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ABSTRACT

The Preference Survey Module: A Validated Instrument for Measuring Risk, Time, and Social Preferences

This paper presents an experimentally validated survey module to measure six key economic preferences – risk aversion, discounting, trust, altruism, positive and negative reciprocity – in a reliable, parsimonious and cost-effective way. The survey instruments included in the module were the best predictors of preferences revealed in incentivized choice experiments. We also offer a streamlined version of the module that has been optimized and piloted for applications where time efficiency and simplicity are paramount, such as international telephone surveys.

JEL Classification: C81, C83, C90

Keywords: survey validation, experiment, preference measurement

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1 Introduction

This paper develops a concise, experimentally-validated survey module for measuring risk aversion, time discounting, trust, altruism, positive and negative reciprocity. These preferences affect individuals' choices in myriad situations.[1] The module is a convenient tool for obtaining standardized measures in all popular methods of data collection. It is therefore a useful tool in a wide range of applications, not least because preference measures can allow for improved prediction of many important economic behaviors, or can provide control variables if researchers want to identify causal effects of other factors that are correlated with preferences.

The module provides a valuable contribution in several respects. First, while incentivized experiments are generally viewed as the gold standard for eliciting preferences, because they measure actual behavior in a controlled way, they are expensive and time consuming; our survey module is developed based on its ability to capture behavior in incentivized experiments. It thus provides a low cost way to measure preferences in large representative samples, while retaining key advantages of the experimental approach.[2]

Second, while some existing survey measures have been shown to predict behavior in experiments, these have typically been developed for different individual studies, based on intuitive plausibility, which has led to a large set of diverse measures. Our approach takes the natural next step, assessing which of a wide array of candidate

[1] For example, risk aversion, time preferences, altruism, trust, positive reciprocity and negative reciprocity have all been shown to predict a wide range of choices at the individual level, including, e.g., financial decision-making, educational choices, labor market behavior, charitable giving, social norm enforcement, and health outcomes (see, e.g., Dohmen et al., 2009; Dohmen et al., 2011; Fehr et al., 2002; Kirby et al., 1999; Komlos et al., 2004; Rose-Ackerman, 1996; Smith et al., 2005; Tanaka et al., 2010) and are associated with important life outcomes at the individual level (e.g., Becker et al., 2012) as well as with economic outcomes at the organization level (e.g., LaPorta et al., 1997) and the aggregate level (e.g., Beugelsdijk et al., 2004; Knack and Keefer, 1997; Zak and Knack, 2001).

[2] An alternative methodology is to use life outcomes as a proxy for preferences. While this has the advantage of involving real (typically self-reported) behavior, for potentially large stakes, a disadvantage is that a given life outcome may depend on many personal and environmental factors besides the preference of interest. By contrast, both experiments and survey measures can pose individuals with carefully designed scenarios and choice options, which can isolate a particular preference with a reasonably high degree of precision, and which are held exactly the same across respondents. This can help eliminate a major source of unobserved heterogeneity that affects the inference of preferences from life outcomes.

measures are the best predictors.[3] Specifically, for each preference, we evaluate the ability of roughly 30 different survey measures to predict behavior in corresponding incentivized choice experiments. We include measures developed in previous studies, as well as novel measures. We select the survey items that are jointly the best predictors.

Third, the previous literature has used a wide variety of different types of preference measures, with different formats, wordings, and elicitation modes. This poses a substantial obstacle to the comparability of results across studies. Our preference module provides a new tool for measuring preferences in a standardized way. In psychology, this type of problem has been at least partially addressed by the development of a standard set of measures - in particular the so-called Big Five and Locus of Control - which are conceptualized to be key personality traits and relevant for many settings (Costa and McCrae, 1992; Rotter, 1966). Our module captures a set of preferences identified by economic theory as being fundamental determinants of behavior in many contexts. If the module is widely adopted, it will help enhance comparability across studies and may thereby accelerate scientific progress.

In developing the survey module we took several additional considerations into account: We strove to reduce measurement error in the experimental preference measures by having subjects participate in more than one experiment for a given preference and averaging over the choice-based preference measures. We designed the validation to limit spurious interdependencies in decision-making and response behavior by never asking survey questions relating to a particular preference in the same session in which the respective preference elicitation experiment was conducted; surveys and experiments were conducted one week apart. We restricted the subject pool to subjects who had never participated in an experiment before. This rules out possible biases in behavior due to experiences gained in previous

[3] Fehr et al. (2003), for example, examine six different attitudinal trust questions in terms of their ability to predict behavior in an investment game as introduced by Berg et al. (1995), and find that self-rated trusting behavior and willingness to trust strangers are most strongly associated with behavior in the incentivized experiment. Dohmen et al. (2011) show that self-rated willingness to take risk "in general" is significantly correlated with decisions in an incentivized lottery choice experiment. Vischer et al. (2013) relate answers to a survey question asking respondents to rate their general level of impatience to behavior in an experiment involving inter-temporal trade-offs.

experiments.

When selecting the module items, we considered all possible linear combinations of survey items intended to measure a particular preference, and chose the combination that best explained behavior in the respective experimental preference elicitation task. The selection of a best-subset regression model from the candidate family entailed the well-known trade-off between parsimony and explanatory power that is inherent to model selection in statistics. We used standard model selection criteria to guide our choice, and, in addition, took into account the risk of overfitting by evaluating out-of-sample predictive power, or alternatively by conducting cross-validation procedures.

The selected module involves two survey items for the elicitation of each preference. The preference module is symmetric, in that most preferences are measured with one quantitative and one qualitative item. The single best predictor of behavior for a given preference tends to be quantitative: a hypothetical version of the experiment itself. The second survey item that is typically selected is a qualitative question, asking about a general orientation in the relevant preference dimension. The module thus offers an attractive balance between measures that allow for inferring (cardinal) preference parameters, and subjective measures that capture other contexts besides choices about financial rewards.

It turns out that some of the survey items that are selected by our methodology have been shown to be behaviorally valid in various populations by previous studies. For example, the same qualitative measure of risk preference that is selected for our module has been shown to predict behavior in an incentivized risk experiment with a representative sample of German adults (Dohmen et al., 2011). Notably, the correlation between the survey measure and experiment observed in their representative sample is virtually the same as that found in our validation exercise. Other research shows that the same survey question about risk preference predicts behavior in incentivized experiments in 30 different countries (Vieider et al., 2015). Thus, there are strong indications that the types of measures selected for our module have good predictive power in representative and cross-cultural samples.

We also develop a second, streamlined version of the preference module. It has

slightly weaker explanatory power, but is ideally suited for applications in which time efficiency, simplicity and cultural neutrality are of paramount importance. A prime example is a large-scale international survey among respondents that are representative of the entire population. When developing this streamlined module, we discarded the more complex hypothetical experiments. After selecting the items with highest explanatory power from the modified battery of questions, we tested the performance of the resulting module in an international pilot study.[4] The streamlined module is implementable within tight time constraints, and detailed feedback elicited from respondents was encouraging in terms of confirming a common understanding of the preference module across a very diverse set of cultures. The feedback led to a few minor wording changes that are incorporated in this version of the module.

We are confident that both versions of the preference module will prove useful to scientists interested in measuring economic preferences. In order to make the preference module easily accessible to researchers, we have launched a website (www.global-preferences.org), from which the preference module can be downloaded. We also provide the streamlined version of the preference module in more than 90 languages. Supplementary material and detailed information on the construction of the module, including the design and instructions of the experiment, the set of survey items included in the questionnaires that participants filled in, z-tree files, and detailed regression tables.

The remainder of the paper is organized as follows. Section 2 describes the design of the validation study and the procedures to elicit preferences in experiments and surveys. Section 3 explains the process and the criteria for the selection of items. It also presents the preference module with two items for measuring each of the six preferences, which performs best in out-of-sample prediction. Section 4 discusses additional important properties of the preference module, such as explanatory power and its suitability for non-student subject pools. Section 5 proposes the streamlined version of the preference module and discusses its applicability in representative and

[4] The pilot study was run in 22 countries in Southeast Asia, Central Asia, East Africa, Eastern Europe and the Middle East.

cross-cultural samples. Section 6 concludes.

2 Design of the Validation Study

2.1 Procedural Details

409 subjects participated in our study. Subjects were students from the University of Bonn, who were recruited using ORSEE (Greiner 2004). They were required to have never taken part in an experiment before in order to minimize potential confounds due to earlier experiences in (similar) experiments. Subjects signed up for two laboratory sessions. These were scheduled one week apart and run at the Laboratory for Experimental Economics at the University of Bonn in winter 2010/2011. Both sessions consisted of incentivized experiments and non-incentivized surveys, programmed in zTree (Fischbacher 2007). Each session lasted about two hours. Payoffs earned in the incentivized experiments were paid out to subjects at the end of each session.[5] Average earnings over both sessions amounted to 64 Euros (corresponding to approximately 83 US-dollars at the time of the experiment), including a fixed fee of 10 Euros for participating in both sessions.

