Tax	–0.002	–0.011
	(0.105)	(0.106)
Tax + Hard Earned x Tax	0.226**	0.219**
	(0.100)	(0.100)
Observations	739	739
R^2	0.009	0.034

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of negative emotions ("How upset would you be if the leader invests less than the fair share?"), measured on a standardized 11-point scale, on the treatment variables "Hard Earned & Non-Tax" (indicator variable taking the value of one for individuals in the Hard Earned & Non-Tax treatment (T2), "Windfall & Tax" (indicator variable taking the value of one for individuals in the Windfall & Tax treatment (T3) and "Tax State" (indicator variable taking the value of one for citizens in the Tax State treatment) and a set of explanatory variables (see Table 3 for definitions).

Table 5: Effect of going from Rentier State to Tax State treatment on the willingness to punish for subgroups

	(1) Male	(2) Older	(3) Higher educ	(4) Full time	(5) Income	(6) Conserv.	(7) Pol. eng.	(8) Upset
Total, var = 0	0.127	0.256*	0.024	–0.039	0.136	0.036	0.145	0.126
	(0.133)	(0.134)	(0.149)	(0.157)	(0.133)	(0.135)	(0.138)	(0.125)
Total, var = 1	0.245*	0.119	0.311**	0.343***	0.243*	0.352**	0.233*	0.174
	(0.136)	(0.144)	(0.129)	(0.124)	(0.145)	(0.141)	(0.140)	(0.147)
Difference	0.117	–0.137	0.287	0.382*	0.107	0.316	0.088	0.048
	(0.183)	(0.197)	(0.197)	(0.200)	(0.197)	(0.195)	(0.197)	(0.194)
Background vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Political vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	739	739	739	739	739	739	739	739
R^2	0.018	0.021	0.028	0.022	0.019	0.024	0.021	0.092

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports the estimated regression coefficients for the effect of going from the Rentier State to the Tax State treatment on the standardized value of willingness to punish for different subgroups of the sample. "Total, Var = 0" is the estimated effect on subgroups for which the respective variables in the column headers take the value of zero (the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax" in Table D.1 in Appendix D), "Total, Var = 1" is the estimated effect on subgroups for which the respective variables in the column headers take the value of one (the sum of the estimated parameters for "Hard Earned", "Tax", "Hard Earned x Tax", "Hard Earned x Var", "Tax x Var" and "Hard Earned x Tax x Var" in Table D.1 in Appendix D) and "Difference" is the difference in estimated effect of the Tax State treatment between the subgroup for which "Var" takes the value of zero and subgroups for which "Var" takes the value of one (the sum of the estimated parameters for "Hard Earned x Var", "Tax x Var" and "Hard Earned x Tax x Var" in Table D.1 in Appendix D). "Upset": indicator taking the value of 1 for individuals who state they will be more upset than the median of the sample if the leader invests less than the fair share. See table 3 for explanation of the rest of the variables.

Table 6: Effect of taxation on share invested in the common pool (leaders)

	Share invested			High investment dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
Hard Earned	0.033	0.043	0.050	0.114	0.119	0.124
	(0.100)	(0.099)	(0.099)	(0.101)	(0.100)	(0.100)
Tax	–0.094	–0.099	–0.104	–0.040	–0.053	–0.059
	(0.103)	(0.105)	(0.105)	(0.105)	(0.106)	(0.106)
Hard Earned x Tax	0.113	0.114	0.117	0.034	0.040	0.045
	(0.136)	(0.135)	(0.135)	(0.136)	(0.135)	(0.135)
Male		–0.028	–0.035		0.044	0.037
		(0.065)	(0.064)		(0.064)	(0.063)
Above median age		0.227***	0.241***		0.275***	0.287***
		(0.065)	(0.065)		(0.065)	(0.065)
Above median education		0.100	0.074		0.088	0.060
		(0.068)	(0.068)		(0.067)	(0.067)
Employed full-time		–0.213***	–0.223***		–0.192***	–0.203***
		(0.070)	(0.070)		(0.070)	(0.070)
Above median income		–0.061	–0.053		–0.071	–0.066
		(0.073)	(0.072)		(0.072)	(0.071)
Conservative			–0.133**			–0.110*
			(0.067)			(0.066)
More politically engaged			0.131**			0.161**
			(0.066)			(0.066)
Constant	–0.009	–0.019	–0.012	–0.059	–0.123	–0.136
	(0.070)	(0.094)	(0.102)	(0.073)	(0.096)	(0.104)
Hard Earned + Tax + Hard Earned x Tax	0.052	0.058	0.062	0.108	0.105	0.109
	(0.087)	(0.086)	(0.086)	(0.089)	(0.088)	(0.088)
Hard Earned + Hard Earned x Tax	0.145	0.157*	0.167*	0.148	0.158*	0.169*
	(0.092)	(0.092)	(0.092)	(0.091)	(0.091)	(0.090)
Tax + Hard Earned x Tax	0.019	0.015	0.013	–0.006	–0.014	–0.014
	(0.088)	(0.086)	(0.085)	(0.086)	(0.085)	(0.084)
Observations	957	957	957	957	957	957
R^2	0.003	0.032	0.042	0.004	0.035	0.046

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the standardized value of share invested by the leader on the treatment variables "Hard Earned" (indicator variable taking the value of one for individuals in the Hard Earned treatments (T2 and T4)), "Tax" (indicator variable taking the value of one for individuals in the Tax treatments (T3 and T4)) and "Hard Earned x Tax" (interaction term between "Hard Earned" and "Tax") and a set of explanatory variables (see Table 3 for definitions of variables). Columns (1)-(3) show the results for the discrete definition of share invested (takes values 0.1, 0.2,...,1). Columns (4)-(6) show the results for a dummy taking the value of one if the citizen invests everything in the common pool. "Hard Earned + Tax + Hard Earned x Tax" is the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax". "Tax + Hard Earned x Tax" is the sum of the estimated parameters for "Tax" and "Hard Earned". "Hard Earned + Hard Earned x Tax" is the sum of estimated parameters for "Hard Earned" and "Hard Earned x Tax".

Appendix A Robustness, Hard Earned mechanism

The basic idea behind the Hard Earned mechanism is that the group endowment is generated by the citizen and the leader's performance of the real effort task. There are two possible ways to finance the group endowment through conduction of the real effort task while keeping the size of the group endowment and reward constant across treatments. First, the duration of the real effort task can be held constant and equal to five minutes, and the productivity of the real effort task can be increased from \$1 to \$2 going from the Windfall to the Hard Earned treatments. Second, the productivity of the real effort task can be held constant and equal to \$1 per minute, and the duration of the task can b increased from five to ten minutes between the Windfall and Hard Earned treatments.

In the main treatments, the former type of manipulation of the Hard Earned mechanism is used. To investigate whether the effect of taxation on the willingness to punish is sensitive to the way the Hard Earn mechanism is manipulated, a robustness treatment, "Tax State Extra Hard Earned" is implemented. The treatment is identical to the Rentier State treatment in all respects apart from the real effort task being ten minutes long in stead of five. The treatment can be summarized as follows:

> **Tax State Extra Hard Earned** (Extra Hard Earned & Tax (T4)): Citizen and leader each earn \$2 from performing a **10** minute real effort task. Their earnings are taxed at 50 percent. The \$1 tax collected from each finances the \$2 group endowment.

A.1 Empirical strategy

To test whether the Hard Earned mechanism is sensitive to whether the productivity or the duration of the task is manipulated, the following regression is estimated on a sample restricted to the two Tax State treatments:

$$y_i = \alpha + \beta^{\mathrm{T4b}}\mathrm{T4b}_i + \beta^X X_i + \beta^Z Z_i + \varepsilon_i, \tag{8}$$

where $\mathrm{T4b}_i$ and an indicator variable taking the value of one for citizens in the Tax State Extra Hard Earned treatment and zero for citizens in the Tax State treatment.

A.2 Results

Table A.1: Robustness check for Hard Earned mechanism

	(1)	(2)	(3)
Extra Hard Earned	0.038	0.038	0.068
	(0.123)	(0.123)	(0.122)
Male		–0.081	–0.106
		(0.132)	(0.131)
Above median age		0.076	0.050
		(0.125)	(0.124)
Above median education		0.007	0.023
		(0.130)	(0.130)
Employed full-time		0.354**	0.353**
		(0.141)	(0.142)
Above median income		–0.105	–0.100
		(0.142)	(0.142)
Conservative			0.263**
			(0.127)
More politically engaged			0.264**
			(0.127)
Constant	0.067	–0.092	–0.346**
	(0.088)	(0.154)	(0.174)
Observations	284	284	284
R^2	0.000	0.024	0.047

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions for the standardized willingness to punish variable on "Extra Hard Earned" an indicator variable taking the value of one for individuals in the Hard Earned treatment that worked 10 minutes instead of 5 minutes, and a range of background variables. The background variables are as defined in Table 1.

Appendix B Balance tables

Table B.1: Effect of treatments on background variables, citizens

	Male	Older	Higher educ	Full time	Higher income	Conservative	Pol. engaged
Hard Earned & Non-Tax	–0.053	–0.047	–0.027	–0.025	0.040	–0.043	–0.073
	(0.058)	(0.056)	(0.056)	(0.055)	(0.056)	(0.055)	(0.056)
Windfall & Tax	0.047	–0.048	0.001	–0.042	–0.004	–0.105*	0.033
	(0.068)	(0.058)	(0.058)	(0.058)	(0.058)	(0.057)	(0.058)
Tax State	–0.087*	–0.014	0.016	–0.031	–0.009	0.042	–0.032
	(0.051)	(0.049)	(0.049)	(0.048)	(0.049)	(0.049)	(0.049)
Constant	0.528***	0.503***	0.558***	0.601***	0.466***	0.448***	0.497***
	(0.042)	(0.039)	(0.039)	(0.038)	(0.039)	(0.039)	(0.039)
P-value of F-test	0.088*	0.718	0.694	0.961	0.602	0.012**	0.193

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table displays coefficients from estimated regressions of each of the background indicator variables as the dependent variable on indicator variables for the treatments (see Table 3 for definitions). The Rentier State treatment is the reference category. The reported p-values tests the hypothesis that all the treatments have the same effect on the background indicator variables.

