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Energieinvestitionen und heterogene Präferenzen

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Abstract

Investitionen in Energieeffizienz, wie beispielsweise energieeffizientes Bauen und Renovieren, können einerseits aus finanzieller Sicht des Investors sinnvoll sein, andererseits können sich solche Investitionen auch als positiv für die gesamte Gesellschaft erweisen. Die ersten beiden Studien dieses Schlussberichts untersuchen den öffentlichen Gut Aspekt von Energieinvestitionen in ökonomischen Entscheidungsexperimenten im Labor. Die dritte Studie geht der Frage nach, inwiefern Unterschiede in Energieinvestitionen Schweizer Hauseigentümer durch heterogene Präferenzen erklärt werden können. Die ersten beiden Studien zeigen, dass freiwillige Standards Transparenz über das Investitionsverhalten fördern und auf diese Weise Akteure zu mehr Investitionen bewegen können. Zudem erscheint Ungleichheit im Nutzen aus den Investitionen insbesondere zu pessimistischen Erwartungen über das Beitragsverhalten anderer zu führen. Die dritte Untersuchung mit 630 Schweizer Hauseigentümern zeigt, dass insbesondere Risiko und Zeitpräferenzen (Geduld), aber auch Einstellungen zu Umweltfragen eine Rolle für das Renovationsverhalten spielen.

Abstract

Investments in energy-saving measures, for instance improvements of energy efficiency in the house sector, benefit the investor, but also society. The first two studies included in this report investigate the public good aspects of energy investments in economic decision making experiments in the lab. The third study explores, whether heterogeneous preferences can explain differences in energy investments by Swiss homeowners. The first two studies show that voluntary standards can make investment behavior more transparent and thus can leads also to more investments. Additionally inequality among returns from investments leads to mainly to more pessimistic beliefs about others contribution behavior. The third study with 630 Swiss homeowners shows that in particular risk and time preferences but also environmental preferences play a crucial role for renovation behavior.

Zusammenfassung

Investitionen in Energieeffizienz, wie beispielsweise energieeffizientes Bauen und Renovieren, können einerseits aus finanzieller Sicht des Investors sinnvoll sein, andererseits können sich solche Investitionen auch als positiv für die gesamte Gesellschaft erweisen. Es stellt sich die Frage, weshalb Leute Investitionen in die Förderung von Energieeffizienz tatsächlich tätigen. Wir tragen mit dem Projekt ***Energieinvestitionen und heterogene Präferenzen*** dazu bei, die Motive von Personen, die in energieeffiziente Baumassnahmen investieren, besser zu verstehen.

Ziel des Projektes ist es, zu ermitteln, ob Personen nur dann in Energieeffizienz investieren, wenn diese Investitionen auch von finanziellem Vorteil für sie selbst sind, oder ob andere Motive ebenfalls eine Rolle spielen:

- Welche Rolle spielen **Risikobereitschaft, Geduld** und **Großzügigkeit** der Investoren?
- Beeinflussen **Einstellungen zu Umweltfragen,** ob in Energieeffizienz investiert wird?
- Investieren Personen in Energieeffizienz, weil andere Personen im Umfeld ähnlich handeln (**bedingte Kooperation, Vermeidung von Ungleichheit**)?

Um diese Fragen zu beantworten, kombinieren wir Methoden der Verhaltensökonomik mit klassischen Umfragen in einer umfangreichen Studie. Die Studie lässt sich dabei in zwei Teile untergliedern.

Teil 1: Laborexperimente (Abschnitte 1 und 2)

Der erste Teil der Studie besteht aus ökonomischen Verhaltensexperimenten im Labor. Die Studienteilnehmer wurden in eine **Dilemma-Situation** versetzt, die der Problematik des öffentlichen Gut Aspekts von Investitionen in **Energieeffizienz** nahe kommt. Konkret mussten die Teilnehmer darüber entscheiden, Geld in ein gemeinsames Projekt zu investieren oder das Geld für sich selbst zu behalten. Vom gemeinsamen Projekt profitierten alle Teilnehmer, auch diejenigen, die nichts investierten. Insgesamt wäre es für alle Teilnehmer am besten gewesen, das gesamte Geld in das Projekt zu investieren, jedoch erreichte jeder Teilnehmer individuell die grösste Auszahlung, wenn er nichts in das gemeinsame Projekt investierte. Im Vordergrund der Laborexperimente standen dabei zwei Fragestellungen:

- Wie müssen freiwillige Standards gestaltet sein, um Anreize für Investitionen in das in Energieeffizienz zu schaffen?
- Wie verändert sich die Beitragsbereitschaft, wenn Individuen von den getätigten Investitionen unterschiedlich profitieren oder Unsicherheit über den eigenen Nutzen aus den Investitionen besteht?

Die erste Fragestellung befasst sich mit der Funktion und Ausgestaltung von freiwilligen Standards. **Beiträge zur Energieeffizienz** sind oftmals nur **schlecht sichtbar**. Insbesondere wenn das Zusammentragen von Information aufwendig und kostspielig ist, können **Standards** dafür sorgen, dass solche Investitionen nicht im Verborgenen bleiben. Da viele Menschen bedingt kooperativ sind (siehe z.B. Fischbacher et al. 2001), kann die **Bereitstellung von Information** über das Kooperationsverhalten anderer entscheidend dazu beitragen, dass **mehr Investitionen** getätigt werden.

Die Resultate aus dem Experiment zeigen: Das **Anforderungsniveau eines Standards spielt eine entscheidende Rolle für den Erfolg** des Standards**.** Ein niedriges Anforderungsniveau führt zu geringen Investitionen. Ein hohes Anforderungsniveau steigert zwar von den meisten Teilnehmern geleistete Investition, sorgt aber gleichzeitig dafür, dass der Standard seltener erreicht wird. Da viele Teilnehmer bereit sind, den Standard insbesondere dann zu erfüllen, wenn andere dies auch tun (und zwar unabhängig vom Anforderungsniveau), muss das Anforderungsniveau eines Standards vor diesem Hintergrund abgewägt werden.

Die zweite Fragestellung befasst sich mit der Tatsache, dass unterschiedliche **Individuen** von Investitionen in Energieeffizienz (z.B. von sauberer Luft, guter Wasserqualität, oder geringerem CO_2 -Ausstoss) **unterschiedlich stark profitieren** und zudem oftmals **Unsicherheit über** den **eigenen Nutzen** aus den Investitionen besteht. Sofern das Motiv zur Leistung des eigenen Beitrags die Vermeidung von Ungleichheit ist, würde man erwarten, dass Ungleichheit im Nutzen aus Investitionen in Energieeffizienz dazu führt, dass Individuen deutlich geringere Beiträge investieren. Unsicherheit über den eigenen Nutzen könnte ebenfalls zu einer deutlichen Reduktion der Investitionen führen.

Die **Ergebnisse** aus den Laborexperimenten **zeigen**, **dass Investitionen** in das gemeinsame Projekt im Experiment **bei Ungleichheit** deutlich **zurück gehen**. Interessanterweise scheint dies aber **kein genereller Rückgang der**

Beitragsbereitschaft zu sein, sondern hauptsächlich **ein Rückgang,** der **durch pessimistischere Erwartungen** über das Beitragsverhalten der jeweils anderen Gesellschaftsmitglieder ausgelöst wird. Die Ergebnisse zeigen ferner, dass **Unsicherheit über den eigenen Nutzen** (bei Ungleichheit) **nur eine geringfügige Reduktion der Investitionen** verursacht.

Teil 2: Umfrage & Experimente mit Schweizer Gebäudeeigentümern (Abschnitt 3)

Im zweiten Teil wurden aufbauend auf den Erkenntnissen aus den Laborexperimenten Eigentümer von Einfamilienhäusern in der Deutschschweiz kontaktiert, um deren Investitionstätigkeiten in Energieeffizienz besser zu verstehen. Im Fokus stand hierbei die **Identifikation der Determinanten von Investitionen in Energieeffizienz.** Erhoben wurden Daten aus allen Kantonen der Deutschschweiz. Die Gesamterhebung besteht aus zwei Erhebungswellen, wobei die erste Welle im Kanton Zürich mit Hilfe der Gebäudeversicherung Zürich (GVZ) durchgeführt wurde. Die zweite Erhebungswelle wurde in der Deutschschweiz ausserhalb des Kantons Zürich durchgeführt. Diese Eigentümer wurden direkt durch das Thurgauer Wirtschaftsinstitut kontaktiert. Insgesamt umfasst die Analyse 630 Hauseigentümer, davon 271 aus dem Kanton Zürich und 359 aus anderen Kantonen. Unter letzteren finden sich auch 63 Hauseigentümer, die explizit kontaktiert wurden, da sie ihr Gebäude gemäß einem Minergie Standard renoviert haben.

Die Teilnehmer hatten einen umfangreichen Fragebogen zu Investitionen an ihrem Wohneigentum zu beantworten. Zusätzlich trafen die Gebäudeeigentümer Entscheidungen in verschiedenen ökonomischen Experimenten, die eine **Messung von Risikoeinstellung, Zeitpräferenzen, Umweltpräferenzen** sowie **Grosszügigkeit**, und **Ungleichheitsaversion** ermöglichten.

Unsere **Ergebnisse** zeigen, dass insbesondere Risiko und Zeitpräferenzen, aber auch Einstellungen zu Umweltfragen eine Rolle für das Renovationsverhalten spielen:

(1) Risikobereite Hauseigentümer führen mit höherer Wahrscheinlichkeit Renovationen durch.
(2) Zukunftsorientierte Eigentümer, die ihr Haus bereits renoviert haben, besitzen Häuser mit einer besseren Qualität hinsichtlich der Energieeffizienz und verursachen geringere Heiz- und Energiekosten.

(3) Hauseigentümer mit stark ausgeprägten Umweltpräferenzen renovieren mit höherer Wahrscheinlichkeit gemäß einem Minergie Standard und haben geringere Energie- und Heizkosten.

Unsere Ergebnisse ermöglichen ein besseres Verständnis von Investitionen in Massnahmen zur Verbesserung der Energieeffizienz. Während Investitionen in Energieeffizienz sowohl privaten Nutzen als auch öffentlichen Nutzen (eine geringere Belastung der Umwelt) generieren, deuten unsere Analysen darauf hin, dass der private Nutzen aus derlei Investitionen grundsätzlich im Vordergrund steht. Als grösstes Hindernis für Renovationen identifizieren wir die Tatsache, dass die Ersparnisse aus energetischen Renovationen unsicher sind und in der Zukunft liegen, während die Kosten in der Gegenwart auftreten. Ergebnis (1) verdeutlicht, dass Renovationen als risikobehaftete Investitionen verstanden werden. Ergebnis (2) zeigt, dass, gegeben man geht das Risiko einer Renovation ein, insbesondere die Zeitpräferenzen für die Qualität der Renovation eine Rolle spielt. Die Energieeffizienz der Häuser derjenigen Eigentümer, die mindestens eine Renovation unternommen haben, ist für zukunftsorientierte Hauseigentümer deutlich höher. Ergebnis (3) verdeutlicht zudem die Wichtigkeit von Umwelteinstellungen. Eigentümer mit stark ausgeprägten Umweltpräferenzen sind tatsächlich häufiger bereit, ihr Haus gemäss einem Minergie Standard zu renovieren.

Energiepolitische Folgerungen

Aus den empirischen Ergebnissen lassen sich erste energiepolitische Folgerungen ableiten. Wir untergliedern diese in drei Strategien:

- **Freiwillige Standards**

  Die Laborexperimente haben gezeigt, dass freiwillige Standards helfen können, die Investitionstätigkeit in Energieeffizienz sichtbar zu machen. Durch freiwillige Standards kann es gelingen, Investitionen in (teils) öffentliche Güter von bedingt kooperativen Personen zu fördern. Allerdings sollten freiwillige Standards relativ hohe Anforderungen zu ihrer Erreichung stellen. In der Praxis kann als ein erfolgreiches Beispiel der Minergie Standard für Gebäude genannt werden, der Investitionen transparenter macht und ein hohes Energieeffizienzniveau garantiert. Dies führt dazu, dass nicht nur mehr Klarheit über die individuellen Einsparungen durch Renovationen geschaffen wird, sondern auch mehr

Transparenz bezüglich Energieeffizienz von Renovationen entsteht, die insbesondere umweltbewusste Menschen davon überzeugen kann, energetische Renovationen vorzunehmen.

- **Kommunikationspolitik**

  Die Laborexperimente haben gezeigt, dass Ungleichheiten im Nutzen aus Investitionen in öffentliche Güter (z.B. Energieinvestitionen) nicht die generelle Beitragsbereitschaft senken, sondern in erster Linie die Erwartung in die Beitragsbereitschaft anderer beeinflussen. Daher kann eine entsprechende Kommunikationspolitik dafür sorgen, dass trotz der Ungleichheit Investitionen getätigt werden. Die Feldstudie hat verdeutlicht, dass insbesondere die Risikobereitschaft für den Entscheid einer Renovation eine Rolle spielt. Daher kann eine politische Maßnahme darin bestehen, die wahrgenommenen Risiken für zukünftige Erträge durch entsprechende Kommunikationskampagnen zu reduzieren. Desweiteren haben wir festgestellt, dass sich insbesondere unter den Minergie Hauseigentümern umweltbewusste Personen wieder finden. Umweltbewusste Personen könnten auch durch entsprechende Kampagnen davon überzeugt werden, energetische Renovationen durchzuführen.

- **Leasing ähnliche Finanzierungsmodelle**

  Risikobereite Hauseigentümer führen mit höherer Wahrscheinlichkeit Renovationen durch. Zudem deuten unsere Ergebnisse darauf hin, dass die Zukunftsorientierung von Hauseigentümern eine entscheidende Rolle für das Ausmass der Renovationen einnimmt. Um Investitionen in energetische Renovationen zu fördern, könnten Finanzierungsprogramme entwickelt werden, welche die gegenwärtigen Kosten der Renovation verringern und gleichzeitig das Risiko zukünftiger Ersparnisse mindern. Um diese profitabel bzw. haushaltsneutral zu gestalten, könnten die an der Finanzierung beteiligten Institutionen nicht nur an den Kosten der Renovation, sondern auch an den Einsparungen durch die energetischen Sanierungen beteiligt werden. Hierbei ist anzumerken, dass derlei Massnahmen nicht auf einer Interventionspolitik beruhen müssen,

sondern grundsätzlich auch durch den Markt bereitgestellt werden könnten (z.B. durch Energielieferanten oder große Bauverbände).

Unsere Labor- und Feldstudien ermöglichen einen vielschichtigen Einblick hinsichtlich des Verständnisses von Investitionen in Energieeffizienz und öffentlichen Gütern. Die Laborstudien zeigen, dass freiwillige Qualitätsstandards i) ein hilfreiches Mittel für Investitionen in öffentliche Güter sein können, wenn die Messlatte zur Erreichung der Standards nicht zu niedrig ist und ii) dass Ungleichheit im Nutzen aus öffentlichen Gütern keinen generellen Rückgang der Beitragsbereitschaft auslösen, sondern hauptsächlich ein Rückgang von Investitionen verursacht, der durch pessimistischere Erwartungen über das Beitragsverhalten der jeweils anderen Gesellschaftsmitglieder entsteht. Die Ergebnisse der Feldstudie deuten darauf hin, dass Risiko- und Zeitpräferenzen, aber auch Einstellungen zu Umweltfragen die Entscheidung für eine Renovation und deren Eingriffstiefe massgeblich beeinflussen. Unsere Forschungsergebnisse bieten neue Anhaltspunkte, die durch Politik genutzt werden können, um effiziente und nachhaltige Bauformen zu fördern.

Summary

Investments in energy-saving measures, for instance improvements of energy efficiency in the house sector, benefit the investor, but also society. The question at hand is why people invest in energy-saving measures and how different incentives can affect these investments. The project ***Investments in Energy-Saving Measures and Heterogeneous Preferences*** aims at understanding individual motivations to improve the energy efficiency of their houses. Is it that individuals only invest in energy-saving measures if it will be financially profitable or may there be different motives for such investments? More specifically:

- What roles do investors' **risk** and **time preferences** as well as **generosity** play?
- Do **environmental preferences** drive investment behavior?
- Is it that people invest in energy-saving measures because others do so as well or because others benefit from investments as well (**conditional cooperation, inequality aversion**)?

To answer these questions this study combines experimental methods with classical survey questions. Our study consists of two parts.

Part 1: Laboratory Experiments (Section 1 and 2)

In the first part, we conduct several laboratory decision making experiments. In the experiments, participants face a (prisoners') **dilemma,** which reflects the problematic nature of the public good aspect of investments in **energy saving measures**. Participants had to decide on whether to invest money in a joint project or keep the money for themselves. All participants profit from the joint project, including those not investing in it. Maximum total payoffs were obtained by full investments by all participants. However, each individual participant obtained the highest individual profit by investing nothing. The experiments focus on two questions:

- How should standards be designed such that they lead to an efficient level of investment?
- How does heterogeneity in returns from investments in energy efficiency and uncertainty about own returns affect the willingness to invest in energy efficiency?

The first question deals with the effects of standards on investments in energy saving measures (or public goods). **Investments in energy efficiency**, e.g. investments in energy-saving measures, **are** frequently **difficult to observe**. **Standards** will **improve** the **visibility of** these **investments**, in particular if gathering the information on contributions is otherwise time-consuming and costly. Knowing that others invest is of particular importance because many people are conditionally cooperative (see also Fischbacher et al. 2001).

The **results** from the experiment **show** that **the level of the standard crucially affects the standards effectiveness**. The implementation of a low standard level leads to low efficiency. Higher standards give rise to higher modal contributions but the likelihood that the standard level is reached gets lower. Many subjects are also more likely to comply with the standard as the number of group members who previously complied with it becomes higher (for any standard level).

The second experiment deals with the fact that **individuals' utility from public goods** (e.g. clean air, better water quality, lower CO_2 emissions) **differs** and is uncertain in many cases. If the motivation to contribute is to reduce inequality, **heterogeneity** in returns from public goods will reduce individuals' contributions. Additionally, **uncertainty** about own returns **may reduce contributions**.

The experimental results indicate that investments in public goods decrease when **heterogeneity** in returns is introduced. However, heterogeneity in returns from the public good **decreases** in particular **the expectations about the contribution behavior of the other members** and does **not** reduce **the general willingness to contribute**. Further, with heterogeneity, **uncertainty** about the own return **weakly reduces contributions**.

Part 2: Survey and Experiments with Swiss homeowners (Section 3)

For the second part of our study, we contacted German-speaking Swiss homeowners to understand their investment behavior in energy-saving measures. House on the results from the laboratory experiments, the focus of the study was to **investigate** the main **determinants of investments in energy efficiency improvements**. We collected data from all German-speaking cantons. The data were collected in two waves. In the first wave we contacted homeowners in the canton of

Zurich via the GVZ (Zurich Houses Insurance). In the second wave we contacted households outside the canton of Zurich (but within the German-speaking part of Switzerland). These homeowners were contacted directly by the Thurgauer Wirtschaftsinstitut (TWI). In total the analysis contains 630 households, 271 from the first wave, 359 from the second. Among the latter, we received completed questionnaires from 63 households who were explicitly contacted, because they renovated their houses in order to obtain a Minergie Standard.

Homeowners were asked to fill in a comprehensive questionnaire about their investments in energy efficiency improvements. Further, they were asked to make decisions in different economic experiments, in which we elicited **preferences for risk, time, environmental preferences** as well as **preferences for generosity** and **equality**.

Our **results** show that in particular risk and time preferences but also environmental preferences play a crucial role for renovation behavior:

(1) Risk-taking people are more likely to renovate their houses.
(2) Among renovators, homeowners with future-oriented time preferences have a higher house quality in terms of energy efficiency and lower energy and heating costs.
(3) People who have strong preferences for the environment are more likely to obtain the Minergie label through renovation and have lower energy and heating costs.

Our results provide a better understanding of households' investments in energy-saving measures. While these investments involve private as well as public returns, we observe that private returns are the first dimension households take into account. The fact that returns from renovations are uncertain and occur in the future seems to matter most. Result (1) suggests that households interpret a renovation as a risky decision with certain costs in the present and uncertain returns in the future. Result (2) suggests that given households decided to renovate, the intensity of the renovation and the resulting quality depend on the homeowners' time preferences. Clearly, among renovators, more future-oriented homeowners have houses with higher energy efficiency. Result (3) shows that environmental preferences matter. People with preferences for the

environment are indeed more likely to obtain the Minergie standard and also have lower energy and heating costs.

Energy policy implications

The findings from our laboratory experiments and the field study yield the following policy implications, which we structure in three strategies:

- **Voluntary standards**

  The laboratory experiments have shown that voluntary standards help to increase the visibility of investments in public goods, for instance investments in energy-saving measures, in particular investments of conditionally cooperative investors. However, the level of the standard must not be too low. A practical example for such a standard is the Minergie standard, which makes investments in energy efficiency visible and guarantees a certain level of efficiency. On the one hand such standards help potential renovators to ascertain individual benefits from renovating, on the other the standard clarifies by how much such investments help to protect the environment. In turn, environmentally friendly investors may be attracted.

- **Communication policies**

  Our laboratory experiments have shown that heterogeneous returns from investments in public goods do not reduce the general willingness to contribute to a public good. Instead heterogeneity seems to reduce the expectation that others still contribute. Thus, communication policies could aim at increasing the expectations about others' contributions to public goods such as the environment. The field study illustrates that homeowners perceive renovations as risky decisions. To reduce the perceived risk of investments communication policies could aim at reducing the perceived risk of such investments. Further, we find that in particular homeowners with preferences for the environment renovated their houses according to a Minergie standard. Thus, communication policies may aim at attracting environmentally friendly investors by

providing transparent information about the eco-friendliness from investments in energy saving measures when renovating the house.

- **Leasing models**

  According to our findings, risk-taking homeowners are more likely to renovate their houses. Also, future-oriented renovators have a better house quality. In order to support investments in energy-saving measures, institutions may develop leasing models (or financing programs) which reduce the current costs of renovations as well as the variance in future returns from investments in energy-saving measures. To keep such programs profitable (or cost neutral), institutions involved in financing the renovations may share not only the costs and risks of the renovation, but also the benefits of future savings. Note that these kind of leasing models do not have to be necessarily provided by political institutions but may also be provided by the market (e.g. risk neutral energy companies may engage in supporting energy efficient renovations).

To conclude, our laboratory and field studies provide various insights into what drives investments in energy-saving measures and public goods. The laboratory studies show that i) standards are very helpful if they are not too easy to fulfill and ii) heterogeneity in returns from investments in public goods creates mainly pessimistic beliefs but does not reduce the willingness to contribute in general. The field study has shown that risk and time preferences are crucial for the decision to renovate and the quality of the renovation. Further we find that preferences for the environment matter for renovating according to the Minergie standard. The insights we provide may facilitate the development of policies which exploit the identified drivers of investments in energy-saving measures in order to achieve efficient and sustainable housing.

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1 Standards and Coordination in Public Goods Games[1]

Abstract

Contributions to public goods are often unobservable. In order to make contributions visible, voluntary standards are used, which make a particular contribution level publicly observable. This paper investigates the effect of such partial information on the contributions to public goods. First, we observe that the implementation of a too low standard level leads to the lowest efficiency. Second, we find that standards function as a coordination device. Higher standards give rise to higher modal contribution but the likelihood that the standard level is reached gets lower. Third, conditional cooperation is observed in the sense that subjects are more likely to comply with the standard as the number of group members who previously complied with it is higher.

[1] A modified version of this chapter is available as an ALISS Working Paper.

1.1 Introduction

Standards have recently been extensively used to certify the environmental quality of goods. Consumers voluntary choose to meet or not these exogenously imposed standards by their purchasing decisions that are publicly observable.[2] Do standards favor environmentally-friendly behaviors? And more generally, do standards help to increase contributions to public goods? Such standards have several functions. They create a focal point for a particular level of contribution and they make visible whether a particular level of contribution is individually provided. Both functions have ambiguous effects on contributions. A focal point supports coordination on this level. This is positive only if the level is sufficiently high. Otherwise, people could be coordinated down to a low level of contribution. The visibility functions if people are conditionally cooperative. Then, it creates an incentive to contribute in order to motivate others to contribute as well. Furthermore, people observing others complying with the standard could be motivated to comply as well. Also this mechanism shows the importance of the level of the standard. Only if it is sufficiently high, people will be motivated to contribute more than if there is no standard. In this paper, we investigate the impact of standards of various levels on people's contributions to public goods in an experiment.

Our study builds on experimental economic literature that has been devoted to understand behavior in public goods games (see Anderson, 2001, and Ledyard, 1995, for reviews). In most of these studies participants learn their own payoff from which they can infer other participants' average behavior. In reality, only in very rare situations this information is available. Most of the time, people only observe partial information regarding others' behavior toward a common pool such as public goods. Standards that are exogenously imposed but voluntary met are one way how partial information is transmitted. They convey the information whether a specific threshold is reached.

We aim in this study to get insights into the effect of a specific type of partial information, the information whether an agent contributes more or less than a

[2] For goods as cars or houses, standards make environmentally-friendly actions more visible. In the car manufacturing sector, we find various standards satisfying several ecological criteria such as ECOnetic for Ford, eco2 for Renault, or Bluetec for Mercedes. In house building or house renovation, the Swiss Minergie label which guaranties energetic efficiency of new houses or renovated houses is now fairly widespread in Europe. Consumers may also meet environmental standards by the behavior they adopt as the equipment of their house with photovoltaic panels or the choice to separate the recyclables.

predefined standard amount to the public goods. Our study evaluates how such partial information affects contribution. In a laboratory experiment we vary the information subjects receive as feedback. In total, we conduct six treatments. In four treatments, we implement standards. These treatments differ in the level of the standard. We compare these treatments with two benchmarks, a situation without any information and a situation with full information.

This study is related to the literature on categorization of donations. If donations are published in categories then category borders serve as standards. Different to our setting there are several 'standards' for donations. In this literature, it has been shown that when donations are categorized and made public in classes, they concentrate on the lower bound of each class (Glazer and Konrad, 1996, Harbaugh, 1998a, Harbaugh, 1998b). Laboratory experiments without anonymity confirm this finding in dictator games (Li and Riyanto, 2009) as well as in public goods games (Andreoni and Petrie, 2004, and Rege and Telle, 2004). We are interested in how the level of the standard affects efficiency, what these studies do not address. Furthermore, we focus on the coordination function of the standard. Therefore, we try to avoid that people are motivated by the prestige motive and conduct an experiment with anonymity about participants' contributions to the public goods.

Our study also adds to the literature on mechanisms that favor public goods provision. The introduction of a punishment option is one of the most powerful mechanisms to induce higher contributions to public goods (Andreoni, et al., 2003, Fehr and Gächter, 2000, Masclet, et al., 2003, Sefton, et al., 2007). However, punishment is not always possible and punishment can be counter-productive when subjects punish contributors to the public goods (Cinyabuguma, et al., 2006, Denant-Boemont, et al., 2007, Hermann, et al., 2008, Nikiforakis, 2008). Communication also fosters contributions (Bochet, et al., 2006, Cason and Khan, 1999, Charness and Dufwenberg, 2006, Ellingsen and Johannesson's, 2004, Isaac and Walker, 1988), but communication is difficult when the market is large or when agents do not meet. As a high percentage of individuals consists of conditional cooperators (Fischbacher, et al., 2001, Fischbacher and Gächter, 2010, Levati, 2002), the implementation of partial information in the form of standards might be another way to foster cooperation. The underlying mechanism is that the standard level can serve as a coordination device for the conditional cooperators.

We show that the implementation of a low standard level leads to lower efficiency than higher standards or than providing no information. We also find that standards function as a coordination device, but the higher the standard level, the fewer people coordinate on this level. Conditional cooperation is observed with respect to complying with the standard level, i.e., more people comply with the standard as the number of other group members who complied with it at the previous period increases. In section 1.2 we present the experimental design and procedures. We analyze the results in section 1.3. Finally, we conclude in section 1.4.

1.2 Experimental Design and Procedures

1.2.1 Design

We use a standard four person linear public goods game. Each agent is endowed with 20 tokens and decides how much to invest into the public goods and how much to keep for herself. The individual marginal return of an investment g_i into the public goods equals 0.4. Since group size is 4, the social marginal return equals 1.6. The payoff function of agent *i* is given by

$$\pi_i = 20 - g_i + 0.4 \sum_{j=1}^{4} g_j \qquad (1)$$

The game is repeated for two times 10 periods. The composition of groups remains the same within each phase of 10 periods. Our treatments differ with respect to the feedback that is provided after every period. In the four interest treatments, a standard is implemented. There are four levels for this standard: the level equals 4 in treatment S4, it equals 8 in treatment S8, 12 in treatment S12, and 16 in treatment S16. In these treatments subjects are not informed about the precise contribution of other group members but only about whether they contributed at least the standard or not. We did not frame this level as a 'standard' but instead all group members are informed about how many of the other group members contributed between 0 and the standard level minus one, and how many contributed between the standard level and 20. The subjects did not receive any information apart from this standard level information. We did not explicitly introduce the standard in order to avoid that subjects are anchored by the standard. In our framing, also the contribution level just below the standard could be an anchor. For instance, in the treatment in which the standard was 4, 3 as well as 4 are at

the limits of the ranges. Anchoring could in principle activate people to report 3 or 4. We can exclude anchoring if we do not observe that many subjects contribute on less than the standard (3 in the example). The data show that this is actually the case.

To understand whether the implementation of a standard is beneficial at all, we use a first control treatment, in which agents receive no information at the end of each period. This treatment is called the "No information treatment", NI. In the other control treatment, the "Full information treatment", FI, full information is provided. In this treatment people are informed about the exact contributions of other members in the group at the end of every period.[3]

Once all agents have played the first 10 periods, they received complete information about all contributions and payments, i.e., on their own contributions and payments as well as those of every person in the group. Then, a second part started. The second part is identical to the first part except with respect to the composition of groups. The existence and the rules of this second part are common knowledge at the very beginning of the experimental sessions, i.e., before agents play the first part. This second part is necessary to let agents learn the effect of the standard on behaviors and payments.

1.2.2 Predictions

According to standard economic theory, each agent maximizes her own profit. In this game there is a dominant strategy to contribute zero. This prediction is independent of the feedback and, therefore, full information, partial information or no information about group members' contributions to the public goods should not alter agents' behaviors in the public goods game. However, if subjects are conditionally cooperative, then they will provide higher contributions if they believe that the others do contribute as well. Furthermore, in the repeated game, selfish subjects mimic conditional cooperators in order to keep cooperation high at the beginning of the experiment (Kreps et al., 1982). A second reason for a decline of contributions is based on the empirical observation that people are usually not willing to contribute as much as the other subjects (Fischbacher and Gächter, 2010).

[3] Most experimental studies on the analysis of behaviors in public goods games can be assimilated to our Full information treatment. In most studies, either agents learn the exact contribution of other members in the group or they learn their own payoff and then can deduce the sum of contributions of other members (see Anderson, 2001, or Ledyard, 1995, for a survey of behaviors in public goods games with this type of information). Cason and Khan (1999) show that average contributions to the public goods are not significantly different when agents receive information on other group members' contributions or only on their own payoff.

The standard can have two effects. First, it can serve as a coordination device for perfect conditional cooperators. Second, it can prevent small undercutting of contribution by imperfect conditional contributors. Compared to the dominant strategy with selfish preferences, this should lead to higher contributions. However, the standard can serve for downward coordination, i.e., subjects who would be willing to contribute more (with a higher standard or without any information) contribute less. Of course, also in the repeated game, selfish subjects will not contribute more than the standard, and conditional cooperators will also not be willing to contribute more than the standard if there are many selfish subjects. Thus, we expect that most contribution will equal zero or the level of the standard. The effect of the level of the standard on average contribution is nevertheless ambiguous. The higher the standard, the more risky is cooperation – also for conditional cooperators. We anticipate that the probability that the standard is provided decreases with the level of the standard.[4] This means that, on the one hand, a high standard level yields to higher contributions by those who comply with the standard. On the other hand, fewer people might be willing to achieve high rather than low standards.

1.2.3 Procedures

The experiment has been conducted at the University of Konstanz, Germany. Participants have been recruited via the ORSEE software (Greiner, 2004) and the experiment has been programmed with z-Tree (Fischbacher, 2007). In total, 12 experimental sessions have been conducted, which represent a total of 252 participants. Subjects participated in only one treatment. Table 1.1 summarizes the number of subjects participating in every treatment as well as the number of groups in each part of the experiment and the number of matching groups.[5]

[4] Evidence has been provided in the context of threshold public goods where an increase of the threshold leads to an increase of the risk of contributing. Cadsby and Maynes (1999) and Suleimand and Rapoport (1992) show that an increase of the threshold leads to a decrease of agents' contributions to the public goods.

[5] A matching group is a subset of subjects in a session. Matching occurs within matching groups, or differently expressed, matching does not occur outside of a matching group. Thus, data between matching groups is statistically independent. In our experiment subjects were in two groups; in one group for period 1 to 10 and in another group in period 11 to 20. These two groups were formed from within the matching group.

Treatments	Abbreviation	Number of subjects	Number of groups	Number of matching groups
No Information	NI	44	11	5
Standard at 4	S4	40	10	4
Standard at 8	S8	36	9	4
Standard at 12	S12	48	12	6
Standard at 16	S16	40	10	4
Full Information	FI	36	9	4
Total		**244**	**61**	**27**

Table 1.1: Description of treatments

Each participant was randomly assigned to a cubicle guaranteeing the anonymity of the experiment. After having read the instructions, each participant had to answer a questionnaire on the instructions (instructions in S4 and questionnaire can be found in appendix C). The experiment started only once all participants had correctly answered every question in the questionnaire. The conversion rate was 1 token equals 0.015€. On average, they earned, 10.43€ (about 14.30$ at the time of the experiment), including a show-up fee of 3€. The experiment lasted about 90 minutes.