In order to minimize spillovers between the experimental and the survey measures, e.g., because individuals might try to avoid cognitive dissonance (Festinger, 1957) and strive for giving consistent responses (Falk and Zimmermann, 2015, and Falk and Zimmermann, forthcoming), we never ran survey and experiment for the same preference during the same session. More specifically, we conducted all experiments relating to social preferences and all surveys relating to time discounting and risk taking in one session. The other session then contained the experiments relating to time discounting and risk taking as well as the surveys on social preferences. In addition, we reversed the order of experimental and survey elicitation of preferences for about half of our subjects. This design feature takes care of potential order effects, i.e., differences in behavior or responses due to differences in the

[5] The payments resulting from the choice experiments on time discounting were delivered to the subjects in cash via regular mail, either at the same day of the session or 12 months later, depending on the payoff relevant choice.

way preferences were measured first. Table 1 gives an overview of the general study design.

	Week 1	**Week 2**
Group 1 (n=198)	Experiments on risk taking and time discounting; Surveys on social preferences	Experiments on social preferences; Surveys on risk taking and time discounting
Group 2 (n=211)	Experiments on social preferences; Surveys on risk taking and time discounting	Experiments on risk taking and time discounting; Surveys on social preferences

Table 1: Overview of Study Design

We also conducted a pre-test with 80 students. This pre-test was intended to provide information on the duration and feasibility of the experiment. Experimental measures for negative reciprocity and altruism were not elicited in this pre-test and the constraints on the participants regarding previous participation were not applied. Otherwise, the protocol was identical. We use data from the this pre-test for assessing the out-of-sample predictive performance of different candidate modules in section 3.

2.2 Preference Elicitation in Choice Experiments

We conducted standard economic choice experiments on risk taking, time discounting, altruism, trust, positive and negative reciprocity, respectively, in order to obtain behaviorally valid preference measures. The experiments that were used in each of the preference dimensions are summarized in Table 2. A detailed description of the experiments is relegated to Appendix A. Monetary stakes were presented to subjects in points, where 100 points equaled 80 Cents. Subjects received feedback about the outcome of the experiments only at the end of the sessions in order to limit the impact of possible income effects on subsequent choices within a session.

All experiments involving social or strategic interaction were one-shot to isolate social preferences from repeated game motives. Specifically, we implemented a perfect stranger random matching protocol implying that subjects never interacted more than once with the same person. Subjects were informed about this at the beginning of each session as well as before each experiment involving social interaction.

For risk taking, time discounting, trust, and positive reciprocity we conducted two experiments each. These experiments had the same structure, but payoffs in the second experiment differed slightly, such that subjects were never asked to make tradeoffs between alternatives that involved the exact same amounts. For instance, the first lottery choice experiment involved 21 choices between a safe payment option, which increased in steps of 50 points from 0 points in the first choice to 1000 points in the last choice, and a lottery that yields 1000 points with probability 0.5 and 0 points otherwise. We perturbed the safe payments in the second experiment by adding or subtracting up to five points to each safe payment alternative. The number of points added or subtracted was determined by a randomly drawn integer value between -5 and +5. In the discounting experiments, in which subjects made choices between an immediate payment and a larger payment with a 12-months delay, we perturbed the delayed payment in the second experiment in the same manner.

The experimental measure of risk aversion was constructed by averaging over the switching rows in the two lottery choice experiments.[6] This averaging reduces measurement error compared to using a single experimental measure. Analogously, we constructed our experimental measure of time preference by averaging the switching rows in the discounting experiments.[7]

Trust and positive reciprocity were elicited as first and second mover behavior, respectively, in two versions of the investment game (Berg et al., 1995). Each subject

[6] As is common for this type of elicitation methods, some subjects exhibit multiple switching points. We observe that 86 individuals switch more than once from preferring the lottery to the safe payment in either of the two lottery choices experiments, 36 of them have multiple switch points in both experiments. For subjects who make that kind of inconsistent choices, we calculate the average switching row in each choice table and construct the experimental measure of risk aversion as the mean of the two averages.

[7] In the discounting experiments, we observe that around 7 percent of subjects switch more than once from preferring the early payment to the late payment. For these subjects we construct the experimental measure by taking the mean of the average switching row in the two experiments involving intertemporal choices.

was in the role of the first and the second mover twice, such that overall each subject participated in four investment games. In one version, the amount sent by the first mover was tripled, in the other one it was doubled. For the second mover behavior, we implemented the contingent response method (Selten, 1967). As our measure of trust, we again took the averages from the two decisions made as a first mover. For positive reciprocity, we first averaged all second mover decisions from the contingent response method in the two versions of the investment game. The average of these two amounts constitutes our preference measure of positive reciprocity.

For altruism, we conducted a dictator game with a charitable organization as recipient. The chosen donation then constitutes our preference measure of altruism. For negative reciprocity, we conducted two different experiments. A subject's minimum acceptable offer in an ultimatum game (Güth et al., 1982) serves as one assessment of negative reciprocity. We obtain a second assessment from a subject's investment into punishment after unilateral defection of their opponent in a prisoner's dilemma (Falk et al., 2005). In order to obtain our preference measure of negative reciprocity, we standardized both variables to account for the different response scales and then took the average.

Table 2: Overview: Experimental Measures

Preference	**Experiment**	**Measure**
Risk Taking	Two multiple price lists in which subjects choose between a lottery and varying safe options.	Average of rows in both price lists in which subjects switch from preferring the lottery to the safe option.
Time Discounting	Two multiple price lists in which subjects choose between a payment "today" and a larger payment "in 12 months".	Average of rows in two price lists in which subjects switch from preferring the early to the delayed payment.
Trust	First mover behavior in two investment games.	Average amount sent as a first mover in both investment games.
Altruism	First mover behavior in a dictator game with a charitable organization as recipient.	Amount of donation.
Positive Reciprocity	Second mover behavior in two investment games (contingent response method).	Average amount sent back in both investment games.
Negative Reciprocity	Investment into punishment after unilateral defection of the opponent in a prisoner's dilemma (contingent response method) and minimum acceptable offer in an ultimatum game	Average score: amount invested into punishment and minimum acceptable offer in an ultimatum game.

2.3 Preference Elicitation in Surveys

In the survey, we asked both quantitative and qualitative questions to measure a given preference. In total, we included 199 survey items.[8] Many survey items were taken or adapted from existing surveys, like the German Socio-Economic Panel Study (SOEP) or the National Longitudinal Study of Youth (NLSY), or from previous research (e.g., Weber et al., 2002; Perugini et al., 2003). Additionally, we designed and included a number of new items. Each battery of survey questions on a particular preference began with a qualitative measure, asking respondents to self-assess their preference "in general" on an 11-point scale.[9] Next, respondents were asked to state how they believe others judge them with respect to that preference and to compare their preference to the attitude of others. Then, respondents had to assess their attitude in qualitative terms with respect to different domains, e.g., financial decision-making. Subsequently, subjects were confronted with a battery of additional qualitative and quantitative survey items.

Quantitative items typically included a hypothetical version of the incentivized choice experiment. Since the multiple price lists used in the lottery choice experiment and in the inter-temporal choice experiment involve 30 choices and are rather time-consuming, we also included an alternative elicitation procedure in which subjects only had to make five sequential choices. In the five-question measure of risk preference all subjects first decided between the lottery versus a safe payment that slightly exceeds the expected value of the lottery. In the second decision (and all subsequent decisions) the lottery remained the same. If the participant had chosen the safe option in the first question, the safe option in the subsequent decision was smaller. If the participant had opted for the lottery, the safe payment increased. In the same manner, the safe option was increased or decreased in the third decision when the lottery or the safe payment were preferred in the second decision, respectively. This procedure was repeated five times. Figure 2 in the Appendix illustrates the method underlying this condensed quantitative measure, which is commonly re-

[8] Section A in the online appendix gives a list of all survey items we used in our study.

[9] An example of this type of question is the general risk question that was validated in Dohmen et al. (2011).

ferred to as an "unfolding brackets" method.[10] For the case of time discounting, an analogous unfolding brackets elicitation was used in which the early option was identical in every choice while the delayed option varied. The procedures are described in detail in Appendix E (for risk taking) and Appendix F (for time discounting). Finally, we asked all subjects to rate the reliability of their answers in the survey part. Before running the item selection procedure for the preference module, we restricted the pool of items to include only those items that are widely applicable, i.e., that are not limited to certain subject pools, e.g., university students.[11] In particular, we excluded items that refer to betting on horses, gambling, drug consumption, risky sports, taking a hitchhiker, or that require respondents to be employed.[12]

3 The Preference Module

3.1 Item Selection Procedure

Our aim was to develop a survey preference module that contains the set of items for each preference that best capture revealed preferences in incentivized laboratory experiments, in the sense of an optimal tradeoff between explanatory power and parsimony. While previous studies have typically focused on identifying survey measures that are significantly correlated with experimental preference measures, our approach is to identify the combination of survey items from an extensive battery of alternative survey items that best predicts choices in incentivized experimental preference elicitation tasks.

In order to identify the best linear combination of items for measuring a particular preference, we regressed each experimental preference measure on different combinations of the respective survey items. In the spirit of best subset selection, we considered all possible combinations of survey items as regressors.[13] We then

[10] In psychology this approach is also referred to as the "staircase method" (Cornsweet 1962).