Table B.2: Effect of treatments on background variables, citizens, worked and not worked

	Male	Older	Higher educ	Full time	Higher income	Conservative	Pol. engaged
Hard Earned & Non-Tax	–0.040	–0.025	–0.058	–0.022	0.054	–0.027	–0.091*
	(0.051)	(0.050)	(0.050)	(0.049)	(0.050)	(0.050)	(0.050)
Windfall & Tax	0.067	–0.071	–0.023	0.005	–0.001	–0.086*	–0.045
	(0.056)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
Tax State	–0.089**	–0.026	–0.017	–0.027	0.003	0.047	–0.051
	(0.045)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
Constant	0.515***	0.500***	0.574***	0.598***	0.456***	0.456***	0.505***
	(0.037)	(0.035)	(0.035)	(0.034)	(0.035)	(0.035)	(0.035)
P-value of F-test	0.007***	0.542	0.632	0.758	0.445	0.008***	0.583

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table displays coefficients from estimated regressions of each of the background indicator variables as the dependent variable on indicator variables for the treatments, on the total sample of citizens, i.e.. including citizens that chose not to work or who are identified as inconsistent switchers. The Rentier State treatment is the reference category. See Table 3 for definition of the variables. The reported p-values test the hypothesis that all the treatments have the same effect on the background indicator variables.

Table B.3: Preferences by treatments, citizens

	Windfall & Non-Tax	Hard Earned & Non-Tax	Windfall & Tax	Hard Earned & Tax	Total	P-value, F-test
Risk averse	0.52	0.47	0.53	0.55	0.52	0.35
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
More altruistic	0.38	0.34	0.33	0.28	0.32	0.37
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
High positive reciprocity	0.48	0.49	0.57	0.47	0.50	0.14
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
High negative reciprocity	0.44	0.46	0.47	0.55	0.49	0.11
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Loss averse	0.61	0.50	0.59	0.51	0.54	0.23
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Above median upset	0.45	0.43	0.53	0.52	0.49	0.13
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Observations	163	158	134	284	739	

mean coefficients; semean in parentheses

Note: The table provides mean values for preferences in the four respective treatments and for the whole sample. The F-test column provides the p-value for an f-test of no difference in means between the four treatments. "Risk averse": indicator variable taking the value of 1 for individuals answering a number lower than median reported (7) to the question *How willing or unwilling you are to take risks?* (0 = Completely unwilling, ..., 10 = Completely willing), and zero otherwise. "More altruistic": indicator variable taking the value of one for individuals answering a number higher than the median reported (9) to the question *How willing are you to give to good causes without expecting anything in return?* (0 = Completely unwilling, ..., 10 = Completely willing), and zero otherwise."High negative Reciprocity": indicator variable taking the value of one if negative reciprocity index is higher than the median. In accordance with Falk et al. (2015), the index for negative reciprocity was constructed using the following three items *If I am treated very unjustly, I will take revenge at the first occasion, even if it is a cost to do so* (0 = Strongly disagree, ..., 10 = Strongly agree (10)), *How willing are you to punish someone who treats you unfairly, even if there may be costs for you?* (0 = Completely unwilling, ..., 10 = Completely willing) and *How willing are you to punish someone who treats others unfairly, even if there may be costs for you?* (0 = Completely unwilling, ..., 10 = Completely willing). From these questions, the index was constructed as follows: negative reciprocity = 0.2631× Willingness to punish if oneself is treated unfairly + 0.2631× Willingness punish if other is treated unfairly + 0.3738× Willingness to take revenge. These weights were obtained by Falk et al. (2015) by running a regression of observed risk behavior in the lab on responses to these survey questions. "High positive reciprocity": indicator variable taking the value of 1 for individuals that answered a number higher than the median reported (10) to the question *When someone does me a favor, I am willing to return it* (0 = Strongly disagree, ..., 10 = Strongly agree), and zero otherwise. "Loss averse": indicator variable taking the value of one for individuals that to the following question *If you could choose between between the following hypothetical scenarios, which would you choose? 1. Lottery: win $80 with probability 1/2, lose $50 with probability 1/2 or 2. Receive $0 for sure* answer "2. Receive $0 for sure". "Above median upset": indicator variable taking the value of 1 for individuals answering a number higher than the median reported (6) to the question *How upset would you feel if the leader invests less than what you think is fair in the common pool?* (0 = Not upset at all, ..., 10 = Very upset). The reported p-values test the hypothesis that all the treatments have the same effect on the preference indicator variables.

Table B.4: Effect of treatments on preferences, citizens

	Risk averse	More altruistic	High pos. reci.	High neg. reci	Loss averse	More upset
Hard Earned & Non-Tax	–0.047	–0.045	0.009	0.020	–0.107*	–0.017
	(0.056)	(0.054)	(0.056)	(0.056)	(0.055)	(0.056)
Windfall & Tax	0.008	–0.052	0.090	0.035	–0.018	0.082
	(0.058)	(0.056)	(0.058)	(0.058)	(0.057)	(0.058)
Tax State	0.024	–0.102**	–0.013	0.114**	–0.097**	0.073
	(0.049)	(0.047)	(0.049)	(0.049)	(0.049)	(0.049)
Constant	0.521***	0.380***	0.485***	0.436***	0.607***	0.448***
	(0.039)	(0.038)	(0.039)	(0.039)	(0.038)	(0.039)
P-value of F-test	0.353	0.369	0.139	0.110	0.233	0.131

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table displays coefficients from estimated regressions of each of the preference indicator variables as the dependent variable on indicator variables for the treatments. The Rentier State treatment is the reference category. See Table B.3 for definition of the variables. The reported p-value tests the hypothesis that all the treatments have the same effect on the preference indicator variables.

Table B.5: Effect of treatments on decision to work

	(1)	(2)
Tax State	0.001	0.003
	(0.019)	(0.019)
Hard Earned & Non-Tax	0.029	0.032*
	(0.018)	(0.018)
Windfall & Tax	–0.062**	–0.059**
	(0.027)	(0.027)
Male		–0.010
		(0.014)
Above median age		0.027*
		(0.014)
Above median education		0.006
		(0.017)
Employed full-time		–0.011
		(0.016)
Above median income		0.004
		(0.018)
Conservative		–0.017
		(0.016)
More politically engaged		0.040***
		(0.015)
Constant	0.951***	0.932***
	(0.015)	(0.022)
P-value F-test	0.001***	0.001***
Observations	983	983
R^2	0.017	0.033

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Regressions showing the relationship between the decision to work (dependent variable is indicator variable taking the value of one for citizen who choose to work) and treatments. The Rentier State treatment is is the reference category in all regressions. "Tax State" is an indicator variable taking the value of one for individuals in the Tax State treatment, "Hard Earned & Non-Tax" is an indicator variable taking the value of one for individuals in the Hard Earned & Non-Tax treatment and "Windfall & Tax" is an indicator variable taking the value of one for individual in the Windfall & Non-Tax treatment. "P-value of F-test" reports the p-value for the test of "Tax State" = "Hard Earned & Non-Tax" = "Windfall & Tax". The background variables are as defined in Table 3.

Table B.6: Effect of treatments on inconsistent punishment behavior

	(1)	(2)
Tax State	0.079**	0.073**
	(0.034)	(0.035)
Hard Earned & Non-Tax	0.026	0.024
	(0.038)	(0.039)
Windfall & Tax	0.043	0.047
	(0.041)	(0.041)
Male		–0.040
		(0.025)
Above median age		–0.005
		(0.027)
Above median education		–0.020
		(0.029)
Employed full-time		0.027
		(0.030)
Above median income		–0.006
		(0.031)
Conservative		0.036
		(0.028)
More politically engaged		–0.009
		(0.027)
Constant	0.160***	0.170***
	(0.026)	(0.043)
P-value F-test	0.300	0.384
Observations	929	929
R^2	0.006	0.012

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Regressions showing the relationship between switching the wrong way (not punish low levels of investments and punish high levels of investments) or multiple times (dependent variable is indicator variable taking the value of one for citizens who switch the wrong way) and treatments. The Rentier State treatment is is the reference category in all regressions. "Tax State" is an indicator variable taking the value of one for individuals in the Tax State treatment, "Hard Earned & Non-Tax" is an indicator variable taking the value of one for individuals in the Hard Earned & Non-Tax treatment and "Windfall & Tax" is an indicator variable taking the value of one for individual in the Windfall & Non-Tax treatment."P-value of F-test" reports the p-value for the test of "Tax State" = "Hard Earned & No-Tax" = "Windfall & Tax". The background variables are as defined in Table 3.

Appendix C Deviations from Pre-Analysis Plan

C.1 Deviations from Pre-Analysis Plan

Theoretical framework
The theoretical framework presented in the paper states that taxation causes a higher demand for accountability through an increased salience of fairness. The framework presented in the pre-analysis plan included both the salience of fairness considerations and deviations from reference payoff.

Dependent variable
The dependent variable was defined as "Highest investment share not punished" in the pre-analysis plan, but is defined as "Highest investment share punished" in the specifications reported in the paper. The latter definition was chosen for pedagogical reasons, but does not qualitatively change the results. The results for the original definition of the dependent variable is reported in Table D.4.

Heterogeneity analysis
Employment status was not pre-specified as a dimension for the heterogeneity analysis in the pre-analysis plan, but results for this are presented in the paper. This is because the emission of employment status from the pre-analysis plan was not intentional.