1.3 Results

We address the following questions: *(i)* Does the implementation of a standard increase or decrease contributions to the public goods? and *(ii)* How are coordination and conditional cooperation affected by the implementation of a standard? To answer these questions, we first present descriptive statistics about contributions. Because agents must learn the effect of the implementation of a standard to make informed decisions, we focus our analysis on agents' behavior in the second part of the experiment when answering question *(ii)*.

1.3.1 Main treatment effects

We first analyze the effect of the implementation of a standard on the average contribution of agents. Table 1.2 describes the average contributions separating the two parts of the experiment, i.e., before and after the feedback about payments on the 10 first periods. Moreover, we differentiate periods 1, periods 1 to 8 and periods 9 and 10. We separate period 1 because in the first period the observations are independent of

each other[6], and we separate the last two periods because there is a strong end-game effect in partner matching public goods games. Contributions in the first period are significantly lower in the NI than in the FI treatment in both parts (the statistics of the Wilcoxon rank-sum test are equal to *1.879* and *3.136*, and are significant at the 10% and 1% level, respectively in the first and second part). This suggests that some subjects choose their contribution to the public goods in order to influence other group members to highly contribute as well.

	Part 1				Part 2			
	Period 1	Periods 1-8	Periods 9 and 10	Total	Period 11	Periods 11-18	Periods 19 and 20	Total
NI	8.95	8.60	8.66	8.61	7.14	7.17	7.10	7.15
S4	8.43	6.72	5.31	6.44	5.98	4.82	3.43	4.54
S8	9.81	9.51	5.44	8.69	10.08	8.57	5.63	7.98
S12	9.60	8.65	6.97	8.31	8.35	7.46	4.38	6.84
S16	9.25	8.49	6.68	8.13	11.05	9.80	6.41	9.12
FI	11.81	11.22	5.78	10.13	12.36	11.47	5.22	10.22

Table 1.2: Average contributions by treatment

To understand implications of the implementation of partial information such as standards, we compare average contributions to the public goods in the treatments S4 to S16 with benchmark treatments NI and FI. All results of the Wilcoxon rank-sum tests with various specifications of independent observations are provided in appendix A.[7] We find that contributions in treatment S4 are significantly lower compared to contributions in treatments with higher standard levels, i.e., in S8, S12 and S16. Contributions are also lower if standard level 4 is implemented than if no information or full information is provided. Contributions induced by the implementation of higher standards are not significantly increased, neither compared to the situation without any

[6] In period 11, observations of the same group in period 1 to 10 are dependent but not observations of the same group in period 11 to 20.

[7] We use as independent observations average contributions per group as well as per matching group in part 2 from periods 1 to 8 as contributions undergo a end-game effect. Moreover, we use average contributions in the first period of part 2 per group in part 1 because in the first period of part 2 observations are independent regarding the group subjects belong to in part 1.

information nor compared to the situation with full information.[8] Thus, efficiency provided by the implementation of high standards does not differ between standard levels while the implementation of a low standard leads to efficiency losses compared to higher standards.[9]

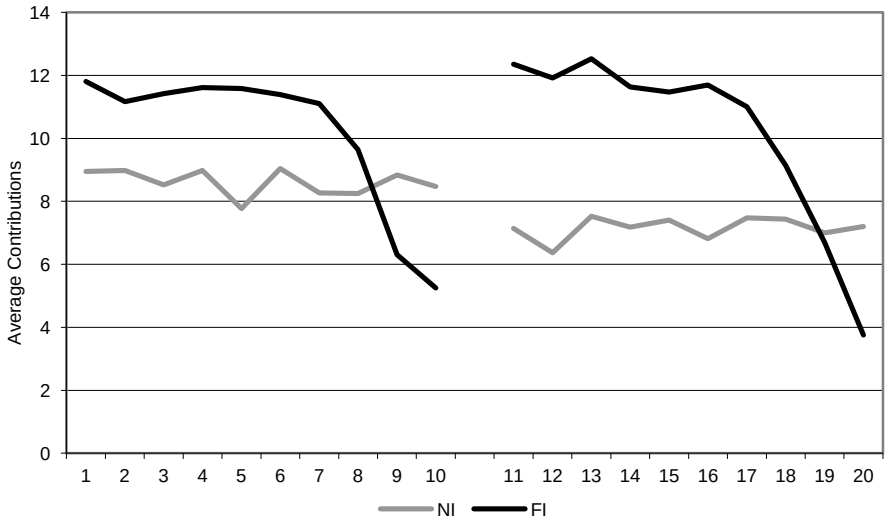


Figure 1.1: Evolution of contributions in the NI and FI treatments

Figure 1.1 and Figure 1.2 show the evolution of contributions over periods. Figure 1.1 confirms previous results in the literature on public goods games. When agents perfectly observe the contributions of other group members at the end of each period, at least some agents try to cooperate and groups manage to reach a positive average contribution. Nevertheless, end-game effects are observed: Contributions strongly decrease as periods approach the end (see Anderson, 2001, and Ledyard, 1995, for a review of similar results in the literature). As people do not receive any information at the end of each period in the NI treatment, average contributions are stable across periods. A decrease in contributions occurs between the first and the second part.[10]

[8] We observe higher average contributions in the S16 treatment compared to in the NI treatments but the difference is not significant.

[9] Efficiency is defined as the sum of the payoffs. It is equivalent to the sum of contributions to the public goods.

[10] This phenomenon could be explained by the fact that one part in the NI treatment can be seen as one period as no feedback is provided. Therefore, we would expect a decrease of average contributions for subsequent parts if there were more than two parts organized.

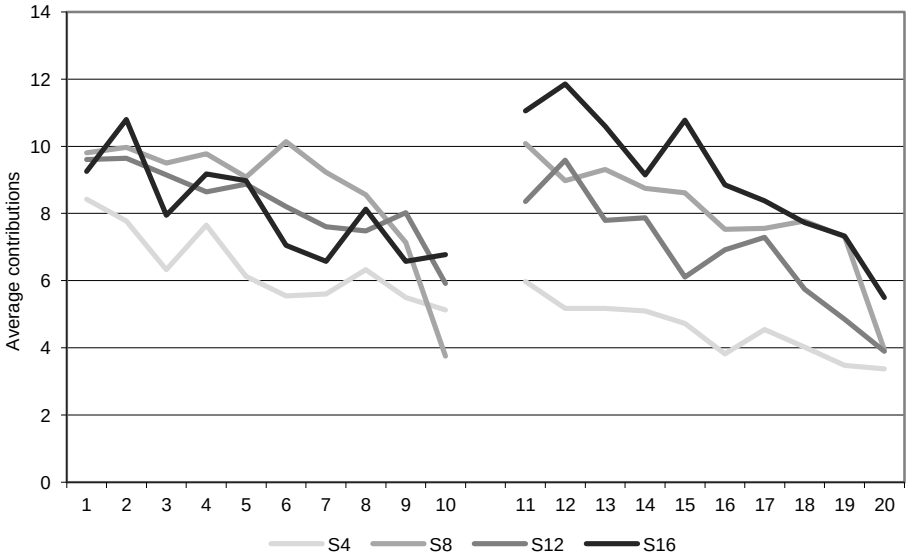


Figure 1.2: Evolution of contributions in the treatments with standard

Also if a standard is implemented, contributions decline. However, the end-game effect is less pronounced than in the FI treatment.[11] Because of these strong end-game effects, we restrict our analysis to periods 1 to 8, or 11 to 18 respectively.

1.3.2 Standards as a coordination device

As explained above, the zero and the standard levels are reasonable focal points for contributions. We expect them to be chosen with high frequency. In order to investigate this question, we study the distributions of contributions. Coordination on the standard level can occur because low contributors increase their contribution or high contributors decrease it. We compare the distributions in the standard treatments with those in the treatments with no information or full information.

Figure 1.3 and Figure 1.4 present the frequency of contributions in each treatment, from period 11 to 18. Figure 3 shows that in the control treatments, many subjects contribute zero: 35.2% and 18.1% of agents' contributions are equal to zero respectively in the NI and the FI treatments. No other contribution amount can be seen as a focal point except 20: 14.5% and 32.3% of agents' contributions are equal to 20 respectively in the NI and the FI treatments. Figure 4, which represents the distribution of contributions in the treatments with standard, gives a very different picture (the

[11] We run linear regressions explaining contributions with a time trend, dummies for treatments and crossed variables as explicative variables. We find that the negative effect of the time trend on contributions is significantly stronger in the FI treatment than in any treatment with standard (except for treatment S8 in part 1) if we include only final periods, i.e., periods 6 or 7 to 10 for part 1 and periods 16 or 17 to 20 for part 2.

Kolmogorov-Smirnov test rejects at 1% the hypothesis of equal distributions of the average contribution by group between the treatments with standard and the control treatments).

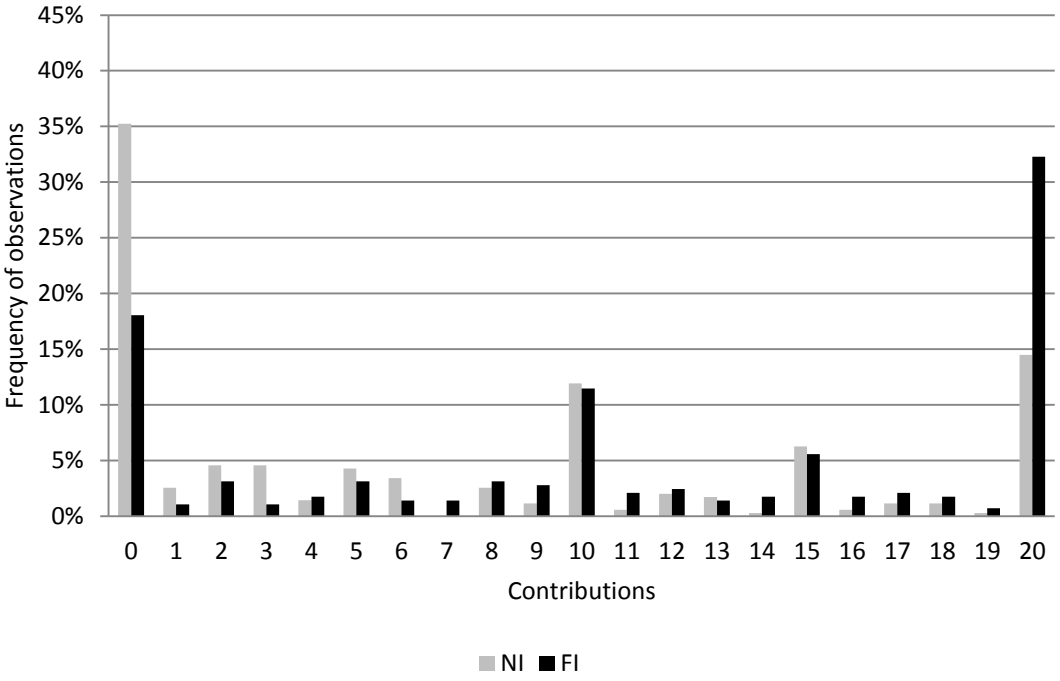


Figure 1.3: Distribution of contributions in the NI and FI treatments

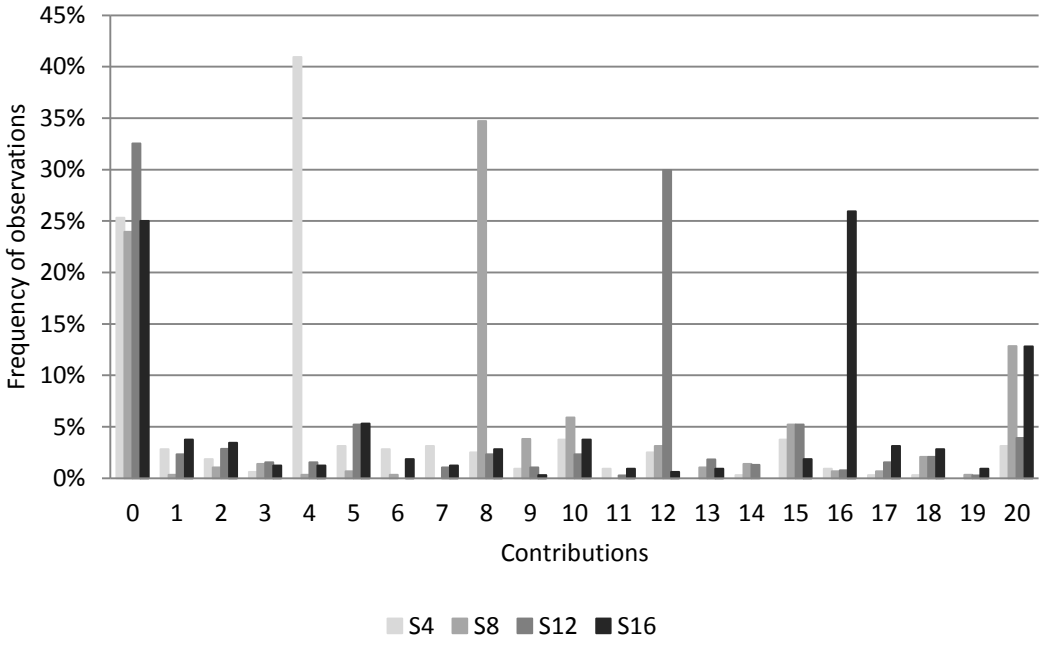


Figure 1.4: Distribution of contributions in the treatments with standard

Table 1.3 synthesizes distributions of contributions for treatments with standard. We classify contributions into four categories: contributions equal to zero, contributions between zero and the standard level, contributions equal to the standard level and contributions between the standard level and 20.

Contributions	0	]0;Standard[	Standard	]Standard;20]
S4	25.31%	5.31%	40.94%	28.44%
S8	23.96%	4.17%	34.72%	37.15%
S12	32.55%	20.57%	29.95%	16.93%
S16	25.00%	29.38%	25.94%	19.69%

Table 1.3: Frequencies of contributions in the treatments with standard

It is clear that two focal points exist in every treatment with standard: contributing zero and contributing the standard level. While between 25% and 41% of people coordinate on the standard level in the treatments with standard, in the control treatments, the highest share of people playing one standard level is only 5%. In all treatments with standard, subjects are significantly more likely to contribute the standard level to the public goods than in the NI and FI treatments but not more likely to contribute zero (see appendix B for results of the Wilcoxon rank-sum tests). Hence, the implementation of a standard can be seen as a coordination device.[12] From these results, we deduce that differences in average contributions in the treatments with standard and the control treatments do not come from a general increase or decrease of all agents' contributions but from coordination on a new focal value that is exogenously determined and that corresponds to the standard level.

Further, comparing coordination in the various treatments with standard, the data show that the higher the standard level, the lower the share of people choosing to contribute exactly the standard level. The Spearman's rank correlation coefficient between the level of the standard and the share of people choosing to contribute exactly the standard level is equal to -0.336 (-0.412) and is significant at the 5% (10%) level if

[12] The coordination on these two focal points is stronger in the second part of the experiment. This suggests that, as expected, people need to observe the effect of a standard to really appreciate its value. The mechanism is fully understood only once participants have been able to observe and evaluate the impact of the standard.

we use groups as independent observations (if we use matching groups as independent observations).

To precise our analysis of the role of standards as a coordination device, we now focus on the direction of coordination. We differentiate global and local changes to specify the impact of the implementation of a standard. Four different scenarii are hypothesized. The convergence toward the standard level may be due to *(i)* a higher contribution of all people who would otherwise contribute less than the standard level, *(ii)* a lower contribution of all people who would otherwise contribute more than the standard level, or local changes, *(iii*) a higher contribution of people who would otherwise contribute slightly less than the standard level and *(iv)* a lower contribution of people who would otherwise contribute slightly more than the standard level. Figures 1.5a to 1.5d illustrate the corresponding expected results in each of the four hypothetical cases for the uniform distribution as a reference. The vertical line represents a general standard level.

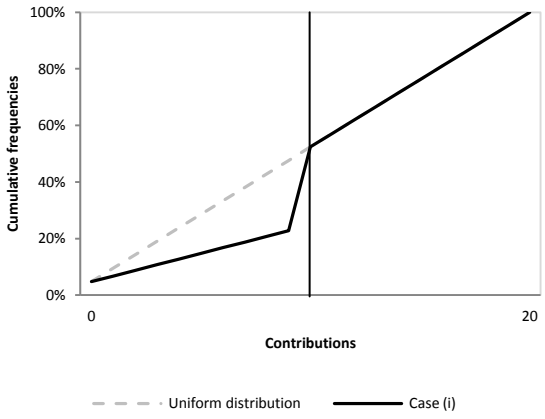


Figure 1.5a. Case (i)

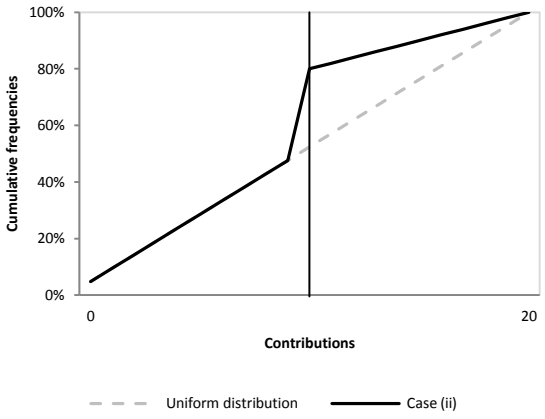


Figure 1.5b. Case (ii)

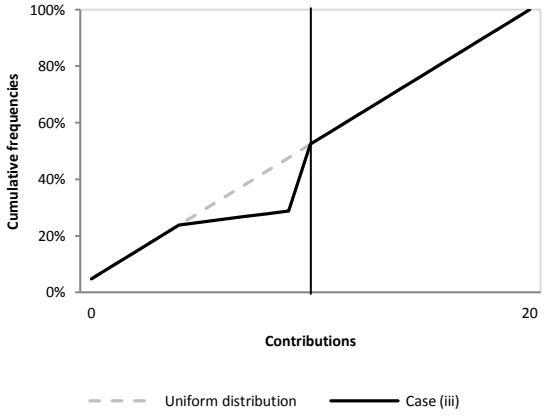


Figure 1.5c. Case (iii)

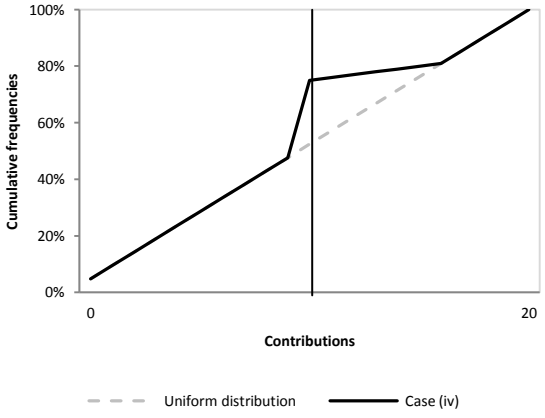


Figure 1.5d. Case (iv)

We represent observed distributions in the data in the same way as the theoretical distributions just presented. Figures *1.6*a to *1.6*d present the cumulative distributions of contributions in each treatment with standard as well as distributions in both NI and FI treatments. For results of the Wilcoxon rank-sum tests showing significance of differences between the numbers of observations for specific ranges of contributions between treatments with standard and control treatments, report to appendix B.

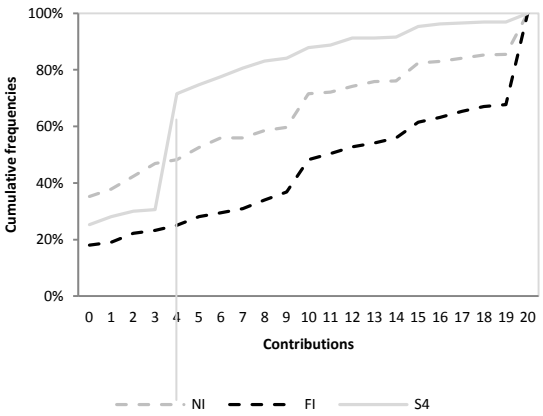


Figure 1.6a. Treatment S4

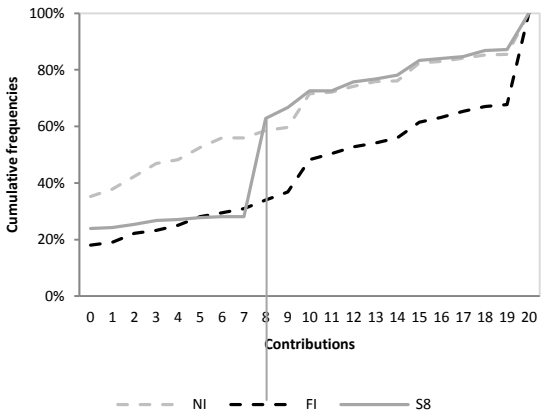


Figure 1.6b. Treatment S8

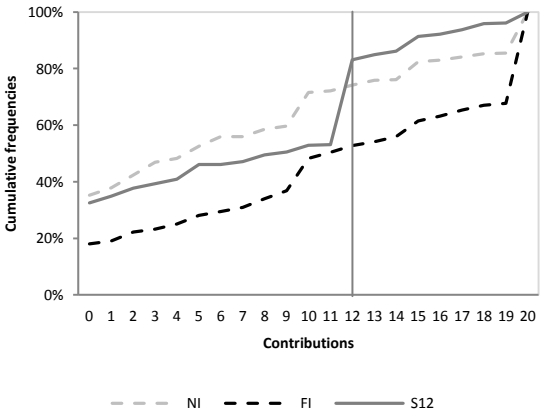


Figure 1.6c. Treatment S12

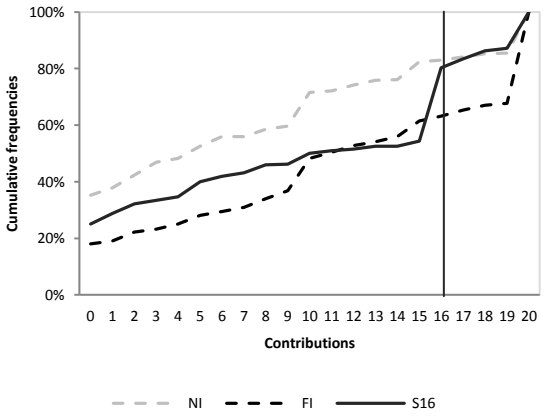


Figure 1.6d. Treatment S16

We observe first that the number of contributions below the standard level is significantly lower in the treatments with standard than in the NI treatment for any level of the standard. Second, the number of contributions above the standard level is significantly lower only in the S4 treatment compared to the NI treatment. Therefore, we can conclude that relatively to the NI treatment, coordination on the standard level is due to an increase of contributions below the standard when the standard is sufficiently high, i.e., in S8, S12 and S16, but to both an increase of contributions below the standard and a decrease of contributions above the standard when the standard is low, i.e., in S4.

More precisely, when the standard is high, i.e., in S12 or S16, contributions are only locally increased. Compared to the FI treatment, coordination on the standard level comes from a strong decrease of the number of contributions higher than the standard level. This strong effect is mainly due to a decrease of very high contributions, i.e., contributions higher than 16.

1.3.3 Conditional cooperation

In this section, we analyze how contributions depend on the behavior of other group members. Since subjects only observe whether the other subjects comply with the standard or not, we analyze how the number of other group members complying with the standard affects the own propensity to comply with the standard. Table 6 shows the probability to comply with the standard, i.e., to contribute at least the standard level, conditional on how many other subjects complied with the standard in the previous period for the four treatments with standard. In the last column in Table 4, we present the slope of conditional cooperation, i.e. the slope of the equation of the linear curve approximating the share of contributions that comply with the standard in function of the number of other group members complying with the standard in the previous period. The slope of the standard level is presented in the last line of Table 1.4.

# others complying with the standard in the previous period	0	1	2	3	Slope CC
S4	0,40	0,61	0,57	0,85	0,133
S8	0,67	0,55	0,73	0,77	0,048
S12	0,19	0,37	0,57	0,68	0,165
S16	0,12	0,23	0,53	0,93	0,272
Slope S	-0,132	-0,131	-0,031	0,013	

Table 1.4: Share of contributions that reach the standard

We observe conditional cooperation in all four treatments as the probability to contribute at least the standard level is higher if many other subjects contribute at least the standard level as well. This effect is significant at the 5% level, tested using probit regression with groups as clusters. The pattern is similar across the treatments with the exception when the standard level is 16. In S16, the conditional cooperation is much stronger. In particular, if only few others comply with the standard, subjects are unlikely to comply with the standard. Actually, if the number of other subjects complying with the standard at the previous period is 0 or 1, the probability to contribute at least the standard level is lower for high standards. This effect is significant at the 1% level, tested using probit regression with groups as clusters. If 2 or 3 comply with the standard, the compliance rate does not significantly depend on the level of the standard.

For the cooperation it is not only important how many subjects comply with the standard, the level of their contribution matters as well. For example, with a high standard subjects might be reluctant to comply with the standard but would be willing to make a higher contribution if they know that many other players comply with the standard. In Table 1.5 we address this question. Our main explanatory variable is the number of other group members complying with the standard in the previous period multiplied with the standard level. We use this variable in order to make the different standard levels comparable. This number can be conceived as the approved contribution. Based on the information that subjects get, it is the minimum level of contribution that is possible.[13] We control for a time trend and we cluster on groups (41 clusters).

The results of the regression show that agents' contributions increase in the number of other group members complying with the standard in the previous period. This effect is not significantly different between the four treatments. This shows that although conditional compliance with the standard is stronger for higher standards than for lower standards, conditional contribution is not stronger for higher standards. We find the strongest difference in compliance if only few other players complied with the standard. The results of the regression then show that the lack of compliance with the standard is offset by people making contributions above 0 and above the standard.

[13] Indeed, people who comply with the standard contribute more if the standard level is high and we know that the number of contributions at least equal to the standard increases with the number of group members complying with the standard at the previous period.

Dependant variable: Contribution in periods 1 to 8	
Period	-0.158** (0.070)
Number of others complying with the standard$_{t-1}$ × standard level	0.354*** (0.115)
S8	4.431 (2.736)
S12	1.992* (1.172)
S16	1.822 (1.140)
S8 × Number of others complying with the standard $_{t-1}$ × 8	-0.225 (0.204)
S12 × Number of others complying with the standard $_{t-1}$ × 12	-0.146 (0.121)
S16 × Number of others complying with the standard $_{t-1}$ × 16	-0.086 (0.119)
Constant	2.467** (0.913)
Observations	1148
Prob > F	0.000
Pseudo R^2	0.272

Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 1.5: Contributions across treatments with standard

1.4 Conclusion

The effect of partial information on contributions has been mainly ignored in the literature on public goods even though it is relevant in many situations. Indeed, although investments in environmentally-friendly actions of people cannot be perfectly quantified by others, purchases of goods that meet some standard are made observable. Our study aimed to fill this gap. We investigated the effect of the implementation of partial information on contributions to public goods. The partial information we considered is the implementation of standards that are nowadays widespread.

First, we find that standards function as a coordination device. Second, we observe a tradeoff in the level of the standard. Higher standards trivially lead to higher contributions for subjects complying with the standard, but fewer subjects do comply with higher standards. Third, this results in low efficiency for low standard level. Fourth, conditional cooperation is observed with respect to complying with the standard

level, i.e., more people comply with the standard as the number of other group members who complied with it at the previous period increases.

Regarding policy implications, the results of our experiment suggest that standards certifying the quality of public goods such as the environment should not be too low. In this case, setting up a standard would lead to lower efficiency than the original situation without any information. Instead, high standards should be favored. We also find that, even with anonymity, people coordinate on standard levels. Therefore, some information campaigns presenting environmentally-friendly behaviors of citizens may enhance the contributions to the environment.

1.5 Appendix A - Direction and significance of differences between average contributions

In the following table, we present the sign of the difference between average contributions in different treatments and its degree of significance. Degrees of significance correspond to results of a Wilcoxon rank-sum test. In the first line of each comparison, we use as independent observations average contributions by group in periods 11 to 18 in the second part of the experiment while we use average contributions by matching group in the second line. In the third line, we use average contributions by group in the first period of the second part where groups are those of the first part.

Difference between rank sums on the average contributions					
	NI - *s*	S4 - *s*	S8 - *s*	S12 - *s*	S16 - *s*
Treatments					
S4	+ *				
	+ *				
	+ n.s.				
S8	– n.s.	– ***			
	– *	– **			
	– **	– ***			
S12	– n.s.	– **	+ n.s.		
	– n.s.	– n.s.	+ n.s.		
	– n.s.	– **	+ n.s.		
S16	– n.s.	– **	– n.s.	– n.s.	
	– n.s.	– *	– n.s.	– *	
	– **	– ***	– n.s.	– **	
FI	– *	– ***	– n.s.	– *	– n.s.
	– **	– **	– n.s.	– *	– n.s.
	– **	– ***	– *	– ***	– n.s.

Note: * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table A. Direction and significance of differences between average contributions

1.6 Appendix B– Direction and significance of differences between the number of observations

Degrees of significance correspond to results of a Wilcoxon rank-sum test. In the first line of each comparison, we use as independent observations average contributions by group in periods 11 to 18 in the second part of the experiment while we use average contributions by matching group in the second line. In the third line, we use average contributions by group in the first period of the second part where groups are those of the first part. We mainly present significance of differences between numbers of observations when contributions equal zero, are between 0 and the standard level, are equal to the standard level and are higher than the standard level (columns 2 to 5). For more details, we present in columns 6 to 10 significance of differences between numbers of observations for small intervals of contributions:]0;4[,]4;8[,]8;12[,]12;16[and]16;20].

	Difference between rank sums on the number of observations								
	0	**]0;Standard[**	**Standard**	**]Standard;20]**	]0;4[	]4;8[	]8;12[	]12;16[	]16;20]
S4 – NI	– n.s.	– *	+ ***	– ***	– *	+ n.s.	– **	– n.s.	– **
	– n.s.	– n.s.	+ ***	– *	– n.s.	+ n.s.	– *	– n.s.	– *
	– n.s.	– **	+ ***	– n.s.	– **	– n.s.	+ n.s.	– n.s.	– n.s.
S4 – FI	+ n.s.	+ n.s.	+ ***	– ***	+ n.s.	+ n.s.	– **	– n.s.	– ***
	+ n.s.	+ n.s.	+ **	– **	+ n.s.	+ n.s.	– n.s.	– n.s.	– **
	+ n.s.	– n.s.	+ ***	– ***	– n.s.	+ n.s.	– **	– ***	– ***
S8 – NI	– n.s.	– ***	+ ***	– n.s.	– **	– ***	– n.s.	– n.s.	– n.s.
	– n.s.	– **	+ ***	+ n.s.	– **	– *	– n.s.	=	+ n.s.
	– *	– n.s.	+ ***	+ n.s.	– n.s.	+ n.s.	– n.s.	– n.s.	+ n.s.
S8 – FI	+ n.s.	– *	+ ***	– **	– n.s.	– ***	– n.s.	– n.s.	– *
	+ n.s.	– *	+ **	– **	– n.s.	– **	– n.s.	= n.s.	– *
	+ n.s.	– **	+ ***	– **	– n.s.	– ***	– n.s.	– n.s.	– *
S12 – NI	+ n.s.	– **	+ ***	– n.s.	– n.s.	– n.s.	– ***	+ n.s.	– n.s.
	– n.s.	– *	+ ***	– n.s.	– *	– n.s.	– **	– n.s.	– n.s.
	– n.s.	– *	+ ***	+ n.s.	– n.s.	– n.s.	– n.s.	+ n.s.	=
S12 – FI	+ **	– n.s.	+ ***	– **	+ n.s.	– n.s.	– ***	+ n.s.	– **
	+ n.s.	– n.s.	+ ***	– ***	+ n.s.	– n.s.	– **	+ n.s.	– **
	+ **	– **	+ ***	– ***	+ *	– n.s.	– ***	– +	– **
S16 – NI	– n.s.	– **	+ ***	+ n.s.	– n.s.	– n.s.	– **	– **	+ n.s.
	– n.s.	– n.s.	+ ***	+ n.s.	– n.s.	+ n.s.	– *	– n.s.	+ n.s.
	– n.s.	– *	+ ***	+ n.s.	– n.s.	+ n.s.	– n.s.	– n.s.	+ n.s.
S16 – FI	+ n.s.	– n.s.	+ ***	– n.s.	+ n.s.	+ n.s.	– ***	– **	– n.s.
	+ n.s.	– n.s.	+ **	– n.s.	+ n.s.	+ n.s.	– *	– *	– n.s.
	+ n.s.	– n.s.	+ ***	– n.s.	+ *	+ n.s.	– ***	– ***	– n.s.

Note: * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table B. Direction and significance of differences between numbers of observations

1.7 Appendix C – Instructions (translated from German)

Welcome to this economics experiment at the University of Konstanz. Please read the following instructions carefully. Depending on your decisions in this experiment, you will have the possibility to earn more money **additional to the show-up fee of 3 Euros**. Therefore, it is important that you read the instructions carefully.

During the experiment talking to the other participants is not allowed. A violation of this rule will lead to immediate exclusion from the experiment and confiscation of any payments.

In this experiment we will not speak of euros but of points. Your income will always be calculated in points. At the end of the experiment your points will be summed up and converted with the following exchange rate:

1 point = 0.015 euro

At the end of the experiment you will receive your earnings plus the show-up fee of 3 Euros **in cash.**

On the next pages you will find precise explanations for the execution of this experiment. If you have any questions raise your hand and we will come and answer them.

The decision situation

First we want to make you familiar with the basic decision. At the end of the instructions you will find some questions. Answering them will help you to understand the decisions. The experiment will not start until all participants are familiar with the procedures of this experiment.

Participants are randomly matched in groups of 4. The experiment will consist of 2 sets of 10 periods.