[11] In our initial selection of the battery of candidate questions we had still included items that relate to very particular contexts, despite the fact that our ex ante choice of items was guided by judgments about applicability and relevance in diverse populations.

[12] Some of these items might work well for particular sub-samples of the population, but will most likely be uninformative and inappropriate for large fractions of more general population samples.

[13] Alternative selection procedures commonly applied in, e.g., personality psychology are stepwise

took into account statistical model selection criteria, based on explanatory power and prediction error, in order to identify the preferred combination of survey items for each preference.[14]

We implemented the selection procedure using a stepwise approach. In the first step, we ran OLS regressions and identified for every number of regressors the best model in terms of explanatory power, using an $\bar{R}^2$ criterion.[15] In the second step, we considered all models selected in the first step, i.e., one model for any number of regressors, and used information criteria to narrow down the number of candidate models.[16] Since these information criteria differ with respect to the extent to which the inclusion of additional regressors is penalized, the different information criteria will not necessarily all favor the same model. In our case, the two-item and three-item models were among the set of candidate modules for each preference, in the sense that they were reasonably close according to the different information

selection procedures, including forward selection and backward elimination procedures. In forward selection approaches the analysis starts with the null model and chooses the predictor variable which explains the highest share of variance in the dependent variable. Given this predictor, the next variable is selected applying the same criterion. This process is repeated until no additional predictor variables can be found that meet a certain criterion, e.g., an F-statistic above a certain threshold (compare, e.g., Kadane and Lazar, 2004). In backward selection approaches the analysis starts with the model that includes all potential predictor variables and then, one by one, eliminates variables from the model that perform worst according to a predetermined criterion. Again, this procedure is repeated until only predictor variables are left in the model that fulfill a certain criterion. Clearly, the resulting model in both forward selection and backward elimination procedures strongly depends on the order of selecting (eliminating) items. Consequently, they do not necessarily result in the same model (see also Graybill, 1976). Stepwise regression approaches combine backward elimination and forward selection procedures and mitigate the problem of order dependence. However, all three approaches share the feature that not all possible models are evaluated. A further potential alternative would be to use the so-called Lasso-technique as introduced by Tibshirani (1996). Lasso is particular useful when best subset selection is not feasible, e.g., when there are more potential explanatory variables than observations, which is not the case in our setting in which we consider linear models only that are additively separable in explanatory variables. In fact, in this case Lasso selects largely the same modules. We deliberately did not consider non-linear and fully interacted prediction models for reasons of simplicity, to facilitate applicability and interpretation of the preference module, and to enhance comparability of results across studies.

[14] Another important ex ante criterion was cost efficiency, i.e., considering the tradeoff between predictive power and conciseness of the module. It turned out, however, that the statistical criteria were not in conflict with the cost criterion as favored combinations are parsimonious in terms of the number of items.

[15] In the following we will only report results from OLS regressions. However, all results reported here are robust to estimating Ordered Probit models and selecting items using the criteria of maximum log-likelihood or Pseudo-$\bar{R}^2$.

[16] Naturally, R^2 will increase with the number of regressors, but adding regressors may result in overfitting. Different criteria such as adjusted $\bar{R}^2$, the Akaike information criterion (AIC), or the Bayesian information criterion (BIC) contain a penalty term for the number of items.

criteria.[17] Since we value brevity of the preference module, we favor the Bayesian information criterion (BIC), which contains a larger penalty for additional regressors than the Akaike information criterion (AIC). According to the BIC, the two-item model is superior for altruism, negative reciprocity and trust, while the three-item model is selected for risk taking, time discounting and positive reciprocity.[18]

In the final step, we considered the predictive power of our candidate modules, in order to identify the preferred preference module. Whenever possible, we considered out-of-sample predictive power, making use of a truly independent sample of 80 subjects for whom we had collected data on the same experimental and survey measures on risk taking, time discounting, positive reciprocity and trust. For each of these preferences we determined the predicted values of the respective experimental preference measure according to the candidate models that differ with respect of the number of items.[19] For each preference, we then assessed the predictive power of the different candidate models by comparing their mean squared prediction error (MSPE). For all four preference dimensions, the MSPE is minimized for the model with two items.

Since data on altruism and negative reciprocity is lacking in our independent sample, we evaluated the predictive power of the models with different numbers of items for these preference dimensions based on cross-validation using the original sample.[20] In line with our out-of-sample prediction results for the other four pref-

[17] In particular, in our case, the one-item module is never selected, irrespective of whether we consider AIC or BIC. Many previous studies have relied on only one item, which suggests that many of the results in previous literature understate the strengths of correlations between different preference dimensions or the strength of estimated relationships between preferences and outcome variables, due to attenuation bias that results from measurement error. Moreover, studies using survey measures of preferences are often not based on survey preference measures that exhibit the highest correlation with the experimental preference measure (cf. Online Appendix C). The pairwise correlations of single items with the experimental preference measure are also informative with respect to comparability of results across existing studies that are based on single but different measures.

[18] The AIC, on the other hand, favors the two-item module only in the case of positive reciprocity.

[19] Predicted values were calculated as the product of the vector of observed answers to the specific preference module and the vector of estimated coefficients from the regression of the experimental preference measure on the respective preference module in the main sample on which the selection procedure was based.

[20] Our cross-validation procedure entails that the sample is randomly split into k partitions. One partition is used as a validation sample, whereas the remaining $k-1$ samples are used as the "training" sample.

erences, the cross validation errors are smallest when using the two-item models for negative reciprocity and altruism.[21] As a result, we prefer two-item models for each preference dimension.

3.2 Survey Items Contained in the Preference Module

Table 3 displays the items that were selected for the preference module with two survey questions for each preference dimension. Appendix B presents the wording of the survey items in the preference module, translated from German to English; the original wording of the items in German is provided in section D in the online appendix.

A notable feature of the preference module is its symmetry: For most preference dimensions, it contains a measure based on a hypothetical choice experiment and a qualitative item.[22] These two types of measures are complementary in the sense that the quantitative measure is akin to the standard revealed preference approach whereas the qualitative item is a subjective self-assessment. Previous research has shown that subjective assessments with abstract framings can lead to strong all-around predictors of life choices across many different life contexts. For example, a general assessment of willingness to take risks can predict a range of behaviors ranging from holding risky assets, to being self-employed, to smoking (Dohmen et al., 2011). Quantitative survey measures that involve explicit monetary stakes are no exception, as they are somewhat tied to the context of financial decision making by construction; they may be better predictors of financial decisions in life than qualitative measures of a general disposition, but less predictive of choice in other domains. The preference module has an attractive balance between both approaches.

Table 3 also documents the correlations between the module items and the respective behavioral measures. The last column of Table 3 provides estimated OLS coefficients obtained from a multivariate regression of the standardized experimental preference measure on standardized measures of the two survey items for the respective preference dimension. In applications, these coefficients can be used to

[21] Our results obtain using $k = 5$ or using $k = 10$ partitions.
[22] The only exception is positive reciprocity.

calculate weights, and then construct measures for each preference as the weighted sum of the two items that capture the respective preference.

4 Properties of the Preference Module

4.1 Correlation between Survey Preference Measures and Experimental Preference Measures

As a first indication of the quality of the preference module, we present the correlations between the experimental preference measure and its predicted value based on the two survey items. The correlations are 0.4079 for risk taking, 0.5861 for time discounting, 0.6748 for trust, 0.4235 for altruism, 0.5771 for positive reciprocity, and 0.3729 for negative reciprocity. One might be inclined to evaluate these correlations against a benchmark of 1. This benchmark would only be appropriate, however, if the experimental preference measures and the survey based preference measures were measured without error and perfectly aligned with the respective underlying preference. The assumption that there is no measurement error is unlikely to be correct in the case of preference measures. For example, measuring preference parameters that are inherently continuous on a discrete grid, the typical approach in choice experiments, gives rise to measurement error (see Einav et al., 2012).