In addition to socioeconomic background characteristics and negative emotions, the pre-analysis plan specified risk preferences, altruism, positive reciprocity, negative reciprocity and loss aversion as dimensions for the heterogeneity analysis. Table B.4 in Appendix B tests whether the citizens' preferences and negative emotions are affected by treatments, by regressing the respective preference and emotion measures on indicator variables for the Hard Earned & Non-Tax, the Windfall & Non-Tax and the Tax State treatment (Rentier State is the reference category). It shows that the Tax State treatment significantly reduces the citizens' self-reported altruism and loss aversion, and significantly increases negative reciprocity and there is therefore no heterogeneity analysis for these dimensions in the paper. There are no good theoretical reasons to expect heterogeneity in effects of taxation according to positive reciprocity and altruism and the analysis is not presented in the main paper, but can be found in Table D.7.

C.2 Additional analyses reported

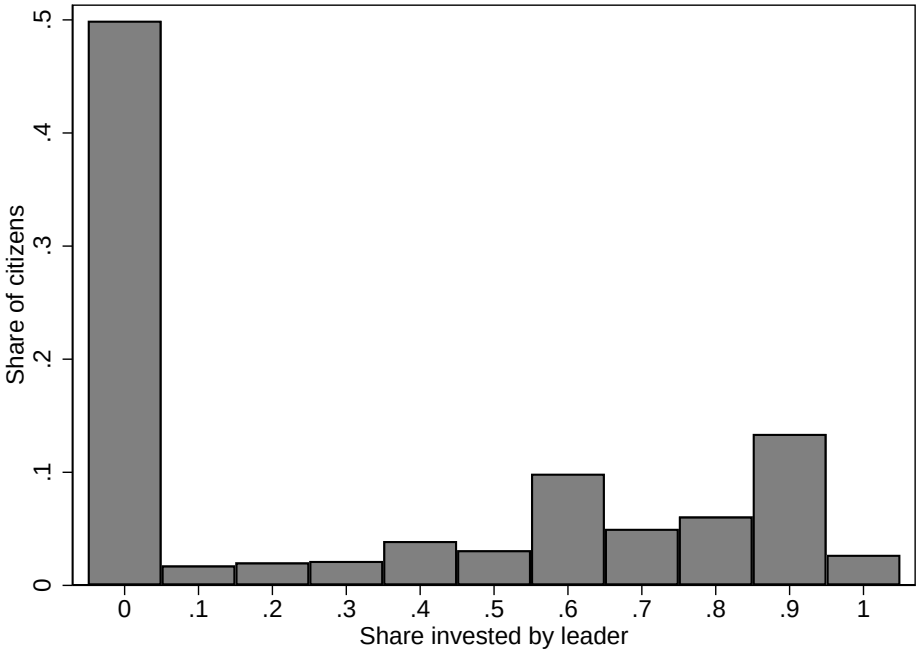
Citizen behavior
The following results are reported in the paper, but were not specified in the pre-analysis plan and should be considered exploratory.

- Regressions with binary dependent variable reported in Columns (4)-(6) in Table 3, and in Columns (1)-(3) in Table D.3

Leader behavior
The pre-analysis specified regressions to investigate the effect of the Hard Earned treatments on the share invested in the common pool in the leader. The paper additionally reports treatment effects of the Tax treatments.

Appendix D Additional figures and tables

Figure D.1: Distribution of the willingness to punish



Note: The figure illustrates the share of citizens that for each of the 11 possible investment levels punish that level as the highest.

Table D.1: Heterogeneity analysis

	(1) Male	(2) Older	(3) Higher educ	(4) Full-time	(5) Income	(6) Conservative	(7) Pol. engaged
Hard Earned	0.017	0.195	–0.045	–0.036	0.007	0.078	0.135
	(0.150)	(0.148)	(0.160)	(0.173)	(0.149)	(0.146)	(0.150)
Tax	0.052	0.289*	–0.243	–0.025	–0.004	0.105	0.078
	(0.158)	(0.158)	(0.169)	(0.180)	(0.160)	(0.152)	(0.168)
Var	–0.190	–0.005	–0.273*	–0.081	–0.101	–0.099	0.117
	(0.135)	(0.075)	(0.156)	(0.161)	(0.158)	(0.153)	(0.154)
HE x Tax	0.058	–0.228	0.312	0.022	0.133	–0.148	–0.068
	(0.208)	(0.208)	(0.223)	(0.237)	(0.211)	(0.201)	(0.214)
HE x Var	0.038	–0.323	0.144	0.122	0.072	–0.105	–0.227
	(0.203)	(0.216)	(0.216)	(0.221)	(0.217)	(0.216)	(0.217)
Tax x Var	0.140	–0.333	0.668***	0.260	0.287	0.035	0.099
	(0.187)	(0.233)	(0.231)	(0.237)	(0.233)	(0.237)	(0.234)
HE x Tax x Var	–0.061	0.519*	–0.526*	0.000	–0.253	0.386	0.217
	(0.272)	(0.304)	(0.304)	(0.310)	(0.306)	(0.307)	(0.307)
Constant	–0.139	–0.278**	–0.029	–0.058	–0.131	–0.138	–0.189
	(0.140)	(0.138)	(0.147)	(0.147)	(0.139)	(0.137)	(0.139)
Total, var = 0	0.127	0.256*	0.024	–0.039	0.136	0.036	0.145
	(0.133)	(0.134)	(0.149)	(0.157)	(0.133)	(0.135)	(0.138)
Total, var = 1	0.245*	0.119	0.311**	0.343***	0.243*	0.352**	0.233*
	(0.136)	(0.144)	(0.129)	(0.124)	(0.145)	(0.141)	(0.140)
Difference	0.117	–0.137	0.287	0.382*	0.107	0.316	0.088
	(0.183)	(0.197)	(0.197)	(0.200)	(0.197)	(0.195)	(0.197)
Background vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Political vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	739	739	739	739	739	739	739
R^2	0.018	0.021	0.028	0.022	0.019	0.024	0.021

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of standardized value of the willingness to punish on the treatment variables "Hard Earned" (indicator variable taking the value of one for individuals in the Hard Earned treatments (T2 and T4), "Tax" (indicator variable taking the value of one for individuals in the Tax treatments (T3 and T4)), "Hard Earned x Tax" (interaction term between "Hard Earned" and "Tax"), "Hard Earned x Var" (interaction term between "Hard Earned" and "Var"), "Tax x Var" (interaction term between "Tax" and "Var" and "Hard Earned x Tax x Var" (interaction term between "Hard Earned", "Tax" and "Var") and a set of explanatory variables (defined in Table 3). "Total, Var = 0" is the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax", "Total, Var = 1" is the sum of the estimated parameters for "Hard Earned", "Tax", "Hard Earned x Tax", "Hard Earned x'Var", "Tax x Var" and 'Hard Earned x Tax x Var", "Difference" is the sum of the estimated parameters for "Hard Earned x Var", "Tax x Var" and "Hard Earned x Tax x Var".

Table D.2: Heterogeneity, preferences and emotion

	(1)
Hard Earned	0.043
	(0.129)
Tax	0.025
	(0.145)
Above median upset	0.516***
	(0.152)
HE x Tax	0.058
	(0.192)
HE x Above median upset	0.012
	(0.213)
Tax x Above median upset	0.115
	(0.227)
HE x Tax x Above median upset	–0.079
	(0.296)
Constant	–0.392***
	(0.131)
Total, Var = 0	0.126
	(0.125)
Total, Var = 1	0.174
	(0.147)
Difference	0.048
	(0.194)
Background vars	Yes
Political vars	Yes
Observations	739
R^2	0.092

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of standardized value of the willingness to punish on the treatment variables (see Table D.1 for definitions of these and the interaction terms)and a set of explanatory variables (see Table 3 for definitions). "Upset": indicator taking the value of 1 for individuals who state they will be more upset than the median of the sample if the leader invests less than the fair share. "Total, Var = 0" is the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax", "Total, Var = 1" is the sum of the estimated parameters for "Hard Earned", "Tax", "Hard Earned x Tax", "Hard Earned x'Var", "Tax x Var" and 'Hard Earned x Tax x Var", "Difference" is the sum of the estimated parameters for "Hard Earned x Var", "Tax x Var" and "Hard Earned x Tax x Var".

Table D.3: Treatment effects on the willingness to punish: dummy for positive punishment

	Only consistent punishers			Total sample of citizens who worked		
	(1)	(2)	(3)	(4)	(5)	(6)
Hard Earned	0.070	0.058	0.072	0.086	0.071	0.085
	(0.112)	(0.112)	(0.113)	(0.103)	(0.103)	(0.103)
Tax	0.086	0.098	0.098	0.102	0.106	0.117
	(0.117)	(0.117)	(0.116)	(0.106)	(0.106)	(0.106)
Hard Earned x Tax	–0.076	–0.086	–0.097	–0.044	–0.053	–0.075
	(0.153)	(0.153)	(0.154)	(0.138)	(0.138)	(0.139)
Male		–0.175**	–0.172**		–0.188***	–0.189***
		(0.069)	(0.069)		(0.063)	(0.063)
Above median age		–0.092	–0.102		–0.083	–0.095
		(0.075)	(0.075)		(0.066)	(0.067)
Above median education		–0.038	–0.043		–0.061	–0.062
		(0.079)	(0.079)		(0.070)	(0.070)
Employed full-time		0.176**	0.182**		0.166**	0.172**
		(0.082)	(0.082)		(0.072)	(0.072)
Above median income		0.048	0.045		0.041	0.038
		(0.084)	(0.083)		(0.072)	(0.072)
Conservative			0.056			0.084
			(0.077)			(0.068)
More politically engaged			0.159**			0.122*
			(0.075)			(0.067)
Constant	–0.062	–0.030	–0.130	–0.094	–0.036	–0.132
	(0.079)	(0.110)	(0.122)	(0.073)	(0.099)	(0.111)
Hard Earned + Tax + Hard Earned x Tax	0.080	0.070	0.073	0.144	0.124	0.127
	(0.099)	(0.098)	(0.098)	0.089	0.089	0.089
Hard Earned + Hard Earned x Tax	–0.006	–0.027	–0.024	0.041	0.018	0.010
	(0.105)	(0.105)	(0.105)	(0.092)	(0.093)	(0.093)
Tax + Hard Earned x Tax	0.010	0.012	0.001	0.058	0.053	0.042
	(0.099)	(0.099)	(0.100)	0.088	0.088	0.089
Observations	739	739	739	929	929	929
R^2	0.001	0.018	0.024	0.003	0.019	0.023

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of a dummy taking the value of one for citizens that punish some investment and zero for citizens that never punish on the treatment variables "Hard Earned" (indicator variable taking the value of one for individuals in the Hard Earned treatments (T2 and T4)), "Tax" (indicator variable taking the value of one for individuals in the Tax treatments (T3 and T4)) and "Hard Earned x Tax" (interaction term between "Hard Earned" and "Tax") and a set of explanatory variables (see Table 3 for definitions). "Hard Earned + Tax + Hard Earned x Tax" is the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax". "Tax + Hard Earned x Tax" is the sum of the estimated parameters for "Tax" and "Hard Earned". "Hard Earned + Hard Earned x Tax" is the sum of estimated parameters for "Hard Earned" and "Hard Earned x Tax". Column (1) - (3) shows the regressions on the sample without the inconsistent punishers, and Column (4) - (6) shows the regressions on the sample including the inconsistent punishers.