During the first 10 periods you are in a group of the same 4 persons. The group composition does not change during the first 10 periods. After this participants will be

randomly assigned to new groups of 4 which will remain unchanged for the following 10 periods. Again the group composition will not change during these 10 periods.

You will never be informed about the identity of the other participants.

Course of a period

At the beginning of each period each group member receives an endowment of 20 points. Each group member has to decide how to spend these 20 points. You can either put points on your private account or invest all or part of your points in a joint project. You are free to invest any part of your endowment into the project; every point that is not invested in the project will automatically be credited to your private account.

Your private account

For each point put on your private account you will earn one point. For example, if you put 20 points on your private account your earnings from your private account will be exactly 20 points. If you put 6 points on your private account you will earn 6 points from your private account. Nobody else but you earns anything from your private account.

Points from the joint project

Points that have been invested in the joint project affect the earnings of all group members. All points that were invested into the joint project in your group will be summed up and multiplied by a factor of 1.6. After the multiplication the points will be equally given back to the members of the group, giving each a quarter of the total.

This means that every group member receives 0.4 times (factor 1.6/4 group members) the sum of all points that were invested in the joint project. Your earnings from the joint project are calculated as follows:

Points from the joint project*= Sum of all points invested in the joint project x 0.4*

For example, if the sum of all invested points turns out to be 60, every group member receives *60 x 0.4 = 24* points from the joint project. If the total of invested points by the four group members sums up to 10 then each one earns *10 x 0.4 = 4* points.

Your income in one period

Your income in each period is the sum of the points you earned from your private account and the points you earned from the joint project:

Points from your private account *(= 20 – your contribution to the joint project)*

+ Points from the joint project *(= 0,4 × sum of all points contributed in the group)*

= total points

Information at the end of a period

At the end of a period you will be informed about the contributions of the other group members. You will not receive the exact amount contributed. Instead you will be

informed about how many members contributed an amount in a certain interval. The intervals are as follows:

"Amount of contributions *between 0 - 3 points*"

and

"Amount of contributions *between 4 - 20 points*"

You will see how many group members contributed an amount of 0 to 3 points to the joint project and you will see how many group members contributed between 4 and 20 points to the joint project.

After this the next period follows.

New group formation after 10 periods

During the first 10 periods you will remain in the same group. At the end of these 10 periods you will be informed in detail how the members of your group had decided in these 10 periods. After that, new groups will be formed randomly and you will have to go through another 10 periods making the same types of decisions as before about how to spend your 20 points of endowment. Overall, you will have to decide 20 times how many points you want to put on your private account and how many points you want to invest in a joint project.

On screen

The following pages contain a detailed description of what you will see on screen.

Here, you are facing the decision described above. The experiment will consist of 2 sets of 10 periods. Each period is structured exactly the same way.

On the first screen you will have to decide how many points of your endowment (20 points per period) you want to invest in the joint project. The points you choose not to invest in the project are automatically assigned to your private account.

In every period you will first see the following screen:

On this screen you can see which period you are in and the amount of your endowment. You have to enter the amount of points you want to invest in the joint project into the blank field. Any integer from 0 to 20 is a possible input.

After you have entered your decision, please press the OK button. As soon as you have done this your decision is confirmed and you will not be able change it anymore.

As soon as all group members have made their decisions the following screen will be shown:

This information screen shows you which period you are in. Additionally, you see the amount of points you invested in the project and which interval you are in. Below you see **how many** other group members chose an investment between the given intervals. It is impossible to tell which person has contributed how much. The intervals are:

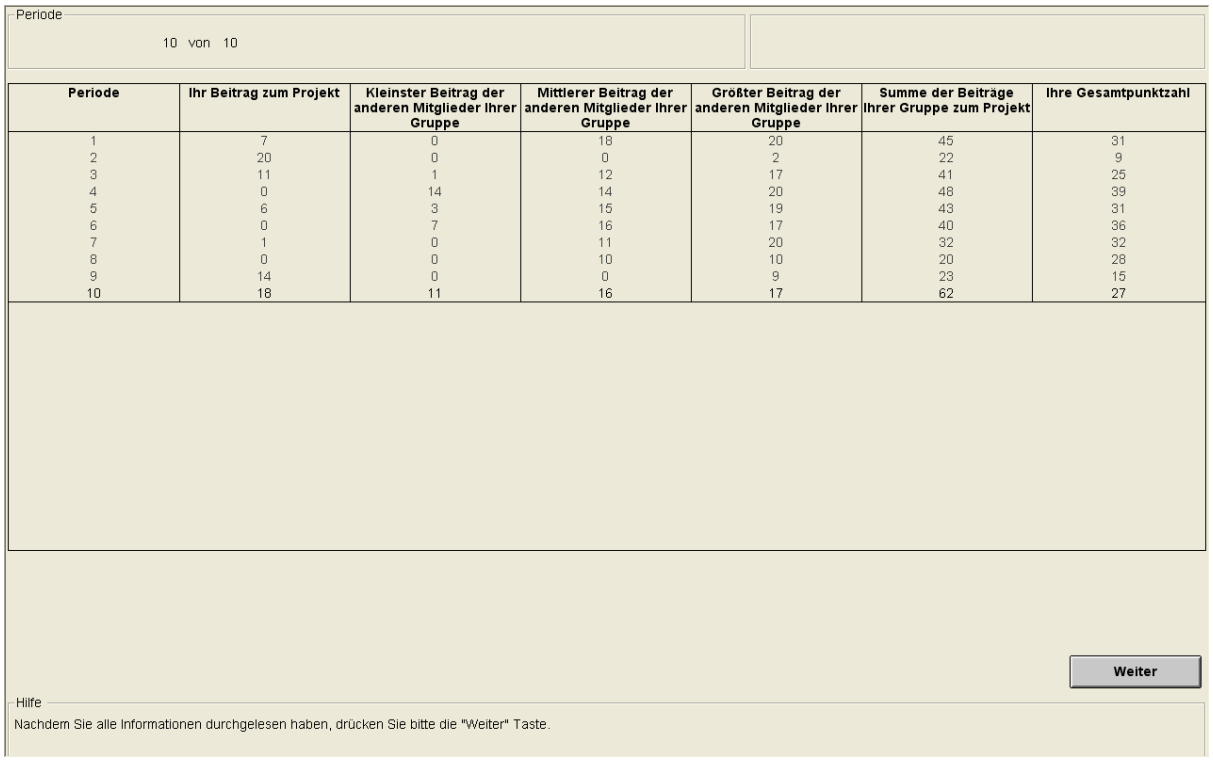
"How many other group members contributing *between 0 - 3 points*" and

"How many other group members contributing *between 4 - 20 points*"

For example, you invested 12 points, the first other member in your group invested 2 points, the second 20 points and the third 4 points. This results in what is shown on the screen above. You are in the interval "4-20" points. One group member is in the interval "0-3" and 2 group members are in the interval "4-20".

You have 30 seconds to look at this screen. After that the period ends and you enter the next period.

After 10 periods you will see the following screen:


Periode

10 von 10

Periode	Ihr Beitrag zum Projekt	Kleinster Beitrag der anderen Mitglieder Ihrer Gruppe	Mittlerer Beitrag der anderen Mitglieder Ihrer Gruppe	Größter Beitrag der anderen Mitglieder Ihrer Gruppe	Summe der Beiträge Ihrer Gruppe zum Projekt	Ihre Gesamtpunktzahl
1	7	0	18	20	45	31
2	20	0	0	2	22	9
3	11	1	12	17	41	25
4	0	14	14	20	48	39
5	6	3	15	19	43	31
6	0	7	16	17	40	36
7	1	0	11	20	32	32
8	0	0	10	10	20	28
9	14	0	0	9	23	15
10	18	11	16	17	62	27

Weiter

Hilfe

Nachdem Sie alle Informationen durchgelesen haben, drücken Sie bitte die "Weiter" Taste.

This screen shows a detailed list of your and your other 3 group members' contributions in every period.

The list is organized so that you find your own contribution in the first column followed by the contribution of the group member that contributed least in this period. It ends with the contribution of the group member that contributed most. Additionally you see the sum of all contributions in this period and in the last column you find your total points of the relevant period.

Please press "continue" as soon as you have read all the information.

After this new groups are formed and you are assigned to a new group of 4 randomly chosen participants.

In this new group you now enter the next 10 periods, where you again have to decide in 10 periods how many points you want to invest into a joint project and how many points you want to keep in your private account.

Practice questions

Please answer the following questions. This will help you to better understand how your total points are calculated. Your income depends on your decisions.

Please answer each question and write down your calculations. When you have finished the questions please raise your hand. A member of the experimental team will come to correct them. *Wrong answers do not have any consequences.* The experiment starts as soon as everybody has answered all questions correctly.

1. Each group member has 20 points. Assume that nobody invests any points in the joint project.
What are your total points? _____

What are the total points of the other group members? _____

2. Each group member has 20 points. You invest 20 points. Every other group member also invests 20 points.
What are your total points? _____

What are the total points of the other group members? _____

3. Each group member has 20 points. Assume that the sum of the other group members' investments is 30 points.

a) What are your total points if you- additional to the 30 points- invest 0 points in the joint project?
Your total points: _____

b) What are your total points if you- additional to the 30 points- invest 8 points in the joint project?
Your total points: _____

c) What are your total points if you- additional to the 30 points- invest 15 points in the joint project?
Your total points: _____

4. Each group member has 20 points. Assume that you invest exactly 8 points in the joint project.

a) What are your total points if the others – additional to your 8 points – invest a sum of 7 points in the joint project?
Your total points: _____

b) What are your total points if the others – additional to your 8 points – invest a sum of127 points in the joint project?
Your total points: _____

c) What are your total points if the others – additional to your 8 points – invest a sum of 22 points in the joint project?
Your total points: _____

1.8 References to chapter 1

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2 Heterogeneous Reactions to Heterogeneity in Returns from Public Goods[14]

Abstract

In many cases individuals benefit differently from the provision of a public good. We study in a laboratory experiment how heterogeneity in returns and uncertainty affects unconditional and conditional contribution behavior in a linear public goods game. The elicitation of conditional contributions in combination with a within subject design allows us to investigate belief-independent and type-specific reactions to heterogeneity. We find that, on average, heterogeneity in returns decreases unconditional contributions but does not affects conditional contributions only weakly. Uncertainty in addition to heterogeneity reduces conditional contributions slightly. Individual reactions to heterogeneity differ systematically. Selfish subjects and one third of conditional cooperators do not react to heterogeneity whereas the reactions of the remaining conditional cooperators vary. A substantial part of heterogeneity in reactions can be explained by inequity aversion which accounts for different reference groups subjects compare to.

[14] A modified version of this chapter is available as a TWI Research Paper and ALISS Working Paper.

2.1 Introduction

Investments in public goods (e.g. investments in energy-saving measures) benefit the investor and others. The value of obtained benefits (e.g. individual cost savings, a reduction in CO2 emissions, clean air or better water quality) is in many cases difficult to assert and different individuals benefit differently from the public good. In order to develop policies to sustain the provision of public goods, it is thus crucial to understand how uncertainty and heterogeneity in returns from public goods affect contribution behavior. Previous experimental work has focused on aggregate effects of heterogeneous returns from public goods on people's unconditional contributions to public goods (see e.g. Fisher et al., 1995) and uncertainty of returns (see e.g. Dickinson, 1998 and Levati et al., 2009). However, unconditional contributions depend on beliefs about others' contributions. Further if people have heterogeneous preferences or differ in their reference points (i.e. they compare to different reference groups), individual reactions to heterogeneity will differ in systematic ways. Studying aggregate effects may then lead to wrong conclusions and entail wrong policy implications. The aim of our paper is therefore to focus on type-specific and belief-independent reactions to heterogeneity.

The novelty of our experimental design is twofold: First, on top of unconditional contributions we elicit conditional contributions of subjects and thereby isolate belief-independent reactions to heterogeneity. Second, we use a within-subject design which allows us to identify type specific reactions to heterogeneity. Additionally, we provide insights on how people perceive heterogeneity in returns by relating our results to theoretical predictions based on two social preference models which we extend to allow for different reference groups to which people may compare.

In the experiment participants play several one-shot linear public goods games in groups of four. The social return from the public good is identical in all the games but we vary the marginal per capita returns (MPCRs). Subjects make unconditional and conditional contributions with certain and homogeneous MPCRs, certain and heterogeneous MPCRs and uncertain and heterogeneous MPCRs. In each game with heterogeneity in MPCRs, two group members receive a high MPCR while the two others receive a low MPCR. Uncertainty only concerns subjects' own MPCRs whereas the distribution of MPCRs is always known.

We find that unconditional contributions are negatively affected by the introduction of heterogeneity in MPCRs from the public good. Conditional contributions are however only weakly affected by heterogeneity. This indicates that negative effects of heterogeneity on contributions to public goods mainly stem from pessimistic beliefs about other's contributions. In heterogeneous environments, uncertainty about the own MPCR does not add a further decrease in unconditional contributions. Conditional contributions are also only slightly reduced when the own MPCR is not known and returns are heterogeneous.

Further we find that individual reactions to heterogeneity differ systematically. Selfish subjects and one third of conditional cooperators do not modify their conditional contributions to the public good when heterogeneity in returns is introduced. Around 17 percent of conditional cooperators increase contributions when receiving the high return and decrease contributions when receiving the low return. Additionally, we observe that 27 percent of conditional cooperators react only to either high or low MPCRs. Another 25 percent of conditional cooperators show the same reaction (an increase or a decrease) regarding both returns.

Since the early experiments reported in Bohm (1972), a vast experimental literature on public goods has grown, showing that individuals invest in public goods even though the individual marginal return from investments to the public good is lower than the individual marginal cost.[15] Because contributions vary with the own returns from the public good (see e.g. Ledyard, 1995), heterogeneity in returns may affect contribution behavior. An early experiment by Fisher et al. (1995) focused on the comparison of contributions to a public good by subjects with the same MPCR under homogeneity and heterogeneity in MPCRs. They neither find strong support for so-called "seeding" (i.e. higher contributions by subjects with low MPCRs in case of heterogeneity in MPCRs) nor for a "poisoning of the well" (i.e. lower contributions by subjects with high MPCRs in case of heterogeneity in MPCRs). However, in their experiment, subjects were only told that heterogeneity in returns is possible. Subjects did not know whether returns were actually different. Other experimental studies indicate that heterogeneous valuations of the public good lead less frequently to the efficient outcome (see e.g. Marwell and Ames, 1980; Bagnoli and McKee, 1991; Chan et al., 1999; Carpenter et al.,

[15] See e.g. Ledyard (1995), Anderson (2001) or Gächter (2007) for surveys.

2009 and Reuben and Riedl, 2009).[16] However, these studies do not elicit conditional contributions and thus cannot disentangle whether the decrease in average contributions is due to pessimistic beliefs about other group members' contributions or due to "pure" inequity considerations. Our experimental design allows us to go beyond this limitation. It indicates that heterogeneity matters for unconditional but not for conditional contributions and thus heterogeneity primarily affects beliefs about others' contributions.

Heterogeneity in returns is closely related to uncertainty about returns because uncertainty about returns involves different possible returns by construction. Dickinson (1998) and Levati et al. (2009) study the effects of uncertainty in MPCRs and find significantly lower individual contributions when the MPCR is stochastic compared to a certain return. Gangadharan and Nemes (2009) differentiate between situations in which the probabilities for low and high MPCRs are known by the subjects and situations with unknown probabilities. In both situations, contributions are significantly lower when there is uncertainty in the returns compared to a certain homogeneous return. However, these studies do not separate the effects of uncertainty from the effects of heterogeneity in returns. We isolate the effect of uncertainty by comparing contributions to the public good when there is heterogeneity in returns and the own returns are known with contributions when there is heterogeneity in returns but own returns are uncertain. Our findings indicate that heterogeneity matters most whereas uncertainty about the own MPCR plays a minor role.

The remainder of this paper is organized as follows. In section 2 we present the experimental design. In section 3 we propose theoretical predictions and highlight the importance of subjects' reference group. Section 4 presents the results of the experiment and section 5 concludes.

[16] Note that we only consider heterogeneity in valuations of public goods. For heterogeneity in productivity see e.g. Tan (2008) or Fellner, et al. (2010) and for heterogeneity in valuations of the private good see e.g. Falkinger, et al. (2000). For a meta study on determinants of contributions in linear public goods games see Zelmer (2003). Her findings indicate that heterogeneity decreases contributions; strongly for endowment heterogeneity and weakly for heterogeneity in MPCRs.

2.2 Experimental Design and Procedures

Subjects played six different versions of a standard one-shot linear public good game in groups of four. At the beginning of the experiment we informed subjects that they would participate in several experiments, but we did not inform them in advance about the specific features of the six versions of the linear public goods game. Subjects received feedback only after the last game. In all six games, subjects received an endowment of 20 points each and the monetary payoff function was the following:

$$y_i = 20 - g_i + \gamma_i \sum_{j=1}^{4} g_j \qquad (1)$$

with y_i representing subject i's monetary income, g_i denoting i's contribution to the public good, and γ_i equal to the marginal per capita return (MPCR) of an investment by subject i. In the first three public good games subjects made unconditional contribution decisions (UC games). In the second three public good games we elicited conditional contributions (CC games).

In treatment UC04, all group members received the same MPCR from the public good: γ_i = 0.4. Each subject decided on her unconditional contribution and the game ended. In UCu0305, we introduced heterogeneity of MPCRs with uncertainty about each subject's own MPCR. Two subjects received $\gamma_L = 0.3$ and two subjects received $\gamma_H = 0.5$. When making their contribution decisions, subjects did not know whether they would receive γ_L or γ_H but they did know that two subjects in the group would receive γ_L and two would receive γ_H. Thus, there was uncertainty about the own MPCR, but the distribution of MPCRs was known. Note further that the marginal social return from the public good is unchanged. In the third game, there is heterogeneity of MPCRs but each subject knew her own MPCR. Subjects again faced a situation in which two subjects received γ_L and two subjects received γ_H. We used the strategy method in this decision. Subjects stated their contribution conditional on having the low (UC03) or high (UC05) MPCR. In the CC games, we elicited conditional contributions which do not depend on subjects' beliefs about the average contribution of their group members. We used the procedure introduced by Fischbacher et al. (2001) in order to elicit conditional contributions. The procedure uses a variant of the strategy method (Selten, 1967). Subjects first decide on their unconditional contribution and then fill in a conditional contribution table. They state how many points they wish to contribute dependent on

the average contribution of their group members' ($\bar{g}$). [17] For each group, a random device (a die) selects one subject for whom the conditional contribution is relevant and three subjects for whom the unconditional contribution is relevant. MPCRs and information about possible MPCRs are equivalent to the information in the UC games. Table 2.1 summarizes the treatments.

In all sessions, CC games were conducted after UC games to have a progression of complexity in games. However, we altered the order among UC and CC games to control for changes in subjects contributions as the session progresses. In six sessions, the order was first UC04, then UCu0305 and finally UC03/UC05 (first homogeneity then heterogeneity) while in four sessions the order was UC03/UC05, UCu0305 and finally UC04 (first heterogeneity then homogeneity). The order in CC games followed the order in UC games. At the end of the session, we selected one of the games to be payoff relevant.[18] Subjects received no feedback until the end of the last experiment and were informed about this at the beginning of the experiment. Because we distributed the instructions for each game just before the game started, subjects' decisions in each public good game did not depend on any of the characteristics of the subsequent public good games.

We computerized the experiment using z-Tree (Fischbacher, 2007). Each subject sat at a randomly assigned and separated computer terminal and was given a copy of instructions.[19] A set of control questions was provided to ensure the understanding of the game. If any participant repeatedly failed to answer correctly, the experimenter

Type of game and MPCR	**Name**
Unconditional cooperation games (UC games)	
γ_i =0.4	UC04
γ_i =0.3 or γ_i =0.5, with uncertainty	UCu0305
γ_i =0.3 (with heterogeneity)	UC03
γ_i =0.5 (with heterogeneity)	UC05
Conditional cooperation games (CC games)	
γ_i =0.4	CC04
γ_i =0.3 or γ_i =0.5, with uncertainty	CCu0305
γ_i =0.3 (with heterogeneity)	CC03
γ_i =0.5 (with heterogeneity)	CC05

Table 2.1: Treatments

[17] Averages are rounded to integer numbers, i.e. subjects have to fill in 21 values. The instructions in the appendix provide a screenshot.

[18] We do not report results on a seventh decision (a donation decision) made by our subjects which was also elicited and included in the random selection of payoffs.

[19] A copy of translated instructions can be found in the appendix.

provided an oral explanation. No form of communication between the subjects was allowed during the experiment. We conducted all sessions at the LakeLab (University of Konstanz, Germany). The data were collected over ten sessions with 228 participants in total. The sessions took place between November 2009 and January 2010 and in February 2011. The experiment lasted about 1 hour and 30 minutes. Participants received on average 21.96 euros including a show-up fee of 4 euros. We recruited participants from the local subject pool including undergraduate and graduate students of all fields of studies (46 percent male) using ORSEE (Greiner, 2004).

2.3 Theoretical predictions

Selfish subjects have a dominant strategy not to contribute in the UC games. In the CC games, the conditional cooperation of selfish subjects is also zero for all contribution levels of other subjects. These predictions do not depend on our treatment variations. However, experimental research on public goods games has shown that people are willing to contribute significantly more to the public good than suggested by the assumption of selfishness. Several models have been suggested to explain such behavior: reciprocity models (e.g. Rabin, 1993; Dufwenberg and Kirchsteiger, 2004 and Falk and Fischbacher, 2006) or models of inequity aversion (e.g. Fehr and Schmidt, 1999 and Bolton and Ockenfels, 2000). All these theories predict some form of conditional cooperation if the players have a sufficiently strong social motive.

In this section, we discuss the theoretical predictions for conditional contributions by players with non-selfish preferences in our versions of the linear public goods game. Theoretical predictions focus on conditional contribution behavior, because players' unconditional contributions in the CC games depend on players' beliefs about other players' contributions. We present predictions of two well known inequity aversion models by Fehr and Schmidt, 1999 and Bolton and Ockenfels, 2000). Additionally, we discuss how players will behave according to these models if they have specific reference groups to which they compare themselves.

In the model of Fehr and Schmidt (1999) (from now on FS-model), individuals maximize a utility function of the following type:

$$U(y_i, y_j) = \begin{cases} y_i - \frac{\alpha_i}{n-1} \sum_{j \neq i} (y_j - y_i) & y_j > y_i \\ y_i & \text{if } y_j = y_i \\ y_i - \frac{\beta_i}{n-1} \sum_{j \neq i} (y_i - y_j) & y_j < y_i \end{cases} \quad (1),$$

with $\alpha_i \geq \beta_i$ and $0 \leq \beta_i < 1$. α_i is a parameter representing individual i's disadvantageous inequity aversion (or envy) while β_i corresponds to her advantageous inequity aversion. In the linear public good game with four players the monetary payoff of individual i is $y_i = 20 - g_i + \gamma_i \sum_{j=1}^{4} g_j$. y_j denotes the income of players j. According to the FS-model, subjects with a sufficiently high disutility from advantageous inequality (β_i) are willing to contribute to the public good in order to reduce the advantageous inequality (given others contribute). In particular, players will contribute positive amounts if their β is larger than or equal to $\beta_{crit} = \frac{1-\gamma i}{1-\gamma_i+\bar{\gamma}}$ with $\bar{\gamma} = \frac{1}{n-1} \sum_{j \neq i} \gamma_j$. Because of the linearity of the public good game and of the FS-model, for all but a finite set of values of border case parameters the best reply is zero contribution, full contribution or a contribution that generates equal payoffs with some player. In particular, if all players have the same MPCR, then conditional cooperation is either zero or perfect (i.e. $g_i = \bar{g}$). For the homogeneous case with MPCR $\gamma = 0.4$, it is perfect for players with a value of β >0.6.

In the heterogeneous case, players with higher MPCRs have to contribute more than players with low MPCRs to reduce inequality resulting from positive contributions (and players expect this in an equilibrium with positive contributions in which beliefs match actions[20]). The logic of the FS-model can be put in a nutshell as follows: First, each player never wants to be materially worse off than the richest of its three group members[21] and second, players who are sufficiently advantageously inequity averse will contribute as much as is necessary to realize payoff equalization with the richest of the other players[22]. Thus, in an equilibrium with positive contributions all payoffs have to be the same. Players with $\gamma_i = 0.5$ achieve payoff equality if they contribute 7/3 times as much as the players with $\gamma_i = 0.3$ (and vice versa). In other words, equilibria with positive contribution are characterized by the fact that players with an MPCR of 0.5

[20] Assuming all members make the same contribution with MPCR heterogeneity is not plausible in an equilibrium with positive contributions. With equal contributions, it is optimal for individuals with the high MPCR to contribute the same amount as the group average but for individuals with the low MPCR it is optimal to contribute 1/3 of the group average. Consequently in an equilibrium with positive contributions in which beliefs match actions we will not observe same contributions by high and low MPCR individuals. Note also, that in our experiment, subjects do not have explicit information about inequity in contributions of the other group members but only condition on the average contribution of their group members. Cheung (2011) shows however, that information on individual contributions will also affect conditional contributions.

[21] It can be shown that for every player, the marginal utility of contributing is strictly smaller than zero as soon as one other player receives a higher payoff due to $\alpha_i \geq \beta_i$ and $0 \leq \beta_i < 1$.

[22] The marginal utility of contributing will be strictly positive for a low MPCR player who is richer than any other player, if her $> \beta_{crit0.3} = \frac{21}{34} \sim 0.618$. The marginal utility of contributing will be strictly positive for a high MPCR player who is richer than any other player, if her $\beta > \beta_{crit0.5} = \frac{26}{45} \sim 0.577$.

contribute 61.5% above the average of the other players and players with an MPCR of 0.3 contribute 52.9% of the average contribution of the other players. Because the threshold for a payoff equalizing contribution is lower for players with an MPCR of 0.5 than for players facing homogeneity and an MPCR of 0.4, which is again higher than the threshold for the situation in which all individuals face heterogeneity with an MPCR of 0.3, we should also observe more people contributing positive amounts in situation CC05 than in CC04, and more in CC04 than in CC03.

As a further benchmark, we extend the FS-model by assuming that some players compare only to a specific reference group. Players who compare only to counterparts who have the same MPCR (although there is heterogeneity in MPCRs) have a threshold for positive contributions of $\beta_{crit0.3} \geq 0.7$ or $\beta_{crit0.5} \geq 0.5$ and contribute exactly the average contribution of their group members. If players compare only with group members who have a different MPCR, players with $\gamma = 0.3$ who compare only to players with the high MPCR have $\beta_{\text{crit}0.3} \geq 0.5833$ and contribute 1/3 of the average contributions whereas players with $\gamma = 0.5$ who compare only to players with the low MPCR have $\beta_{\text{crit}0.5} \geq 0.625$ and contribute twice the average when facing the high MPCR.[23] Consequently the qualitative predictions of the FS-model about the number of players contributing to the public good do not differ for different reference groups. However, optimal contribution levels are different, as we show in Figure 2.1.

In the game with uncertain MPCRs (UCu0305) players have identical information ex-ante. It is thus plausible to assume that players' unconditional contributions will be the same. Although players equalize expected payoffs ex-ante, a low MPCR player will experience disutility from inequality toward the two richer players ex-post and therefore will prefer to contribute 0. This implies that no equilibrium with positive unconditional contributions exists in the FS-Model. For conditional contributions, it can be shown that an expected utility maximizer who cares sufficiently strongly about advantageous inequality ($\beta>0.6$) will contribute positive amounts as long as she is not

[23]Note that the threshold is smaller for a player with the low MPCR who compares only to high MPCR individuals than for an individual with a high MPCR comparing only to low MPCR individuals because it is less costly for the player with the low MPCR to reduce inequality (he loses 0.7 by contributing one unit and each member of his reference group gains 0.5. A player with the high MPCR loses only 0.5 when contributing 1 unit while his reference group members gain only 0.3 each).

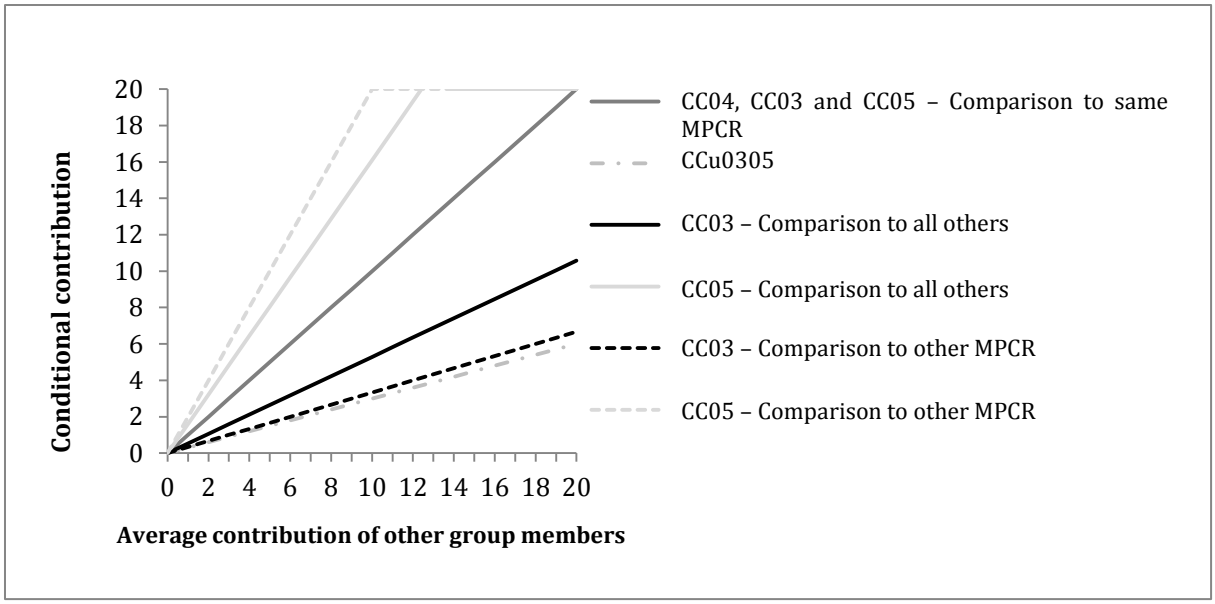


Figure 2.1: Optimal conditional contributions (FS-model, β=0.8)

poorer than the richest other player in her group when facing the low MPCR. The FS-model allows for positive conditional contributions under uncertainty but predicts a strong decrease in total conditional contributions if uncertainty is introduced. However, positive conditional contributions will in any case be lower or equal to 35% of the group members' average contribution (see also Figure 2.1).

We now turn to the predictions of the ERC model by Bolton and Ockenfels (2000). In the BO-model it is assumed that each agent i maximizes the following utility function:

$$U_i = U_i\left(y_i, \frac{y_i}{c}\right) \tag{2}$$

The utility of each agent depends on her monetary payoff y_i and her relative payoff $\frac{y_i}{c}$. The sum of all group members' monetary payoffs is represented by c, $c = \sum_{j=1}^{n} y_i$. Based on Bolton and Ockenfels (2000), in our framework each agent maximizes the following utility function:

$$U_i = y_i - \vartheta_i \left(\frac{y_i}{y_i + 3\bar{y}} - \frac{1}{4}\right)^2 \tag{3}$$

with $\bar{y}$ being the average payoff of the other group members. The parameter ϑ_i represents an individual preference parameter and expresses the importance of disutility from inequality. It is assumed to be weakly positive. If this parameter is sufficiently high, players will conditionally contribute to the public good because if the

other players contribute, the own contribution reduces the difference between the own and the other players' payoffs. For this reason, conditional cooperation is also weakly increasing in ϑ_i. If there is heterogeneity in the MPCRs, it is not generally true that an increase in the own MPCR and a decrease in the other players' MPCRs increases the own contribution. However, it can be shown numerically to hold for the parameters chosen in the experiment ($g_{CC05} \geq g_{CC04} \geq g_{CCu0305} \geq g_{CC03}$). The logic of the numerical analysis works as follows. First, it can be shown that conditional contributions are monotonically increasing in ϑ_i. Because this is the case, it is sufficient to show in a second step that increasing ϑ_i leads to a successive increase in the components of the vector of conditional contributions in the different situations ($g_{cc05}, g_{CC04}, g_{CCu0305}, g_{CC03}$). Using this procedure reveals also that according to the BO-model conditional contributions are only weakly higher in CC04 than in CCu0305, but the difference amounts to at most one point.

In order to understand systematic differences in reactions to heterogeneity, we extend also the BO-model by allowing subjects to differ in their reference group, i.e. we differentiate cases in which subjects compare their own payoffs to the average payoff of all other group members from cases where subjects compare their own payoffs only to the payoff of other group members who have a specific MPCR. Formally, we replace the value of $\bar{y}$ in (3) by the average payoff of the respective reference group. Figure 2 presents subjects' optimal conditional contributions depending on the average contribution of other group members, for a value $\vartheta_i = 2000$. The order of the conditional contribution schedules shown in Figure 1 does not depend on the parameter value of ϑ_i. Figure 2 includes optimal conditional contributions for all games with certainty about the own MPCR.[24] Additionally, for treatments CC03 and CC05, we include optimal conditional contributions for subjects who compare to a specific reference group only. The spread between conditional contributions in CC03 and CC05 will be larger if subjects compare their own payoff only to the average payoff of group members with the other MPCR than if they compare their payoff to all group members. Instead,

[24] We do not include the optimal contributions for CCu0305, which are weakly below optimal contribution in CC04, in order not to charge the figure unnecessarily here.