With measurement error, the correlation between the experimental preference measure and a candidate item from our battery of survey questions would be smaller than one, even if the survey item measured the underlying preference equally well as the experimental measure. It seems therefore more adequate to consider a benchmark that recognizes the consequences of measurement error. An obvious benchmark is the correlation θ between two measurements that arise from the repetition of the exact same experiment because the best predictor of behavior in an experiment is arguably a prior choice in the same experiment. In what follows, we use a test-retest sample to measure θ. This test-retest correlation then becomes our benchmark for the highest possible correlation one might achieve between survey measures and experiment, should the two be perfectly aligned. We compare the

Preference		Item Description	Correlation	OLS Coeff.
Risk	risk_quant	Multiple price list (31 hypothetical choices between a lottery and a safe option)	0.4095***	0.2758***
Taking	risk_qual	How do you see yourself: Are you a person who is generally willing to take risks, or do you try to avoid taking risks?	0.3524***	0.2034***
Time	time_quant	List of 25 hypothetical choices between an early payment "today" and a delayed payment "in 12 months"	0.5826***	0.4849***
Discounting	time_qual	In comparison to others, are you a person who is generally willing to give up something today in order to benefit from that in the future?	-0.4039***	-0.1712***
Trust	trust_quant	Hypothetical investment game: first mover behavior	0.6201***	0.6289***
	trust_qual	Self-assessment: As long as I am not convinced otherwise, I assume that people have only the best intentions.	0.2829***	0.1331***
Altruism	altr_quant	You won 1,000 Euro in a lottery. Considering your current situation, how much would you donate to charity?	0.3913***	0.1845***
	altr_qual	How do you assess your willingness to share with others without expecting anything in return when it comes to charity?	0.3845***	0.3210***
Positive	posrecip_quant1	Hypothetical investment game: second mover behavior	0.5560***	0.4857***
Reciprocity	posrecip_quant2	Hypothetical scenario: Which bottle of wine do you give as a thank-you gift?	0.3530***	0.1640***
Negative	negrecip_quant	Minimum acceptable offer in hypothetical ultimatum game	0.3416***	0.3284***
Reciprocity	negrecip_qual	How do you see yourself: Are you a person who is generally willing to punish unfair behavior even if this is costly?	0.1609***	0.1479***

See Appendix B for the exact wordings of the survey questions. The column "Correlation" displays Spearman correlations between the survey item and the respective experimental measure. The final column displays OLS coefficients in a regression of the standardized experimental measure on the standardized module items. For details see the regression tables in section B in the online appendix. ***, **, and * denote significance at the 10-, 5-, and 1-percent level, respectively.

Table 3: The Preference Module

actual explanatory power of the survey measures to this revised benchmark.

In order to assess the size of measurement error in the experimental preference measures, we conducted additional experiments with 44 subjects, who participated in preference elicitation experiments twice. The experimental sessions were scheduled one week apart (there was no perturbation of experimental parameters across sessions). The data on two identical experimental measures elicited one week apart allow us to compute the test-retest correlations (i.e., θ) between two experimental measures of the same underlying preference.

We estimate the test-retest correlation (more precisely, the square of the correlation) by regressing the preference measure revealed in the experiments in the first session on the respective preference measure obtained in the second session and calculating the R^2 for this regression. The share of variance that can be explained by the second experimental measure is substantially lower than 1, indicating the presence of measurement error in the experimental measures. The correlations are 0.3469 for risk taking, 0.6715 for discounting, 0.5986 for trust, and 0.4203, 0.4336, 0.4446 for altruism, positive reciprocity and negative reciprocity respectively.[23] The R^2-values of these regressions serve as a sensible benchmark against which to evaluate the explanatory power of our preference module, since these values measure the explanatory power for behavior in the experiments of an identical repeated measure of the experiment itself. Compared to this benchmark, our survey module achieves high explanatory power.

4.2 Out-of-Sample Prediction

After having established the superiority of the two item survey module in out-of-sample prediction relative to longer modules in the previous section, we now discuss the out-of-sample performance of the two item survey module in absolute terms. For the subjects in our pretest panel we used their survey responses to predict their choices in the four experimental preference elicitation tasks (measuring risk and time preferences, trust and positive reciprocity), and regressed the actual

[23] A more detailed regression table is relegated to section B in the online appendix.

choices on the predicted choices. If our preference module reliably captures the preferences of individuals in this sample, one would expect the intercept of the regression of actual on predicted choices to be zero and the coefficient of the predicted value to be 1. In fact, we cannot reject the hypothesis that the constant is zero and the slope coefficient equals one for all preferences, except for trust, at the 10 percent significance level. For trust, we find that the slope coefficient is not statistically different from one if we suppress the constant in the regression. It is also reassuring that predicted and actual choices are strongly and statistically significantly correlated. The correlations are 0.2919 for risk preferences, 0.5868 for time discounting, 0.2629 for trust, and 0.4424 for positive reciprocity.

4.3 Validity in Non-Student Samples

Conceptually, the module will be behaviorally relevant for non-students as long as the correlations between survey items and experiments are similar to those in our student sample. While the distributions of preferences may differ for students and non-students, there is no particular reason to think that the correlation structure should differ. Even if it does, it seems likely that the same types of survey items would still be selected as best predictors for non-students as for students; in the student sample the top two predictors are typically superior to other measures by a substantial margin. Moreover, the quantitative survey items in the module closely resemble the experimental measures that are widely used to elicit preferences in non-student samples. Hence, there is no compelling reason why the correlations between these hypothetical and incentivized measures should exist only among students.

Empirically, there is evidence that survey measures are significantly correlated with experimental preference measures in representative, non-student samples. For example, Fehr et al. (2003) used a representative sample of adults, and documented a significant correlation between subjects' behavior in an incentivized investment game, and survey measures on trust of the type contained in our preference module. Likewise it has been shown that answers to the qualitative survey question to elicit risk attitudes, contained in our preference module, are significantly correlated

with incentivized lottery choices in a large representative subject pool (Dohmen et al., 2011). In fact, they report a correlation coefficient between the survey measure and behavior in the lottery choice experiment in their representative sample that is almost identical to the one in our validation sample consisting of students.[24] It is also notable that the correlation is not significantly different for students versus non-students in their representative sample. Similarly, Ziegelmeyer and Ziegelmeyer (2012) predict risk-taking behavior in an alternative lottery choice experiment (Holt and Laury, 2002) using the same survey item that is part of our module. In addition, the qualitative survey risk measure contained in our preference module has previously been administered in the German Socio-Economic Panel Study, and other large representative surveys in the US, Asia and Australia as well as in other European countries. Various studies have documented that answers to this question are related to risky behaviors in many contexts of life, for example, occupational choice and self-employment, geographical mobility, ownership of risky assets, as well as smoking (see, e.g., Barasinska et al., 2012; Bauernschuster et al. 2014; Bonin et al., 2007; Caliendo et al., 2009; Dohmen et al., 2011; Fouarge et al., 2014; Jaeger et al., 2010). These findings illustrate that the types of survey items selected in our preference module provide behaviorally valid preference measures in non-student samples.

There is also evidence that items from our preference survey module are valid across cultures. For example, recent empirical work by Vieider et al. (2015) uses the same qualitative measure of risk attitudes that is included in our module and documents that it correlates with incentivized lottery choice experiments conducted in 30 different countries. In addition, Hardeweg et al. (2013) replicate the validation exercise of Dohmen et al. (2011) and confirm the significant relationship between this risk question and incentivized lottery choices for a representative sample of 900 inhabitants of rural Northern Thailand. Ding et al. (2010) corroborate these results for a sample of 121 Beijing University students. Taken together, this evidence

[24] The correlations are 0.25 in the representative sample of Dohmen et al. (2011), and 0.24 in our validation sample if we focus on the same survey measure for predicting behavior in a single risk experiment (as shown above, the correlation is even higher for the validation sample if we use choices from both risk aversion experiments).

suggests that the survey module can provide a useful tool for preference elicitation also in an international context.

5 A Streamlined Version of the Preference Module

Our survey module offers a reliable, easily implementable and low cost alternative to conducting incentivized experiments. Nevertheless, there are applications for which our module will not be ideal, as some of the quantitative items either require instructions that are as complex as corresponding experiments (e.g., the hypothetical investment game) or entail a considerable number of decisions (e.g., multiple price lists for eliciting risk and time preferences). Particularly if time constraints are severe or if respondents have limited cognitive capacity, an even simpler and shorter module seems useful, even though it might come at some costs in terms of lower explanatory power. A streamlined module is also particularly useful for measuring preferences in large scale, representative, and cross cultural surveys, as these may use telephone, have severe time constraints, and cover a subject pool that is heterogeneous in terms of education and cognitive capacity. With this in mind, when developing the streamlined version we also paid particular attention to ensuring that the preference survey measures can be implemented across different cultural backgrounds, and are understandable and measure the same preference across different cultures.

Streamlining the module involved two major steps, that led to adjustments of the module, which are described in detail in Appendix C. First, we discarded the hypothetical versions of our experimental preference elicitation tasks, which are typically time-consuming, as they involve a large number of choices or require rather complex instructions that do not seem advisable in telephone surveys. We then implemented the selection procedure described in section 3 on the set of remaining survey items. As this restricted set included simpler analogues of the discarded items, this restriction ultimately only led to a minimal reduction in explanatory power (R^2) (see Appendix C). For example, in the case of risk taking and time dis-

counting the "staircase" measures measures were selected. These measures are very comparable to the quantitative measures based on the multiple price lists for lottery choices and intertemporal choice respectively, yet their implementation is much more time-efficient, as the "staircase" procedures only require five interdependent choices (lottery vs. safe payments and early vs. delayed payments, respectively).[25] Since these preference measures are highly correlated with the respective multiple price list measure and with the respective experimental preference measure (see section C in the online appendix), the reduction in explanatory power of the streamlined version compared to the original version in terms of R^2 is only 0.02 in the case of risk taking and 0.04 in the case of time discounting.