Table D.4: Treatment effects on lowest investment share not punished

	(1)	(2)	(3)
Hard Earned	0.048	0.044	0.054
	(0.107)	(0.108)	(0.108)
Tax	0.128	0.139	0.136
	(0.116)	(0.116)	(0.117)
Hard Earned x Tax	0.002	–0.012	–0.014
	(0.152)	(0.152)	(0.153)
Male		–0.124*	–0.119*
		(0.069)	(0.069)
Above median age		–0.010	–0.016
		(0.074)	(0.074)
Above median education		–0.007	–0.015
		(0.080)	(0.080)
Employed full-time		0.143*	0.146*
		(0.081)	(0.081)
Above median income		0.006	0.006
		(0.084)	(0.084)
Conservative			0.011
			(0.077)
More politically engaged			0.130*
			(0.075)
Constant	–0.102	–0.116	–0.183
	(0.076)	(0.108)	(0.122)
Hard Earned + Tax + Hard Earned x Tax	0.178*	0.172*	0.176*
	(0.097)	(0.098)	(0.097)
Hard Earned + Hard Earned x Tax	0.050	0.032	0.040
	(0.107)	(0.108)	(0.108)
Tax + Hard Earned x Tax	0.130	0.128	0.122
	(0.098)	(0.098)	(0.098)
Observations	739	739	739
R^2	0.005	0.013	0.017

Robust standard errors in parentheses,* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of standardized value of willingness to punish, measured as the lowest share invested for which the citizen does not punish, on the treatment variables "Hard Earned" (indicator variable taking the value of one for individuals in the Hard Earned treatments (T2 and T4), "Tax" (indicator variable taking the value of one for individuals in the Tax treatments (T3 and T4)) and "Hard Earned x Tax" (interaction term between "Hard Earned" and "Tax") and a set of explanatory variables (see Table 3 for definitions). "Hard Earned + Tax + Hard Earned x Tax" is the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax". "Tax + Hard Earned x Tax" is the sum of the estimated parameters for "Tax" and "Hard Earned". "Hard Earned + Hard Earned x Tax" is the sum of estimated parameters for "Hard Earned" and "Hard Earned x Tax".

Table D.5: Heterogeneity regressions without controls

	(1) Male	(2) Older	(3) Higher educ	(4) Full time	(5) Income	(6) Conservative	(7) Pol. engaged
Hard Earned	–0.018	0.199	–0.047	–0.025	–0.014	0.078	0.158
	(0.148)	(0.147)	(0.159)	(0.172)	(0.147)	(0.144)	(0.148)
Tax	0.044	0.298*	–0.241	–0.027	–0.002	0.110	0.097
	(0.157)	(0.157)	(0.168)	(0.180)	(0.158)	(0.152)	(0.168)
Var	–0.200	0.210	–0.230	–0.092	–0.074	–0.115	0.151
	(0.133)	(0.151)	(0.153)	(0.157)	(0.153)	(0.152)	(0.152)
HE x Tax	0.075	–0.218	0.321	0.025	0.157	–0.134	–0.088
	(0.206)	(0.206)	(0.222)	(0.235)	(0.208)	(0.200)	(0.213)
HE x Var	0.087	–0.342	0.139	0.098	0.100	–0.121	–0.268
	(0.201)	(0.213)	(0.215)	(0.220)	(0.215)	(0.214)	(0.215)
Tax x Var	0.151	–0.367	0.648***	0.259	0.267	–0.002	0.036
	(0.188)	(0.232)	(0.229)	(0.236)	(0.232)	(0.237)	(0.232)
HE x Tax x Var	–0.081	0.527*	–0.513*	0.016	–0.265	0.406	0.286
	(0.271)	(0.303)	(0.302)	(0.307)	(0.303)	(0.307)	(0.303)
Constant	0.004	–0.207**	0.027	–0.046	–0.067	–0.050	–0.176
	(0.105)	(0.104)	(0.116)	(0.125)	(0.102)	(0.105)	(0.108)
HE + HE x Var	0.068	–0.143	0.092	0.073	0.086	–0.044	–0.110
	(0.145)	(0.154)	(0.144)	(0.137)	(0.157)	(0.159)	(0.156)
Tax + Tax x Var	0.195	–0.068	0.407***	0.232	0.265	0.108	0.133
	(0.142)	(0.171)	(0.155)	(0.152)	(0.170)	(0.183)	(0.160)
Total, var = 0	0.101	0.279**	0.034	–0.028	0.140	0.054	0.167
	(0.133)	(0.134)	(0.149)	(0.157)	(0.132)	(0.136)	(0.136)
Total, var = 1	0.258*	0.098	0.308**	0.345***	0.242*	0.337**	0.221
	(0.135)	(0.143)	(0.129)	(0.125)	(0.146)	(0.141)	(0.141)
Difference	0.157	–0.182	0.275	0.373*	0.102	0.282	0.054
	(0.182)	(0.195)	(0.197)	(0.200)	(0.197)	(0.196)	(0.196)
Observations	739	739	739	739	739	739	739
R^2	0.010	0.011	0.018	0.015	0.008	0.013	0.014

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of standardized value of the willingness to punish on the treatment variables "Hard Earned" (indicator variable taking the value of one for individuals in the Hard Earned treatments (T2 and T4), "Tax" (indicator variable taking the value of one for individuals in the Tax treatments (T3 and T4)), "Hard Earned x Tax" (interaction term between "Hard Earned" and "Tax"), "Hard Earned x Var" (interaction term between "Hard Earned" and "Var"), "Tax x Var" (interaction term between "Tax" and "Var" and "Hard Earned x Tax x Var" (interaction term between "Hard Earned", "Tax" and "Var"). "HE + HE x Var" is the sum of the estimated parameters for "Hard Earned" and "Hard Earned x Var", "Tax + Tax x Var" is the sum of the estimated parameters for "tax" and "Tax x Var", "Total, Var = 0" is the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax", "Total, Var = 1" is the sum of the estimated parameters for "Hard Earned", "Tax", "Hard Earned x Tax", "Hard Earned x'Var", "Tax x Var" and 'Hard Earned x Tax x Var", "Difference" is the sum of the estimated parameters for "Hard Earned x Var", "Tax x Var" and "Hard Earned x Tax x Var".

Table D.6: Heterogeneity regressions for negative emotions, without controls

	(1)
Hard Earned	0.047
	(0.128)
Tax	0.016
	(0.141)
Above median upset	0.535***
	(0.151)
HE x Tax	0.062
	(0.189)
HE x Above median upset	–0.011
	(0.211)
Tax x Above median upset	0.116
	(0.223)
HE x Tax x Above median upset	–0.061
	(0.293)
Constant	–0.341***
	(0.089)
HE + HE x Above median upset	0.037
	0.168
Tax + Tax x Above median upset	0.132
	0.172
Total, var = 0	0.126
	0.123
Total, var = 1	0.169
	0.147
Difference	0.044
	0.192
Observations	739
R^2	0.088

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of standardized value of the willingness to punish on the treatment variables "Hard Earned" (indicator variable taking the value of one for individuals in the Hard Earned treatments (T2 and T4)), "Tax" (indicator variable taking the value of one for individuals in the Tax treatments (T3 and T4)), "Hard Earned x Tax" (interaction term between "Hard Earned" and "Tax"), "Hard Earned x Var" (interaction term between "Hard Earned" and "Var"), "Tax x Var" (interaction term between "Tax" and "Var") and "Hard Earned x Tax x Var" (interaction term between "Hard Earned", "Tax" and "Var"). "HE + HE x Var" is the sum of the estimated parameters for "Hard Earned" and "Hard Earned x Var", "Tax + Tax x Var" is the sum of the estimated parameters for "tax" and "Tax x Var", "Total, Var = 0" is the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax", "Total, Var = 1" is the sum of the estimated parameters for "Hard Earned", "Tax", "Hard Earned x Tax", "Hard Earned x'Var", "Tax x Var" and 'Hard Earned x Tax x Var", "Difference" is the sum of the estimated parameters for "Hard Earned x Var", "Tax x Var" and "Hard Earned x Tax x Var".