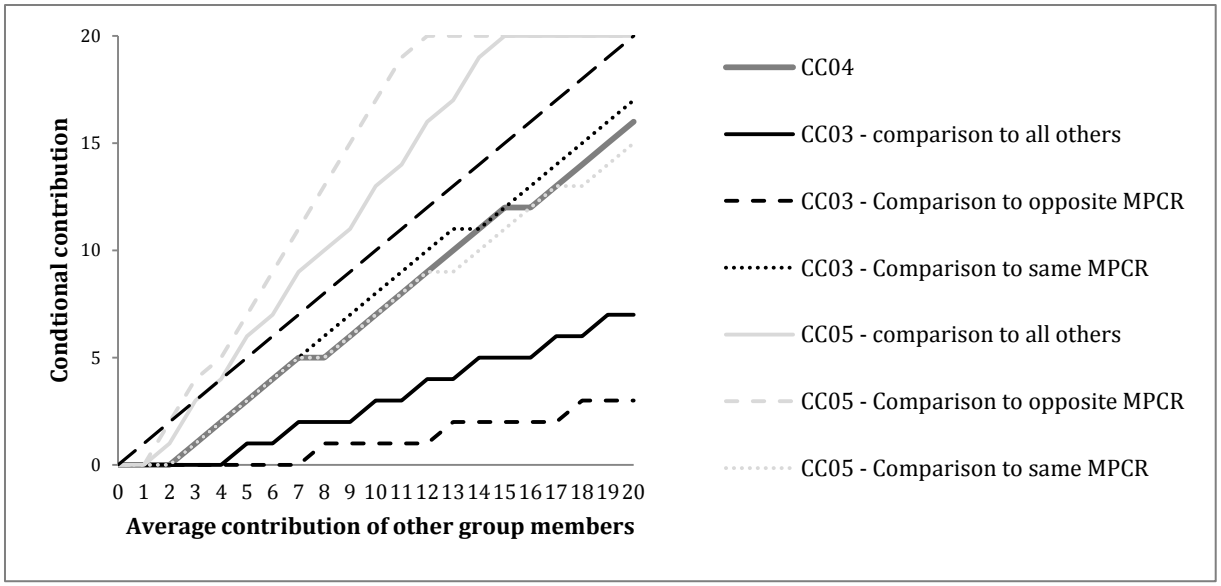


Figure 2.2: Optimal conditional contributions (BO-model, with $\vartheta_i = 2000$)

they will roughly contribute the same in CC03, CC04 and CC05, if they compare their own payoff to the payoff of other group members receiving the same MPCR.

Both the FS- and the BO-model predict that individuals may modify their contribution behavior when heterogeneity in returns from the public good is introduced. In the FS-model, participants have to be less inequity averse to make positive conditional contributions in CC05 than in CC04 than in CC03 (i.e. critical level of β is lower in CC05 than in CC04 and higher in CC03 than in CC04) and also subjects, who contribute positive amounts, contribute less with the low MPCR than with the high MPCR. The BO-model comes to a similar conclusion, because each individual will contribute weakly higher amounts in CC05 than in CC04 than in CC03 for a positive inequity parameter ϑ. Therefore, we should expect on average higher contributions in CC05 than in CC04 than in CC03.

Hypothesis 2.1 (MPCR effect): On average, compared to the homogeneous MPCR of 0.4, average conditional contributions are higher in CC05 and lower in CC03.

Further both models suggest that heterogeneity affects conditional contributions on average negatively

Hypothesis 2.2 (Heterogeneity effect): On average, the average of conditional contributions in CC05 and CC03 is lower than the conditional contributions in the homogeneous case with an MPCR of 0.4.

Because different players may perceive the game differently, we also derived predictions for the FS- and BO-model for subjects who compare only to a specific reference group. Both models suggest that conditional contributions should strongly react to heterogeneity if subjects compare themselves only to group members with the other MPCR, and that reactions to heterogeneity are rather weak if subjects compare only to group members with the same MPCR. This leads us to Hypothesis 2.3.

Hypothesis 2.3 (Type-specific reactions): Conditional cooperators' reactions to heterogeneity differ such that one fraction of conditional cooperators strongly increase contributions in CC05 and strongly decrease contributions in CC03 whereas another fraction reacts only weakly to heterogeneity in returns.

The predictions with respect to conditional contributions under uncertainty about the own MPCR differ strongly: the FS-model predicts that subjects strongly reduce conditional contributions whereas the BO-model predicts that contributions in CCu0305 are only weakly smaller than contributions in CC04 and do not differ by more than one point. Therefore, we formulate hypotheses 2.4a and 2.4b with respect to conditional contributions under uncertainty.

Hypothesis 2.4a (Uncertainty effect): Contributions in CCu0305 do strongly differ from conditional contributions in CC04.

Hypothesis 2.4b (Uncertainty effect): Contributions in CCu0305 do not differ by more than one point from conditional contributions in CC04.

2.4 Results

2.4.1 Results from unconditional cooperation games (UC games)

Figure 2.3 presents average unconditional contributions in the UC games as well as the mean of UC03 and UC05 as an additional benchmark. We observe significantly higher contributions to the public good when MPCRs are homogeneous rather than heterogeneous, irrespective of uncertainty (Wilcoxon signed-rank test: UC04 vs. UCu0305, $z=5.526$, $p<0.001$ and UC04 vs. MeanUC03UC05, $z=3.894$, $p<0.001$).[25] Subjects on average contribute positive amounts even under uncertainty about the own MPCR.

[25] This result holds irrespective of the order in which subjects played the game.

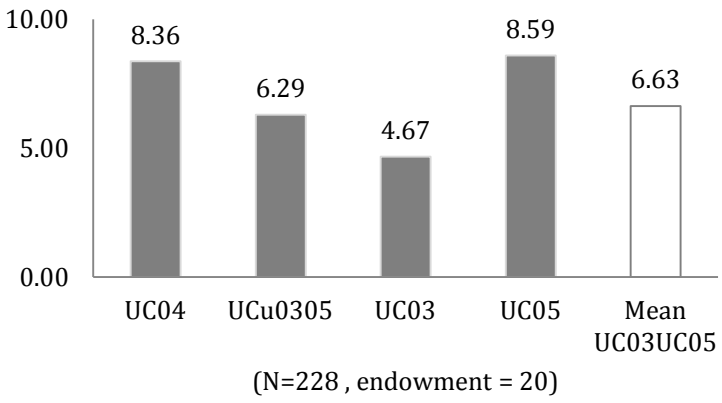


Figure 2.3: Average unconditional contributions to the public good in UC games

The introduction of uncertainty in addition to heterogeneity only slightly lowers subjects' contributions (Wilcoxon signed-rank test: UCu0305 vs. MeanUC03UC05, *z=2.316*, *p=0.021*). In UC03, average unconditional contributions are lower than in UC04 (Wilcoxon signed-rank test: *z=8.094*, *p<0.001*) and weakly higher in UC05 than in UC04 (Wilcoxon signed-rank test: *z=1.775*, *p=0.076*). Nevertheless, the decrease of contributions between UC04 and UC03 is much stronger than the increase of contributions between UC04 and UC05 (Wilcoxon signed-rank test: *z=3.894*, *p<0.001*). Isaac and Walker (1988) showed that MPCRs and contributions are positively related in homogeneous environments. We cannot completely confirm this finding for heterogeneous environments. We find that lower returns induce a decrease of contributions when MPCRs are heterogeneous; we only observe a weak increase in contributions with high MPCRs in the heterogeneous environment. Thus the (positive) effect of the value of the MPCR seems to interact with the (negative) effect of heterogeneity of group members' MPCRs.

The results on unconditional contributions give the global effect of heterogeneity in returns on average contributions to the public good. However, the decrease in unconditional contributions might be driven by pessimistic beliefs about other group members' contributions. Therefore we focus next on subjects conditional contributions, which are independent of beliefs about group members' average contributions.

2.4.2 Results from conditional cooperation games (CC games)

Figure 2.4 shows average conditional contributions for all subjects in all treatments. Subjects on average increase their conditional contributions in CC05 compared to CC04 whereas they decrease conditional contributions in CC03. Average conditional contributions in CC04 are 5.81, in CC05 6.31, in CC03 5.10 and in CCu0305 5.45.[26] Thus we cannot reject Hypothesis 2.1.

Result 2.1: On average, conditional contributions are higher in CC05 and lower in CC03 compared to the homogeneous MPCR of 0.4.

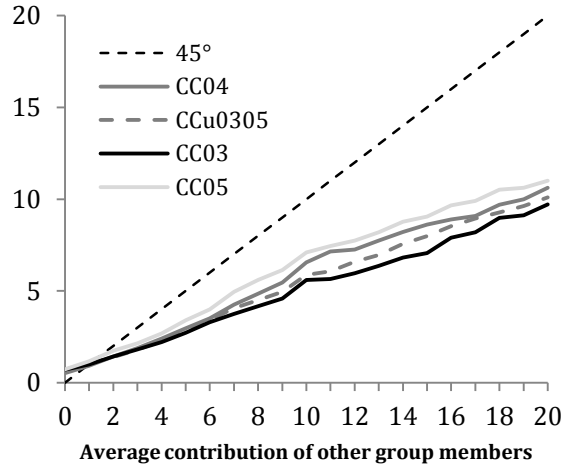


Figure 2.4: Average conditional contributions to the public good (N=228)

To investigate whether subjects adjust conditional contributions by changing their conditional contribution for every given average contribution level (i.e. they adjust the slope of their contribution schedule) or whether subjects simply become more or less generous when heterogeneity is introduced (i.e. they shift their schedule), we regress subjects' conditional contributions in model (1) of Table 2.2 on the average contribution by their group members for the different treatments. The first column of table 2.2 shows that in CC03 subjects decrease their slope significantly by 0.067 whereas they do not significantly increase their slope in CC05. Instead, they behave more generously by shifting up the intercept of their schedule by 0.311.

In order to test hypothesis 2, we consider the average contribution of CC03 and CC05 for each individual subject to measure the aggregate effect of the introduction of heterogeneity in returns in model (2). Interestingly, heterogeneity does not affect

[26] All averages are significantly different from another at the 5 percent level according to Wilcoxon sign rank tests.

conditional contributions of subjects significantly, suggesting that heterogeneity in particular affects subjects' beliefs about others' contributions. We summarize this finding in result 2.2.[23]

Result 2.2: Conditional contributions of subjects with homogeneous MPCRs do not significantly differ from the average of subjects' conditional contributions with heterogeneous MPCRs.

Dependent variable :	**Model (1)**		**Model (2)**	
Conditional contribution	All subjects	Conditional Cooperators	All subjects	Conditional Cooperators
Average contribution of other group members	**0.523*** **	**0.816*** **	**0.523*** **	**0.816*** **
	(0.031)	(0.028)	(0.031)	(0.028)
CC04	Ref.	Ref.	Ref.	Ref.
CCu0305	-0.048	-0.009	-0.048	-0.009
	(0.108)	(0.110)	(0.108)	(0.110)
MeanCC03CC05			0.134	**0.285** **
			(0.121)	(0.143)
CC03	-0.044	0.045		
	(0.151)	(0.183)		
CC05	**0.311** **	**0.524*** **		
	(0.134)	(0.150)		
Group average × CC04	Ref.	Ref.	Ref.	Ref.
Group average × CCu0305	**-0.031***	**-0.078*** **	**-0.031***	**-0.078*** **
	(0.016)	(0.020)	(0.016)	(0.020)
Group average × MeanCC03CC05			-0.024	**-0.097*** **
			(0.022)	(0.026)
Group average × CC03	**-0.067*** **	**-0.146*** **		
	(0.023)	(0.028)		
Group average × CC05	0.019	**-0.048***		
	(0.024)	(0.028)		
Constant	**0.582*** **	-0.205	**0.582*** **	-0.205
	(0.208)	(0.193)	(0.208)	(0.193)
Observations	19,152	12,096	14,364	9,072
# clusters	228	144	228	144
R^2	0.225	0.489	0.229	0.516

Table 2.2: OLS regressions on conditional contributions[27]
Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

[27] We also controlled for order effects. We find that subjects become less generous as the experiment progresses. Considering model (1) for all subjects, those who first face the heterogeneous case contribute in CC04 about the average of their conditional contribution in CC03 and CC05. Subjects who face the homogeneous situation first contribute slightly less than the average of their conditional contribution in CC03 and CC05. For conditional cooperators we find qualitatively similar results with both orders.

Figure 2.4 also shows that with uncertainty about the own MPCR, average conditional contributions are lower than conditional contributions in CC04 but higher than in CC03. We can thus reject hypothesis 4a. Further contributions in CC04 are by more than 1 point higher than in CCu0305 for almost all group average contributions larger than 10.[28] We also find that uncertainty does not make subjects less generous, but reduces the slope of their contribution schedule (see also column 1 of model (1) in table 2.2). We summarize these findings as follows.

Result 2.3: Uncertainty in MPCRs reduces conditional contributions on average by not more than 1.5 points.

To study individual and type-specific reactions, we classify subjects based on their behavior in CC04 for the subsequent analysis. We define preference types according to the procedure introduced by Fischbacher et al. (2001): Selfish subjects are subjects who always contribute zero to the public good; conditionally cooperative subjects are subjects who monotonically increase their contribution to the public good as the average contribution of other group members increases or whose contributions are significantly positively correlated to the average contribution of other group members. The last type of subject shows a hump-shaped contribution pattern, i.e. these subjects' contributions are increasing in the average contribution of other group members until a specific value and then decrease in it.

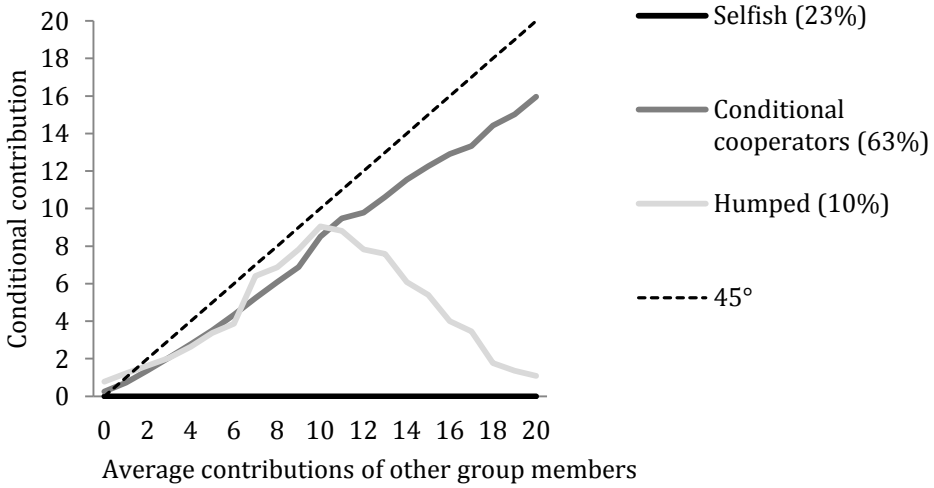


Figure 2.5: Average of conditional contributions in CC04 by type

[28] The exceptions are group averages of 12 and 17.

Over the 228 participants, we observe 23% selfish subjects, 10% show a humped-shaped pattern and 63% are conditional cooperators. Only 4% of the participants do not fit in any of these categories.[29] The contribution of each type for all potential average contributions of other group members in CC04 is depicted in Figure 2.5. Subjects with a humped-shaped pattern and subjects who do not follow a specific strategy are few (in total they represent 14% of the subjects) and display behavior that is not consistent with stability of other-regarding preferences. We briefly report the results for subjects categorized as humped-shaped and selfish but concentrate our analysis on conditionally cooperative subjects.

2.4.3 Selfish subjects and subjects with a humped-shaped contribution schedule

Almost all subjects who are classified as selfish in CC04 contribute zero to the public good for any average contribution of other group members in CC03, CC05 and CCu0305. Thus heterogeneity does not significantly affect contribution behavior by these subjects.[30] Conditional contributions schedules with humped-shaped patterns are rare (22 out of 228 subjects). Subjects with such schedules contribute on average 4.43 in CC04. Average contributions are higher when heterogeneity is introduced, weakly in CC03 (5.66, Wilcoxon signed-rank tests, $p = 0.0998$) and strongly in CC05 (7.02, $p = 0.0002$). Changes in average contributions are mainly caused by 8 subjects, who show a humped-shaped pattern in CC04 but are conditionally cooperative either in CC03, CC05 or both. Subjects showing a humped-shaped pattern in all three situations (CC04, CC03, CC05) are only weakly affected by heterogeneity.

2.4.4 Conditional cooperators - At the aggregate level

Figure 2.6 presents conditional contributions for subjects classified in CC04 as conditional cooperators. The figure shows that the slope in CC03 and CCu0305 is flatter than the slope in CC04. However, the slope is almost identical in CC05 and CC04. We test with a linear regression whether these results are significant (see Table 2.2).

Model (1) shows that if MPCRs are homogeneous, an increase of the average contributions of group members by one point will lead to an increase in conditional contribution by 0.816. However, the positive effect of the average contribution of other group members is significantly lower when heterogeneity of MPCRs is introduced (with

[29] As a comparison, Fischbacher, et al. (2001) find about one third of subjects classified as free riders whereas about 50 percent are conditionally cooperative.

[30] Six out of 52 as selfish classified subjects contribute more than zero in CC03, UC05. Among them 4 who slightly increase contributions in both UC03 and UC05 and two who only increase their contributions in UC05.

and without uncertainty about the own MPCR). When the own MPCR is certain, the positive effect of group members' average contribution is significantly smaller in CC03 than in CC05. Besides, a high MPCR makes conditional cooperators on average more generous (+0.417 points irrespective of the group average compared to CC04) but a low MPCR makes subjects on average less generous (-0.572 points irrespective of the group average compared to CC04). We summarize the findings in result 2.4.

Result 2.4: At the aggregate level, the slope of the contribution schedule of conditional cooperators decreases when they receive the low MPCR but does not increase when they receive the high MPCR compared to homogeneous MPCRs.

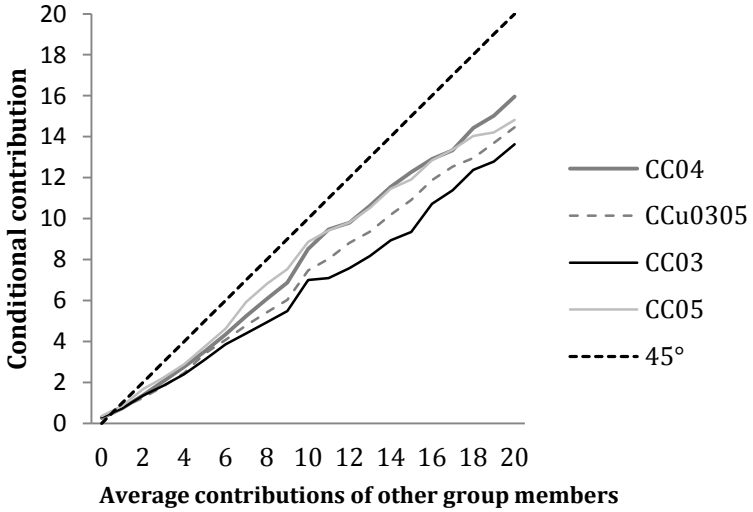


Figure 2.6: Average of conditional contributions by conditional cooperators

Model (2) shows that heterogeneity slightly increases generosity of conditional cooperators but reduces the slope of conditional cooperators' contribution schedules on average by almost 0.1 points. Thus, for average contributions higher than 4, heterogeneity reduces conditional contributions of conditional cooperators although the social return of the public good is identical to the homogeneous case. Comparing the coefficients of *CCu0305* and *MeanCC03CC05* as well as *Group average × CCu0305* and *Group average × MeanCC0305* allows us to infer whether uncertainty in addition to heterogeneity in MPCRs changes behavior of conditional cooperators. Clearly, conditional cooperators are more generous when they know their own MPCR (Wald test, p=0.013) but the slope coefficients do not significantly differ (Wald test, p=0.359). We summarize this finding in result 2.5.

Result 2.5: In case of heterogeneity of MPCRs, conditional cooperators are significantly less generous when facing uncertainty about their own MPCR but do not additionally reduce the slope of their contribution schedule.

2.4.5 Conditional cooperators - At the individual level

Hypothesis 2 suggests that some conditional cooperators react to the introduction of heterogeneity in MPCRs but others do not, because this type of subject compares her payoff only to the payoff of the subject with the same MPCR. To test hypothesis 2, we use the hierarchical cluster analysis of Ward (1963). This method is based on the minimization of the intra-group variance. At each step in the analysis, the union of every possible cluster pair is considered and the two clusters whose fusion results in minimum increase in variance are combined. To classify subjects, we use two variables reporting how subjects' conditional cooperation differs between CC04 and CC03 and between CC04 and CC05. The first variable is the average of each subject's difference in conditional contributions in CC03 and CC04. We call this variable Diff03 (Diff03 = average of ($g_{i03} - g_{i04}$). Diff03 being negative indicates that subjects' conditional cooperation is less perfect when the subject's MPCR equals 0.3 (with heterogeneity of MPCRs) than when it equals 0.4 (with homogeneity of MPCRs). To compute the second variable, we do the same but replace the low MPCR by the high MPCR. We name this second variable Diff05 = $g_{i05} - g_{i04}$.

On average, the difference between the average contribution of other group members and the conditional contribution of a conditional cooperator is equal to 2.04 in CC04. When there is heterogeneity in MPCRs, this value is equal to 3.45 if subjects receive the low MPCR, 2.00 if subjects receive the high MPCR and 2.83 if they do not know which MPCR they will receive. We have thus Diff03 = -1.41 and Diff05 = 0.04. We identify six categories of subjects with Ward's classification method. For each category of subjects, the average and standard deviation of Diff03 and Diff05 as well as the share of conditional cooperators it includes are presented in table 2.4. From Ward's classification of conditional cooperators, we can infer whether behavior corresponds to the classifications suggested by theory. On the one hand, 31.9% of conditional cooperators behave as if they compare their payoff to the payoff of the other group member receiving the same MPCR. They do not significantly change their behavior as heterogeneity in MPCRs is introduced (t-test for difference with 0, $p = 0.178$ for Diff03 and $p = 0.852$ for Diff 05, Wilcoxon signed rank test, p-value=0.649). On the other hand,

17.4% of conditional cooperators behave as if they compare their payoff to the average payoff of all other group members, or to the two group members having the opposite MPCR. These subjects modify their conditional contributions to the public goods as heterogeneity of MPCRs is introduced: they significantly decrease their contributions to the public goods when they receive the low MPCR and increase it when they receive the high MPCR (Wilcoxon signed rank test for difference with 0, $p < 0.01$ for Diff03 and Diff05). Hence, we cannot reject hypothesis 2.

Ward's classification yields two further categories, in which behavior corresponds roughly to the theoretical prediction by the BO-model for subjects who compare their payoff only to payoffs of subjects with a specific MPCR of either 0.3 or 0.5. According to the theoretical model, for subjects who only compare to others with an MPCR of 0.5 it should hold that $g_{CC04} > g_{CC03}$ *and* $g_{cc04} \geq g_{cc05}$. Indeed, 12.5% of conditional cooperators roughly behave in this way. They significantly and strongly decrease their contribution when they receive the low MPCR and do not significantly

	Share	Average Diff03	Average Diff05	SD Diff03	SD Diff05
Comparison with the same MPCR subject[31]	31,9%	0,06	0,01	0,29	0,45
Comparison to all others & to opp. MPCR[32]	17,4%	-1,60***	0,59***	0,65	0,61
Comparison to 05 subject(s)	12,5%	-5,39***	0,76	2,07	1,55
Comparison to 03 subject(s)	14,6%	0,77***	1,75***	1,04	0,83
Heterogeneity averse[33]	16,7%	-4,95***	-4,70***	2,56	2,78
Heterogeneity lover	6,9%	3,39***	5,28***	2,43	2,96

Table 2.3: Classification of conditional cooperators
Stars indicate whether values are significantly different from zero according to Wilcoxon sign rank tests, with *= p-value < 0.10, **= p-value < 0.05 and ***= p-value <0.01

[31] No reaction to heterogeneity in returns may also result from comparisons in contributions instead of final payoffs.

[32] We cannot separate subjects comparing themselves to subjects with the opposite MPCR from subjects comparing to all others, because the theoretical predictions do not differ qualitatively.

[33] Heterogeneity averse people are actually classified into two different clusters. Although average Diff03 and average Diff05 have the same sign in both clusters, the magnitude is different. We group these two clusters because for both Diff03 and Diff05 are strongly negative. Each cluster presents 8.3% of the population. In the first cluster, average Diff03 is -6.94 and average Diff05 is -6.86 while in the second cluster these values are respectively -2.97 and -2.54.

change their behavior if they receive the high MPCR (Wilcoxon signed rank test for difference with 0, $p < 0.01$ for Diff03 and p=0.123 for Diff05). Behavior of another 14.6% of conditional cooperators roughly coincides with the prediction of the BO-model for subjects who compare their payoff only to payoffs of members receiving an MPCR of 0.3. They significantly increase their contribution when they receive the high MPCR and slightly increase it when they receive the low MPCR (Wilcoxon signed rank test for difference with 0, $p < 0.01$ for Diff03 and Diff05).

The two last categories include subjects who are affected by the introduction of heterogeneity in MPCRs in the same way by both CC03 and CC05. We name 16.7% of our subjects "heterogeneity averse" because they significantly decrease their contribution when heterogeneity is introduced irrespective of their own MPCR (Wilcoxon signed rank test for difference with 0, $p < 0.01$ for Diff03 and Diff05). We have called the smallest (6.9%) and last category of subjects "heterogeneity loving" as they significantly increase their contribution in UC03 and UC05 (Wilcoxon signed rank test for difference with 0, $p < 0.01$ for Diff03 and Diff05).

2.5 Conclusion

We investigated whether the introduction of heterogeneity and uncertainty in returns from public goods affects unconditional and conditional contribution behavior. Unconditional contributions depend on beliefs whereas conditional contributions are belief-independent. A within-subject design allowed us further to analyze reactions to heterogeneity in MPCRs from the public good at the individual level. Based on the assumption that subjects may compare to different reference groups, we hypothesized that individuals react differently to heterogeneity in returns.

The results show that, at the aggregate level, heterogeneity in MPCRs from the public good reduces unconditional contributions significantly, regardless of whether the own MPCR from the public good was certain or uncertain. However, conditional contributions are less strongly affected by heterogeneity, suggesting that negative effects of heterogeneous environments may in particular result from more pessimistic beliefs about others' contribution behavior.

Decomposing our results on conditional contributions shows that reactions to heterogeneity in returns are heterogeneous. Differences in reactions are systematic. Heterogeneity does not affect selfish subjects' behavior significantly. Conditional

cooperators' reactions are mixed. We detect around one third of conditional cooperators who do not react to heterogeneity in MPCRs. 17 percent of conditional cooperators decrease their contributions when they receive the low MPCR and increase it when they receive the high MPCR. Additionally, some conditional cooperators mainly react to only high or low returns while others have the same reaction regarding both returns when heterogeneity is introduced. A substantial part of this variation can be explained by accounting for different reference groups subjects may compare to. The decomposition of results on conditional contributions yields an important insight: Heterogeneity decreases conditional contributions mainly for two types of conditional cooperators. The first type dislikes heterogeneity in general. The second type behaves as if comparing only to group members with higher returns from the public good.

Our results show that heterogeneity in returns from public goods reduces unconditional contributions. Thus, a desirable policy should aim at reducing heterogeneity in returns to public goods. One measure to reduce heterogeneity in returns are compensations. However, compensations require the policy maker to be able to identify returns from public goods for different individuals. Hence compensations are difficult to be implemented in practice. However, we also find that heterogeneity affects conditional contributions rather weakly. This result indicates that pessimistic beliefs about others' contributions are the main cause for the reduction in unconditional contributions. Consequently, specific communication campaigns which counteract pessimistic beliefs about others' contributions are a promising measure to increase unconditional contributions to the public good. Such policies should emphasize that many of those who gain more from a public good are also willing to contribute more to it. Counteracting the weak negative impact of heterogeneity on conditional contributions seems to be more difficult. While it may be helpful to make heterogeneity in returns less salient for conditional cooperators who dislike heterogeneity in general, de-emphasizing heterogeneity without deceiving the public is difficult. Further most policies which try to increase contributions by individuals who compare only with others who gain more from the public good require the possibility to identify these individuals. One possible exception are policies which highlight the general fact that many people are conditionally cooperative even if they face heterogeneity in returns.

2.6 Appendix to Chapter 2: Instructions (translated from German)

Instructions

You are about to participate in an experiment on decision-making. During this session, you can earn money. The amount of your earnings depends on your decisions and on the decisions of the participants you will interact with.

In the experimental session, you will make decisions in seven different experiments. One experiment will be randomly chosen to determine your payment. At the very beginning of the experimental session, one participant will be randomly selected to throw a die at the end in order to select the experiment that will be paid and to make all other random selections. The chosen experiment will be announced at the end of the experimental session. The experiment selected for payments is the same for all participants in the session. The payment you will receive will be your income in the selected experiment. In addition, you will receive a show-up fee of 4 Euros. You will be paid in cash at the end of the experimental session.

Each experiment is independent of the previous experiment you play. The next experiment starts as everybody in the room has made his decision in the previous experiment.

Please read the instructions carefully. To make sure that all participants have understood correctly, you will have to answer questions about the instructions.

You are not allowed to communicate during the experiment. If you have any questions, please ask us. Violation of this rule will lead to the exclusion from the experimental session and all payments. If you have questions, please raise your hand. A member of the experimenter team will come to you and answer them in private.

Thank you for your participation.

We will not speak in Euros during the experimental session, but rather in points. Your whole income will first be calculated in points. At the end of the experiment, the total amount of points you earned will be converted to Euros at the following rate:

1 point = 0.75 Euro

All participants will be divided in groups of four members. Except from us – the experimenters – no one knows who is in each group.

We describe the exact experiment process below.

The basic decision situation

We first introduce you to the basic decision situation. Further instructions will be distributed during the session. You will find control questions at the end of the description of the basic decision situation that help to understand the basic decision situation.

You will be a member of a group consisting of **4 people**. These groups will be reconstituted when a new experiment starts. Nobody knows the composition of the groups. Neither before, nor after the experimental session you will learn which people are/were in your group. You will receive a membership number in the group (1, 2, 3 or 4) that will remain the same for the whole experiment.

Each group member has to decide on the allocation of 20 points. You can put these 20 points into your **private account** or you can invest them **fully** or **partially** into a project. Each point you do not invest into the project will automatically remain in your private account.

Your income from the private account

You will earn one point for each point you put into your private account.

Income from your private account = *20 – your contribution to the project*

For example, if you put 20 points into your private account (and therefore do not invest in the project), your income will amount to exactly 20 points out of your private account. If you put 6 points into your private account, your income from this account will be 6 points. **No one except you earns something from your private account.**

Your income from the project

Each group member will profit equally from the amount you invest into the project. On the other hand, you will also get a payoff from the other group members' investments. The income for each group member will be determined as follows:

Income from the project = *sum of all contributions × 0.4*

If, for example, the sum of all contributions to the project is 60 points, then you and the other members of your group each earns 60 × 0.4 = 24 points out of the project. If four members of the group contribute a total of 10 points to the project, you and the other members of your group each earns 10 × 0.4 = 4 points.

Total income

Your total income is the sum of your income from your private account and that from the project:

Your total income =
Income from your private account (= 20 – your contribution to the project)
+ Income from the project (= sum of all contributions to the project × 0.4)

Control questions

Please answer the following control questions. They will help you to gain an understanding of the calculation of your income, which varies with your decision about how you distribute your 20 points. *Please answer all the questions and write down your calculations.*

1. Each group member has 20 points. Assume that none of the four group members (including you) contributes anything to the project.
   What will *your* total income be? _____

What will the total income of the *other* group members be? _____

2. Each group member has 20 points. You invest 20 points in the project. Each of the other three members of the group also contributes 20 points to the project.

What will *your* total income be? _____
What will the total income of the *other* group members be? _____

3. Each group member has 20 points. The other 3 members contribute a total of 30 points to the project.
   a) What will *your* total income be, if you – in addition to the 30 points – invest 0 points into the project?

Your **Income _____**

   b) What will *your* total income be, if you – in addition to the 30 points – invest 8 points into the project?

Your **Income _____**

   c) What will *your* total income be, if you – in addition to the 30 points – invest 15 points into the project?

Your **Income _____**

4. Each group member has 20 points at his or her disposal. Assume that you invest 8 points to the project.

a) What is your total income if the other group members – in addition to your 8 points – contribute another 7 points to the project?

***Your* Income _____**

b) What is your total income if the other group members – in addition to your 8 points – contribute another 12 points to the project?