Second, we tested the resulting preference module, which is based on the modified set of candidate measures, in an in-depth pilot study in 22 countries. In collaboration with Gallup Europe, we surveyed respondents from 10 countries in central Asia (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan), 2 countries in South-East Asia (Bangladesh and Cambodia), 5 countries in Southern and Eastern Europe (Croatia, Hungary, Poland, Romania, Turkey), 4 countries in the Middle East and North Africa (Algeria, Jordan, Lebanon, and Saudi-Arabia), and 1 country in Eastern Africa (Kenya).[26] In each country, the sample size was 10 to 15 people. Overall, more than 220 interviews were conducted. In most countries, the sample was mixed in terms of gender, age, educational background, and area of residence (urban vs. rural). For all items involving hypothetical monetary amounts we adjusted the stake sizes for each country in terms of their real value such that they represent the same share of a country's median income in local currency as the share of the amount in Euro of the German median income, where our validation study had been conducted. Monetary

[25] The staircase procedures are presented in detail in Appendix E and Appendix F.

[26] Gallup Europe ensured that the items of the preference module were translated into the major languages of each target country, using state-of-the-art techniques. The translation process involved three steps. As a first step, a translator suggested an English, Spanish or French version of a German item, depending on the region. A second translator, being proficient in both the target language and in English, French, or Spanish, then translated the item into the target language. Finally, a third translator would review the item in the target language and translate it back into the original language. If differences between the original item and the back-translated item occurred, the process was adjusted and repeated until all translators agreed on a final version.

amounts used in the validation study with the German sample were rounded numbers to facilitate easy calculations (e.g., the expected return of a lottery with equal chances of winning and losing) and to allow for easy comparisons (e.g., 100 Euro today versus 107.50 in 12 months). To proceed in a similar way in all countries, monetary amounts were always adjusted to the next "round and easy" number after adjusting the amounts in terms of their real values.[27] In order to detect potential difficulties in the understanding of module items and differences in the respondents' interpretation, respondents were explicitly asked to give extensive feedback with respect to the appropriateness and understandability of the module. In particular, we asked respondents to rephrase the meaning of the items in their own words and to state any difficulties in understanding the items.[28] If they encountered difficulties in understanding or interpreting items, respondents were asked to make suggestions on how to modify the wording of the item in order to attain the desired meaning.

Overall, the understanding and implementability of our module was very good. Nevertheless, respondents' feedback induced some additional changes to some items. In terms of wording changes, the use of the term "lottery" in hypothetical risky choices was troubling to some Muslim participants, and some refused to answer the item completely since gambling is a taboo (*haram*) in Islam. As a consequence, we dropped the term "lottery" and replaced it with the more neutral but equally accurate term "random draw". Second, the term "charity" caused confusion in Eastern Europe and Central Asia, so it was replaced it with "good cause". Third, some respondents had difficulties answering the question asking about one's willingness to punish unfair behavior without knowing who was treated unfairly. We therefore decided to split the question into two separate items, one item asking for one's willingness to punish unfair behavior towards others, and another asking for one's willingness to punish unfair behavior towards oneself. Fourth, some participants, especially in countries with current or relatively recent phases of volatile and high inflation rates, stated that their answer to questions involving intertemporal

[27] While this necessarily resulted in some (minor) variations in the real stake size between countries, it minimized cross-country differences in the understanding the quantitative items due to difficulties in assessing the involved monetary amounts.

[28] For example, respondent were explicitly asked to explain a "50-percent chance" in their own words and give their own interpretation of "safe payment".

tradeoffs would depend on the rate of inflation, or said that they would always take the immediate payment due to uncertainty with respect to future inflation. Therefore, we added the following phrase to each question involving hypothetical choices between immediate and future monetary amounts: "Please assume there is no inflation, i.e., future prices are the same as today's prices." The final version of the streamlined preference module is presented in Table 4. Finally, the survey questions were brought into a format that is consistent with the Gallup World Poll questionnaire style. For example, the first question of the module, which happened to be the qualitative survey question on risk taking, was commenced by the request "Please tell me". The complete module version including exact wordings is relegated to Section D in the appendix.

Preference	**Module Items**
Risk	1. *Staircase measure (five interdependent choices between a lottery and a safe option)*
Taking	2. Please tell me, in general, how willing or unwilling you are to take risks.
Time	1. *Staircase measure (five interdependent choices between an early and a delayed amount of money)*
Discounting	2. How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?
Trust	1. I assume that people have only the best intentions.
Altruism	1. *Hypothetical donation.*
	2. How willing are you to give to good causes without expecting anything in return?
Positive	1. *Hypothetical choice: size of a "thank-you"-gift.*
Reciprocity	2. When someone does me a favor I am willing to return it.
Negative	1. If I am treated very unjustly, I will take revenge at the first occasion, even if there is a cost to do so.
Reciprocity	2. How willing are you to punish someone who treats **you** unfairly, even if there may be costs for you?
	3. How willing are you to punish someone who treats **others** unfairly, even if there may be costs for you?

Table 4: The Streamlined Module

6 Conclusion

This paper presents an experimentally validated survey module to measure six key economic preferences – risk aversion, discounting, trust, altruism, positive and negative reciprocity – in a reliable, parsimonious and cost-effective way. The paper offers two versions of the module. One provides the maximum explanatory power, subject to having a parsimonious number of survey items (two items) per preference. We strongly recommend this tool for eliciting preferences in small to medium-scale studies among (fairly) educated respondents, such as lab experiments and field experiments. This version of the module is also well-suited for surveys that use detailed questionnaires or that are based on written or computer-assisted personalized interviews (CAPI). The other version of the module is a more streamlined one that prioritizes time efficiency, and simplicity, at the expense of a modest reduction in explanatory power. This streamlined version of the module is particularly useful in the context of large-scale international surveys among respondents sampled from the entire age and education spectrum and covering individuals from diverse socio-economic backgrounds.

The streamlined version of the module is also well-suited for all kinds of survey modes, including telephone surveys. Indeed, it has now been successfully implemented within framework of the Gallup World Poll 2012, a major international survey. This has yielded the Global Preference Survey (GPS) data, which has preference measures for more than 80,000 drawn as representative samples in each of 76 countries worldwide (see Falk et al., 2015, for a detailed description of this data set). Importantly, these data reveal the behavioral validity of our preference module (Falk et al., 2015). For example, more risk tolerant individuals are more likely to become self-employed and are more likely to smoke. Likewise, patient individuals are more likely to save and have higher educational attainment around the world. Finally, social preferences are strongly correlated with a broad range of prosocial behaviors and outcomes such as donating, volunteering time, assisting strangers, helping friends and relatives, or family structure.

Both versions of the preference module share several desirable features. First,

the module items are experimentally validated. The ability of the items to explain behavior in incentivized choice experiments helps ensure that they are meaningful for predicting choices under real incentives, mitigating one of the major concerns about hypothetical questions. The selected items are not just significant predictors of behavior, but are jointly the best predictors out of a large set of alternative measures. The validation is based on a consistent research design across preferences, and applies state-of-the-art experimental techniques and transparent, quantitative criteria for module selection. Second, the modules consist of a balanced mix of qualitative self-assessments and questions involving quantitative hypothetical trade-offs. This gives the module an attractive balance between different approaches to assessing preferences. Third, the module has a wide range of possible applications. The two versions can be implemented in various survey modes, including modes with tight time constraints. Some module items have already been validated in representative samples, and in different countries. We additionally conducted an international pilot in order to verify comprehension and implementability of the module across very different cultures. Thus, the two versions of the module can be applied to a range of different subject pools, from lab experiments, to large representative samples, or to samples that are culturally very heterogeneous. Fourth, by providing an attractive and low cost approach to measuring preferences the module has the potential for widespread adoption, with potentially significant positive externalities in terms of easier comparison of results across studies.

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A Design of Experimental Preference Elicitation Tasks

Risk Taking We used a multiple price list format to elicit how subjects trade off risky payments and sure payments. Subjects made choices in two tables. In each of the 21 rows of a given table they had to choose between a safe payment and a lottery that yielded 1000 points with probability 0.5 and 0 points otherwise. The lottery was always the same in all rows of both price lists, while the safe payment varied. We call these tables "price lists" as is commonly done in the literature. In one price list, we increased the safe payment in steps of 50 points from 0 points in the first choice to 1000 points in the last choice. In the other price lists we perturbed these safe payments by adding or subtracting up to five points to each safe payment alternative. The number of points added or subtracted was determined by a randomly drawn integer value between -5 and +5. These integer values were randomly drawn once and for all before the experiment was programmed. As a result, all subjects faced the same lists of choices. After subjects had made their choices, one of the choices was randomly selected for payment. Subjects were informed about this procedure in advance. The row in which a subject switched from preferring the lottery to preferring the safe payment informs us about the subjects' risk preferences. Earlier switching points indicate a lower certainty equivalent than later switching points.

Time Discounting In order to obtain a measure of the subjects' willingness to trade off monetary payoffs at two different points in time we adapted a the design from Dohmen et al. (2010), and asked subjects to make choices in two price lists. In both price lists, subjects had to trade off a payment of 400 points "today" and a higher payment that would be received 12 months in the future. In one price list, we increased the delayed amount such that the implied annual return from waiting would rise in steps of 2.5 percentage points from 0 percent in the first row to 60 percent in the 25th row, assuming semiannual compounding. In the second price list we perturbed the actual delayed payments by adding or subtracting an amount of up to 0.6 points. Again, one choice made in the two price lists was randomly selected by

the computer for payment. Subjects were informed about this procedure in advance.