Table D.7: Heterogeneity, preferences

	(1) Risk averse	(2) Positive reciprocity
Hard Earned	–0.037	0.255*
	(0.160)	(0.150)
Tax	0.207	0.309*
	(0.176)	(0.163)
Var	–0.135	0.237
	(0.153)	(0.155)
HE x Tax	–0.003	–0.297
	(0.226)	(0.215)
HE x Var	0.149	–0.442**
	(0.216)	(0.217)
Tax x Var	–0.143	–0.349
	(0.233)	(0.232)
HE x Tax x Var	0.032	0.625**
	(0.305)	(0.304)
Constant	–0.110	–0.297**
	(0.152)	(0.142)
HE + HE x Var	0.111	–0.187
	(0.146)	(0.157)
Tax + Tax x Var	0.064	–0.040
	(0.154)	(0.166)
Total, Var = 0	0.167	0.267**
	(0.147)	(0.133)
Total, Var = 1	0.206	0.102
	(0.131)	(0.144)
Difference	0.038	–0.165
	(0.197)	(0.197)
Background vars	Yes	Yes
Political vars	Yes	Yes
Observations	739	739
R^2	0.022	0.023

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of the standardized value of the willingness to punish on the treatment variables "Hard Earned" (indicator variable taking the value of one for individuals in the Hard Earned treatments (T2 and T4), "Tax" (indicator variable taking the value of one for individuals in the Tax treatments (T3 and T4)), "Hard Earned x Tax" (interaction term between "Hard Earned" and "Tax"), "Hard Earned x Var" (interaction term between "Hard Earned" and "Var"), "Tax x Var" (interaction term between "Tax" and "Var" and "Hard Earned x Tax x Var" (interaction term between "Hard Earned", "Tax" and "Var") and a set of explanatory variables. "Risk averse": indicator variable taking the value of 1 for individuals that are more than median risk averse, "Positive reciprocity" indicator variable taking the value of 1 if individual is more than median risk averse, "Upset": indicator taking the value of 1 for individuals who state they will be more upset than the median of the sample if the leader invests less than the fair share. "Total, Var = 0" is the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax", "Total, Var = 1" is the sum of the estimated parameters for "Hard Earned", "Tax", "Hard Earned x Tax", "Hard Earned x'Var", "Tax x Var" and 'Hard Earned x Tax x Var", "Difference" is the sum of the estimated parameters for "Hard Earned x Var", "Tax x Var" and "Hard Earned x Tax x Var".

Table D.8: Heterogeneity regressions with dummy as dependent variable with controls

	(1) Male	(2) Older	(3) Higher educ	(4) Full time	(5) Income	(6) Conservative	(7) Pol. engaged
Hard Earned	–0.019	0.072	0.048	–0.091	0.002	–0.042	0.047
	(0.145)	(0.141)	(0.156)	(0.171)	(0.144)	(0.143)	(0.146)
Tax	0.110	0.178	–0.025	–0.135	0.142	0.046	0.112
	(0.155)	(0.156)	(0.157)	(0.174)	(0.157)	(0.151)	(0.166)
Male	–0.049	0.097	0.019	–0.187	0.006	–0.151	–0.047
	(0.125)	(0.143)	(0.150)	(0.156)	(0.150)	(0.143)	(0.142)
HE x Tax	0.074	–0.049	0.106	0.318	0.032	0.110	–0.061
	(0.206)	(0.209)	(0.215)	(0.233)	(0.210)	(0.203)	(0.213)
HE x Var	0.019	–0.170	–0.112	0.136	–0.025	0.071	–0.139
	(0.191)	(0.204)	(0.205)	(0.213)	(0.207)	(0.201)	(0.202)
Tax x Var	–0.068	–0.226	0.173	0.356	–0.155	0.044	–0.075
	(0.169)	(0.223)	(0.223)	(0.229)	(0.224)	(0.221)	(0.223)
HE x Tax x Var	0.111	0.382	0.050	–0.325	0.215	0.050	0.415
	(0.258)	(0.296)	(0.297)	(0.304)	(0.301)	(0.294)	(0.298)
Constant	–0.045	–0.095	–0.027	0.033	–0.062	–0.013	–0.040
	(0.138)	(0.135)	(0.140)	(0.150)	(0.138)	(0.137)	(0.136)
Total, var = 0	0.164	0.201	0.129	0.092	0.176	0.115	0.097
	(0.136)	(0.130)	(0.144)	(0.163)	(0.133)	(0.139)	(0.132)
Total, var = 1	0.226*	0.186	0.240*	0.259**	0.211	0.280**	0.298**
	(0.132)	(0.144)	(0.132)	(0.120)	(0.144)	(0.133)	(0.142)
Difference	0.062	–0.015	0.111	0.167	0.035	0.165	0.201
	(0.183)	(0.193)	(0.195)	(0.202)	(0.196)	(0.191)	(0.193)
Background vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	739.	739	739	739	739	739	739
R^2	0.012	0.013	0.014	0.014	0.012	0.012	0.016

Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions of standardized value of the high punishment indicator variable (takes the value of one for individuals that punish shares invested of 0.9 or 1) on the treatment variables "Hard Earned" (indicator variable taking the value of one for individuals in the Hard Earned treatments (T2 and T4), "Tax" (indicator variable taking the value of one for individuals in the Tax treatments (T3 and T4)), "Hard Earned x Tax" (interaction term between "Hard Earned" and "Tax"), "Hard Earned x Var" (interaction term between "Hard Earned" and "Var"), "Tax x Var" (interaction term between "Tax" and "Var" and "Hard Earned x Tax x Var" (interaction term between "Hard Earned", "Tax" and "Var") and a set of explanatory variables (see Table 3 for definitions). "Total, Var = 0" is the sum of the estimated parameters for "Hard Earned", "Tax" and "Hard Earned x Tax", "Total, Var = 1" is the sum of the estimated parameters for "Hard Earned", "Tax", "Hard Earned x Tax", "Hard Earned x'Var", "Tax x Var" and 'Hard Earned x Tax x Var", "Difference" is the sum of the estimated parameters for "Hard Earned x Var", "Tax x Var" and "Hard Earned x Tax x Var".

Appendix E Testing the theoretical framework

E.1 Empirical specification

To further investigate the Possession mechanism, the effect of citizens having had the money in their possession is scrutinized in the loss and in the gain domain for leader investments separately. Two dependent variables are defined. First, $y_{i,\text{loss}}$ is the highest level of investments in the loss domain (a share of 0 - 0.6 of group endowment is invested) that the citizen punishes. This variable takes the value of 0.6 for both individuals that punish investments of 0.6 and higher and individuals that punish 0.6, but not higher. Second, $y_{i,\text{gain}}$ is the lowest investment in the gain domain (0.7 - 1 of group endowment invested) for which the citizen does not punish higher investments. This variable takes the value of 0.7 for both individuals that do not punish investments of 0.7 and individuals that punish investments of 0.7, but do no punish higher investments.

Different versions of the following equation are estimated:

$$y_i = \alpha + \beta^{\mathrm{T}}\text{Treatment}_i + \beta^X X_i + \beta^Z Z_i + \varepsilon_i. \tag{9}$$

The first four take $y_{i,\text{loss}}$ as the dependent variable. The first estimates Equation (9) for a sample limited to T1 and T3, where Treatment_i is an indicator variable taking the value of one for individuals in T3. The second estimates the equation for a sample limited to T2 and T4, where Treatment_i is an indicator variable taking the value of one for individuals in T4. The third estimates the equation for the total sample, where Treatment_i is an indicator variable taking the value of one for individuals in the two tax treatments, T3 and T4. The fourth estimates the equation for a sample restricted to T1 and T4, where Treatment_i is an indicator variable taking the value of one for individuals in T4. The last four versions take $y_{i,\text{gain}}$ as the dependent variable, but are otherwise similar to the first four.

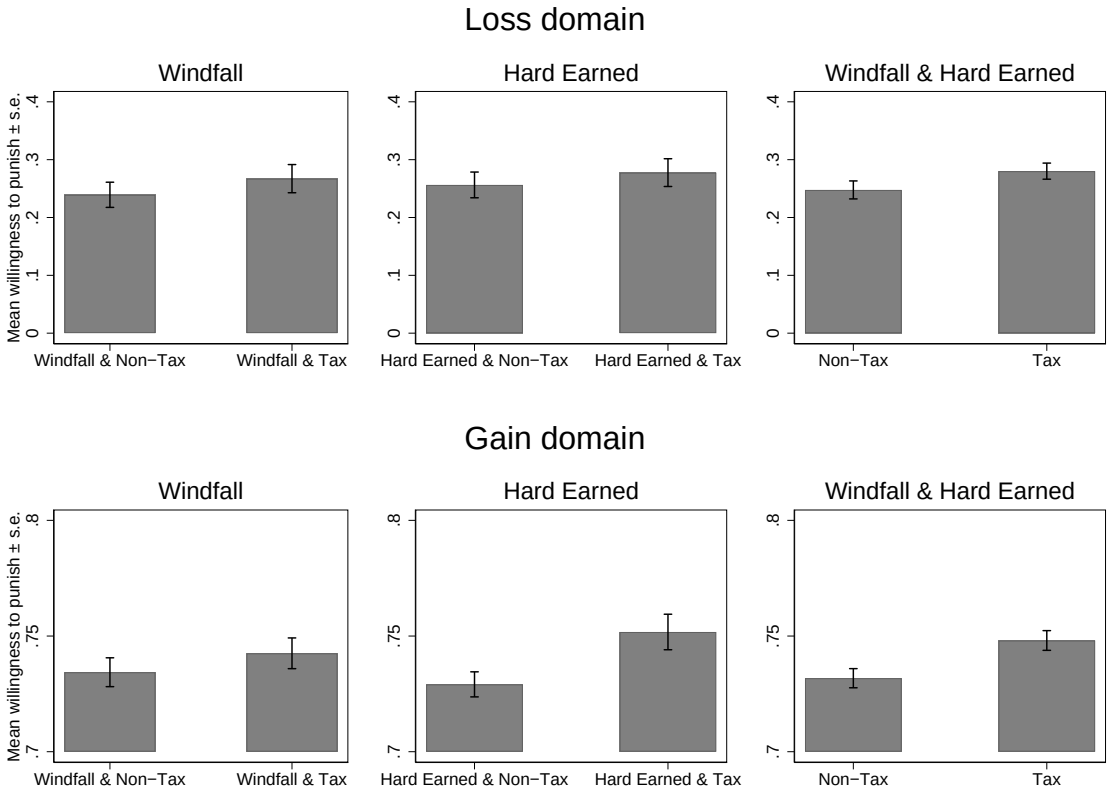
E.2 Results

The paper theorizes that the effect of taxation on demand for accountability can be explained by taxation causing fairness considerations to be more salient, which in turn makes citizens care more about, and more willing to punish, unfair government behavior. An alternative explanation is that citizens' willingness to punish the government is *reference dependent*, meaning that it is determined by their reference point for the government's behavior (Martin, 2016; Paler, 2013; Sandbu, 2006). More specifically, it could be theorized that citizens get a higher utility from punishing negative deviations from their reference point than from punishing positive deviations from their reference point, because negative deviations are perceived as losses (Kahneman and Tversky, 1979). Recent research argues that reference points are expectations-based (Köszegi and Rabin, 2006; 2007; 2009; Abeler et al., 2011; Marzilli Ericson and Fuster, 2011; Gill and Prowse, 2012; Banerji and Gupta, 2014), and the citizens' reference point can thus be modeled as expectations about what the government will do. Martin (2016) argues that the natural reference point for the citizens' expectations is their pre-tax income. Simplifying this theory, taxed citizens can be assumed to expect to receive benefits from the government equal to the tax they pay, whereas non-taxed citizens can be assumed to expect nothing. Thus, taxation causes a higher demand for accountability through increasing the citizens' expectations about the benefits the government will provide.