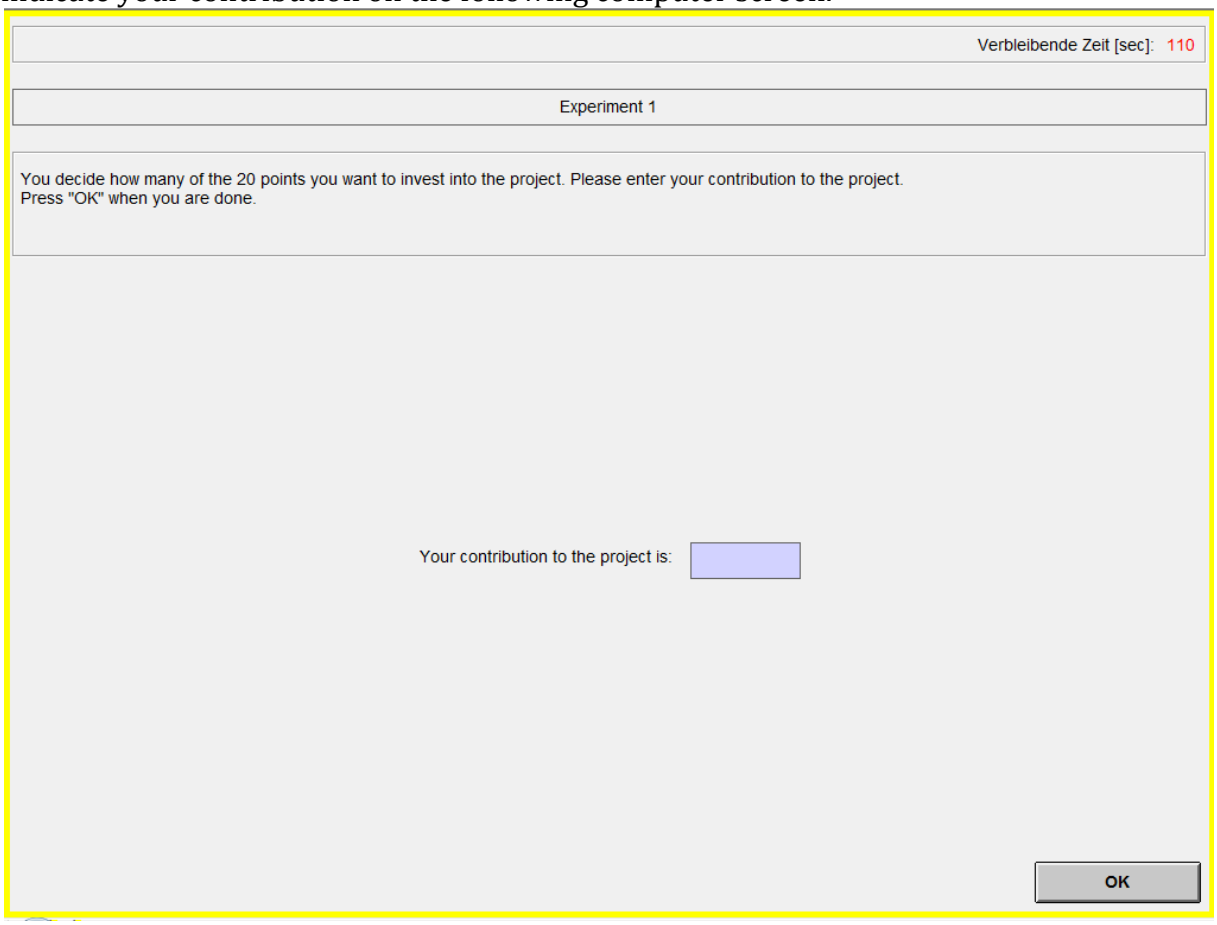
***Your* Income _____**

c) What is your income if the other group members – in addition to your 8 points – contribute another 22 points to the project?

***Your* Income _____**

Experiment 1

The experiment 1 includes the decision situation just described to you.
As you know, you will be a member of a group consisting of 4 persons and you will have 20 points at your disposal. You can put them into a private account or you can invest them into a project.
You decide how many of the 20 points you want to invest into the project. Please indicate your contribution on the following computer screen.



After you have determined your contribution, please click “OK”.

Experiment 2

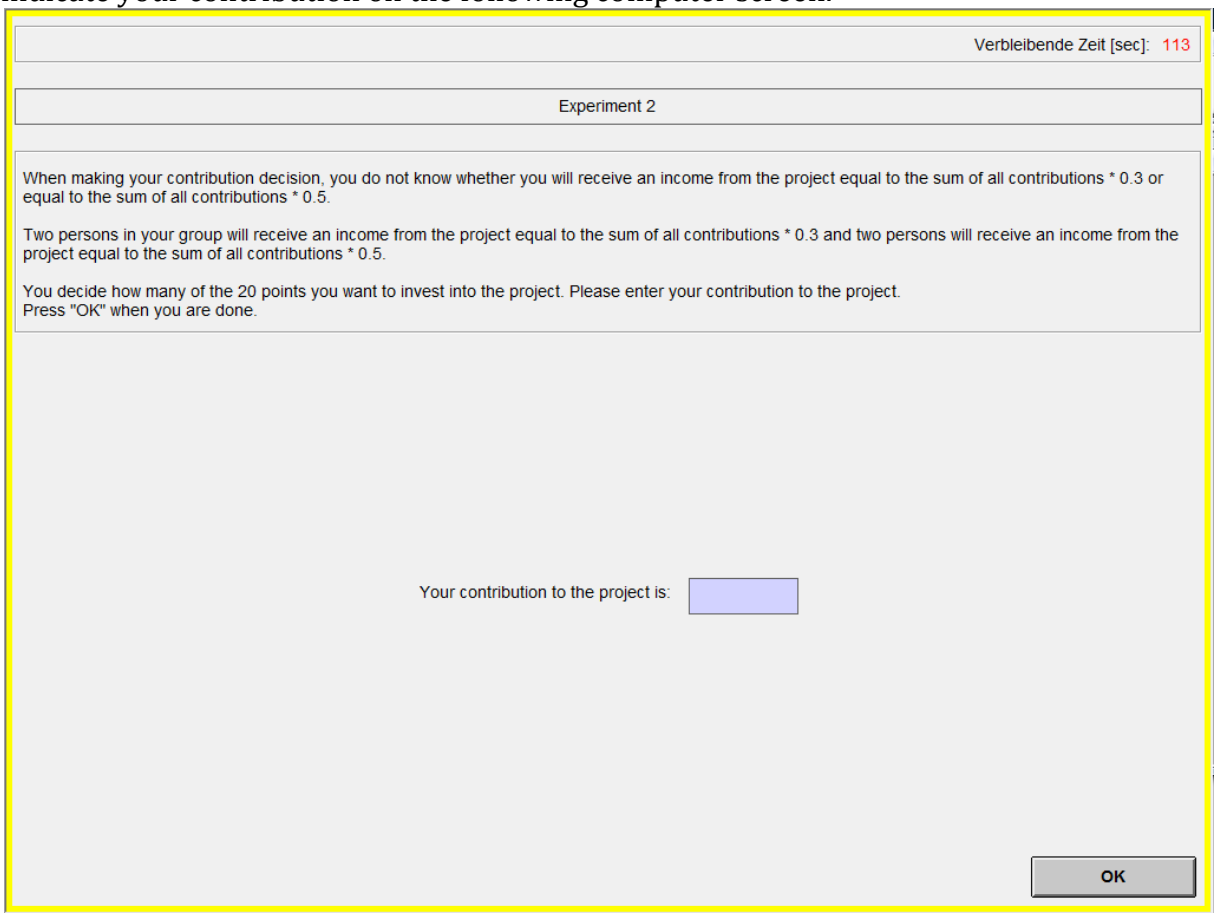
The experiment 2 consists of the basic decision situation, except for one change.
As you know, you will be a member of a group consisting of 4 persons and you will have 20 points at your disposal. You can put them into a private account or you can invest them into a project.
Your income from the project is different from the basic decision situation. In your group, two persons will receive an income from the project equal to:

***Income from the project** = sum of all contributions × 0.3*

And, two persons will receive an income from the project equal to:

***Income from the project** = sum of all contributions × 0.5*

When making your contribution decision, you do not know whether you will receive an income from the project equal to the sum of all contributions × 0.3 or equal to the sum of all contributions × 0.5. But you know that two persons in your group will receive an income from the project equal to the sum of all contributions × 0.3 and two persons will receive an income from the project equal to the sum of all contributions × 0.5.
You decide how many of the 20 points you want to invest into the project. Please indicate your contribution on the following computer screen.



After you have determined your contribution, please click “OK”.

The random selection of the income from the project will be implemented as follows. Each group member is assigned a number between 1 and 4. As you remember, a participant was randomly selected at the beginning of our experimental session. This participant will throw a 6-sided die at the very end of the experimental session. The resulting number will be entered into the computer.

Your income from the project will be equal to the sum of all contributions × 0.5 or × 0.3, depending on the result of the 6-sided die and on your membership number according to the following table:

Your income from the project will be equal to the sum of all contributions × ...

If the result of the die is:	If your membership number is: 1	2	3	4
1	**0.3**	**0.3**	**0.5**	**0.5**
2	**0.3**	**0.5**	**0.3**	**0.5**
3	**0.3**	**0.5**	**0.5**	**0.3**
4	**0.5**	**0.3**	**0.3**	**0.5**
5	**0.5**	**0.3**	**0.5**	**0.3**
6	**0.5**	**0.5**	**0.3**	**0.3**

Control questions

Please answer the following control questions. They will help you to gain an understanding of the calculation of your income, which varies with your decision about how you distribute your 20 points. *Please answer all the questions and write down your calculations.*

Assume that your membership number is 1.

1. Each group member has 20 points. Assume that none of the four group members (including you) contributes anything to the project. The result of the 6-sided die thrown at the end of the experiment is 4.

What will *your* total income be? _____
What will the total income of the group member 2 be? _____
What will the total income of the group member 3 be? _____
What will the total income of the group member 4 be? _____

2. Each group member has 20 points. You invest 20 points in the project. Each of the other three members of the group also contributes 20 points to the project. The result of the 6-sided die thrown at the end of the experiment is 2.

What will *your* total income be? _____
What will the total income of the group member 2 be? _____
What will the total income of the group member 3 be? _____
What will the total income of the group member 4 be? _____

3. Each group member has 20 points. The other 3 members contribute a total of 30 points to the project. The result of the 6-sided die thrown at the end of the experiment is 1.

a) What will *your* total income be, if you – in addition to the 30 points – invest 0 points into the project?

***Your* Income _____**

b) What will *your* total income be, if you – in addition to the 30 points – invest 8 points into the project?

***Your* Income _____**

c) What will *your* total income be, if you – in addition to the 30 points – invest 15 points into the project?

***Your* Income _____**

4. Each group member has 20 points at his or her disposal. Assume that you invest 8 points to the project. The result of the 6-sided die thrown at the end of the experiment is 5.

a) What is your total income if the other group members – in addition to your 8 points – contribute another 7 points to the project?

***Your* Income _____**

b) What is your total income if the other group members – in addition to your 8 points – contribute another 12 points to the project?

***Your* Income _____**

c) What is your income if the other group members – in addition to your 8 points – contribute another 22 points to the project?

***Your* Income _____**

Experiment 3

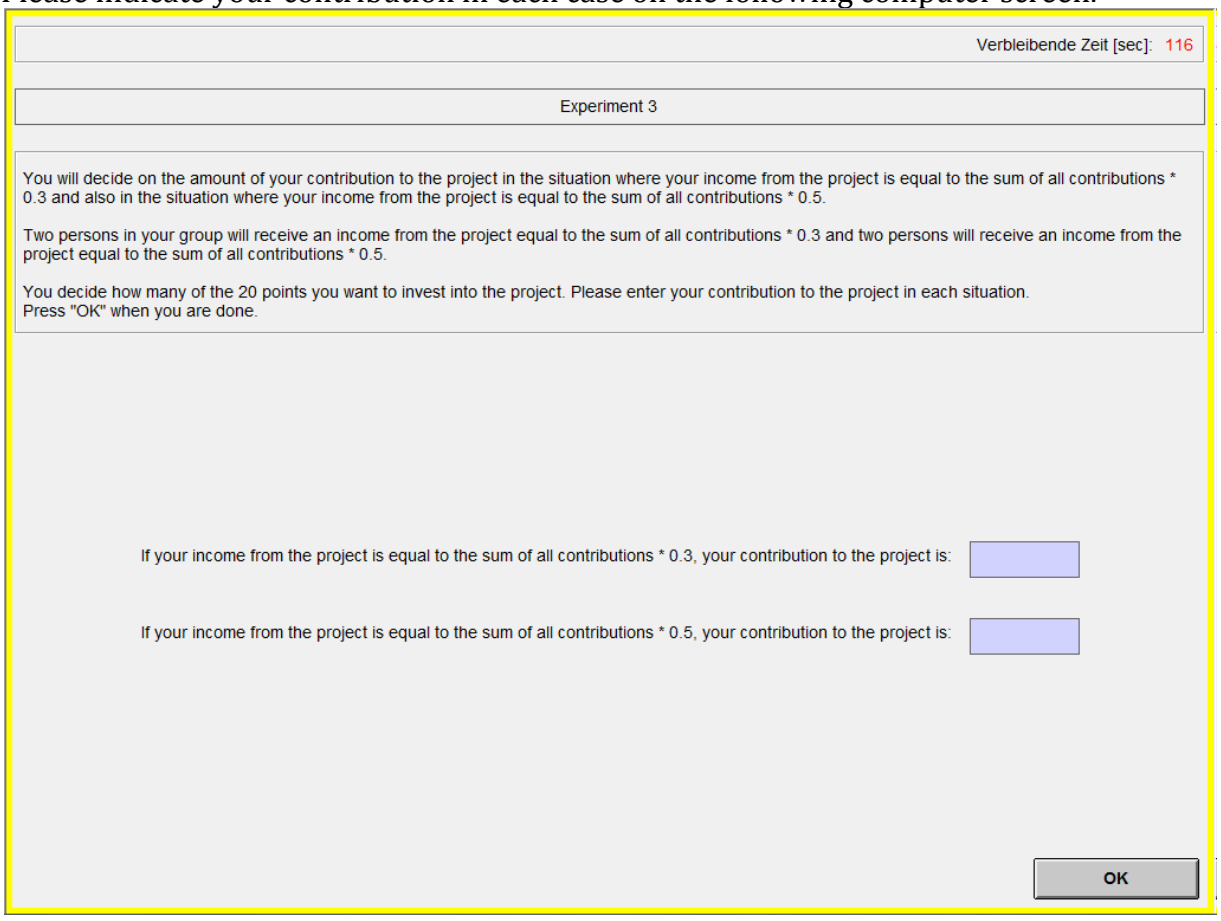
The experiment 3 consists of the situation in the experiment 2 with one change.
As you know, you will be a member of a group consisting of 4 persons and you will have 20 points at your disposal. You can put them into a private account or you can invest them into a project.
As in experiment 2, in your group, two persons will receive an income from the project equal to:

Income from the project = *sum of all contributions* × *0.3*

And, two persons will receive an income from the project equal to:

Income from the project = *sum of all contributions* × *0.5*

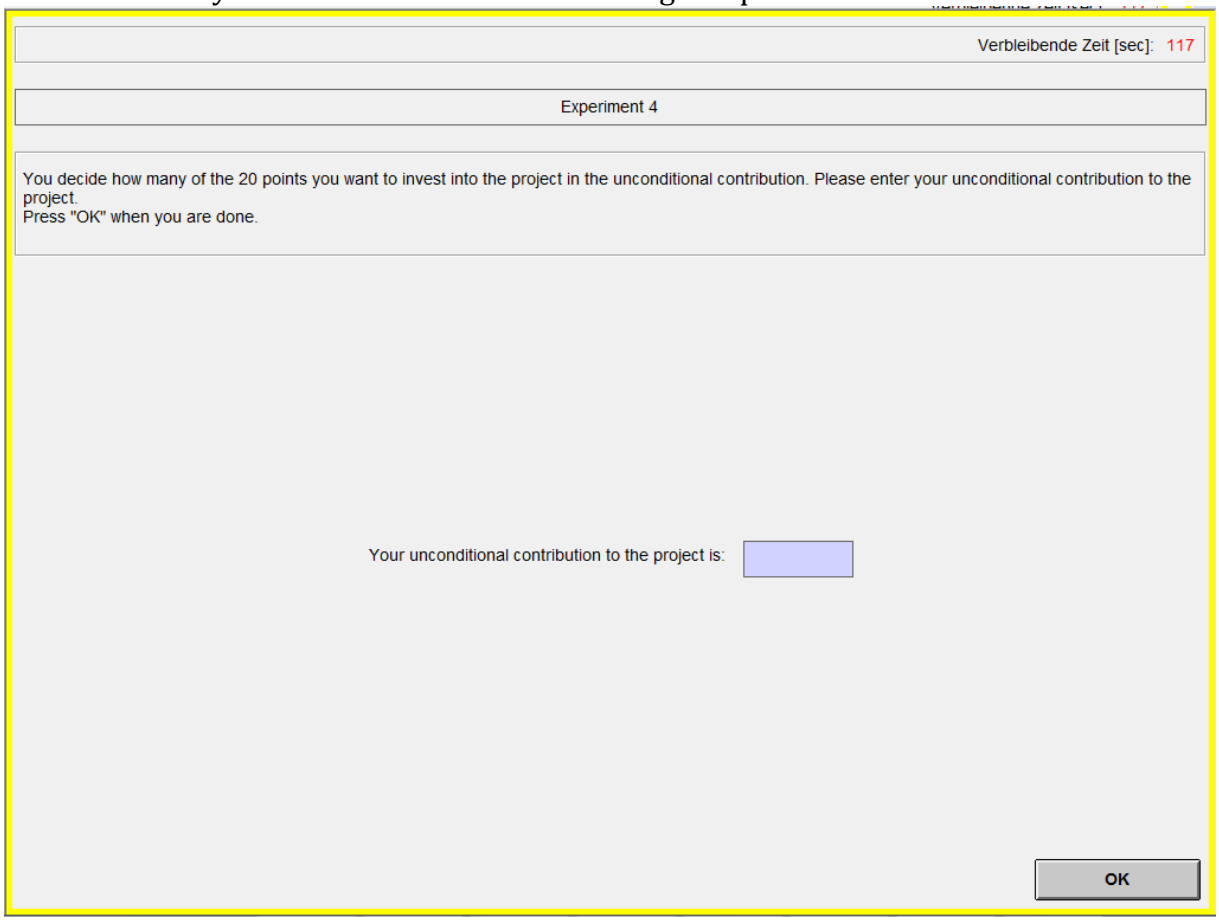
Differently from experiment 2, you will decide on the amount of your contribution to the project for each situation, i.e. if your income from the project is equal to the sum of all contributions × 0.3 and also if your income from the project is equal to the sum of all contributions × 0.5. Recall that two persons in your group will receive an income from the project equal to the sum of all contributions × 0.3 and two persons will receive an income from the project equal to the sum of all contributions × 0.5.
You decide how many of the 20 points you want to invest into the project if your income from the project is equal to the sum of all contributions × 0.3 and also if it is equal to the sum of all contributions × 0.5.
Please indicate your contribution in each case on the following computer screen.



After you have determined your contributions, please click “OK”.
The random selection of the income from the project is implemented as in experiment 2.

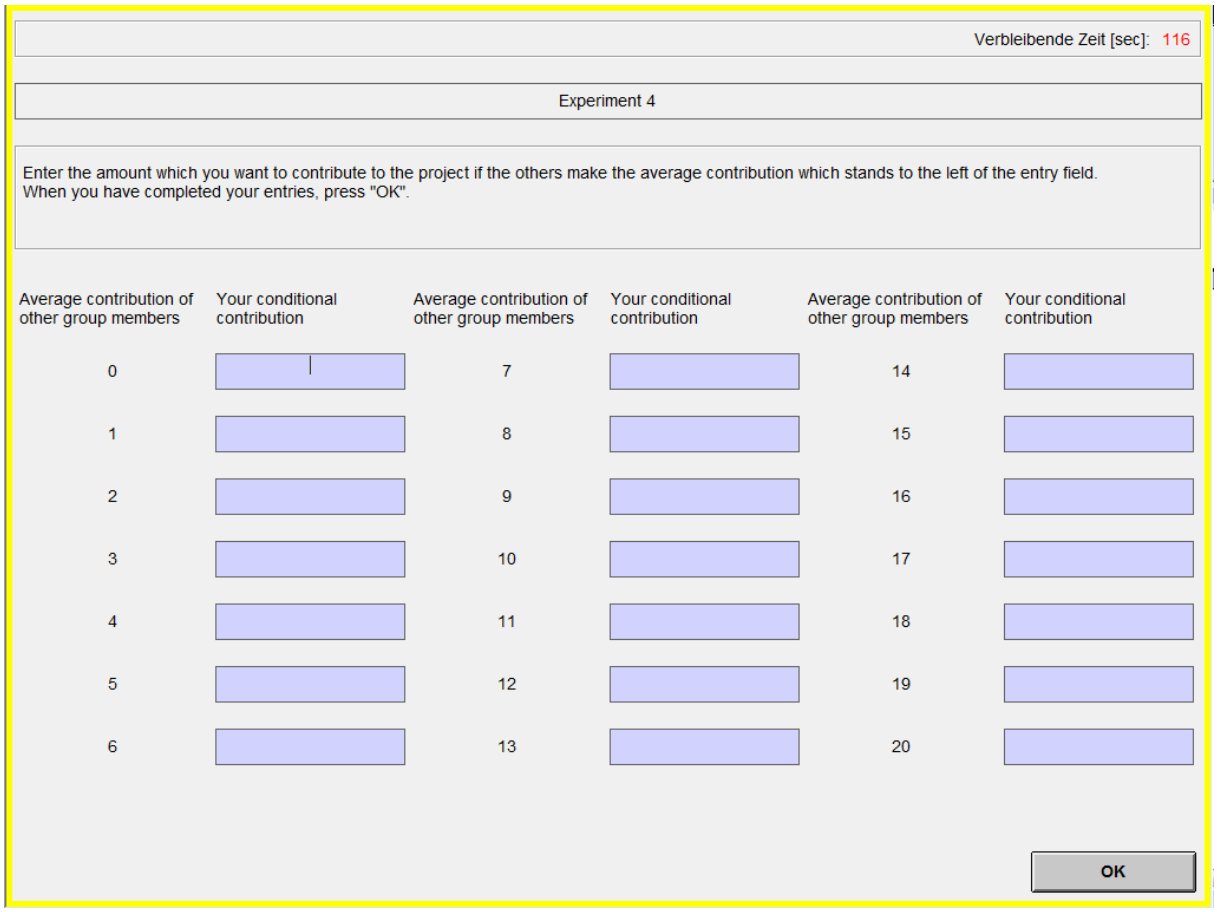
Experiment 4

The experiment 4 includes the basic decision situation just described to you at the beginning of the experimental session.
As you know, you will be a member of a group consisting of 4 persons and you will have 20 points at your disposal. You can put them into a private account or you can invest them into a project.
In this experiment 4, each subject has to make **two types** of decisions, which we will refer to below as the **"unconditional contribution"** and **"contribution table"**.
• You decide how many of the 20 points you want to invest into the project in the **unconditional contribution**.
Please indicate your contribution in the following computer screen:



After you have determined your unconditional contribution, please click "OK".

• Your second task is to fill in a **contribution table** where you indicate how many points **you want to contribute** to the project **for each possible average contribution of the other group members** (rounded to the next integer). You can condition your contribution on that of the other group members. This will be immediately clear to you if you take a look at the following table. This table will be presented to you in the experiment:



The numbers are the possible (rounded) average contributions of the **other** group members to the project. You simply have to insert how many points you will contribute to the project into each input box – conditional on the indicated average contribution. **You have to make an entry into each input box**. For example, you will have to indicate how much you contribute to the project if the others contribute 0 points to the project, how much you contribute if the others contribute 1, 2, or 3 points, etc. You can insert **any integer numbers from 0 to 20** in each input box. Once you have made an entry in each input box, click "OK".

After all participants have made an unconditional contribution and have filled in their contribution table, a random mechanism will select a group member from every group. Only **the contribution table will be the payoff-relevant decision for the randomly determined subject**. Only the **unconditional contribution** will be the payoff-relevant decision for the **other three group members** not selected by the random mechanism. You obviously do not know whether the random mechanism will select you when you make your unconditional contribution and when you fill in the contribution table. You will therefore have to think carefully about both types of decisions because both can become relevant for you. Two examples should make this clear.

EXAMPLE 1: Assume that **the random mechanism selects you. This implies that your relevant decision will be your contribution table**. The unconditional contribution is the relevant decision for the other three group members. Assume they made unconditional contributions of 0, 2, and 4 points. The average contribution of these three group members, therefore, is 2 points. If you indicated in your contribution table that you will contribute 1 point if the others contribute 2 points on average, then the total contribution to the project is given by 0+2+4+1=7. All group members, therefore, earn 0.4×7=2.8 points from the project plus their respective income from the private account. If, instead, you indicated in your contribution table that you would

contribute 19 points if the others contribute two points on average, then the total contribution of the group to the project is given by 0+2+4+19=25. All group members therefore earn 0.4×25=10 points from the project plus their respective income from the private account.

EXAMPLE 2: Assume **that the random mechanism did not select you,** implying that **the unconditional contribution is taken as the payoff-relevant decision** for you and two other group members. Assume your unconditional contribution is 16 points and those of the other two group members are 18 and 20 points. Your average unconditional contribution and that of the two other group members, therefore, is 18 points. If the group member whom the random mechanism selected indicates in her contribution table that she will contribute 1 point if the other three group members contribute on average 18 points, then the total contribution of the group to the project is given by 16+18+20+1=55. All group members will therefore earn 0.4×55=22 points from the project plus their respective income from the private account. If, instead, the randomly selected group member indicates in her contribution table that she contributes 19 if the others contribute on average 18 points, then the total contribution of that group to the project is 16+18+20+19=73. All group members will therefore earn 0.4×73=29.2 points from the project plus their respective income from the private account.

The random selection of the participants will be implemented as follows. Each group member is assigned a number between 1 and 4. As you remember, a participant was randomly selected at the beginning of the experiment. This participant will throw a 4-sided die at the very end of the experiment. The resulting number will be entered into the computer. If the die indicates the membership number that was assigned to you, then your contribution table will be relevant for you and the unconditional contribution will be the payoff-relevant decision for the other group members. Otherwise, your unconditional contribution is the relevant decision.

Experiment 5

The experiment 5 consists of the decision situation you just played in experiment 4, except for one change.

Your income from the project is different from the basic decision situation. In your group, two persons will receive an income from the project equal to:

Income from the project = *sum of all contributions × 0.3*

And, two persons will receive an income from the project equal to:

Income from the project = *sum of all contributions × 0.5*

When making your contribution decision, you do not know whether you will receive an income from the project equal to the sum of all contributions × 0.3 or equal to the sum of all contributions × 0.5. But you know that two persons in your group will receive an income from the project equal to the sum of all contributions × 0.3 and two persons will receive an income from the project equal to the sum of all contributions × 0.5.

As in the experiment 5, you have two tasks to complete.

• Your first task is to decide how many of the 20 points you want to invest into the project in the **unconditional contribution**. After you have determined your conditional contribution, please click "OK".

• Your second task is to fill in a **contribution table** where you indicate how many points **you want to contribute** to the project **for each possible average contribution of the other group members** (rounded to the next integer). You can condition your contribution on that of the other group members. Once you have made an entry in each input box, click "OK".

As in experiment 2, **the random selection of the income from the project** will be implemented as follows. Each group member is assigned a number between 1 and 4. As you remember, a participant was randomly selected at the beginning of our experimental session. This participant will throw a 6-sided die at the very end of the experimental session. The resulting number will be entered into the computer.

Your income from the project will be equal to the sum of all contributions × 0.5 or × 0.3, depending on the result of the 6-sided die and on your membership number according to the following table:

Your income from the project will be equal to the sum of all contributions × ...

If the result of the die is:	If your membership number is: 1	2	3	4
1	**0.3**	**0.3**	**0.5**	**0.5**
2	**0.3**	**0.5**	**0.3**	**0.5**
3	**0.3**	**0.5**	**0.5**	**0.3**
4	**0.5**	**0.3**	**0.3**	**0.5**
5	**0.5**	**0.3**	**0.5**	**0.3**
6	**0.5**	**0.5**	**0.3**	**0.3**

The random selection of the participants is identical as just presented in experiment 4.

Experiment 6

The experiment 6 consists of the situation in the experiment 5 with one change.
As you know, you will be a member of a group consisting of 4 persons and you will have 20 points at your disposal. You can put them into a private account or you can invest them into a project.
As in experiment 5, in your group, two persons will receive an income from the project equal to:

Income from the project = *sum of all contributions* $\times$ *0.3*

And, two persons will receive an income from the project equal to:

Income from the project = *sum of all contributions* $\times$ *0.5*

Differently from experiment 5, you will decide on the amount of your contribution to the project for each situation, i.e. if your income from the project is equal to the sum of all contributions $\times$ 0.3 and also if your income from the project is equal to the sum of all contributions $\times$ 0.5. Recall that two persons in your group will receive an income from the project equal to the sum of all contributions $\times$ 0.3 and two persons will receive an income from the project equal to the sum of all contributions $\times$ 0.5.
As in the experiments 4 and 5, you have two tasks to complete.
• Your first task is to decide how many of the 20 points you want to invest into the project in the **unconditional contribution** when your income from the project is equal to the sum of all contributions $\times$ 0.5 and also when it is equal to the sum of all contributions $\times$ 0.3. After you have determined your conditional contribution, please click "OK".
• Your second task is to fill in a **contribution table** where you indicate how many points **you want to contribute** to the project **for each possible average contribution of the other group members** (rounded to the next integer). You will enter first the contribution table if your income from the project is equal to the sum of all contributions $\times$ 0.5 and second the contribution table if your income from the project is equal to the sum of all contributions $\times$ 0.3. Once you have made an entry in each input box, click "OK".

The **random selection of the income from the project** and the **random selection of the participants** are organized as previously.

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3 Field Study: Investments in Energy Saving Measures and Heterogeneous Preferences

Abstract

We investigate Swiss homeowners' motives for investments in energy saving measures and analyze whether preferences with respect to risk, time, environmental, and social preferences drive their investments in energy-efficient renovations. We combine methods from experimental economics with classical survey questions. The data from 630 single family home owners show that homeowners who declare to be risk taking in general are more likely to have renovated their house or to plan to renovate their house. Among renovators, we find that homes of renovators with lower discount rates are more energy efficient. Environmental preferences mainly play a role for renovating according to the Minergie standard.

3.1 Introduction

To ensure sustainable development for our society, energy expenses that damage the quality of the environment must be reduced. The building sector is one of the most energy consuming sectors (Eichholtz et al., 2010 and Royal Institution of Chartered Surveyors, 2005) but it also offers large possibilities for greenhouse gas abatement (see e.g. Enkvist et al., 2007; Intergovernmental Panel on Climate Change, 2007; Levine et al., 2007; Stern, 2008 and Evans et al., 2011).[34] Therefore, efforts can be made to improve the energy efficiency of construction or renovation of houses. Firms can improve the energy efficiency of their office buildings in the vein of corporate social responsibility and households can invest in energy efficiency renovation or construction of homes.

Homeowners deciding about energy-efficient renovations face several market barriers (Sorrell, 2004) such as liquidity constraints (see e.g. Clinch and Healy,2000) information gaps, transaction costs as well as incentive conflicts between tenants and homeowners (Golove and Eto, 1996; Levinson and Niemann, 2004 and Houser et al., 2009). Further, uncertainty about future energy price developments may hinder retrofitting in an energy efficient way (Metcalf and Hassett, 1999) and homeowners may not expect energy efficiency to be capitalized into the value of homes (see Jakob, 2007 and Gans, 2012).[35]

Apart from market failures heterogeneity of homeowners' preferences, for instance in time and risk preferences but also in social and environmental preferences, may influence homeowners' investment behavior. Clearly, homeowners deciding about energy-efficient renovations have to trade off current investments with uncertain future returns. The higher the expected future savings on energy costs and future transaction prices, the likelier are investments in energy-saving measures by homeowners (Hausman, 1979; Klier and Linn, 2008; Beresteanu and Li, 2011 and Alberini et al., 2011a).[36] However, Train (1985) already shows in a literature review that discount rates in energy-related decisions vary significantly among investors and types of investment, indicating that heterogeneity in time preferences may explain that homeowners'

[34] In 2005, the construction and operation of buildings account for around 40 percent of worldwide consumption of raw materials and energy.

[35] For a further discussion of barriers and drivers of energy efficient renovations see also Achtnicht and Madlener (2012).

[36] This holds also for office buildings (see e.g. Brounen and Kok, 2011; Eichholtz et al. 2010; Fuerst and McAllister, 2011; Miller et al., 2008 and Salvi et al., 2008).

willingness to invest in energy efficient renovations differs strongly. Further, Farsi (2010) provides a conjoint analysis that shows that risk considerations seem to be a central issue in dealing with energy efficiency in residential buildings.[37] Home owners may hesitate to invest in energy-saving measures if benefits from new technologies are uncertain, not only because of a lack of information but also because of their risk attitudes in general. If the latter is the case, simple cost-benefit analyses in expected terms do not fully capture the decision-making process of investors. Our study provides insights on how far time and risk preferences relate to actual renovation behavior of homeowners. Further, we complement work by Hässig et al. (2008) and Achtnicht (2010) by investigating whether environmental preferences of homeowners additionally affect the extent of renovations.[38] Because other members of society may benefit from energy savings as well, we investigate also to what extent social preferences influence home owners' investment behavior.

Our study focuses on Swiss homeowners. Although Switzerland is one of the most advanced countries with respect to energy efficiency among OECD countries (see Evans et al., 2011) there is an important potential to reduce CO_2 emissions in the Swiss housing market. Jakob and Madlener (2004) for instance report that energy use for space heating may be reduced by 33-50% in existing buildings and by 80% or more in new buildings.[39] However, Jochem and Jakob (2003) indicate that only few Swiss homeowners invest in renovating building envelopes, which may contribute substantially to improvements of buildings' energy efficiency. Although Banfi et al. (2008) provide evidence that the willingness to pay for building efficiency enhancements exceed the cost of implementing these measures, homeowners in Switzerland are reluctant to invest in energy saving measures by retrofitting their building envelopes and do so mainly at the end of the building element's lifetime or during general renovation projects (see also Jakob, 2007).[40] The aim of our study is to broaden the understanding of homeowners' investments in energy saving measures and energy consumption behavior by eliciting

[37] See also Epper, et al. (2011), whose participants explicitly stated that they are uncertain about future energy costs.

[38] Hässig, et al. (2008) indicate the importance of environmental preferences. They report that Minergie homeowners in Switzerland state that investments are partly made because of homeowners preferences for the environment. Achtnicht (2010) find that environmental benefits matter for the decision for heating systems but do not play a significant role for insulation choices.

[39] See further Jochem (2004) who provide a detailed analysis of energy perspectives on CO_2 reduction potentials in Switzerland up to 2010.