We also notified subjects ex ante about the payment mode. In particular, they were told that any payment resulting from this experiment would be delivered to them via regular mail. If they chose the payment "today" the respective amount would be sent on the same day. If they chose the payment "in 12 months", it would be sent to them exactly 12 months after the experiment. By keeping the payoff mode identical over all time horizons we can rule out concerns about differential credibility of payments dependent on timing, or simply a taste for a certain payoff mode, as drivers of decision making. These features were made very salient to subjects: To enhance credibility an envelope was placed in each cubicle and subjects had to write on the envelope the address to which they wanted the payment delivered. In order to allow us to identify the relevant payment they also had to note their identification number on the envelope. No participant expressed any concern with respect to this procedure.

The row in which a subject switched from preferring the earlier payment to the larger delayed payment (or, equivalently, the implied annual rate of return in the switching row) provides a measure of impatience.

Trust We conducted two versions of the Investment Game as introduced by Berg et al. (1995). We refer to this as the Trust Game. In one version of this game the amount sent by the first to the second mover was doubled by the experimenter, in the second version the amount was tripled. In every version of this experiment both subjects were endowed with 500 points. The choice set of the first mover was restricted to amounts in $\{0, 50, 100, ..., 500\}$, because we applied the contingent response method for the second mover. Each subject acted in the role of the first and second mover in each version, such that overall each subject took part in four Investment Games. All outcomes of the four decisions of the Investment Games were payoff relevant. The average amount sent as a first mover in the two versions serves as our measure of the subjects' willingness to trust strangers.

Altruism Subjects were endowed with 300 points and had to decide how many of these points to assign to a charitable organization. We gave them a list of well-established and well-known charitable organizations with various purposes but they could also name a different charitable organization to which they wanted the money to be donated. The list of charitable organizations included: Brot für die Welt, Kindernothilfe, German Red Cross, Welthungerhilfe, Bund für Umwelt und Naturschutz Deutschland, Greenpeace, Terre des Hommes, and Aktion Mensch. At the end of the laboratory session we gave the subjects an address of a website on which they could look up all donations made to the charitable organizations. Subjects were informed again about the possibility to check their donation after all sessions had been conducted and the money had been transferred to the charitable organizations. This was done in order to ensure credibility and transparency of the procedure. The amount an individual transferred to charity serves as a measure of their altruistic inclination.

Positive Reciprocity We elicited positive reciprocity from second mover behavior in the Trust Games described above. The use of the contingent response method for second mover behavior allowed us to measure how much a subject wanted to send back for each possible amount sent to them by the first mover. The payoff relevant choice was the one corresponding to the actual choice made by the first mover. Average second mover behavior in the Investment Games then constitutes our behavioral measure of the individual's willingness to reciprocate positively. Subjects were informed about their opponents' decisions and the resulting payoffs at the end of the laboratory session.

Negative Reciprocity We conducted two different types of experimental game in order to elicit subjects' willingness to reciprocate negatively. First, subjects took part in two Ultimatum Games as introduced by Güth et al., 1982. Subjects were randomly assigned the role of the proposer in one game and the role of the responder in the other game. Proposers had to decide how many of 500 points they wanted to offer to the responder. Responders, in turn, had to indicate their minimum

acceptable offer and this was taken as a first measure of the individuals' level of negatively reciprocal inclination. A higher minimum acceptable offer increases the rejection probability, and is hence a measure of the higher willingness to forego a monetary payoff in order to reduce the payoff of the proposer.

We also conducted a Prisoner's Dilemma with a subsequent punishment stage (see e.g., Falk et al., 2005 or Fehr and Gächter, 2000). The Prisoner's Dilemma was framed as a project in which both players could decide to participate or not. If both players decided to participate they both received 480 points. If both players decided not to participate, both received 300 points. If one player decided not to participate while the other decided to do so, the former received 540 points while the latter received 240 points. Figure 1 illustrates the payoff structure of this part of the experiment. First, subjects had to decide how many points to invest into punishing their opponent contingent on every possible first stage outcome. Punishment was costly.[29] Then they were asked to decide whether they wanted to participate in the project or not. All decisions were taken simultaneously.

As a measure of the individuals' willingness to reciprocate negatively we consider behavior in both experiments, i.e., minimum acceptable offer in the Ultimatum Game and the amount invested into punishment given unilateral defection of the other player. We standardized both measures to account for the different response scales and took the average. This constitutes the score for the level of negative reciprocity.

		Player 2	
		In	Out
Player 1	In	480, 480	240, 540
	Out	540, 240	300, 300

Figure 1: Payoff Matrix: Prisoner's Dilemma

[29] We implemented two different punishment technologies: in 7 sessions the technology was such that each point invested into punishment resulted in one point being deducted from the opponent. In the other sessions each point invested into punishment lead to three points being deducted from the other player.

B The Preference Module

1. Risk Taking

   (a) List of 31 hypothetical choices between a lottery (300 Euro with a 50-percent chance and 0 Euro with a 50-percent chance) and varying safe options (starting at 0 Euro and increasing to 300 Euro in increments of 10 Euro)

   (b) How do you see yourself: are you a person who is generally willing to take risks, or do you try to avoid taking risks? *Please use a scale from 0 to 10, where a 0 means you are "completely unwilling to take risks" and a 10 means you are "very willing to take risks". You can also use the values in-between to indicate where you fall on the scale.*

2. Time Discounting

   (a) List of 25 hypothetical choices between an early payment "today" (100 Euro) and a varying delayed payment "in 12 months" (100.0/103.0/106.1/ 109.2/112.4/115.6/118.8/122.1/125.4/128.8/132.3/135.7/139.2/ 142.8/ 146.4/150.1/153.8/157.5 161.3/165.1/169.0/172.9/176.9/180.9/185 Euro).

   (b) In comparison to others, are you a person who is generally willing to give up something today in order to benefit from that in the future or are you not willing to do so? *Please use a scale from 0 to 10, where a 0 means you are "completely unwilling to give up something today" and a 10 means you are "very willing to give up something today". You can also use the values in-between to indicate where you fall on the scale.*

3. Trust

   (a) Please consider the following situation: You and another person, whom you do not know, both participate in a study where you can decide on how to assign a certain amount of money and thereby determine the outcome. The rules are as follows. Both participants get an account with 20 Euros. At the beginning, both participants thus own 20 Euros. The

other person decides first. She can transfer money to your account. She can transfer any amount: 0, 1, 2 Euro, etc. up to 20 Euro. Each Euro that she transfers to you is tripled by the conductors of the study and booked to your account. After this first stage the other person therefore has 20 Euro minus the amount she transferred to you in her account. You have 20 Euro plus the tripled amount of the transfer of the other person on your account. Now you get to decide: you have the opportunity to transfer money back to the other person. You can transfer any amount up to 80 Euro, depending on how much you have in your account. This will be the end of the study and the account balances will be final. The other person has in her account 20 Euros minus the amount she transferred to you plus the amount you transferred back. You have 20 Euro plus the tripled amount of what the other person transferred to you minus the amount you transferred back to her. We would like to know how much you would choose to transfer back to the other person, for a given transfer of her to you.

Suppose you were assigned the role of the other person. Which amount would you choose to transfer?

(b) How well does the following statement describe you as a person? As long as I am not convinced otherwise, I assume that people have only the best intentions. *Please use a scale from 0 to 10, where 0 means "does not describe me at all" and a 10 means "describes me perfectly". You can also use the values in-between to indicate where you fall on the scale.*

4. Altruism

(a) Imagine the following situation: you won 1,000 Euro in a lottery. Considering your current situation, how much would you donate to charity? *(Values between 0 and 1000 are allowed)*

(b) How do you assess your willingness to share with others without expecting anything in return when it comes to charity? *Please use a scale from 0 to 10, where 0 means you are "completely unwilling to share" and a 10*

means you are "very willing to share". You can also use the values in-between to indicate where you fall on the scale.

5. Positive Reciprocity

   (a) Please consider the following situation: You and another person, whom you do not know, both participate in a study where you can decide on how to assign a certain amount of money and thereby determine the outcome. The rules are as follows. Both participants get an account with 20 Euros. At the beginning, both participants thus own 20 Euros. The other person decides first. She can transfer money to your account. She can transfer any amount: 0, 1, 2 Euro, etc. up to 20 Euro. Each Euro that she transfers to you is tripled by the conductors of the study and booked to your account. After this first stage the other person therefore has 20 Euro minus the amount she transferred to you in her account. You have 20 Euro plus the tripled amount of the transfer of the other person on your account. Now you get to decide: you have the opportunity to transfer money back to the other person. You can transfer any amount up to 80 Euro, depending on how much you have in your account. This will be the end of the study and the account balances will be final. The other person has in her account 20 Euros minus the amount she transferred to you plus the amount you transferred back. You have 20 Euro plus the tripled amount of what the other person transferred to you minus the amount you transferred back to her. We would like to know how much you would choose to transfer back to the other person, for a given transfer of her to you.