The present data can shed light on how well this simplified theory predicts willingness to punish by comparing behavior in Non-Tax to Tax-treatments. The theory predicts that citizens in the Tax treatments expect to get a monetary payoff equal to their pre-tax income, \$2. Their post-tax income is \$1, and the leader therefore has to invest a share of at least 0.7 of the \$2 group endowment in order for the citizen to get his pre-tax reference payoff. Citizens in the Non-Tax treatments, on the other hand, do not pay any tax, and their "pre-tax" income is \$1, which they get regardless of the leaders' investments. Thus, the leaders do not have to invest anything in order for the citizens to get their reference payoffs in the Non-Tax treatments. If the citizens' utility from punishment is higher for investments below the reference point, citizens in the Tax treatments should have a higher willingness to punish investment shares between 0 and 0.6 than citizens in the Non-Tax treatments, but there should be no difference in punishment behavior for investment shares of 0.7 and higher. This is because investment shares between 0 and 0.6 are below the reference point for citizens in the Tax treatments but above the reference point for citizens in the Non-tax treatments, whereas investments shares of 0.7 or higher are above the reference point for citizens in both Non-Tax and Tax treatments.

Figure E.1 illustrates the effect of going from a Non-Tax treatment to a Tax treatment on punishment of investments shares for which citizens in the Tax treatments are below their reference point (upper panel) and on punishment of investment shares for which all citizens are above their reference point (lower panel), respectively. Both panels show the effect for Windfall treatments only, for Hard Earned treatments only, and for the pooled sample of Windfall and Hard Earned treatments. The upper panel illustrates that going from a Non-Tax to Tax treatment increases willingness to punish investment shares that leave citizens in the Tax treatments below their reference point for Windfall treatments, but that the effect is not significant for any of the three comparisons. The lower panel shows that going from Non-Tax to Tax treatments increases punishment of investment shares that leave citizens in all treatments above their reference point and that the effect is significant for both the Hard Earned treatment and the pooled sample of Windfall and Hard Earned treatments. Tables E.1 and E.2 show that these results replicate in a regression framework. The finding that the Tax manipulation increases punishment of investments that leave citizens in both Tax and Non-Tax treatments above their reference point, but does not significantly affect punishment of investment levels that leave the citizens in the Tax treatments below their reference point does not support the reference dependent model. There are several possible interpretations of this result. For instance, the citizens' reference point may not be defined by their pre-tax income, punishment may not solely be determined by the reference point, but can also be influenced by other factors such as fairness and the utility from punishment may be not be zero, for positive deviations from the reference point.

Figure E.1: Effect of Tax treatments below and above reference point



Note: **Upper panel:** The figure shows the means and estimated standard errors for the willingness to punish investments where citizens in the tax treatments are below their reference point. The left panel illustrates the effect of taxation when the group endowment is windfall (p-value of t-test = 0.39), the middle panel illustrates the effect of taxation when the group endowment is hard earned (p-value of t-test = 0.51) and the right panel illustrates the effect of taxation for windfall and hard earned group endowments combined (p-value of t-test = 0.12). **Lower panel:** The figure shows the mean and estimated standard errors for the willingness to punish for levels of investments where citizens in all treatments are above their reference point. The left panel illustrates the effect of taxation when the group endowment is windfall (p-value of t-test = 0.37), the middle panel illustrates the effect of taxation when the group endowment is hard earned (p-value of t-test = 0.015), and the right panel illustrates the effect of taxation for windfall and hard earned group endowments combined.

E.3 Main analysis

Table E.1: Effect of Tax treatments for investment levels below reference point

	Windfall		Hard Earned		All	
	(1)	(2)	(3)	(4)	(5)	(6)
Tax	0.099	0.094	0.075	0.071	0.115	0.114
	(0.116)	(0.116)	(0.116)	(0.115)	(0.074)	(0.074)
Male		–0.112		–0.298**		–0.124*
		(0.100)		(0.119)		(0.069)
Above median age		–0.004		–0.156		–0.020
		(0.117)		(0.117)		(0.074)
Above median education		–0.014		–0.032		–0.031
		(0.126)		(0.127)		(0.079)
Employed full-time		0.047		0.319**		0.187**
		(0.125)		(0.138)		(0.082)
Above median income		0.064		–0.021		–0.007
		(0.130)		(0.139)		(0.084)
Conservative		–0.053		0.026		0.023
		(0.122)		(0.119)		(0.077)
More politically engaged		0.199*		0.022		0.138*
		(0.120)		(0.117)		(0.075)
Constant	–0.095	–0.159	–0.034	0.002	–0.065	–0.156
	(0.077)	(0.173)	(0.079)	(0.155)	(0.055)	(0.106)
Observations	297	297	301	301	739	739
R^2	0.002	0.021	0.001	0.041	0.003	0.018

Note: The table reports regressions where the dependent variable is the standardized value of the willingness to punish for investment levels that leaves the citizen below his or her reference point in the Tax treatment. Columns (1)-(6) present results for the discrete punishment variable . Columns (1)-(2) present results for a sample restricted to the Windfall treatments, Columns (3)-(4) present results for a sample restricted to the Hard Earned treatments and Columns (5)-(6) present results for the whole sample. "Tax" is an indicator variable taking the value of one for individuals in the tax treatments, Windfall & Tax and Hard Earned & Tax. See Table 3 for definitions of background variables.

Table E.2: Effect of Tax treatments for investment levels above reference point

	Willingness to punish						High punishment dummy					
	Windfall		Hard Earned		All		Windfall		Hard Earned		All	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Tax	0.100	0.090	0.276**	0.276**	0.199***	0.197***	0.076	0.068	0.188	0.199*	0.160**	0.158**
	(0.111)	(0.114)	(0.114)	(0.113)	(0.072)	(0.072)	(0.112)	(0.114)	(0.116)	(0.115)	(0.073)	(0.072)
Male		–0.093		–0.195*		–0.063		–0.088		–0.140		–0.050
		(0.088)		(0.116)		(0.067)		(0.089)		(0.120)		(0.068)
Above median age		0.032		–0.134		0.026		0.003		–0.122		0.014
		(0.110)		(0.114)		(0.074)		(0.112)		(0.115)		(0.075)
Above median education		0.103		–0.019		0.042		0.115		–0.031		0.072
		(0.127)		(0.126)		(0.082)		(0.127)		(0.129)		(0.083)
Employed full-time		–0.035		0.050		0.004		–0.015		–0.038		–0.025
		(0.117)		(0.121)		(0.079)		(0.120)		(0.124)		(0.079)
Above median income		0.017		0.034		0.031		–0.080		0.080		–0.015
		(0.136)		(0.140)		(0.086)		(0.135)		(0.136)		(0.085)
Conservative		–0.147		–0.000		–0.020		–0.143		–0.045		–0.056
		(0.118)		(0.116)		(0.078)		(0.112)		(0.118)		(0.076)
More politically engaged		–0.049		0.039		0.032		–0.106		0.006		–0.016
		(0.115)		(0.114)		(0.076)		(0.111)		(0.115)		(0.075)
Constant	–0.081	–0.002	–0.145**	–0.043	–0.112**	–0.140	–0.088	0.056	–0.094	0.042	–0.091*	–0.059
	(0.076)	(0.168)	(0.066)	(0.144)	(0.050)	(0.106)	(0.072)	(0.170)	(0.072)	(0.154)	(0.051)	(0.109)
Observations	297	297	301	301	739	739	297	297	301	301	739	739
R^2	0.003	0.015	0.020	0.033	0.010	0.012	0.002	0.016	0.009	0.018	0.006	0.009

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports regressions where the dependent variable is the standardized willingness to punish variable for investment levels that leaves the citizen above the reference point. Columns (1)-(6) present results for the discrete punishment variable. Column (7)-(12) presents results for the high punishment indicator variable. Columns (1)-(2) present results for a sample restricted to the Windfall treatments, Columns (3)-(4) present results for a sample restricted to the Hard Earned treatments and Columns (5)-(6) present results for the whole sample. "Tax" is an indicator variable taking the value of one for individuals in the tax treatments, Windfall & Tax and Hard Earned & Tax. See Table 3 for definitions of background variables.