[40] Note that building efficiency enhancements do not always exceed the cost of implementing such measures. For instance, Scarpa and Willis (2010) results suggest that households' value of renewable energy adoption is not sufficient to cover the higher capital costs of micro-generation energy technologies (e.g. solar-panels) in the UK.

Swiss homeowners' preferences with respect to risk, time, environmental, and social preferences. To do so, we combine methods from experimental economics with classical survey questions. We focus on homeowners of single family houses who live in their own house such that decision makers incur cost but also receive the full benefits of renovations. Homeowners received a letter with a questionnaire asking for characteristics of the house and personal information. In addition, the questionnaire contained several incentive compatible paper and pencil experiments measuring risk and time preferences, social preferences such as preferences for generosity and equality, and environmental preferences.

The study was conducted in the German speaking part of Switzerland. In total, the analysis contains 630 homeowners. Two waves were organized: in the first wave, we focused on the canton of Zurich (271 completed questionnaires). Homeowners of the first wave were addressed between August and October 2010. In the second wave, we addressed homeowners outside the canton of Zurich. The second wave was launched in November 2011. We received 359 completed questionnaires; among them were 63 questionnaires from explicitly addressed Minergie homeowners.[41] Our data allows us to shed light on which preferences affect the renovation and energy consumption decisions as well as on the question of how houses' energy efficiency depends on homeowners' risk, time, environmental and social preferences. Further, we explicitly addressed homeowners of houses which were renovated according to the Minergie standard for two reasons: First, the Minergie standard can be seen as an objective measure of energy efficiency of the houses. Second, comparing homeowners who receive a Minergie standard with households who also renovated but did not receive the standard provides a better understanding of how the Minergie houses are seen by homeowners and in turn leads to a better understanding of whether and how quality standards may help to provide energy efficient investments.[42]

We find that risk attitudes of homeowners are particularly important for homeowners' decisions to retrofit their houses: homeowners who declare being risk-

[41] The Swiss standard "Minergie" was introduced in 1998. More than 8000 buildings have been certified until 2007, among them about 700 buildings which received the label after a renovation. Hässig, et al. (2008) provide a comprehensive survey among Minergie and non-Minergie homeowners as well as architects. The results of the survey suggest that environmental preferences and comfort are main determinants for the decision to renovate according to the Minergie standard.

[42] They indicate the importance of environmental preferences. They report that Minergie homeowners in Switzerland state that investments are partly made because of homeowners preferences for the environment.

taking in general are more likely to have renovated their houses or to plan to renovate their houses. This indicates that long-term investments may be perceived as risky investments. While not investing in energy-efficiency measures may be perceived as the "safe" status quo, retrofitting a house is immediately costly and savings through better home energy efficiency are frequently uncertain. Among households who renovated at least once, we find that time preferences predict the energy efficiency of the house. More precisely, households who value the future particularly strongly report higher house qualities. Environmental preferences mainly play a role for renovating according to the Minergie standard. Also, comparing renovators whose houses fulfill a Minergie standard with non-Minergie renovators shows that Minergie renovators are more risk-taking and more likely chose the selfish option in a dictator game, which indicates that Minergie renovators are not only concerned about the environment but also about money. In addition, we find that – controlling for the energy efficiency of the house – time preferences and preferences for the environment affect homeowners' energy consumption significantly. Future-oriented homeowners and homeowners with strong preferences for the environment have lower energy and heating costs.

Traditional policies to foster energy efficient renovations and construction of buildings have focused on monetary incentives such as tax reductions and subsidies and several studies have shown that monetary incentives (tax rebates and subsidies) can be effective. (see e.g. Alberini and Filippini, 2011). In addition to monetary incentives researchers have recommended to promote the diffusion of information about technologies and economics of energy efficiency renovations as well as the assignment of energy efficiency renovation specialists (see Alberini et al., 2011b). Our results suggest that the renovation decision itself is perceived as a risky decision whereas the extent of the renovation strongly depends on homeowners' time preferences. Thus promising policies should reduce the perceived risk of renovations and provide immediate gains for renovators. To reduce the perceived risk in renovations households need some future earnings "guarantees" to invest in home renovation. Indeed, renovations require high expenses at the moment of the investment and yield uncertain future energy savings. Public policy should provide clear information on new technologies and the reality of future energy savings when the house insulation is renovated. Alternatively, one may provide financing schemes reducing the risk of the renovation. For instance, governments or energy companies may engage in supporting energy efficient renovations by sharing the costs, risks but also the benefits of future savings. Such

measures may also cope with the finding that the quality of the house in terms of energy efficiency is higher for people with future-oriented preferences. Further we find that people with preferences for the environment are more likely to renovate according to the Minergie standard, the Minergie standard should be promoted as a standard that not only yields notable energy savings but also guarantees the protection of the environment.

The remainder of this chapter is organized as follows. In Section 3.2 we report the data collection procedure and present descriptive statistics. In Sections 3.3 and 3.4 we explain measures of house quality and preferences, respectively. We present the results in Section 3.5. Section 3.6 concludes.

3.2 Data

We collected data from German-speaking Swiss cantons in two waves. In the first wave (2010) we contacted 2500 homeowners in the canton of Zurich with the help of the canton of Zurich buildings insurance (GVZ). In the second wave, we contacted 2353 additional households outside the canton of Zurich but within the (at least partly) German-speaking cantons of Switzerland. Questionnaires in the second wave were sent to 19 Cantons.[43] In this second wave, we explicitly addressed 214 owners of houses which were renovated to fulfill a Minergie standard.[44] Retrofitting the house according to a Minergie standard guarantees an efficient use of energy and may serve as an objective proxy for the energy efficiency of houses.

We received a total of 630 completed questionnaires, 271 in the first wave and 359 (including 63 from the Minergie sample) in wave 2. For the further analysis, we focus on data of homeowners of single family houses who live in their house (593 households in total). The response rate in the first wave was particularly low (about 11

[43] Including the following cantons: AG, AI, AR, BE, BL, BS, FR, GL, GR, LU, NW, OW, SG, SH, SO, SZ, TG, UR, VS, ZG.

[44] Data were acquired via the Minergie website and used with allowance by Minergie. Note that most single family houses with Minergie standard are new houses. Renovations of living houses to acquire a Minergie Label made about 7 percent of total houses for living with Minergie standard in 2010.

Figure 3.1: Sample composition

percent), which we attribute to the comprehensiveness of the questionnaire and skepticism with respect to monetary rewards for participation due to the fact we randomly selected one fourth of participants to be paid. We therefore changed the payment procedure for the second wave and shortened the questionnaire which resulted in a slightly higher response rate of about 15 percent. Figure 3.1 shows how many questionnaires we received across cantons. Clearly, a large fraction was received from the canton of Zurich, which was explicitly addressed in wave 1. In the second wave, among the 19 addressed cantons, most questionnaires were received from the cantons of Bern, Aargau, Thurgau and St. Gallen. Response rates varied between cantons and were largest in the cantons of Nidwalden, Schaffhausen, Aargau, Obwalden and Thurgau and lowest in Glarus and Appenzell-Innerhoden.[45]

In wave 1, we contacted owners of various aged houses whereas in wave 2 we focused on newer houses, which were built in the period between 1993 and 1997. The distribution of house construction year in our sample is reflected in the histograms in Figure 3.2. As wave 2 includes homeowners who were addressed explicitly, because their home fulfills a Minergie standard, Figure 3.2 presents separated graphs for wave 2 depending on whether the house fulfills the Minergie standard or not. As there are in general rather few houses which are renovated to fulfill the Minergie standard, we did not restrict the period in which the houses were built.

[45] Response rates vary between cantons, from 40 percent in NW to about 5 percent in AI, with the median response rate at around 16.7 percent (UR).

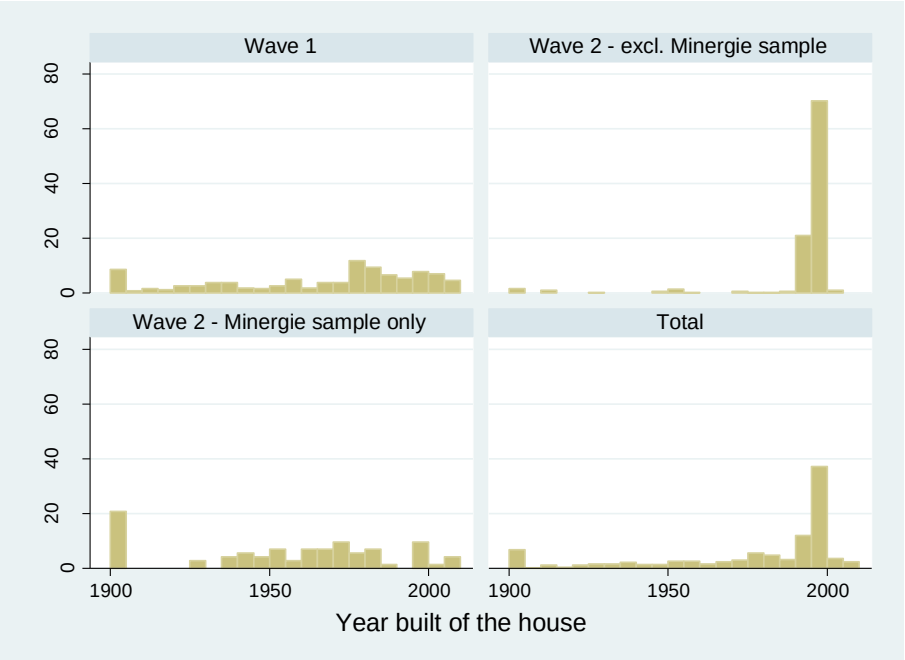

Figure 3.2: Histograms for year built in wave 1 and 2[46]

In the following analysis, we will investigate separately households' investments in energy saving measures depending on whether they fulfill the Minergie standard or not. We therefore first focus on waves 1 and 2 including households without the Minergie label, controlling for the canton where the homeowner lives (Sections 3.5.1 and 3.5.2). In Section 3.5.3, we investigate decisions of households in wave 2 to study preferences leading to the choice of renovation according to the Minergie standard. In total, 75 households (20.95%) fulfill the Minergie standard in wave 2 including 63 respondents addressed explicitly. Section 3.5.4 provides a short analysis of the relation of preferences, energy, and heating costs.

Homeowners were asked to answer questions on the quality of their house and whether their house fulfills the Swiss green building standard Minergie (which reflects past investments in energy-efficiency improvements). The questionnaire also included socio-demographic questions about gender, age, education degree, and spending and saving habits. Because homeowners have to trade off current investments with uncertain future returns when deciding on renovation, homeowners' renovation decisions may depend on their risk attitudes as well as their time preferences. Apart from the tradeoff between current costs and uncertain future benefits homeowners' willingness to retrofit their houses may additionally depend on their preferences for the

[46] 38 houses built before 1900 are indicated as being built in 1900 for scale convenience.

environment, as well as on social preferences, since other members of the society may benefit from energy savings as well. Therefore we elicited homeowners' preferences with respect to risk, time, generosity and equality. To do so we used survey questions as well as incentivized paper and pencil experiments.

All participants of the study had the possibility to earn money by participating. The amount earned depended on the decisions in the different choice tasks. The payment procedure differed in the two waves. In wave 1, not every participant received a payoff: 25 percent of participants were randomly selected for payment. This procedure allowed for higher actual payments but resulted in a rather low response rate. In wave 2, all participants received a fixed payoff of 10 Swiss francs for participation plus a variable amount determined by their own or others' decisions in the choice tasks. In both waves, one decision task was randomly selected to be paid. Participants received the payment via bank transfer or mail about one month after we received the questionnaire.[47] We did so such that participants made decisions in the different choice tasks in the same "risk-in-time" environment. In the two following sections, we present the different quality measures of houses as well as the measures for risk attitudes, time preferences, environmental preferences and social preferences in more detail.

3.3 Quality measures of the houses

Three quality measures with respect to the house were elicited: window, roof and façade quality.[48] Participants rated the qualities on a four point scale. In addition to these quality measures, we asked participants to evaluate the efficiency of their homes. Subjective evaluations of efficiency allow us to estimate how homeowners weight the importance of window, roof and façade quality for the efficiency of their house. Also, we elicited proxies for past and future renovation behavior, asking for the year of the last renovation of the house and whether future renovation is planned. Table 3.1 provides the share of respondents for each category of the quality variables depending on whether the houses fulfill a Minergie standard or not.

[47] Note that participants, whose payoff relevant decision was the time preference task, received their payment either 1 or 7 months after the reception of their questionnaire (depending on their choices for an early or late payment).

[48] Similar questions were also used by Banfi, et al. (2008).

	Share of respondents	
	Waves 1 and 2 excl. Minergie sample	**Minergie sample only[49]**
Window quality		
Enhanced window	0.27	0.66
Standard insulated[50]	0.68	0.34
Medium old window	0.05	0.00
Very old window	0.00	0.00
Roof quality		
Enhanced roof insulation	0.40	0.89
Standard roof insulation[51]	0.52	0.10
Medium old roof insulation	0.05	0.01
Very old roof insulation	0.03	0.00
Façade quality		
Enhanced façade insulation	0.38	0.96
Standard insulation[52]	0.51	0.04
Repainted façade	0.07	0.00
Old facade	0.04	0.00
N≥	496	54

Table 3.1: Window, roof and façade quality

The majority of houses in waves 1 and 2 (excluding the Minergie sample) have standard insulated windows, as well as standard roof and façade quality. Around one quarter of homeowners attribute enhanced insulation with respect to window quality, and one third with respect to roof and façade quality. In the Minergie sample, 66% state that their window quality is enhanced and around 90% or more state that they have enhanced insulation of the façade and roof. Lower than standard values are rare in both samples. The comparisons between declarations of homeowners about the quality of their houses and actual possession of the Minergie label show that the subjective declarations are in line with the real energy efficiency of the house guaranteed by the Minergie label. Wilcoxon ranksum tests show that homeowners with the Minergie label declare a significantly (p-val. < 0.01) higher window quality, façade quality and roof quality than homeowners without the label.

The two lower points of the quality scale present different characteristics but identical energy efficiency.[53] Very few people are in each of these categories. Thus we

[49] The Minergie sample includes all households from wave 2, whose houses fulfill a Minergie standard.

[50] Standard window refers to coated window glass with complete gasket.

[51] Participants could chose among very good, “normal” (standard), medium old and old insulation.

[52] Participants had no additional information on façade insulation other than reported in the table.

[53] For instance, for the facade quality, the two lower points were "no insulation no recently painted" and "no insulation but recently painted". The other possibilities representing an increase in energy efficiency were "standard insulation" and "improved insulation".

	(1) Subjective energy efficiency
Façade quality	0.487***
	(0.048)
Roof quality	0.368***
	(0.051)
Window quality	0.243***
	(0.056)
Constant	-0.151
	(0.206)
Observations	514
R-squared	0.450

Table 3.2: OLS estimation of subjective energy efficiency of the house, cluster-robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

merge these two lower categories for the further analysis. To have a proxy for the global energy efficiency of the house, we create a new variable aggregating the window, roof and façade quality. As these three types of quality characteristics may not have the same weight for households' overall appreciation of house quality, we estimate the weight of each characteristic. In the questionnaire households received, they had to determine on a 5-point scale how they rate the energy efficiency of their house (very low, low, medium, high and very high). This is households' subjective efficiency measure.[54] We regress the subjective efficiency measure from our questionnaire on window, roof and facade quality for all homeowners living in their house (see Table 3.2). Then we calculate the estimated overall quality of the house for every household based on the average weights. We obtain: estimated overall quality = 0.486*façade quality + 0.368*roof quality + 0.243*window quality -0.151. The weights we obtain during this procedure show that homeowners on average attribute stronger weights to façade and roof quality than to window quality. The estimated overall quality ranges from 2.043 and 4.237 for the whole sample. The average overall quality is 3.357 for households in waves 1 and 2 excluding households with the Minergie label and it is 4.086 for households with the Minergie label. The estimated overall quality of the house is significantly higher for the Minergie sample (Wilcoxon ranksum test: *z=10.822, p<0.01*). The distributions of the estimated overall quality of the house and the stated house

[54] In waves 1 and 2 excluding households with the Minergie label, about 54% of homeowners rate their house as medium- efficient and about 35% as highly so. 7% consider the efficiency of their house as low, 3% as very high and 1% as very low. In the Minergie sample almost all homeowners indicated a high (45%) or very high (44%) efficiency of their house, 8% rated their houses' efficiency as medium and only 3% as low or very low. Respondents with a house fulfilling the Minergie standard rate the efficiency of their house significantly higher than other households (Wilcoxon ranksum test: *z=9.742, p<0.01*).

subjective efficiency indicate that these measures of the quality of the house reflect (at least partially) actual quality guaranteed by the Minergie label.

We also elicited the year of the last renovation of houses and whether they plan to renovate in the future. In waves 1 and 2 excluding the Minergie sample, 41.34% of households have renovated their house in the past and 23.61% plan to renovate in the future. All homeowners in the Minergie sample renovated their house (at least once to obtain the standard) and 12 (16%) plan to renovate again in the future. 67% of households in waves 1 and 2 excluding the Minergie sample and 97% of households in the Minergie sample have made renovations in 2000 or after.

3.4 Preference measures

3.4.1 **Risk Preferences**

The measurement of risk preferences is particularly difficult, because risk can be context-specific. To deal with this problem, we measured risk preferences using a questionnaire (in a very similar way as Dohmen et al., 2005) and additionally made use of a lottery decision task similar to the procedure introduced by Holt and Laury (2002) in the first wave.

The risk questionnaire allowed participants to indicate their willingness to take risks in general.[55] Participants could tick a box on a five point scale (ranging from "not ready to take risks" (value 1) to "very risk-taking" (value 5)). Figure 3.3 shows histograms for risk-taking in general. The two sample distributions do not differ (Wilcoxon ranksum test: *z=0.650*, *p=0.516*).

In the lottery task, subjects chose in ten rows between lottery A $L_A(\pi,40;1-\pi\ 32)$ and Lottery B $L_B(\pi,80;1-\pi,\ 2)$. In the first decision $\pi=.1$ and in each following decision π increased in steps of .1. In rows 1 to 4, a risk neutral person would choose L_A whereas she would switch to lottery B in row 5 (because from decision 5 on the expected value of lottery B is larger than the expected payoff from lottery A). Thus, the later a person switches from choosing lottery A to choosing lottery B, the more risk averse the person is to be considered. Dohmen et al. (2005) find that answers to the general risk attitude

[55] They were also asked for their risk attitudes in different contexts such as risk-taking in financial matters, car driving, leisure and sports, and professional career. We will report in the analysis the effect of risk-taking in general on energy saving investments. Nevertheless, we found similar effects of risk-taking in financial matters, but not for risk risk-taking in car driving, leisure and sports, and professional career.

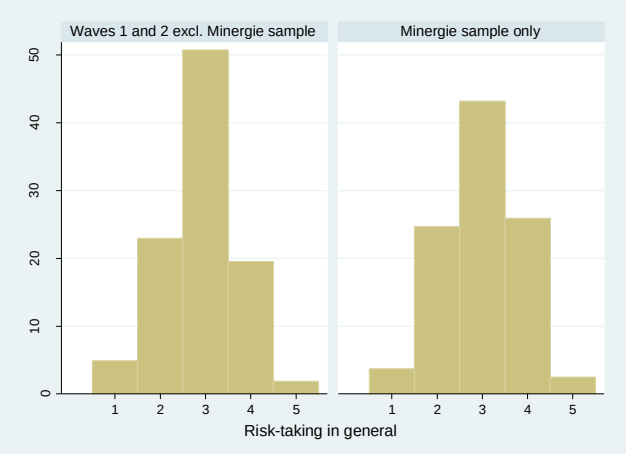

Figure 3.3: Risk-taking in general (n=607, not risk seeking=1, very risk seeking=5)

question predict actual behavior in the lottery tasks (with safe options) very well. We do not find such a close relation between general risk attitude measures and lottery choices. However, the lottery task was in general perceived as difficult by participants, resulting in inconsistencies and complaints. Referring to the lotteries, some participants even doubted whether or not the survey was to be taken seriously. We therefore eliminated the lottery task in wave 2. For the further analysis we will focus on answers to the general risk attitude question to proxy participants' risk attitudes.[56]

3.4.2 Time Preferences

In order to measure how homeowners value future payments, our subjects had to decide in 11 decisions on whether they wanted to receive 80 Swiss francs in one month or a higher amount (up to 108 Swiss francs) in seven months. The less money a person needs to switch from the amount in one month to the amount in the far future, the stronger is the person's value on future payments.[57] In the analysis we will use the respondents' minimum discount factor, i.e. $\frac{\text{amount in one month}}{\text{amount in seven month}}$, at which the respondent chooses the future amount for the first time. Histograms are provided in Figure 3.4. The two samples do not differ significantly (Wilcoxon ranksum test: $z=0.242$, $p=0.809$).

[56] Note also, that the measure based on the lottery task turned out not to be statistically significantly related to the probability of having renovated or planning to renovate the house in wave 1 whereas risk-taking with respect to financial decision making yields results similar to those obtained by using the answers on general risk attitudes.

[57] For a critical review discounting and time preferences see also Frederick, et al. (2002)

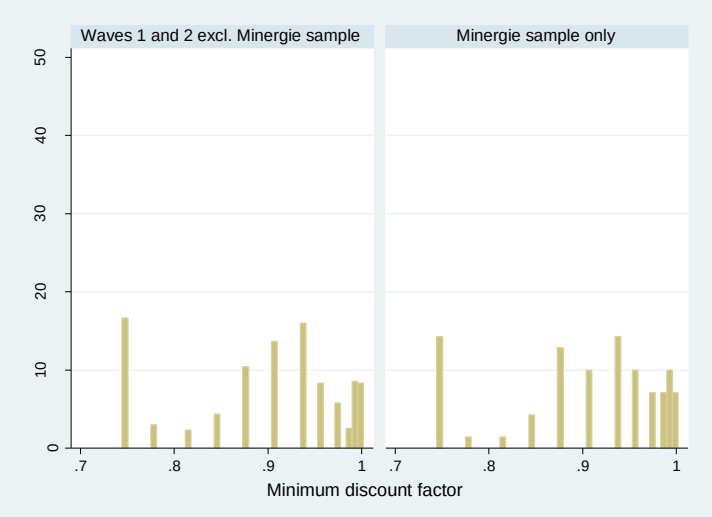

Figure 3.4: Minimum discount factors (n=496)[58]

3.4.3 Preferences for the environment

One clear motivation for investments in energy efficiency are preferences for the environment. We use several measures as proxies for environmental preferences: *i)* A behavioral measure, namely a donation decision within our study, *ii)* questions from a questionnaire on environmental preferences (Dunlap and Van Liere (1978)) and *iii)* self-stated donations to environmental associations.

The donation decision within the questionnaire was framed differently in wave 1 and 2. In wave 1, participants were allowed to donate between 0 and 100 percent of their payment received by us. Because some subjects donated 100 percent potentially in order to stay completely anonymous, we restricted the donation amount to at most 60 percent in wave 2. Donations by subjects were doubled by us, such that those subjects willing to contribute to an environmental association had a good reason to do so within our study rather than outside of it. In order to avoid conflict of environmental and political preferences subjects could choose from four environmental associations (Greenpeace, WWF, Stiftung Bergwaldprojekt, and equiterre).[59] Figure 3.5 shows histograms for the donations across samples. The two samples do not differ (Wilcoxon ranksum test: $z=1.351$, $p=0.177$).

[58] The reduced number of observations results from inconsistencies in choices, e.g. subjects preferred 80.50 in 7 months over 80 in 1 month but preferred 80 in 1 month over 81 in 7 months. As a further proxy for time preferences we also calculated the number of choices in favor of the present. The results are similar to those obtained using the minimum discount factor.

[59] Indeed, at least half of the subjects chose a less politically active and rather regionally oriented association (Stiftung Bergwaldprojekt).

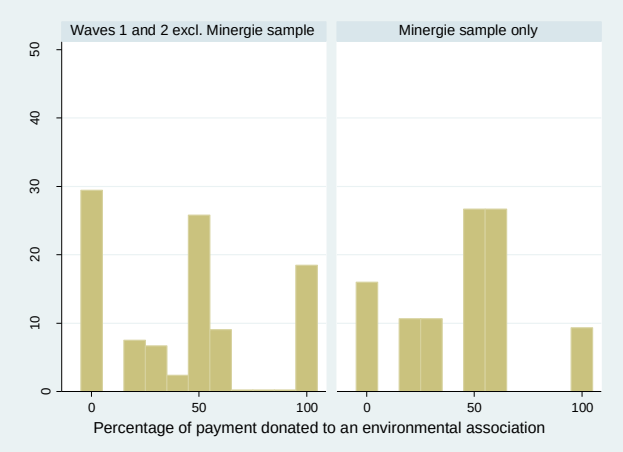

Figure 3.5: Percentage of payment donated in our study (n=534)

The questions on environmental preferences were based on the New Environmental Paradigm Scale (Dunlap and Liere (1978)). Participants were asked to state their agreement with the following three statements:i) "We are approaching the limit of the number of people the earth can support." ii) "To survive, people have to live in harmony with nature." and iii) "People do not have to adapt to nature, because they can restore it." We built an index on the following three statements by adding positively framed questions and subtracting negatively framed questions. The environmental preference index then ranges from 0 to 9. We report the distribution in histograms in Figure 3.6. We observe that people whose houses fulfills the Minergie standard have a higher environmental preference index (Wilcoxon ranksum test: $z=1.786$, $p=0.074$).

Also we report summary statistics on whether or not people state that they donate to environmental associations: 39.6% of homeowners who do not have the Minergie label state that they donate to environmental associations whereas 57.5% of the Minergie sample state that they donate to environmental associations. These shares are significantly different ($\chi^2=6.1203$, $p=0.013$). Households had also had to declare whether they usually give to social associations: 74.6% of homeowners who do not have the Minergie label and 84.9% of the Minergie sample state that they donate to social associations. Households in the Minergie sample are not significantly more likely to make donations to social associations ($\chi^2=1.2253$, $p=0.268$). These differences indicate that it is not the general habit of donations which is more prominent among Minergie homeowners but it is specifically donations to environmental associations which are associated with energy efficient investments.

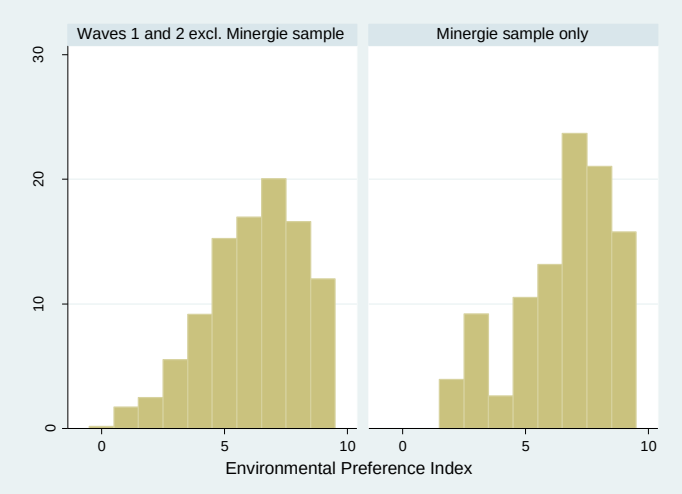

Figure 3.6:.Environmental preference index (n=594)

3.4.4 Social preference measures

Investments in energy saving measures benefit not only the investor but also others. It is thus possible, that people who care about others are particularly likely to invest in energy saving measures. For this reason, we used two experiments to measure social preferences. In the first experiment (generosity game), we measure generosity, when being generous is costless. The homeowner received a fixed amount and could decide how much another person will receive. In the second experiment (dictator game), we focus on generosity which is costly. The homeowner could decide how to share a fixed total amount of money.

Preferences for generosity

The generosity game is a two player game in which the first player receives a fixed payoff of X and can decide on the payoff Y for the second player, with $Y \in [X - d, X + d]$ and $d \geq 0$, keeping his own payoff constant. The higher the value of Y, the more generous is a player to be considered. Very generous persons or persons with preferences for efficiency (in the sense of maximum total payoff for the two players) choose to give the maximum amount to the other person. In principal, the game allows us to identify three broad preference types. Type 1 gives less than X to the second person and can be considered not to be generous. Type 2 is generous as long as she does not face disadvantageous inequality (which can also be interpreted as an envious type). Type 3 gives Y>X and can be considered as generous or as an efficiency seeker.

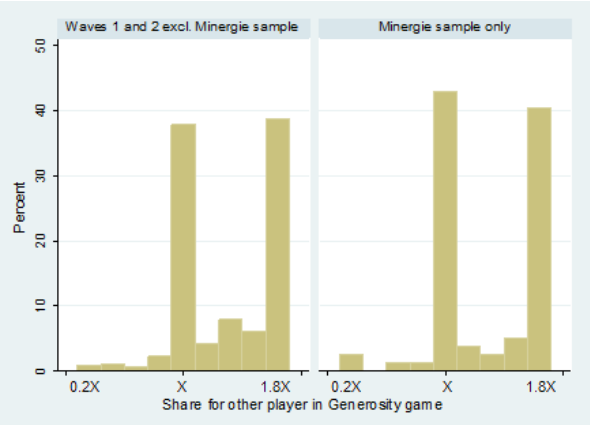

Figure 3.7: Amount for other participant in the generosity game (n=606)

The parameters in our experiment are the following: d = 0.8X with X=50 Swiss francs in wave 1 and X=25 Swiss francs in wave 2. Figure 3.7 shows histograms for the share allocated to the other player (between 20% and 180% of the own payoff) depending on whether the house has the Minergie label (samples do not differ, Wilcoxon ranksum test: *z=0.606*, *p=0.545*). It is noteworthy that the type 1, who chooses Y<X is very rare in our sample. Thus our generosity measure splits the main part of our sample into envious and generous types. About 40 percent of our subjects are of type 2 (envious) and around 40 percent are of type 3 (generous / efficiency seeker).

Preferences for fairness

In order to measure whether people are willing to give up money in order to share fairly, we used a dictator game. In this game, player 1 receives an amount of money Z which she can distribute between herself and another player. In our experiment, Z =100 Swiss francs in wave 1 and Z=50 Swiss francs in wave 2. The minimum share which could be allocated to a player was restricted to 10 percent of Z. A selfish person chooses to give the lowest possible amount to the other person. Figure 3.8 shows histograms for the share of Z (between 10% and 90%) allocated to the other player. The two samples do not differ (Wilcoxon ranksum test: *z=0.791*, *p=0.429*). In both samples we observe few selfish subjects. More than 60 percent of participants establish perfect equality. This share is surprisingly high compared to usual dictator game results where the mean share for the other person ranges around 25 percent (see e.g. Engel, 2010).

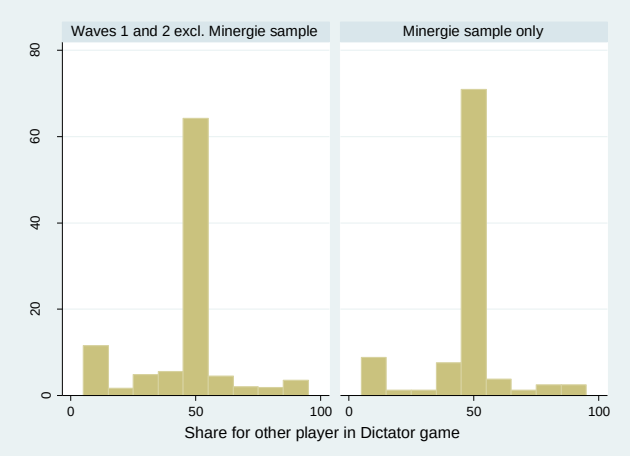

Figure 3.8: Share for other player in the dictator game (n=607)

3.5 The impact of risk, time, environmental and social preferences on investments in energy saving measures

A natural way to think about a renovation decision is to assume that households first decide on whether or not to renovate at all and second, they decide on the exact enhancements they want to achieve by retrofitting their home. Therefore, we first focus on the decision to renovate the house at all and second analyze how the quality of the house relates to preferences contingent on renovation activity.

Which kind of preferences do we expect to matter most? First, because benefits from investments in energy saving measures are uncertain and second, energy savings will be realized in the future, the most promising candidates among preferences to matter are risk and time preferences. Apart from preferences which relate to direct individual costs and benefits, investments in energy saving measures may also be perceived as contributions to a public good, namely to the environment. This calls for ideological concerns such as preferences for the environment to matter and maybe even preferences for generosity or equality in general.

In the following section we analyze how preferences relate to the renovation decision of homeowners. In Section 3.5.2 we study the impact of respondents' preferences on the energy efficiency of the house itself. Both section 3.5.2 and 3.5.3 focus on homeowners of houses which have no Minergie label. In section 3.5.3 we investigate the specific characteristics of persons with houses which fulfill a Minergie standard. Finally, in section 3.5.4 we also shed some light on how preferences affect energy consumption behavior. For all regressions results presented, we use cluster-

robust standard errors with clustering on postal codes (if not indicated otherwise) because house quality as well as renovation behavior of different homeowners may be correlated when houses are geographically close. We also ran the analysis with clustering on cantons and without clustering. The results are qualitatively similar. Differences are indicated in the respective regression tables.