      Suppose the other person transfers 5/10/15/20 Euro to your account. After the first stage you then own 20+3*5/10/15/20=35/50/65/80 Euro, the other person owns 20-5/10/15/20=15/10/5/0 Euro. What amount do you choose to transfer back?

   (b) Imagine the following situation: you are shopping in an unfamiliar city and realize you lost your way. You ask a stranger for directions. The

stranger offers to take you with their car to your destination. The ride takes about 20 minutes and costs the stranger about 20 Euro in total. The stranger does not want money for it. You carry six bottles of wine with you. The cheapest bottle costs 5 Euro, the most expensive one 30 Euro. You decide to give one of the bottles to the stranger as a thank-you gift. Which bottle do you give?

Respondents can choose from the following options: The bottle for 5, 10, 15, 20, 25, or 30 Euro)

6. Negative Reciprocity

   (a) Imagine the following situation: together with a person whom you do not know you won 100 Euro in a lottery. The rules stipulate the following: One of you has to make a proposal about how to divide the 100 Euro between you two. The other one gets to know the proposal and has to decide between two options. He or she can accept the proposal or reject it. If he or she accepts the proposal, the money is divided according to the proposal. If he or she rejects the proposal, both receive nothing.

   Suppose that the other person offered the following split: 50 Euro for you and 50 Euro for himself/herself. Do you accept this split? If you do, you will receive 50 Euro and the other person will receive 50 Euro. If you reject, both of you receive 0 Euro.

   Note that individuals answered a total of 5 questions that use the same wording but vary the amount that was offered by the other person. These amounts were 50, 40, 30, 20, and 10.

   (b) How do you see yourself: Are you a person who is generally willing to punish unfair behavior even if this is costly? *Please use a scale from 0 to 10, where 0 means you are "not willing at all to incur costs to punish unfair behavior" and a 10 means you are "very willing to incur costs to punish unfair behavior". You can also use the values in-between to indicate where you fall on the scale.*

C Development of Streamlined Version of the Preference Module

In this appendix, we document the steps involved in streamlining the module for each preference domain.

C.1 Risk Taking

For the sub-module for risk taking, we discarded the multiple price list measure from the set of candidate items, and ran the selection procedure described in section 3 on the restricted set of items. The "staircase" procedure for a hypothetical lottery choice (see Appendix E) was selected. This quantitative measure is very comparable to the choice list measure, as it contains the same lottery. Yet, it is much more time-efficient to use "staircase" procedure, as it only requires five interdependent choices between a lottery and a safe payment. The other item selected for risk was the same qualitative measure selected in the original module. The resulting reduction in explanatory power of the streamlined version compared to the original version in terms of R^2 is only 0.02. Since the term "lottery" in the description of the hypothetical risky choices was troubling to some Muslim participants in our pilot study, we replaced the term "lottery" with the more neutral but equally accurate term "random draw".

C.2 Time discounting

For the sub-module for time discounting, we discarded the multiple price list measure from the set of candidate items, and ran the selection procedure described in section 3 on the restricted set of items. The "staircase" procedure for intertemporal choice (see Appendix F) was selected. This quantitative measure mirrors the hypothetical choice list for the same intertemporal trade-off as in the original version of the module, as it contains the same monetary amount for the early payment. Yet, it is much more time-efficient to use "staircase" procedure, since it only requires five interdependent choices between an early payment and a delayed payment. The

other item selected for time discounting is again a subjective self-assessment, albeit a slightly different one than in the original module version. Instead of the item asking for a self-assessment of one's willingness to abstain from something today in order to benefit from that in the future *in comparison to others*, the item selected asks for the same self-assessment *in general*. Since this change was only minor relative to the original module we modified the sub-module accordingly. The resulting reduction of 0.04 in adjusted R^2 compared to the original module version is again rather modest.

Since some participants in our pilot study stated that their answer in questions involving intertemporal tradeoffs would depend on the rate of inflation, or said that they would always take the immediate payment due to uncertainty with respect to future inflation, we added the following phrase to each question involving hypothetical choices between immediate and future monetary amounts: "Please assume there is no inflation, i.e., future prices are the same as today's prices."

C.3 Trust

We discarded the hypothetical investment game, which involves rather lengthy and complex instructions. Since there was no adequate and implementable alternative for the hypothetical experiment, and since trust has been widely measured using qualitative measures, we opted for a one-item sub-module for trust.

C.4 Altruism

Sine the term "charity" caused confusion in Eastern Europe and Central Asia, we replaced it with "good cause".

C.5 Positive Reciprocity

For positive reciprocity, we discarded the hypothetical choices as a second mover in the investment games before running the selection procedure. Corresponding to the original sub-module, the procedure selected the quantitative item measuring one's willingness to reciprocate by asking for which wine bottle (a cheaper or a more expensive one) one would give to a stranger in order to reciprocate kindness in a

hypothetical scenario. Since giving a bottle of wine is a very common and popular gesture in Western industrialized societies but very uncommon or even inappropriate in other cultures, e.g., Muslim societies, we replaced "bottles of wine" with the more neutral term "thank-you-gift". As a second item, the selection procedure picked a simple subjective self-assessment: "When someone does me a favor I am willing to return it". The resulting modified sub-module for positive reciprocity comes with a reduction in adjusted R^2 to 0.19 in our experimental subject pool.

C.6 Negative Reciprocity

In the case of negative reciprocity we discarded the hypothetical experiment. The item selection procedure resulted in selecting two qualitative self-assessments, the first of them being the "general willingness to punish"-item that was also included in our original module version. In this case, there was a reduction in adjusted R^2 by 0.0975 relative to our original module. Since the second item strongly resembled the first item ("general willingness to punish"), we decided to instead include an item asking for one's willingness to take revenge, thereby adding a more emotional and less neutral item to the sub-module. This change resulted in a negligible reduction of adjusted R^2 of 0.0047).

Since some respondents in our pilot study stated that they had difficulties answering the question asking about one's willingness to punish unfair behavior because they did not understand who was treated unfairly, we decided to split the question into two separate items, one item asking for one's willingness to punish unfair behavior towards others, and another asking for one's willingness to punish unfair behavior towards oneself.

D Refined Version of the Preference Module Used to Collect Global Preference Data in Gallup World Poll 2012

1. Please tell me, in general, how willing or unwilling you are to take risks.

   Please use a scale from 0 to 10, where 0 means you are "completely unwilling to take risks" and a 10 means you are "very willing to take risks". You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

completely unwilling to take risks										very willing to take risks
0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

2. We now ask for your willingness to act in a certain way in four different areas.

   Please again indicate your answer on a scale from 0 to 10, where 0 means you are "completely unwilling to do so" and a 10 means you are "very willing to do so". You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

	completely unwilling to do so										very willing to do so
How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?	0	1	2	3	4	5	6	7	8	9	10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

How willing are you to punish someone who treats **you** unfairly, even if there may be costs for you?	0	1	2	3	4	5	6	7	8	9	10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
How willing are you to punish someone who treats **others** unfairly, even if there may be costs for you?	0	1	2	3	4	5	6	7	8	9	10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
How willing are you to give to good causes without expecting anything in return?	0	1	2	3	4	5	6	7	8	9	10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

3. How well do the following statements describe you as a person?

   Please indicate your answer on a scale from 0 to 10. A 0 means "does not describe me at all" and a 10 means "describes me perfectly". You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

	does not describe me at all										describes me perfectly
When someone does me a favor I am willing to return it.	0	1	2	3	4	5	6	7	8	9	10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
If I am treated very unjustly, I will take revenge at the first occasion, even if there is a cost to do so.	0	1	2	3	4	5	6	7	8	9	10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I assume that people have only the best intentions.	0	1	2	3	4	5	6	7	8	9	10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

4. Please imagine the following situation: You can choose between a sure payment of a particular amount of money, or a draw, where you would have an equal chance of getting 300 Euro or getting nothing. We will present to you five different situations.