Appendix F Leaders

Table F.1: Background by treatment, leaders

	Windfall & Non-Tax	Hard Earned & Non-Tax	Windfall & Tax	Hard Earned & Tax	Total	F-test
Male	0.43	0.49	0.52	0.54	0.50	0.59
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Above median age	0.48	0.50	0.51	0.50	0.50	0.98
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Above median education	0.55	0.60	0.49	0.54	0.55	0.11
	(0.04)	(0.03)	(0.04)	(0.03)	(0.02)	
Employed full time	0.54	0.61	0.50	0.57	0.56	0.09
	(0.04)	(0.03)	(0.04)	(0.03)	(0.02)	
Above median income	0.46	0.47	0.45	0.46	0.46	0.89
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Conservative	0.43	0.48	0.43	0.44	0.45	0.50
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
More politically engaged	0.47	0.49	0.49	0.45	0.47	0.57
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Observations	194	199	183	381	957	

mean coefficients; semean in parentheses

Note: The table provides mean values for background characteristics in the four respective treatments and for the whole sample. The F-test column provides the p-value for an f-test of no difference in means between the four treatments. See Table 3 for definitions of background variables.

Table F.2: Effect of treatment on background variables, leaders

	Male	Older	Higher educ	Full time	Higher income	Conservative	Pol. engaged
Hard Earned & Non-Tax	0.065	0.013	0.052	0.077	0.008	0.049	0.018
	(0.053)	(0.051)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
Windfall & Tax	0.091*	0.024	–0.055	–0.033	–0.016	–0.007	0.023
	(0.055)	(0.052)	(0.052)	(0.052)	(0.051)	(0.051)	(0.052)
Hard Earned & Tax	0.113**	0.017	–0.003	0.033	–0.005	0.008	–0.018
	(0.047)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
Constant	0.428***	0.485***	0.546***	0.536***	0.464***	0.433***	0.469***
	(0.038)	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
P-value of F-test	0.586	0.978	0.112	0.092	0.893	0.504	0.573

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table displays coefficients from estimated regressions of each of the background indicator variables as the dependent variable on indicator variables for the treatments for the leaders in the sample. The Rentier State treatment is the reference category. See Table 3 for definition of the variables. The reported p-values test the hypothesis that all the treatments have the same effect on the background indicator variables.

Table F.3: Preferences by treatment, leaders

	Windfall & Non-Tax	Hard Earned & Non-Tax	Windfall & Tax	Hard Earned & Tax	Total	F-test
Risk averse	0.47	0.46	0.53	0.45	0.47	0.21
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
More altruistic	0.42	0.32	0.34	0.31	0.34	0.72
	(0.04)	(0.03)	(0.04)	(0.02)	(0.02)	
High positive reciprocity	0.45	0.48	0.45	0.45	0.46	0.80
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
High negative reciprocity	0.54	0.48	0.56	0.49	0.51	0.10
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Loss averse	0.54	0.45	0.42	0.48	0.48	0.42
	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	
Observations	194	199	183	381	957	

mean coefficients; semean in parentheses

Note: The table provides mean values for preferences in the four respective treatments and for the whole sample of leaders. The F-test column provides the p-value for an f-test of no difference in means between the four treatments. See Table B.3 for definitions of variables.

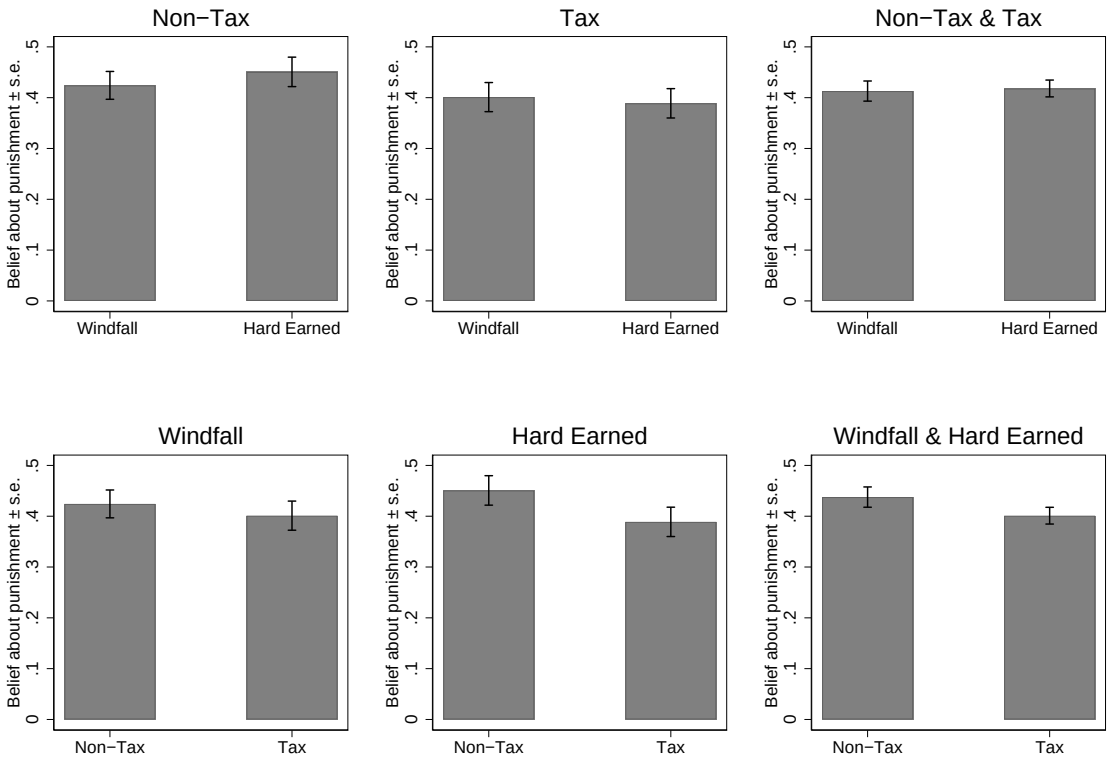
Table F.4: Effect of treatment on preferences, leaders

	Risk averse	More altruistic	High pos. reci.	High neg. reci.	Loss averse
Hard Earned & Non-Tax	–0.037	–0.106**	0.014	–0.049	–0.079
	(0.050)	(0.049)	(0.050)	(0.050)	(0.050)
Windfall & Tax	0.035	–0.078	–0.011	0.016	–0.099*
	(0.052)	(0.050)	(0.051)	(0.051)	(0.051)
Tax State	–0.041	–0.113***	–0.015	–0.079*	–0.043
	(0.044)	(0.043)	(0.044)	(0.044)	(0.044)
Constant	0.490***	0.423***	0.454***	0.546***	0.536***
	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
P-value of F-test	0.213	0.714	0.795	0.103	0.415

Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table displays coefficients from estimated regressions of each of the preference indicator variables for leaders as the dependent variable on indicator variables for the treatments. The Rentier State treatment is the reference category. See Table B.3 for definition of the variables. The reported p-value tests the hypothesis that all the treatments have the same effect on the preference indicator variables.

Figure F.1: Effect of treatments on leaders' beliefs about punishment

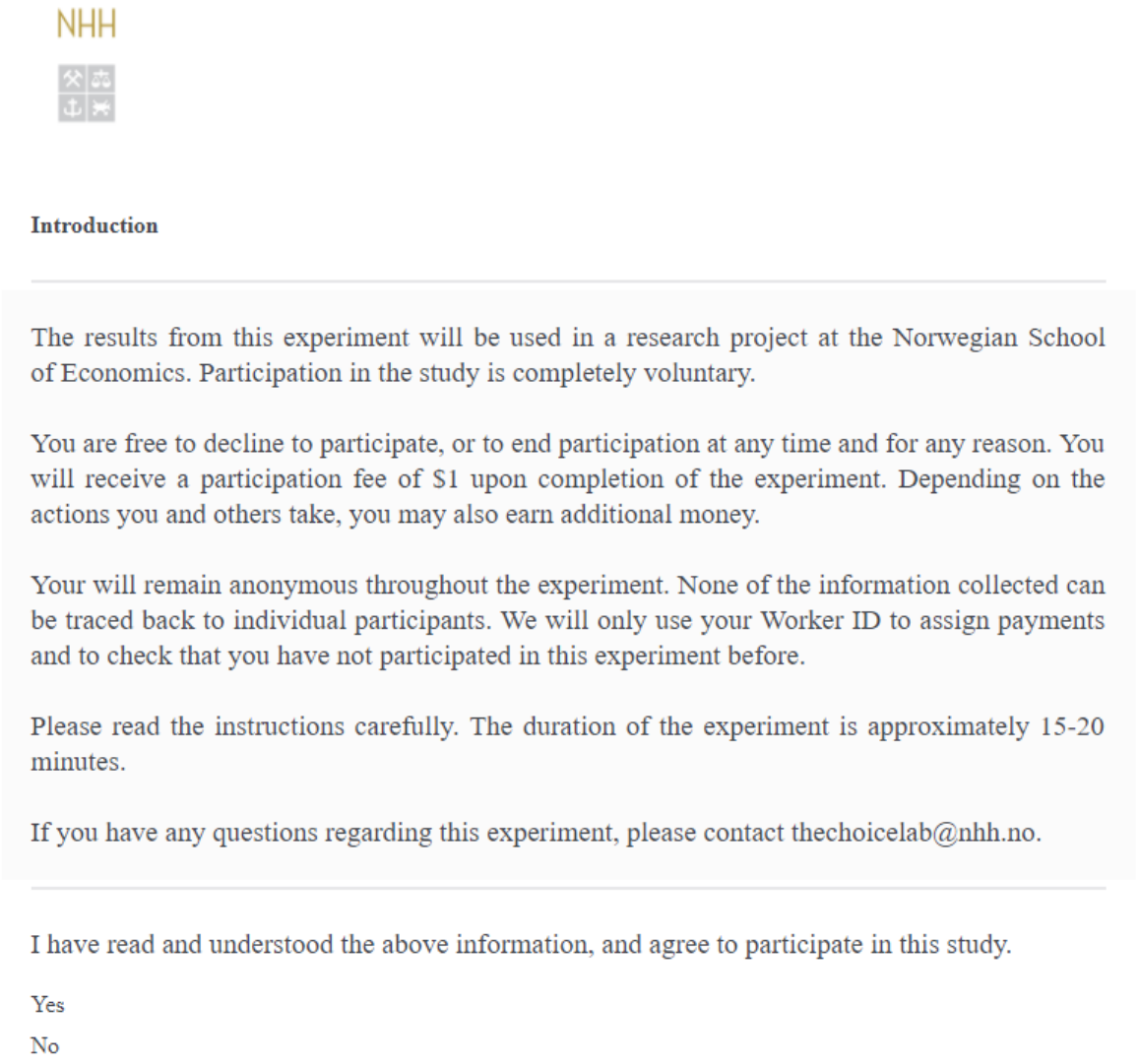


Note: The figure shows the mean and error bars for the lowest share invested invested the leader thinks the citizen does not punish. **Upper panel:** The left panel illustrates the effect of the Hard Earned treatment when the group endowment is given directly to the leader, the middle panel illustrates the effect of Hard Earned treatment when the group endowment is collected through tax, and the right panel illustrates the pooled effect of the Hard Earned treatment. **Lower panel:** The left panel illustrates the effect of the tax treatment when the group endowment is windfall, the middle panel illustrates the effect of the tax treatment when the group endowment is earned, and the right panel illustrates the pooled effect of the Tax treatment.