3.5.1 Decision to renovate

Table 3.3 presents results from Probit regressions explaining households' decisions to renovate. We analyze the behavior of respondents in waves 1 and 2 excluding households with the Minergie label. In model (1) we estimate the probability of (at least one) renovation in the past and in model (2) we estimate the probability that households plan a renovation in the future. Model (3) explains any type of renovation, past or future. Explanatory variables are the preference measures presented in the previous section: risk preferences, time preferences, environmental preferences, as well as efficiency and equality preferences. We also control for the age of the house[60] and its size in square meters. As mentioned earlier we use cluster robust standard errors clustering on postal codes. The regressions show that among our preference measures respondents' risk preferences are the main driver of past renovations. Respondents who declare being more risk seeking have a higher probability of having had their house renovated in the past. The decision of future renovation is affected in the same direction by risk preferences. These results indicate that households perceive renovations as risky investments that lead to uncertain future returns but entail certain costs at the time of the investment decision.[61] Other preference measures are not significantly related to the probability of past renovation. Planned future renovations are however significantly affected by preferences for efficiency, time preferences, and (slightly) by environmental preferences (measured by the percent donated in our study). Efficiency seekers (i.e. generous people) are more likely to plan a renovation in the future. Interestingly the probability of a future renovation is lower for more future-oriented persons. However, the probability to renovate in the future also depends on the current quality state of the

[60] In order to cope with the possibility of a non-linear relationship between house age and renovation behavior, we generated four house age classes, which include 25 percent of observations each.

[61] Risk preferences measured by the lottery task are only available in wave 1. Using only data from the first wave yields a similar but statistically insignificant relation to past renovation behavior.

Probit Regression with cluster-robust SE	Model (1) Pr(Past renovation)	Model (2) Pr(Future renovation)	Model (3) Pr(Past or future renovation)
Selfish	0.056	-0.011	0.053
	(0.062)	(0.042)	(0.063)
Efficiency seeker	-0.049	**0.109****	0.006
	(0.048)	(0.046)	(0.055)
Minimum discount factor	-0.014	**-0.039***	-0.033
(standardized)	(0.031)	(0.021)	(0.030)
Risk-taking in general	**0.068***[62]	**0.056*****	**0.083*****
	(0.039)	(0.021)	(0.032)
Percentage of payment donated to an environmental association	-0.001 (0.001)	**0.001*** (0.000)	0.001 (0.001)
Environmental Preference Index	0.011	0.001	0.007
	(0.015)	(0.008)	(0.016)
Donations to environmental associations	0.037	0.040	0.068
	(0.053)	(0.040)	(0.057)
Donations to social associations	-0.027	-0.006	**-0.113****
	(0.053)	(0.042)	(0.056)
House younger than 15 years	Ref.	Ref.	Ref.
15-17 year old house	0.030	0.001	0.032
	(0.082)	(0.060)	(0.070)
18-46 year old house	**0.489*****	0.040	**0.404*****
	(0.051)	(0.047)	(0.045)
House older than 46 years	**0.624*****	**0.130***	**0.535*****
	(0.036)	(0.067)	(0.039)
Sizes of the house (in m^2 - standardized)	0.007 (0.024)	**0.030*** (0.016)	0.041 (0.038)
Observations	308	309	309
Pseudo R-squared	0.257	0.0647	0.235
Prob > Chi2	0.00	0.00	0.00
# clusters (postal code)	153	153	153

Table 3.3: Decision to renovate

house. Thus, it could be that future-oriented individuals are less likely to renovate in the future because they either renovated their homes already or bought houses with a higher quality, which do not have not to be renovated in the near future. In a robustness test including the estimated quality of the house as an additional regressor we find that the minimum discount factor is not significantly related to future renovations. Interestingly, generous people (efficiency seekers) are more likely to plan future renovations than non-efficiency seekers. Further, as expected, older houses are more likely to have been renovated and are also more likely to be renovated in the future (for a similar finding see Alberini et al., 2011b). We summarize this section with result 3.1.

[62] With clustering on cantons or robust standard errors with clustering the coefficient fails to be significant in model (1). However, excluding controls it turns out to be significant at the 5 percent level.

Result 3.1: Persons who are more likely to take risks in general are also more likely to renovate their house. The more renovators discount future utility, the lower is the energy efficiency of their house.

3.5.2 Energy efficiency of the house

In the following we present results on how time preferences, risk preferences and environmental preferences relate to the quality of the house. Again we use the minimum discount factor as a proxy for time preferences, the answers on the four point scale of our general risk question[63] as a proxy for risk preferences and the percentage of income the participant donated to an environmental association as a proxy for environmental preferences. Overall house quality is a weighted measure of stated window, façade and roof quality.

As a first step, we present Spearman rank correlations in Table 3.4. Correlations between time preferences and quality measures of the house are weak, mainly positive but statistically insignificant at the ten percent level. Risk preferences are positively associated with the overall quality of the house (which is mainly driven by the window and roof quality). We observe no clear picture with respect to environmental preferences. Further we find no significant association of stated quality of the house and social preferences (measured by the share participants allocated to counterparts in dictator and generosity games).

In a second step, we run OLS regressions[64] explaining the estimated overall quality of the house, accounting for conjoint effects of preferences (see table 3.4). In models (1) to (3),

	Minimum discount factor	**Risk-taking in general**	**Environmental Preferences (percent donated)**[65]
Window Quality	-0.021 (0.663)	**0.099** (0.023)**	0.059 (0.211)
Roof quality	0.036 (0.458)	**0.129*** (0.003)**	**-0.080* (0.086)**
Facade quality	0.057 (0.237)	0.057 (0.197)	0.029 (0.537)
Overall quality	0.006 (0.897)	**0.098** (0.026)**	-0.005 (0.917)
Subjective Efficiency	-0.001 (0.976)	0.005 (0.910)	0.043 (0.357)

Table 3.4: Quality and preferences, rank correlations (p-values are indicated in parentheses)

[63] Note that risk-taking with respect to financial matters is also significantly correlated with the quality of the house. However, correlations of risk-taking in other domains such as leisure and sport or car-driving are smaller and only rarely significantly correlated. The risk-taking measure from the lottery choice task in wave 1 does not significantly correlate with any measure of house quality.

[64] Tobit regressions (controlling for the censoring of the dependent variable) confirm the qualitative results of the OLS models.

[65] Other proxies for environmental preferences (environmental preference index and stated donations to environmental associations) are insignificantly correlated with stated quality of the house.

we explain the overall quality of the house based on risk, time, environmental, and preferences for generosity, and equality preferences. In models (4) to (6), we add controls such as the age of the house and its size. In models (1) and (4), we consider all households (without the Minergie label). Model (1) in Table 3.2 shows that the more risk-taking homeowners are, the higher is the probability to renovate. If we think about a renovation decision as a two step procedure in which households first decide on whether or not to renovate and second, decide on the exact enhancements they want to achieve by retrofitting their home, it is worthwhile to investigate whether heterogeneity of preferences can explain the efficiency of houses among renovators separately. Therefore, in models (2) and (5), we focus on households who already renovated their house. Models (3) and (6), in which we focus on households who did not renovate their house, complete the analysis.

From the regressions in table 3.3 we know that the more risk-taking homeowners are, the higher is the probability to renovate. In turn, models (1) and (4) in Table 3.5 indicate that people who are more risk-taking have a higher estimated overall home quality with respect to efficiency. Models (2) and (5) shed some light on households who already renovated their houses: the estimated overall quality increases with their minimal discount factor. This means that more future-oriented renovators have a significantly higher overall quality. Time preferences do not affect the overall quality of houses that have not been renovated (see models (3) and (6)). In this case, risk seeking households declare a higher quality of their house, suggesting that not only the renovation of houses but also the buying decisions are perceived as risky decisions. Environmental preferences of homeowners do not affect the overall quality of their house. We also observe that older houses have a lower overall quality but the quality is increasing with the size of the house.

Result 3.2: Future-oriented renovators have a significantly higher estimated house quality regarding energy efficiency.

OLS Regression	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Dependent Variable: (robust SE in parentheses)	Overall quality					
	Without controls			With controls		
	Full sample	Only renovated houses	Only non-renovated	Full sample	Only renovated houses	Only non-renovated
Selfish	-0.113	**-0.189**** [66]	0.020	-0.017	-0.129	0.112
	(0.096)	(0.092)	(0.114)	(0.091)	(0.131)	(0.116)
Efficiency seeker	-0.001	-0.008	0.013	0.044	0.075	0.030
	(0.040)	(0.067)	(0.052)	(0.053)	(0.096)	(0.063)
Minimum discount factor	0.021	**0.101****	-0.033	0.018	**0.109****	-0.024
(standardized)	(0.023)	(0.041)	(0.029)	(0.028)	(0.050)	(0.030)
Risk-taking in general	**0.086*****	0.002	**0.162*****	**0.094****	-0.002	**0.153*****
	(0.028)	(0.058)	(0.040)	(0.039)	(0.064)	(0.040)
Percentage of payment donated to an env. assoc.	-0.000	0.001	-0.001	0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Environmental	-0.001	-0.008	0.004	0.011	0.007	0.004
Preference Index	(0.009)	(0.009)	(0.013)	(0.014)	(0.024)	(0.017)
Donations to env. assoc.				0.027	-0.028	0.075
				(0.055)	(0.092)	(0.068)
Donations to social assoc.				-0.073	0.035	-0.143
				(0.071)	(0.103)	(0.096)
House younger than 15 years	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
15-17 year old house				0.010	0.242	-0.052
				(0.060)	(0.146)	(0.066)
18-46 year old house				**-0.159****	0.038	**-0.245****
				(0.074)	(0.131)	(0.105)
House older than 46 years				**-0.476*****	**-0.331****	**-0.618*****
				(0.086)	(0.132)	(0.203)
Sizes of the house (in m2 - standardized)				**0.044****	**0.061*****	0.011
				(0.018)	(0.014)	(0.043)
Constant	**3.169*****	**3.354*****	**2.998*****	**3.196*****	**3.287*****	**3.164*****
	(0.107)	(0.198)	(0.125)	(0.163)	(0.270)	(0.177)
Observations	299	130	168	299	130	168
R-squared	0.027	0.044	0.100	0.177	0.225	0.207
# clusters (postal code)	148	39	114	-	-	-

Table 3.5: Estimated overall quality of the houses[67]

To summarize our results so far, we find that households' risk preferences drive their decision to renovate the house. Indeed, a renovation is a risky decision which calls for direct expenses and uncertain future returns. For renovated houses we find that higher future valuation is associated with a higher overall quality of the house. This indicates that people with high valuation of future returns from investments in energy saving measures are more likely to invest in renovations which increase the overall quality of their homes.

[66] This coefficient is insignificant if we do not cluster on postal codes. Without any controls it is significantly negatively related to the quality of the house at the ten percent level.

[67] In Models (4) to (6) we use robust standard errors instead of cluster- robust standard errors because of the high number of regressors and the relatively number of clusters.

3.5.3 Minergie homeowners

The Minergie standard is a specific label for energy efficient renovation or building that is well-developed and well-known in Switzerland. Comparing preferences of persons whose homes fulfills the Minergie standard with other households will help explain what the Minergie label adds compared to a renovation increasing the energy efficiency of the house but without the Minergie label.[68] Salvi and Syz (2011, p. 3) study aggregated data of Swiss cantons and find that differences in the concentration of buildings with the Minergie label between Swiss municipalities depend mainly on income levels and cultural affiliation and less importantly on environmentalism measured by the number of votes for the ecological party. Building on their findings, we elicit individual data and propose an analysis of preferences of homeowners who specifically chose to renovate their homes to fulfill the Minergie standard. To limit differences between samples according to the age of the house and the type of town (city or country side), we focus here on households from the second wave.

Table 3.6 reports socio-demographic characteristics of homeowners with and without the Minergie label. We report the share of female respondents, the average age, the share of people with apprenticeship, with a Matura or Berufsmatura, with a college degree (Fachhochschule), with a university degree or a doctorate, and the share of people saying they have another degree. Standard deviations for age are displayed in brackets.

	Homeowners without the Minergie label	**Homeowners with the Minergie label**	**p-values (Wilcoxon rank sum test / χ^2- test)**
Share of female respondents	0.140	0.131	0.856
Age	53.1 (9.73)	51.73 (10.87)	0.041
share of people with apprenticeship	0.644	0.469	0.007
share of people with a Matura or Berufsmatura	0.065	0.094	0.497
share of people with a college degree	0.100	0.172	0.050
share of people with a university degree or a doctorate	0.161	0.250	0.025
Other degree	0.031	0.016	0.434
N≥	258	63	-

Table 3.6: Gender, age and education depending on the ownership of the Minergie label

[68] For further investigations with respect to the Minergie Label see also Hässig et al. (2008).

Females are not represented differently among Minergie and non-Minergie homeowners (χ^2- test, p-val.=0.856), but respondents who have the Minergie label are on average younger than other respondents (Wilcoxon rank sum test: p-val.=0.041). We observe different education levels: homeowners in apprenticeship are less represented among people with the Minergie label than among people without it (χ^2- test, p-val.=0.007) while homeowners with a university degree or doctorate are more represented among people with the Minergie label than among people without it (χ^2- test, p-val.=0.025). Homeowners with a college degree tend also to be relatively more numerous in the Minergie sample (χ^2- test, p-val.=0.05). No significant difference is observed for homeowners with a Matura or Berufsmatura (χ^2- test, p-val. 0.497).

We present in Table 3.7 the average of the minimum discount factor, the average rate of risk-taking in general, the average percent donated to an environmental association in our study, the average of the environmental preference index, the share of people used to giving to environmental or social associations, and the average share given to the other player in the generosity and dictator games.

Although it has been shown in the previous section that homeowners with a high degree of risk-taking in general are more likely to renovate their houses, and homeowners with a high valuation of future revenues have a higher house quality, people who have the Minergie label have neither a significantly higher valuation of future revenues nor are they significantly more risk-taking than people who do not have the Minergie label (Wilcoxon rank sum test: p-val.=0.619 and 0.202, respectively).

	Homeowners without the Minergie label	**Homeowners with the Minergie label**	**p-values (Wilcoxon rank sum test χ^2- test)**
Minimum discount factor	0.892 (0.093)	0.903 (0.085)	0.619
Risk-taking in general	2.827 (0.826)	2.986 (0.880)	0.202
Percent donated to an environmental association in our study	34.286 (28.395)	43.676 (26.424)	0.066
Environmental preference index	6.147 (1.844)	6.594 (1.950)	0.036
Share of people giving to environmental assoc.	0.330 (0.471)	0.575 (0.498)	0.01
Share of people giving to social assoc.	0.810 (0.393)	0.849 (0.360)	0.70
Share given in the generosity game	63.489 (19.665)	66.389 (21.709)	0.274
Share given in the dictator game	50.609 (13.571)	48.056 (15.257)	0.246
N≥	214	52	-

Table 3.7: Preferences depending on the ownership of the Minergie label

Preferences for generosity or equality have no effect (Wilcoxon rank sum test: p-val. = 0.274 and 0.246, respectively). However, environmental preferences are significantly stronger among homeowners of the Minergie label: households with the Minergie label give higher shares of their earning in the study to an environmental association, have a higher environmental preference index and more of them are in the habit of giving to environmental associations (Wilcoxon rank sum test: p-val. = 0.006, p-val. = 0.036, and χ^2-test with p-val=0.01 respectively). However, the shares of Minergie and non-Minergie homeowners who donate to social associations do not differ significantly (χ^2-test, p-val. = 0.76).

To take into account the characteristics of the house and the interactions between preferences, we run a probit regression to estimate the likelihood for households to have the Minergie label based on their risk, time, environmental and social preferences. Marginal coefficients are presented in table 3.8. In models (1) and (2) we explain the probability of having the Minergie label based on the whole sample in wave 2, respectively with and without controls for age and size of the house. In model (3), we focus on the probability of having the Minergie label when the sample consists of renovated houses only.

The results of the regressions follow previous results given by descriptive statistics: the likelihood of having the Minergie label increases with environmental preferences. The higher the percent donated by the participant to an environmental association in our study, the more likely he is to have the Minergie label. Participants who habitually make donations to environmental associations are also more likely to have the Minergie label. Environmental preferences play a role when the whole sample or only renovated houses are included. We also find that among owners of renovated houses, the likelihood of having the Minergie label increases with risk-taking in general. Also, homeowners behaving selfishly in the dictator game (i.e. people who do not care about fairness) appear to be more likely to own a Minergie house, indicating that the Minergie label not only guarantees energy efficiency and thus environmental protection but it also saves money (at least in the long run) It seems that both facts matter for attracting homeowners with possibly different intentions.

Probit regression with cluster-robust SE, Marginal effects	Model (1) Pr(Minergie owner)	Model (2) Pr(Minergie owner)	Model (3) Pr(Minergie owner|renovated)
Selfish	0.152	0.324*	0.202**
	(0.146)	(0.184)	(0.102)
Efficiency seeker	0.067	-0.006	-0.018
	(0.068)	(0.122)	(0.156)
Minimum discount factor	-0.001	0.021	0.083
(standardized)	(0.027)	(0.052)	(0.073)
Riskk-taking in general	0.050	0.088	**0.093***
	(0.036)	(0.060)	(0.054)
Percentage of payment donated to an environmental association	**0.002*** (0.001)	**0.005***** (0.002)	**0.006***** (0.002)
Environmental Preference Index	0.003	0.014	-0.047
	(0.016)	(0.032)	(0.036)
Donations to environmental associations	**0.162****	0.112	**0.216***
	(0.064)	(0.104)	(0.124)
Donations to social associations	-0.101	-0.163	-0.068
	(0.090)	(0.117)	(0.119)
House younger than 15 years	Ref.	Ref.	Ref.
15-17 year old house		excluded	excluded[69]
18-46 year old house		**0.739*****	**0.464*****
		(0.086)	(0.108)
House older than 46 years		**0.735*****	**0.426*****
		(0.082)	(0.143)
Sizes of the house (in m2 – standardized)		0.065 (0.041)	**0.277*** (0.159)
Observations	219	125	69
Pseudo R-squared	0.0902	0.493	0.413
# clusters (postal code)	192	115	65

Table 3.8: Green house (Minergie) homeowners

Additionally, we find that homeowners of larger houses are more likely to have the Minergie label, indicating also that fulfilling the Minergie standard is relatively more costly for small houses.[70]

Result 3.3: Households who are concerned by the environment are more likely to renovate according to the Minergie standard.

[69] Due to the fact that we addressed only homeowners who renovated their house to obtain the Minergie standard, we observe very few (4) houses with a Minergie standard which are between 15 and 17 years old. Thus we excluded these classes from model (3) as well as for consistency for model (2).

[70] As a further remark we note the regressions indicate that older houses are more likely to be renovated according to fulfill a Minergie standard. However, we mainly included the house age as controls and attribute this finding to our sampling procedure.

3.5.4 Energy consumption and preferences

We now turn to the question of whether our preferences measures are also significantly related to energy consumption behavior. To be able to do so, we elicited annual heating and energy costs in wave 2 (also for the Minergie houses). Table 3.9 shows the results of OLS regressions with cluster- robust standard errors.[71] We subsumed the two cost variables as the dependent variable in model (1) and present results for each individual variable in models (2) and (3). As explanatory variables we use our preference measures for risk, time, environmental preferences, selfishness and generosity as well as further controls such as the house age, the number of people living in the house, past and future renovations and whether or not the house fulfills a Minergie standard.

The regressions indicate that time preferences matter for the heating and energy costs. A one standard deviation increase in the minimum discount factor would decrease annual heating plus energy costs by 246 Swiss francs. Also, stated preferences for the environment are associated with lower heating and energy costs. Regarding our controls, houses fulfilling the Minergie Standard are associated with lower heating costs and, future renovations are associated with higher heating and energy costs, indicating that homeowners' decisions to renovate are related to current energy and heating costs. Past renovations per se (controlling for Minergie renovations separately) have no significant effect on the combined cost measure and energy costs but are associated with higher heating costs. Finally the more people live in the house, the higher are the costs, but the additional costs per person are decreasing (negative sign of the squared term). As a robustness test we additionally ran regressions with the estimated overall quality as a regressor. The results are qualitatively similar. The higher the estimated quality is the lower are the costs are. Also the effects of time and environmental preferences remain.

[71] Again, we use cluster-robust standard errors with clustering on postal codes. We obtain the same qualitative results with clustering on cantons and without clustering and robust standard errors. Tobit regressions (controlling for the censoring of the dependent variable) confirm the qualitative results of the OLS models (i.e. coefficient sizes change slightly but are still significant at the same levels).

OLS with cluster-robust SE in parentheses	(1) Annual Heating and Energy Costs	(2) Annual Heating Costs	(3) Annual Energy Costs
Selfish	485.21	-47.03	486.61
	(352.84)	(202.45)	(368.87)
Efficiency seeker	-97.07	7.42	-171.84
	(145.09)	(94.90)	(124.07)
Minimum discount factor (standardized)	**-246.57*** **	**-81.00***	**-172.30****
	(83.12)	(44.71)	(77.19)
Risk-taking in general	102.36	87.79	-8.68
	(102.78)	(62.47)	(92.21)
Percentage of payment donated to an environmental association	3.03	0.34	1.38
	(2.30)	(1.57)	(2.02)
Environmental Preference Index	**-97.51*** **	**-63.97****	**-68.71***
	(36.22)	(27.70)	(35.82)
Donations to environmental associations	-13.02	-110.57	183.28
	(186.04)	(101.53)	(180.34)
Donations to social associations	-68.49	281.49**	-339.94
	(273.34)	(120.66)	(303.69)
House younger than 15 years	Ref.	Ref.	Ref.
15-17 year old house	-123.40	-10.62	-76.64
	(186.12)	(117.08)	(154.77)
18-46 year old house	114.36	228.15	-199.64
	(260.90)	(219.34)	(182.40)
House older than 46 years	-123.94	-5.21	-322.85
	(302.15)	(224.31)	(212.46)
Sizes of the house (in m2 – standardized)	460.12	68.75	165.06
	(340.98)	(94.57)	(179.80)
# people who live in the house	**530.81*** **	**154.32***	**347.84*** **
	(117.36)	(85.69)	(97.99)
(# people who live in the house)^2	**-53.75*** **	**-20.48****	**-27.58****
	(13.18)	(8.64)	(11.42)
Past renovation	172.21	**388.97****	-107.33
	(176.38)	(162.90)	(165.18)
Future renovation planned	**462.71***	-82.50	**493.79***
	(253.48)	(129.51)	(252.60)
House fulfills Minergie standard	**-974.86*** **	**-991.03*** **	-1.29
	(240.81)	(188.41)	(177.02)
Constant	**1,937.90*** **	**1,075.79*** **	**1,200.25*** **
	(464.82)	(378.18)	(416.81)
Observations	197	203	204
Adjusted R-squared	0.23	0.21	0.11
#clusters (postal code)	176	181	182

Table 3.9: Annual heating and energy costs

3.6 Conclusions and policy implications

The building sector is one of the most energy consuming sectors but also offers large possibilities for greenhouse gas abatement. A reduction in households' energy consumption can help to reduce CO_2 emissions and is crucial for sustainable development of the housing market. For a better understanding of households' behavior in terms of reduction of energy expenses in their homes, we analyze which preferences of households drive their investments in energy saving measures for their houses as well as their energy consumption behavior. We find that first, people who declare that they are risk-taking in general are more likely to renovate their houses. Second, people who strongly value future incomes have a higher house quality in terms of energy efficiency and lower energy and heating costs. Third, people who have strong preferences for the environment are more likely to have the Minergie label that guarantees energy efficiency and environmental protection.

Apart from interesting results in terms of content our study also highlights a noteworthy methodological issue for the use of paper and pencil experiments in the field. Participants seemed to prefer certain (although lower) payoffs to uncertain (but higher) payoffs. Some participants explicitly mentioned that they perceived the random payment procedure in the first wave as a lottery game itself. This is in itself interesting and calls for further investigation. While current research mostly discusses incentivized vs. non-incentivized elicitation of preferences (see for instance Epper et al., 2011) future research may also investigate how the general payment procedure (certain payment with lower vs. uncertain payment but higher payoffs) affects participation.

Our results provide a better understanding of households' investments to finance a public good (the environment) in a complex context with uncertain and future returns. We observe that private returns from the public good are the first dimension households take into account. The fact that returns are uncertain and occur in the future drives households' decisions whether to renovate and to what extent. Considerations for the public good itself (the environment) are taken into account only for risk-taking homeowners who value future earnings. Our findings should help public policy aimed at enhancing energy efficient building renovation or construction to be more efficient. We identify three important channels to promote energy efficient building renovation. First, households need some future earnings guarantees to invest in home renovation. Indeed,

renovations require high expenses at the moment of the investment and yield uncertain future energy savings. Public policy should emphasize the reality of future energy savings when the house insulation is renovated or provide financing schemes reducing the risk of the renovation. However, such schemes may also be provided by the market. For instance, risk neutral energy companies may engage in supporting energy efficient renovations by sharing the costs, risks but also the benefits of future savings. By this means, contracting on renovations may help to overcome homeowners risk aversion and help to build a more sustainable housing sector in similar ways as zero-percent financing and leasing models may help customers to buy energy efficient refrigerators. Second, we find that future-oriented renovators own houses with higher energy efficiency. Thus public communication policy may highlight that high quality houses lead to notable energy savings immediately after retrofitting the home. Finally, our findings complement results by Hässig (2008) who also find that preferences for the environment are important for the decision to renovate according to the Minergie standard. In turn, public policy should promote the Minergie standard as a standard that does not only yield notable energy savings but also helps to protect the environment.

To conclude, to reduce households' energy consumption due to their building quality, public policy should use information campaigns emphasizing that future earnings are quite certain and high. To reduce the (perceived) risk of investments public policy could also develop a subvention that decreases the current investment costs and reduces the variance in future returns. In a similar way “contracting” for sharing renovation costs and benefits may induce more investments in energy saving measures. The Minergie standard should be promoted as both a way to reduce energy and heating costs as well as a way to protect the environment.

3.7 Appendix to chapter 3

Questionnaire for wave 1

THURGAUER WIRTSCHAFTSINSTITUT
an der Universität Konstanz

Entscheidungsbogen

In diesem Teil können Sie durch Ihre Entscheidungen Geld verdienen. Wir bitten Sie in insgesamt vier Entscheidungssituationen Entscheidungen zu treffen. Jede Entscheidung hat eine Entscheidungs-Nummer (01 bis 25). Wir werden in etwa jedem vierten Teilnehmer der Studie eine der getroffenen Entscheidungen ausbezahlen.

Die Auslosung der Teilnehmer, die eine Auszahlung erhalten, ist verknüpft mit der Ziehung der Swiss Lotto Joker-Zahl. Welche Entscheidung ausbezahlt wird, wird durch die letzten beiden Ziffern der Joker-Zahl bestimmt.
Stimmen die letzten beiden Ziffern der Swiss Lotto Joker-Zahl mit einer Ihrer Entscheidungs-Nummer überein, so wird die Entscheidung mit der entsprechenden Entscheidungs-Nummer ausbezahlt.
Sind die beiden letzten Ziffern der Joker-Zahl zum Beispiel "18", so würde die Entscheidung mit der Entscheidungsnummer "18" ausbezahlt. Weitere Informationen zum genauen Ablauf der Auszahlung finden Sie auf dem Beiblatt "Information zur Auszahlung".

Entscheidungssituation 1

In dieser Entscheidungssituation erhalten Sie durch Ihre eigene Entscheidung oder durch die Entscheidung eines anderen, zufällig ausgewählten Teilnehmers einen Geldbetrag.

Entscheidungs- Nummer 01

Stimmen die letzten beiden Ziffern der Joker-Zahl mit der oben stehenden Entscheidungs-Nummer überein, erhalten Sie von uns in jedem Fall Fr. 50.- und entscheiden zusätzlich darüber, welchen Betrag wir einem anderen, zufällig ausgewählten Teilnehmer der Studie zukommen lassen. Dabei können Sie dem anderen, zufällig ausgewählten Teilnehmer einen Betrag zwischen Fr.10.- und Fr. 90.- zuweisen.

Kreuzen Sie bitte an, welchen Betrag ein anderer, zufällig ausgewählter Teilnehmer erhalten soll:

Sie erhalten	Fr. 50.-	Fr. 50.-	Fr. 50.-	Fr. 50.-	Fr. 50.-	Fr. 50.-	Fr. 50.-	Fr. 50.-	Fr. 50.-
Ein anderer Teilnehmer erhält	Fr. 90.-	Fr. 80.-	Fr. 70.-	Fr. 60.-	Fr. 50.-	Fr. 40.-	Fr. 30.-	Fr. 20.-	Fr. 10.-
Ihre Entscheidung	☐	☐	☐	☐	☐	☐	☐	☐	☐

Bitte genau eine Auszahlung ankreuzen!

Auch Sie können zufällig als ein Teilnehmer ausgelost werden, der durch einen anderen Teilnehmer einen Geldbetrag zugewiesen bekommt. Sie erhalten Geld durch einen anderen Teilnehmer, wenn die letzten beiden Ziffern der Joker-Zahl mit folgender Entscheidungs-Nummer übereinstimmen:

Entscheidungs-Nummer 02

Sie haben genau eine Auszahlung angekreuzt? Dann weiter zu Entscheidungssituation 2.

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THURGAUER WIRTSCHAFTSINSTITUT
an der Universität Konstanz

Entscheidungssituation 2

In dieser Entscheidungssituation erhalten Sie durch Ihre eigene Entscheidung oder durch die Entscheidung eines anderen zufällig ausgewählten Teilnehmers einen Geldbetrag.

Entscheidungs- Nummer 03

Stimmen die letzten beiden Ziffern der Joker-Zahl mit der oben stehenden Entscheidungs-Nummer überein, erhalten Sie von uns insgesamt Fr. 100.-, die Sie zwischen sich und einem zufällig ausgewählten Teilnehmer aufteilen sollen. Dies ist nicht der gleiche Teilnehmer wie in Entscheidungssituation.

Wie verteilen Sie das Geld? Kreuzen Sie bitte das entsprechende Feld an:

Sie erhalten	Fr. 10.-	Fr. 20.-	Fr. 30.-	Fr. 40.-	Fr. 50.-	Fr. 60.-	Fr. 70.-	Fr. 80.-	Fr. 90.-
Ein anderer Teilnehmer erhält	Fr. 90.-	Fr. 80.-	Fr. 70.-	Fr. 60.-	Fr. 50.-	Fr. 40.-	Fr. 30.-	Fr. 20.-	Fr. 10.-
Ihre Entscheidung	☐	☐	☐	☐	☐	☐	☐	☐	☐

Bitte genau eine Auszahlung ankreuzen!

Auch Sie können zufällig als ein Teilnehmer ausgelost werden, der durch einen anderen Teilnehmer einen Teil der Fr. 100.- zugewiesen bekommt. Sie erhalten Geld durch einen zufällig gewählten Teilnehmer, wenn die letzten beiden Ziffern der Joker-Zahl mit folgender Entscheidungs-Nummer übereinstimmen:

Entscheidungs-Nummer 04

Sie haben genau eine Auszahlung angekreuzt? Dann weiter zu Entscheidungssituation 3.

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THURGAUER WIRTSCHAFTSINSTITUT
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Entscheidungssituation 3

Im Folgenden sollen Sie in 11 unterschiedlichen Situationen zwischen zwei Auszahlungen (A oder B) wählen. **Auszahlung A wird in einem Monat ausbezahlt, Auszahlung B in sieben Monaten.** Bitte kreuzen Sie für jede Situation in der letzten Spalte an, welche Auszahlung (A oder B) Sie bevorzugen.

Erklärung zur Auszahlung:
Entsprechen die letzten beiden Ziffern der Joker-Zahl einer der Entscheidungs-Nummer in der ersten Spalte der Tabelle, so wird Ihre Entscheidung aus der entsprechenden Zeile umgesetzt. D.h. Sie erhalten den Betrag den Sie in der entsprechenden Zeile gewählt haben nach einem bzw. nach sieben Monaten ausbezahlt. Wenn also z.B. die Entscheidung 08 ausgelost wird, erhalten Sie in einem Monat Fr. 80.-, wenn Sie in der Zeile mit Entscheidungs-Nummer 08 in der letzten Spalte A angekreuzt haben. Wenn Sie dort B angekreuzt haben, erhalten Sie in sieben Monaten Fr. 83.50.

Entscheidungsnummer	**Auszahlung A** (in einem Monat)	**Auszahlung B** (in sieben Monaten)	**Ihre Wahl**
05	Fr. 80.-	Fr. 80.50	☐ A ☐ B
06	Fr. 80.-	Fr. 81.00	☐ A ☐ B
07	Fr. 80.-	Fr. 82.00	☐ A ☐ B
08	Fr. 80.-	Fr. 83.50	☐ A ☐ B
09	Fr. 80.-	Fr. 85.50	☐ A ☐ B
10	Fr. 80.-	Fr. 88.00	☐ A ☐ B
11	Fr. 80.-	Fr. 91.00	☐ A ☐ B
12	Fr. 80.-	Fr. 94.50	☐ A ☐ B
13	Fr. 80.-	Fr. 98.50	☐ A ☐ B
14	Fr. 80.-	Fr. 103.00	☐ A ☐ B
15	Fr. 80.-	Fr. 108.00	☐ A ☐ B

Sie haben in jeder Zeile eine Wahl getroffen? Dann weiter zu Entscheidungssituation 4.

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Entscheidungssituation 4

Im Folgenden sollen Sie in 10 Situationen zwischen zwei Lotterien (C oder D) wählen. Der Ausgang jeder Lotterie (C oder D) hängt von der drittletzten Ziffer der Swiss Lotto Joker-Zahl ab. In der untenstehenden Tabelle sehen Sie über jedem Betrag keine, eine oder einen Bereich von Zahlen. Falls Ihre Entscheidung ausbezahlt wird, zahlen wir Ihnen den Betrag in der von Ihnen gewählten Lotterie aus, über dem die drittletzte Ziffer der Joker-Zahl steht. Steht über einem Betrag beispielsweise die "0", so würde dieser Betrag ausbezahlt, sofern die drittletzte Ziffer der Joker-Zahl gerade eine "0" ist. Stehen über einem Betrag beispielsweise die Zahlen "0,1,2,3,4,5", so wird dieser Betrag ausgezahlt, sofern die drittletzte Ziffer der Joker-Zahl entweder "0", "1", "2", "3", "4" oder "5" ist. D.h. umso mehr Zahlen über einem Auszahlungsbetrag stehen, umso wahrscheinlicher ist es, dass dieser Betrag ausbezahlt wird.

Ein Beispiel zur Verdeutlichung
Gehen Sie zunächst davon aus, dass die beiden letzten Ziffern der Joker-Zahl mit der obersten Entscheidungsnummer (16) in der ersten Spalte übereinstimmen, d.h. Sie gehen also zunächst für dieses Beispiel davon aus, dass ihre Entscheidung aus der ersten Zeile ausbezahlt wird. Nehmen wir weiter an, Sie hätten sich in dieser Zeile für Lotterie C entschieden. Wäre die drittletzte Ziffer der Joker-Zahl eine "0", so würden Sie von uns Fr. 40.- erhalten. Wäre die drittletzte Ziffer keine "0" (sondern eine "1" "2" "3" "4""5" "6" "7" "8" oder "9") erhielten Sie von uns Fr. 32.-.

Bitte kreuzen Sie in jeder Zeile die Lotterie an, die Sie wählen möchten. Sie treffen Ihre Wahl in der letzen Spalte.

Entscheidungs-Nummer	**Lotterie C**		**Lotterie D**		**Ihre Wahl**
	0	1,2,3,4,5,6,7,8,9	0	1,2,3,4,5,6,7,8,9	
16	**Fr. 40.-**	**Fr. 32.-**	**Fr. 80.-**	**Fr. 2.-**	☐ C ☐ D
	0,1	2,3,4,5,6,7,8,9	0,1	2,3,4,5,6,7,8,9	
17	**Fr. 40.-**	**Fr. 32.-**	**Fr. 80.-**	**Fr. 2.-**	☐ C ☐ D
	0,1,2	3,4,5,6,7,8,9	0,1,2	3,4,5,6,7,8,9	
18	**Fr. 40.-**	**Fr. 32.-**	**Fr. 80.-**	**Fr. 2.-**	☐ C ☐ D
	0,1,2,3	4,5,6,7,8,9	0,1,2,3	4,5,6,7,8,9	
19	**Fr. 40.-**	**Fr. 32.-**	**Fr. 80.-**	**Fr. 2.-**	☐ C ☐ D
	0,1,2,3,4	5,6,7,8,9	0,1,2,3,4	5,6,7,8,9	
20	**Fr. 40.-**	**Fr. 32.-**	**Fr. 80.-**	**Fr. 2.-**	☐ C ☐ D
	0,1,2,3,4,5	6,7,8,9	0,1,2,3,4,5	6,7,8,9	
21	**Fr. 40.-**	**Fr. 32.-**	**Fr. 80.-**	**Fr. 2.-**	☐ C ☐ D
	0,1,2,3,4,5,6	7,8,9	0,1,2,3,4,5,6	7,8,9	
22	**Fr. 40.-**	**Fr. 32.-**	**Fr. 80.-**	**Fr. 2.-**	☐ C ☐ D
	0,1,2,3,4,5,6,7	8,9	0,1,2,3,4,5,6,7	8,9	
23	**Fr. 40.-**	**Fr. 32.-**	**Fr. 80.-**	**Fr. 2.-**	☐ C ☐ D
	0,1,2,3,4,5,6,7,8	9	0,1,2,3,4,5,6,7,8	9	
24	**Fr. 40.-**	**Fr. 32.-**	**Fr. 80.-**	**Fr. 2.-**	☐ C ☐ D
	0,1,2,3,4,5,6,7,8,9	-	0,1,2,3,4,5,6,7,8,9	-	
25	**Fr. 40.-**	**Fr. 32.-**	**Fr. 80.-**	**Fr. 2.-**	☐ C ☐ D

Sie haben in jeder Zeile eine Wahl getroffen? Dann weiter zum Fragebogen.

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Fragebogen

Investitionsverhalten (allg.)

Wer trifft im Allgemeinen die finanziellen Entscheidungen in Ihrem Haushalt?
Bitte nur ankreuzen, falls Sie mit einer anderen Person zusammen leben

- ☐ vorrangig Sie allein
- ☐ vorrangig Ihr(e) Partner(in)
- ☐ Sie zusammen mit Ihrer/Ihrem Partnerin/Partner
- ☐ Sie oder Ihr(e) Partner(in) zusammen mit einer anderen Person

Wie wichtig sind für Sie bei der Entscheidungsfindung finanzieller Fragen folgende Personen
Eine "1" bedeutet "unwichtig" eine "10"bedeutet sehr wichtig

	unwichtig *sehr wichtig*
Verwandte, die nicht in Ihrer Wohnung wohnen	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10
Freunde	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10
Arbeitskollegen	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10
Nachbarn	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10
Kundenbetreuer von Banken, Versicherungen oder Finanzdienstleistern	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

Wenn Sie einmal zurück denken, wie Sie (und Ihr(e) Partner(in)) gemeinsam mit Ihren Einkünften im Jahr 2009 ausgekommen sind: Was trifft am besten auf Sie zu?

- ☐ Am Monatsende blieb immer reichlich Geld übrig
- ☐ Am Monatsende blieb oft etwas Geld übrig
- ☐ Es blieb nur etwas übrig, wenn zusätzlich einmalige Einkünfte hinzukamen
- ☐ Am Monatsende hat es öfter nicht gereicht
- ☐ Am Monatsende hat das Geld nie gereicht

Welcher der folgenden Sätze trifft am ehesten auf das persönliche Sparverhalten von Ihnen (und Ihrem/ Ihrer Partner/in) zu?

- ☐ Ich/ wir lege(n) regelmässig einen festen Betrag an, etwa auf einem Sparbuch, einem Sparvertrag, in Aktien oder einer Lebensversicherung
- ☐ Ich/ wir lege(n) jeden Monat etwas zurück, die Höhe bestimme(n) ich/wir je nach finanzieller Situation
- ☐ Ich/ wir lege(n) etwas zur Seite, wenn etwas zum Sparen übrig bleibt
- ☐ Ich/ wir spare(n) nicht, da kein finanzieller Spielraum vorhanden ist.
- ☐ Ich will bzw. wir wollen nicht sparen, sondern jetzt das Leben geniessen.

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THURGAUER WIRTSCHAFTSINSTITUT
an der Universität Konstanz

Investitionsverhalten (Fragen zu Ihrem Gebäude)

Bitte beantworten Sie nun einige Fragen zu Ihrem Gebäude.

Um welche Art von Gebäude handelt es sich? ☐ Einfamilienhaus ☐ Mehrfamilienhaus

Bewohnen Sie das Gebäude selbst? ☐ ja ☐ nein, sondern: _____

Wie viele Wohnungen hat das Haus? ☐☐☐☐

Wie viele Zimmer hat das Haus? ☐☐☐☐

Wie gross ist die Wohnfläche des Hauses (in Quadratmetern)? ☐☐☐☐

Wie viele Lichtquellen gibt es in etwa im Haus? ☐☐☐☐

Bei wie vielen Lichtquellen werden Energiesparlampen verwendet? ☐☐☐☐

Wann wurde das Haus gebaut? ☐☐☐☐

Wann wurde das Haus zuletzt saniert (Monat/Jahr)? ☐☐ / ☐☐

Ist eine Sanierung für die Zukunft geplant? ☐ Ja, und zwar (Monat/Jahr) ☐☐ / ☐☐ ☐ nein

In welchem Sanierungszustand befinden sich...

Fenster:
- ☐ Sehr gute Wärmedämmung (Dreifachwärmeschutzverglasungen)
- ☐ Normale Isolierverglasung (beschichtetes Glas, lückenlose Gummidichtung)
- ☐ Mittelalte Wärmedämmung (unbeschichtetes Glas, keine Gummidichtung)
- ☐ Alte Wärmedämmung (nur eine Scheibe, keine Beschichtung, keine Gummidichtung

Gebäudehülle:
- ☐ Verbesserte Wärmedämmung
- ☐ Standardwärmedämmung
- ☐ Keine Wärmedämmung aber neu gestrichen
- ☐ Alt, keine Wärmedämmung nicht neu gestrichen

Belüftung: ☐ Kontrollierte Belüftung ☐ Keine kontrollierte Belüftung

Dach:
- ☐ Sehr gute Wärmedämmung
- ☐ Normale Wärmedämmung
- ☐ Mittelalte Wärmedämmung
- ☐ Alte Wärmedämmung

Wie schätzen Sie die Energieeffizienz Ihres Hauses ein?
☐ Sehr gering ☐ Gering ☐ Mittel ☐ Hoch ☐ Sehr hoch

Wie schätzen Sie die Energieeffizienz der Gebäude im Umkreis Ihres Gebäudes in etwa ein?
☐ Sehr gering ☐ Gering ☐ Mittel ☐ Hoch ☐ Sehr hoch

Besitzen Sie einen Gebäudeenergieausweis der Kantone (GEAK®)?
☐ ja ☐ nein

Falls ja, welche Effizienzklasse der <u>Gesamtenergie</u> hat das Gebäude? A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☐

welche Effizienzklasse der <u>Gebäudehülle</u> hat das Gebäude? A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☐

Erfüllt das Haus einen MINERGIE ®-Standard? ☐ ja ☐ nein

Falls ja, welchen? ☐ MINERGIE® ☐ MINERGIE -ECO®
☐ MINERGIE-P® ☐ MINERGIE -P-ECO®

Wurde die MINERGIE-Plakette am Haus sichtbar angebracht?
☐ ja ☐ nein

Aus welchem Grund wurde die Plakette an- bzw. nicht angebracht?

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THURGAUER WIRTSCHAFTSINSTITUT
an der Universität Konstanz

Einstellungen und Werte

Wie gut beschreiben die folgenden Eigenschaften Ihre Person? *Eine "1" bedeutet, dass die Eigenschaft überhaupt nicht zutrifft, ein "5" bedeutet, dass die Eigenschaft voll zutrifft.*

	Trifft überhaupt nicht zu				*Trifft voll zu*
Zuverlässig, selbstdiszipliniert	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Besorgt, leicht aufzuregen	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Offen für neue Erfahrungen, vielschichtig	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Zurückhaltend, still	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Mitfühlend, warmherzig	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Desorganisiert, unachtsam	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Kritisch, streitsüchtig	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Ruhig, gefühlsmässig stabil	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Konventionell, nicht kreativ	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Extrovertiert, enthusiastisch	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Bitte geben Sie auf einer Skala von 1 bis 5 an, für wie wünschenswert Sie es halten, dass sich die Menschen in unserer Gesellschaft im Allgemeinen nach den folgenden Vorstellungen richten. Für wie wünschenswert halten Sie es, dass man…

	überhaupt nicht wünschenswert				*sehr wünschenswert*
…pflichtbewusst ist?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
…in der Arbeit etwas leistet?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
…das Leben geniesst?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
…sich gegenseitig hilft und unterstützt?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
…sich selbst zu verwirklichen sucht?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
…sich an gesellschaftliche Regeln hält?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
…Gleichheit anstrebt?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Sind Sie ein riskobereiter Mensch oder versuchen Sie Risiken zu vermeiden? Bitte schätzen Sie Ihre Risikobereitschaft in den folgenden Bereichen ein. *Eine "1" bedeutet gar nicht risikobereit und eine "5" sehr risikobereit.*

	gar nicht risikobereit				*sehr risikobereit*
im Allgemeinen	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
beim Autofahren	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
bei Geldanlagen	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
bei Freizeit und Sport	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
bei Ihrer beruflichen Karriere	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

In welchem Mass stimmen Sie persönlich den folgenden Aussagen auf einer Skala von "1" bis "5" zu? *Eine "1" bedeutet keine Zustimmung und eine "5" vollständige Zustimmung*

	keine Zustimmung				*vollständige Zustimmung*
Menschen müssen sich nicht an die Natur anpassen, weil sie diese zu ihrem Besten wieder herstellen können	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Wir nähern uns der Grenze der Menge von Menschen an, die durch die Erde ernährt werden kann	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Die Menschheit wurde erschaffen um über den Rest der Natur zu verfügen	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Für eine gesunde Wirtschaft benötigen wir einen (stationären) Zustand, in dem industrielles Wachstum kontrolliert wird	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Um überleben zu können müssen Menschen im Einklang mit der Natur leben	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

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Derzeitige Lebenssituation

Nachfolgend sind einige Aspekte aufgeführt, die im Leben eine Rolle spielen. Beurteilen Sie bitte anhand einer Skala von 0 bis 10, inwieweit Sie mit dem jeweiligen Aspekt zufrieden sind.

Wie zufrieden sind Sie mit…
Eine "0" bedeutet völlig unzufrieden und "10" völlig zufrieden.

	völlig unzufrieden										*völlig zufrieden*
Ihrer Gesundheit?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
Ihrer Arbeit?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
Ihrer Wohnung?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
Ihrem Einkommen?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
Ihrem Lebensstandard insgesamt ?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10

Sind Sie? ☐ weiblich ☐ männlich

In welchem Jahr wurden Sie geboren? 1 9 ☐ ☐

In welcher Haushaltsform wohnen Sie? ☐ Einzelhaushalt ☐ Familienhaushalt ☐ Paarhaushalt

Welchen Beruf üben Sie aus?

Ihr höchster Bildungsabschluss ist:

☐ Lehrabschluss ☐ Fachhochschulabschluss ☐ keiner
☐ Berufsmatura ☐ Universitätsabschluss ☐ sonstiger:
☐ Matura ☐ Doktorat

Sind Sie Mitglied in einem/ mehreren Vereinen ☐ Ja, in ☐☐ (Anzahl) Vereinen ☐ Nein

Falls ja, in welchem(/n) Verein(en)?

Betreiben Sie eine Sportart? ☐ regelmässig ☐ manchmal ☐ nie

Falls Sie eine Sportart betreiben, welchen Sport üben Sie aus?

Gehen Sie abstimmen? ☐ regelmässig ☐ manchmal ☐ nie

Spenden Sie für gute Zwecke? ☐ regelmässig ☐ manchmal ☐ nie

Falls Sie spenden, an welche Art von Organisation spenden Sie?

☐ Umwelt-Organisationen und zwar an:
☐ Soziale Einrichtungen und zwar an:
☐ kulturelle Einrichtungen und zwar an:
☐ Bildung und Forschung und zwar an:

Wie viel spenden Sie im Durchschnitt pro Jahr?

Herzlichen Dank, dass Sie den Entscheidungsbogen und den Fragebogen ausgefüllt haben!

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THURGAUER WIRTSCHAFTSINSTITUT
an der Universität Konstanz

Information zur Auszahlung

Die Auslosung der Teilnehmer, die einen Geldbetrag erhalten, hängt wie bereits auf dem Entscheidungsbogen erklärt mit der Swiss Lotto Joker-Zahl zusammen. Stimmen die letzten beiden Ziffern der Joker-Zahl mit einer Entscheidungs-Nummer überein, so wird die Entscheidung mit der entsprechenden Entscheidungs-Nummer ausbezahlt.

Die Joker-Zahl wird im Rahmen der Swiss Lotto-Ziehung jeweils am Mittwoch und Samstag ermittelt. Die Ziehung der Joker-Zahl wird am Fernsehen ausgestrahlt. Sie können nun wählen, welche Ziehung für Ihren Entscheidungsbogen relevant sein soll:

☐ Ziehung am 04.09.2010 ☐ Ziehung am 25.09.2010 ☐ Ziehung am 02.10.2010

Wichtig ist, dass der Poststempel auf Ihrem Rücksendeumschlag ein früheres Datum als die gewählte Ziehung hat. Andernfalls kann keine Auszahlung des Betrages erfolgen.

Wenn Sie einen Auszahlungsbetrag erhalten, haben Sie die Möglichkeit einen Teil der Auszahlung an eine der untenstehenden Umweltorganisationen zu spenden. **Wenn Sie etwas spenden, verdoppeln wir den von Ihnen gespendeten Betrag.**

Falls Sie eine Auszahlung erhalten, welchen Anteil Ihrer Auszahlung möchten Sie spenden?

☐ 0% des Auszahlungsbetrages
☐ 10% des Auszahlungsbetrages
☐ 20% des Auszahlungsbetrages
☐ 30% des Auszahlungsbetrages
☐ 40% des Auszahlungsbetrages
☐ 50% des Auszahlungsbetrages
☐ 60% des Auszahlungsbetrages
☐ 70% des Auszahlungsbetrages
☐ 80% des Auszahlungsbetrages
☐ 90% des Auszahlungsbetrages
☐ 100% des Auszahlungsbetrages

An welche Organisation wollen Sie spenden?

☐ WWF ☐ Greenpeace ☐ Stiftung Bergwaldprojekt ☐ equiterre (früher SGU)

Herzlichen Dank, dass Sie den Fragebogen und den Entscheidungsbogen ausgefüllt haben.
Damit wir Ihnen den möglichen Auszahlungsbetrag zukommen lassen können bitten wir Sie, hier anzugeben, wie wir im Falle einer Auszahlung vorgehen sollen. Bitte kreuzen Sie hierzu die gewünschte Vorgehensweise an und füllen Sie die in der gewählten Vorgehensweise benötigten Felder aus:

☐ überweisen Sie den Betrag direkt an

Kontoinhaber: _____

Kontonummer: _____

Name der Bank/Adresse: _____

Kontaktieren Sie mich…

☐ ...per Email Emailadresse: _____

☐ ...per Post Adresse: _____

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Alternative last page:

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an der Universität Konstanz

Information zur Auszahlung

Die Auslosung der Teilnehmer, die einen Geldbetrag erhalten, hängt wie bereits auf dem Entscheidungsbogen erklärt mit der Swiss Lotto Joker-Zahl zusammen. Stimmen die letzten beiden Ziffern der Joker-Zahl mit einer Entscheidungs-Nummer überein, so wird die Entscheidung mit der entsprechenden Entscheidungs-Nummer ausbezahlt.
Die Joker-Zahl wird im Rahmen der Swiss Lotto-Ziehung jeweils am Mittwoch und Samstag ermittelt. Die Ziehung der Joker-Zahl wird am Fernsehen ausgestrahlt. Sie können nun wählen, welche Ziehung für Ihren Entscheidungsbogen relevant sein soll:

☐ Ziehung am 04.09.2010 ☐ Ziehung am 25.09.2010 ☐ Ziehung am 02.10.2010

Wichtig ist, dass der Poststempel auf Ihrem Rücksendeumschlag ein früheres Datum als die gewählte Ziehung hat. Andernfalls kann keine Auszahlung des Betrages erfolgen.

Wenn Sie einen Auszahlungsbetrag erhalten, haben sie die Möglichkeit einen Teil der Auszahlung an eine der untenstehenden Umweltorganisationen zu spenden. **Wenn Sie etwas spenden, verdoppeln wir den von Ihnen gespendeten Betrag.**

Falls Sie eine Auszahlung erhalten, welchen Anteil Ihrer Auszahlung möchten Sie spenden?

☐ 0% des Auszahlungsbetrages ☐ 60% des Auszahlungsbetrages
☐ 10% des Auszahlungsbetrages ☐ 70% des Auszahlungsbetrages
☐ 20% des Auszahlungsbetrages ☐ 80% des Auszahlungsbetrages
☐ 30% des Auszahlungsbetrages ☐ 90% des Auszahlungsbetrages
☐ 40% des Auszahlungsbetrages ☐ 100% des Auszahlungsbetrages
☐ 50% des Auszahlungsbetrages

An welche Organisation wollen Sie spenden?

☐ WWF ☐ Greenpeace ☐ Stiftung Bergwaldprojekt ☐ equiterre (früher SGU)

Wenn Sie 60% oder mehr spenden, veröffentlichen wir auf Wunsch Ihren Namen in einer Liste von Spendern im Tagesanzeiger. Der gespendete Betrag wird dabei nicht veröffentlicht.
Wenn Sie eine Veröffentlichung wünschen, geben Sie Ihren Namen für die Veröffentlichung bitte hier an:

☐ Ja, folgender Name _____ ☐ Nein

Herzlichen Dank, dass Sie den Fragebogen und den Entscheidungsbogen ausgefüllt haben.
Damit wir Ihnen den möglichen Auszahlungsbetrag zukommen lassen können bitten wir Sie, hier anzugeben, wie wir im Falle einer Auszahlung vorgehen sollen. Bitte kreuzen Sie hierzu die gewünschte Vorgehensweise an und füllen Sie die in der gewählten Vorgehensweise benötigten Felder aus:

☐ überweisen Sie den Betrag direkt an

Kontoinhaber: _____
Kontonummer: _____
Name der Bank/Adresse: _____

Kontaktieren Sie mich…

☐ ...per Email Emailadresse: _____
☐ ...per Post Adresse: _____

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Questionnaire for wave 2 (in German)

THURGAUER WIRTSCHAFTSINSTITUT
an der Universität Konstanz

Investitionen (Gebäude)

Bitte beantworten Sie zunächst einige Fragen zu Ihrem Gebäude.

Um welche Art von Gebäude handelt es sich?	☐ Einfamilienhaus	☐ Mehrfamilienhaus
Bewohnen Sie das Gebäude selbst?	☐ ja	☐ nein
Wie gross ist die Wohnfläche des Hauses in etwa (in Quadratmetern)?	☐☐☐☐	
Wie viele Lichtquellen (Lampen) gibt es in etwa im Haus?	☐☐☐☐	
Bei wie vielen Lichtquellen werden Energiesparlampen verwendet?	☐☐☐☐	
Wie viele Personen bewohnen das Gebäude in etwa?	☐☐☐☐	
Wie hoch sind Ihre jährlichen Heizkosten in etwa?	☐☐☐☐ Fr.	
Wie hoch sind Ihre jährlichen Stromkosten in etwa?	☐☐☐☐ Fr.	
Wann wurde das Haus gebaut (Jahr)?	☐☐☐☐	
Wann wurde das Haus zuletzt saniert (Jahr)?	☐☐☐☐	
Ist eine Sanierung für die Zukunft geplant?	☐ Ja, und zwar (Jahr) ☐☐☐☐	☐ nein

In welchem Sanierungszustand befinden sich...

Fenster:	☐ Sehr gute Wärmedämmung (Dreifachwärmeschutzverglasungen) ☐ Normale Isolierverglasung (beschichtetes Glas, lückenlose Gummidichtung) ☐ Mittelalte Wärmedämmung (unbeschichtetes Glas, keine Gummidichtung) ☐ Alte Wärmedämmung (nur eine Scheibe, keine Beschichtung / Dichtung)
Gebäudehülle:	☐ Verbesserte Wärmedämmung ☐ Standardwärmedämmung ☐ Keine Wärmedämmung aber neu gestrichen ☐ Alt, keine Wärmedämmung, nicht neu gestrichen
Belüftung:	☐ Kontrollierte Belüftung ☐ Keine kontrollierte Belüftung
Dach:	☐ Sehr gute Wärmedämmung ☐ Normale Wärmedämmung ☐ Mittelalte Wärmedämmung ☐ Alte Wärmedämmung

Wie wird Ihr Haus hauptsächlich beheizt? (Mehrfachnennung möglich):
☐ Ölfeuerung ☐ Gasfeuerung ☐ Holzfeuerung ☐ Elektroheizung ☐ Wärmepumpe
☐ Sonstige: ____________________

Wie schätzen Sie die Energieeffizienz Ihres Hauses ein?
☐ Sehr gering ☐ Gering ☐ Mittel ☐ Hoch ☐ Sehr hoch

Wie schätzen Sie die Energieeffizienz der Gebäude im Umkreis Ihres Gebäudes in etwa ein?
☐ Sehr gering ☐ Gering ☐ Mittel ☐ Hoch ☐ Sehr hoch

Erfüllt das Haus einen MINERGIE ® - Standard? ☐ Ja ☐ nein

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THURGAUER WIRTSCHAFTSINSTITUT
an der Universität Konstanz

Einstellungen und Investitionsverhalten

Sind Sie ein risikobereiter Mensch oder versuchen Sie Risiken zu vermeiden?
Bitte schätzen Sie Ihre Risikobereitschaft in den folgenden Bereichen ein.

	gar nicht risikobereit				sehr risikobereit
im Allgemeinen	☐	☐	☐	☐	☐
beim Autofahren	☐	☐	☐	☐	☐
bei Geldanlagen	☐	☐	☐	☐	☐
bei Freizeit und Sport	☐	☐	☐	☐	☐
bei Ihrer beruflichen Karriere	☐	☐	☐	☐	☐

In welchem Mass stimmen Sie persönlich den folgenden Aussagen zu?

	keine Zustimmung				vollständige Zustimmung
Menschen in unserer Gesellschaft sollten pflichtbewusst sein.	☐	☐	☐	☐	☐
Wir nähern uns der Grenze der Menge von Menschen an, die durch die Erde ernährt werden kann.	☐	☐	☐	☐	☐
Um überleben zu können müssen Menschen im Einklang mit der Natur leben.	☐	☐	☐	☐	☐
Menschen in unserer Gesellschaft sollten in der Arbeit etwas leisten.	☐	☐	☐	☐	☐
Menschen müssen sich nicht an die Natur anpassen, weil sie diese zu ihrem Besten wieder herstellen können.	☐	☐	☐	☐	☐
Menschen in unserer Gesellschaft sollten sich gegenseitig helfen und unterstützen.	☐	☐	☐	☐	☐

Wenn Sie einmal zurück denken, wie Sie (und Ihr(e) Partner(in) gemeinsam) mit Ihren Einkünften im Jahr 2010 ausgekommen sind: Was trifft am besten auf Sie zu?

- ☐ Am Monatsende blieb immer reichlich Geld übrig.
- ☐ Am Monatsende blieb oft etwas Geld übrig.
- ☐ Es blieb nur etwas übrig, wenn zusätzlich einmalige Einkünfte hinzukamen.
- ☐ Am Monatsende hat es öfter nicht gereicht.
- ☐ Am Monatsende hat das Geld nie gereicht.

Welcher der folgenden Sätze trifft am ehesten auf das persönliche Sparverhalten von Ihnen (und Ihrem/ Ihrer Partner/in) zu?

- ☐ Ich/ wir lege(n) regelmässig einen festen Betrag an, etwa auf einem Sparbuch, einem Sparvertrag, in Aktien oder einer Lebensversicherung.
- ☐ Ich/ wir lege(n) jeden Monat etwas zurück, die Höhe bestimme(n) ich/wir je nach finanzieller Situation.
- ☐ Ich/ wir lege(n) etwas zur Seite, wenn etwas zum Sparen übrig bleibt.
- ☐ Ich/ wir spare(n) nicht, da kein finanzieller Spielraum vorhanden ist.
- ☐ Ich will bzw. wir wollen nicht sparen, sondern jetzt das Leben geniessen.

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THURGAUER WIRTSCHAFTSINSTITUT
an der Universität Konstanz

Entscheidungssituationen

Wir bitten Sie nun in drei Entscheidungssituationen über Geldbeträge zu entscheiden.

- Für Ihre Teilnahme erhalten Sie in jedem Fall einen Geldbetrag ausbezahlt.
- Die Höhe des Betrages hängt von Ihren und Entscheidungen anderer Teilnehmer ab.
- Es wird für jeden Teilnehmer genau eine Entscheidung umgesetzt und ausbezahlt.
- Es wird zufällig ausgelost, welche Entscheidung umgesetzt und ausbezahlt wird.
- Das Projektteam hat genug Geld budgetiert, um alle Teilnehmer auszuzahlen.

Sie erhalten grundsätzlich Fr. 10.- für Ihre Teilnahme an der Studie. Diese werden Ihnen nach Eingang des Fragebogens (innerhalb eines Monats) per Post zugesandt. Zusätzlich erhalten Sie einen Geldbetrag aus einer der im Folgenden beschriebenen Entscheidungssituationen, der zwischen Fr. 5.- und Fr. 108.- beträgt.

Informationen zum genauen Ablauf finden Sie auch unter:

www.investitionsstudie.twi-kreuzlingen.ch

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Entscheidungssituation 1

Ihre Entscheidung:

- Sie sollen entscheiden, wie viel Geld ein anderer, zufällig ausgewählter Teilnehmer der Studie erhält.
- Wenn Ihre Entscheidung umgesetzt wird, erhalten Sie in jedem Fall Fr. 25.- und ein zufällig ausgewählter anderer Teilnehmer erhält den von Ihnen bestimmten Betrag (Fr. 5.- bis Fr. 45.-).

Wie verteilen Sie das Geld?

Sie erhalten	Fr. 25.-								
Ein anderer Teilnehmer erhält	Fr. 45.-	Fr. 40.-	Fr. 35.-	Fr. 30.-	Fr. 25.-	Fr. 20.-	Fr. 15.-	Fr. 10.-	Fr. 5.-
Ihre Entscheidung	☐	☐	☐	☐	☐	☐	☐	☐	☐

Bitte genau eine Auszahlung ankreuzen!

Auch Sie können zufällig als Teilnehmer ausgewählt werden, der durch einen anderen Teilnehmer einen Geldbetrag zugewiesen bekommt.

Sie haben genau eine Auszahlung angekreuzt? Dann weiter zu Entscheidungssituation 2.

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an der Universität Konstanz

Entscheidungssituation 2

Ihre Entscheidung:

- Sie sollen entscheiden wie Fr. 50.- zwischen Ihnen und einem anderen, zufällig ausgewählten Teilnehmer aufgeteilt werden.
- Dies ist nicht der gleiche Teilnehmer wie in Entscheidungssituation 1.

Wie verteilen Sie das Geld?

Sie erhalten	Fr. 5.-	Fr. 10.-	Fr. 15.-	Fr. 20.-	Fr. 25.-	Fr. 30.-	Fr. 35.-	Fr. 40.-	Fr. 45.-
Ein anderer Teilnehmer erhält	Fr. 45.-	Fr. 40.-	Fr. 35.-	Fr. 30.-	Fr. 25.-	Fr. 20.-	Fr. 15.-	Fr. 10.-	Fr. 5.-
Ihre Entscheidung	☐	☐	☐	☐	☐	☐	☐	☐	☐

Bitte genau eine Auszahlung ankreuzen!

Auch Sie können zufällig als Teilnehmer ausgewählt werden, der durch einen anderen Teilnehmer einen Geldbetrag zugewiesen bekommt.

Sie haben genau eine Auszahlung angekreuzt? Dann weiter zu Entscheidungssituation 3.

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Entscheidungssituation 3

Ihre Entscheidung:

- Möchten Sie lieber in einem Monat (nach Eingang Ihres Fragebogens) Fr. 80.- erhalten oder in sieben Monaten einen höheren Betrag B?
- Bitte treffen Sie diese Entscheidung für die zwölf, unten angegebenen Geldbeträge.
- Wenn Entscheidungssituation 3 für Sie ausbezahlt wird, erhalten Sie die Auszahlung, für die Sie sich entschieden haben, bei Wahl von Auszahlung A in einem Monat und bei Wahl von Auszahlung B in 7 Monaten nach Eingang Ihres Fragebogens.

Bitte kreuzen Sie für jede Entscheidungsnummer in der letzten Spalte an, ob Sie Auszahlung A (Fr. 80.- in einem Monat) oder Auszahlung B (höherer Betrag in sieben Monaten) wählen.

Entscheidungs-nummer	Auszahlung A (in einem Monat)	Ihre Wahl	Auszahlung B (in sieben Monaten)
1	Fr. 80.-	☐ A ☐ B	Fr. 80.00
2		☐ A ☐ B	Fr. 80.50
3		☐ A ☐ B	Fr. 81.00
4		☐ A ☐ B	Fr. 82.00
5		☐ A ☐ B	Fr. 83.50
6		☐ A ☐ B	Fr. 85.50
7		☐ A ☐ B	Fr. 88.00
8		☐ A ☐ B	Fr. 91.00
9		☐ A ☐ B	Fr. 94.50
10		☐ A ☐ B	Fr. 98.50
11		☐ A ☐ B	Fr. 103.00
12		☐ A ☐ B	Fr. 108.00

Bitte treffen Sie in jeder Zeile eine Wahl zwischen Auszahlung A und Auszahlung B

Sie haben in jeder Zeile eine Wahl getroffen? Dann weiter zu den statistischen Angaben.

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Statistische Angaben

Sind Sie?	☐ weiblich ☐ männlich
Wie alt sind Sie?	☐☐
Welches ist Ihr höchster Bildungsabschluss?	☐ Lehrabschluss ☐ Matura ☐ Universitätsabschluss ☐ Sonstiger:
Gehen Sie abstimmen?	☐ regelmässig ☐ manchmal ☐ nie
Spenden Sie für gute Zwecke?	☐ regelmässig ☐ manchmal ☐ nie

Falls Sie spenden, an welche Art von Organisation spenden Sie?

☐ Umwelt-Organisationen
☐ Soziale Einrichtungen
☐ Kulturelle Einrichtungen
☐ Bildung und Forschung
☐ Sonstige:

Wie viel spenden Sie im Durchschnitt pro Jahr (in Franken)?

Herzlichen Dank, dass Sie an unserer Studie teilgenommen haben.

Sie können einen Teil Ihrer Gesamtauszahlung (maximal 60%) an eine der untenstehenden Umwelt-Organisationen spenden.

- Wir verdoppeln den von Ihnen gespendeten Betrag.
- Wenn Sie 40% oder mehr spenden, veröffentlichen wir auf Wunsch Ihren Namen in einer Liste von Spendern im Tagesanzeiger.
- Der gespendete Betrag wird dabei nicht veröffentlicht.
- Wenn Sie eine Veröffentlichung wünschen, geben Sie Ihren Namen für die Veröffentlichung bitte hier an:

Welchen Anteil Ihres möglichen Auszahlungsbetrages möchten Sie spenden?

☐ 0% ☐ 10% ☐ 20% ☐ 30% ☐ 40% ☐ 50% ☐ 60%

Wenn Sie etwas spenden, an welche Organisation möchten Sie spenden?

☐ WWF ☐ Greenpeace ☐ Stiftung Bergwaldprojekt ☐ equiterre (früher SGU)

Platz für Ihre Anmerkungen

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