Appendix G Instructions

G.1 Introduction

Figure G.1: Introduction (all participants)



G.2 Role assignment

Figure G.2: Role assignment (all citizens)

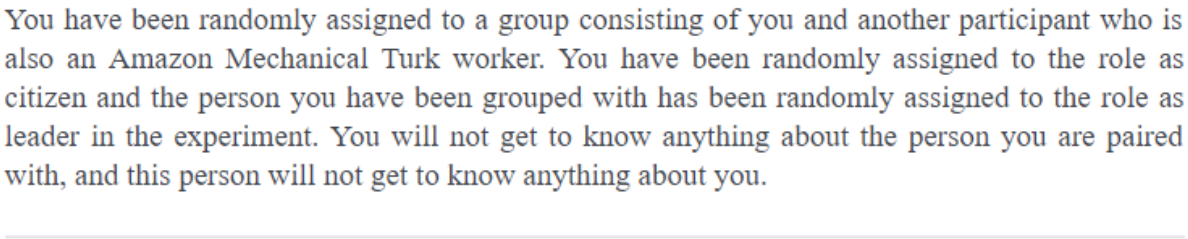
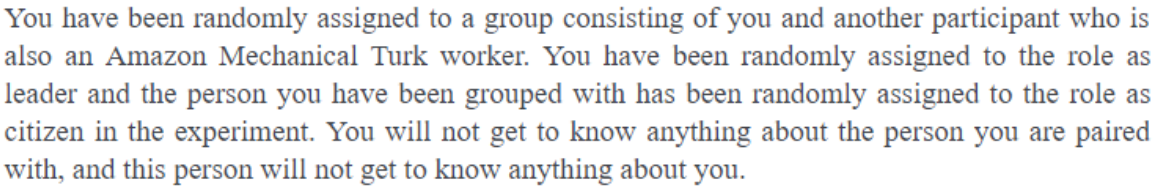


Figure G.3: Role assignment (all leaders)



G.3 Task description (citizens)

Figure G.4: Task description, Rentier State

You now get the opportunity to earn $1 by completing a 5-minute picture categorization assignment.

The leader you have been grouped with got the opportunity to complete the same assignment as you. **He or she chose to do so, and earned $1.**

Regardless of your and the leader's choice to complete the assignment or not, your group receives $2 in group money.

It is the task of the leader to decide how much of the group money to invest in a common pool. The amount invested in the common pool will be multiplied by 1.5 and shared equally between you and the leader. The remaining group money will be given to the leader.

Your total payment will consist of two parts:

1. Earnings ($1 if you choose to complete the assignment, $0 otherwise)
2. Half of the common pool ($0 - $1.5, depending on the leader's decision)

The leader's total payment will consist of three parts:

1. Earnings ($1 because he or she chose to complete the assignment)
2. Half of the common pool ($0 - $1.5, depending on the leader's decision)
3. The group money not invested in the common pool ($0 - $2, depending on the leader's decision)

Figure G.5: Task description, Hard Earned & Non-Tax

You now get the opportunity to earn $1 by completing a 5-minute picture categorization assignment. If you complete the assignment, your group receives $1 in group money.

The leader you have been grouped with got the opportunity to complete the same assignment as you. **He or she chose to do so, and earned $1. Because of the leader's completion of the assignment, your group receives $1 in group money.**

It is the task of the leader to decide how much of the group money to invest in a common pool. The amount invested in the common pool will be multiplied by 1.5 and shared equally between you and the leader. The remaining group money will be given to the leader.

Your total payment will consist of two parts:

1. Earnings ($1 if you choose to complete the assignment, $0 otherwise)
2. Half of the common pool ($0 - $1.5, depending on the leader's decision and the group money available)

The leader's total payment will consist of three parts:

1. Earnings ($1 because he or she chose to complete the assignment)
2. Half of the common pool ($0 - $1.5, depending on the leader's decision and the group money available)
3. The group money not invested in the common pool ($0 - $2, depending on the leader's decision and the group money available)

Figure G.6: Task description, Windfall & Tax

You now get the opportunity to earn $1 by completing a 5-minute picture categorization assignment. Regardless of whether you chose to complete the assignment, you additionally receive $1.

The leader you have been grouped with got the opportunity to complete the same assignment as you. **He or she chose to do so, and earned $1. In addition, the leader received $1, independent of his or her choice to complete the assignment.**

Your and the leader's total earnings (earnings from assignment + additional dollar received) will be taxed at 50%. It is the task of the leader to decide how much of the tax revenues collected to invest in a common pool. The amount invested in the common pool will be multiplied by 1.5 and shared equally between you and the leader. The remaining tax revenues will be given to the leader.

Your total payment will consist of two parts:

1. Post-tax earnings ($1 if you choose to complete the assignment, $0 otherwise)
2. Half of the common pool ($0 - $1.5, depending on the leader's decision and the tax revenues available)

The leader's total payment will consist of three parts:

1. Post-tax earnings ($1 because he or she chose to complete the assignment
2. Half of the common pool ($0 - $1.5, depending on the leader's decision and the tax revenues available)
3. The tax revenues not invested in the common pool ($0 - $2, depending on the leader's decision and the tax revenues available)

Figure G.7: Task description, Tax State

You now get the opportunity to earn $2 by completing a 5-minute picture categorization assignment.

The leader you have been grouped with got the opportunity to complete the same assignment as you. **He or she chose to do so, and earned $2.**

Your and the leader's earnings will be taxed at 50%. It is the task of the leader to decide how much of the tax revenues collected to invest in a common pool. The amount invested in the common pool will be multiplied by 1.5 and shared equally between you and the leader. The remaining tax revenues will be given to the leader.

Your total payment will consist of two parts:

1. Post-tax earnings ($1 if you choose to complete the assignment, $0 otherwise)
2. Half of the common pool ($0 - $1.5, depending on the leader's decision and the tax revenues available)

The leader's total payment will consist of three parts:

1. Post-tax earnings ($1 because he or she chose to complete the assignment)
2. Half of the common pool ($0 - $1.5, depending on the leader's decision and the tax revenues available)
3. The tax revenues not invested in the common pool ($0 - $2, depending on the leader's decision and the tax revenues available)

[Control questions]

G.4 Punishment decision

Figure G.8: Punishment decision, Rentier State

For completing the picture categorization assignment, you earn $1.

To confirm that you have understood how much you earn from completing the assignment, please enter the amount (without the dollar sign) in the box below.

The leader you have been grouped with also completed the picture categorization assignment and earned $1.

Your group receives $2 in group money unconditional on your or the leader's completion of the assignment.

The leader has been given the task of deciding how much of the group money to invest in the common pool. The leader gets the amount of group money not invested in the common pool.

You will be given the opportunity to reduce the leader's payment at a small cost. You can choose between:

1. Reduce leader's payment by $0.5 by paying $0.05.
2. Do nothing.

You will make this choice for each possible decision the leader can make about how much of the group money to invest in the common pool. We will implement your choice for the leader's actual decision.

You will not get to know the leader's decision until we pay out the additional payments from the experiment. This will be done as soon as possible and within 3 weeks of submission of the HIT.

We now ask you to make your decisions about what you would like to do for each of the possible decisions the leader can make. You can do one of the following:

1. Reduce leader's payment by \$0.5 by paying \$0.05.
2. Do nothing.

We will implement your choice for the leader's actual decision. The table below illustrates the payoff you and the leader will receive from the common pool for all possible decisions the leader can make. In the first row, you indicate what you want to do if the leader invests nothing in the common pool. In the intermediate rows, you indicate what you want to do when the leader invests intermediate amounts in the common pool. In the last row, you indicate what you want to do if the leader invests everything in the common pool.

Please indicate your decision for **all** the possible leader decisions.

	Do you want to reduce the leader's payment by \$0.5 by paying \$0.05?	
	Yes	No
\$0.0 (leader: \$2.00, YOU: \$0.00)	○	○
\$0.2 (leader: \$1.95, YOU: \$0.15)	○	○
\$0.4 (leader: \$1.90, YOU: \$0.30)	○	○
\$0.6 (leader: \$1.85, YOU: \$0.45)	○	○
\$0.8 (leader: \$1.80, YOU: \$0.60)	○	○
\$1.0 (leader: \$1.75, YOU: \$0.75)	○	○
\$1.2 (leader: \$1.70, YOU: \$0.90)	○	○
\$1.4 (leader: \$1.65, YOU: \$1.05)	○	○
\$1.6 (leader: \$1.60, YOU: \$1.20)	○	○
\$1.8 (leader: \$1.55, YOU: \$1.35)	○	○
\$2.0 (leader: \$1.50, YOU: \$1.50)	○	○