4.1 What would you prefer: a draw with a 50 percent chance of receiving 300 Euro, and the same 50 percent chance of receiving nothing, or the amount of 160 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.17

☐ = Sure payment → *Go to question* 4.2

4.2 Would you prefer the 50/50 chance or the amount of 80 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.10

☐ = Sure payment → *Go to question* 4.3

4.3 Would you prefer the 50/50 chance or the amount of 40 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.4

☐ = Sure payment → *Go to question* 4.7

4.4 Would you prefer the 50/50 chance or the amount of 60 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.5

☐ = Sure payment → *Go to question* 4.6

4.5 Would you prefer the 50/50 chance or the amount of 70 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.6 Would you prefer the 50/50 chance or the amount of 50 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.7 Would you prefer the 50/50 chance or the amount of 20 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.8

☐ = Sure payment → *Go to question* 4.9

4.8 Would you prefer the 50/50 chance or the amount of 30 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.9 Would you prefer the 50/50 chance or the amount of 10 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.10 Would you prefer the 50/50 chance or the amount of 120 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.14

☐ = Sure payment → *Go to question* 4.11

4.11 Would you prefer the 50/50 chance or the amount of 100 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.13

☐ = Sure payment → *Go to question* 4.12

4.12 Would you prefer the 50/50 chance or the amount of 90 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.13 Would you prefer the 50/50 chance or the amount of 110 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.14 Would you prefer the 50/50 chance or the amount of 140 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.15

☐ = Sure payment → *Go to question* 4.16

4.15 Would you prefer the 50/50 chance or the amount of 150 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.16 Would you prefer the 50/50 chance or the amount of 130 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.17 Would you prefer the 50/50 chance or the amount of 240 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.25

☐ = Sure payment → *Go to question* 4.18

4.18 Would you prefer the 50/50 chance or the amount of 200 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.22

☐ = Sure payment → *Go to question* 4.19

4.19 Would you prefer the 50/50 chance or the amount of 180 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.20

☐ = Sure payment → *Go to question* 4.21

4.20 Would you prefer the 50/50 chance or the amount of 190 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.21 Would you prefer the 50/50 chance or the amount of 170 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.22 Would you prefer the 50/50 chance or the amount of 220 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.23

☐ = Sure payment → *Go to question* 4.24

4.23 Would you prefer the 50/50 chance or the amount of 230 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.24 Would you prefer the 50/50 chance or the amount of 210 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.25 Would you prefer the 50/50 chance or the amount of 280 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.29

☐ = Sure payment → *Go to question* 4.26

4.26 Would you prefer the 50/50 chance or the amount of 260 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.27

☐ = Sure payment → *Go to question* 4.28

4.27 Would you prefer the 50/50 chance or the amount of 270 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.28 Would you prefer the 50/50 chance or the amount of 250 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.29 Would you prefer the 50/50 chance or the amount of 300 Euro as a sure payment?

☐ = 50/50 chance → *Go to question* 4.31

☐ = Sure payment → *Go to question* 4.30

4.30 Would you prefer the 50/50 chance or the amount of 290 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

4.31 Would you prefer the 50/50 chance or the amount of 310 Euro as a sure payment?

☐ = 50/50 chance → *Go to question 5*

☐ = Sure payment → *Go to question 5*

5. Please think about what you would do in the following situation.

You are in an area you are not familiar with, and you realize that you lost your way. You ask a stranger for directions. The stranger offers to take you to your destination. Helping you costs the stranger about 20 Euro in total. However, the stranger says he or she does not want any money from you. You have 6 presents with you. The cheapest present costs 5 Euro, the most expensive one costs 30 Euro. Do you give one of the presents to the stranger as a "thank-you"-gift? If so, which present do you give to the stranger?

☐ no present

☐ the present worth 5 Euro

☐ the present worth 10 Euro

☐ the present worth 15 Euro

☐ the present worth 20 Euro

☐ the present worth 25 Euro

☐ the present worth 30 Euro

6. Imagine the following situation: Today you unexpectedly received 1,000 Euro. How much of this amount would you donate to a good cause? *(Values between 0 and 1,000 are allowed)*

7. Suppose you were given the choice between receiving a payment today or a payment in 12 months. We will now present to you 5 situations. The payment today is the same in each of these situations. The payment in 12 months is different in every situation. For each of these situations we would like to know which you would choose. Please assume there is no inflation, i.e. future prices are the same as today's prices.

   7.1 Please consider the following: would you rather receive 100 Euro today or 154 Euro in 12 months?

   ☐ = Today → *Go to question* 7.17

   ☐ = In 12 months → *Go to question* 7.2

   7.2 Would you rather receive 100 Euro today or 125 Euro in 12 months?

   ☐ = Today → *Go to question* 7.10

   ☐ = In 12 months → *Go to question* 7.3

   7.3 Would you rather receive 100 Euro today or 112 Euro in 12 months?

   ☐ = Today → *Go to question* 7.7

   ☐ = In 12 months → *Go to question* 7.4

   7.4 Would you rather receive 100 Euro today or 106 Euro in 12 months?

   ☐ = Today → *Go to question* 7.6

   ☐ = In 12 months → *Go to question* 7.5

   7.5 Would you rather receive 100 Euro today or 103 Euro in 12 months?

   ☐ = Today [*Final question*]

   ☐ = In 12 months [*Final question*]

   7.6 Would you rather receive 100 Euro today or 109 Euro in 12 months?

   ☐ = Today [*Final question*]

   ☐ = In 12 months [*Final question*]

7.7 Would you rather receive 100 Euro today or 119 Euro in 12 months?

☐ = Today → *Go to question* 7.8

☐ = In 12 months → *Go to question* 7.9

7.8 Would you rather receive 100 Euro today or 122 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.9 Would you rather receive 100 Euro today or 116 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.10 Would you rather receive 100 Euro today or 139 Euro in 12 months?

☐ = Today → *Go to question* 7.14

☐ = In 12 months → *Go to question* 7.11

7.11 Would you rather receive 100 Euro today or 132 Euro in 12 months?

☐ = Today → *Go to question* 7.13

☐ = In 12 months → *Go to question* 7.12

7.12 Would you rather receive 100 Euro today or 129 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.13 Would you rather receive 100 Euro today or 136 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.14 Would you rather receive 100 Euro today or 146 Euro in 12 months?

☐ = Today → *Go to question* 7.16

☐ = In 12 months → *Go to question* 7.15

7.15 Would you rather receive 100 Euro today or 143 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.16 Would you rather receive 100 Euro today or 150 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.17 Would you rather receive 100 Euro today or 185 Euro in 12 months?

☐ = Today → *Go to question* 7.18

☐ = In 12 months → *Go to question* 7.25

7.18 Would you rather receive 100 Euro today or 202 Euro in 12 months?

☐ = Today → *Go to question* 7.22

☐ = In 12 months → *Go to question* 7.19

7.19 Would you rather receive 100 Euro today or 193 Euro in 12 months?

☐ = Today → *Go to question* 7.20

☐ = In 12 months → *Go to question* 7.21

7.20 Would you rather receive 100 Euro today or 197 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.21 Would you rather receive 100 Euro today or 189 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.22 Would you rather receive 100 Euro today or 210 Euro in 12 months?

☐ = Today → *Go to question* 7.23

☐ = In 12 months → *Go to question* 7.24

7.23 Would you rather receive 100 Euro today or 215 Euro in 12 months?

☐ = [*Final question*]

☐ = [*Final question*]

7.24 Would you rather receive 100 Euro today or 206 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.25 Would you rather receive 100 Euro today or 169 Euro in 12 months?

☐ = Today → *Go to question* 7.29

☐ = In 12 months → *Go to question* 7.26

7.26 Would you rather receive 100 Euro today or 161 Euro in 12 months?

☐ = Today → *Go to question* 7.28

☐ = In 12 months → *Go to question* 7.27

7.27 Would you rather receive 100 Euro today or 158 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.28 Would you rather receive 100 Euro today or 165 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.29 Would you rather receive 100 Euro today or 177 Euro in 12 months?

☐ = Today → *Go to question* 7.31

☐ = In 12 months → *Go to question* 7.30

7.30 Would you rather receive 100 Euro today or 173 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

7.31 Would you rather receive 100 Euro today or 181 Euro in 12 months?

☐ = Today [*Final question*]

☐ = In 12 months [*Final question*]

E Staircase Risk

The staircase procedure for eliciting risk preferences consists of a sequence of lottery choices. Everybody starts with the same first question. The choice for the lottery or the safe payment option then determines the next question in the sequence. This procedure is repeated four times. Subjects were instructed as follows:

Please imagine the following situation: You can choose between a sure payment and a lottery. The lottery gives you a 50 percent chance of receiving 300 Euro. With an equally high chance you receive nothing. Now imagine you had to choose between the lottery and a sure payment. We will present to you five different situations. The lottery is the same in all situations. The sure payment is different in every situation.

1. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 160 Euro as a sure payment?

   (a) lottery → *go to question 17*

   (b) sure payment → *go to question 2*

2. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 80 Euro as a sure payment?

   (a) lottery → *go to question 10*

   (b) sure payment → *go to question 3*

3. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 40 Euro as a sure payment?

   (a) lottery → *go to question 4*

   (b) sure payment → *go to question 7*

4. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 60 Euro as a sure payment?

   (a) lottery → *go to question 5*

   (b) sure payment → *go to question 6*

5. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 70 Euro as a sure payment?

   (a) lottery

   (b) sure payment

6. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 50 Euro as a sure payment?

   (a) lottery

   (b) sure payment

7. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 20 Euro as a sure payment?

   (a) lottery → *go to question 8*

   (b) sure payment → *go to question 9*

8. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 30 Euro as a sure payment?

   (a) lottery

   (b) sure payment

9. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 10 Euro as a sure payment?

    (a) lottery

    (b) sure payment

10. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 120 Euro as a sure payment?

    (a) lottery → *go to question 14*

    (b) sure payment → *go to question 11*

11. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 100 Euro as a sure payment?

    (a) lottery → *go to question 13*

    (b) sure payment → *go to question 12*

12. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 90 Euro as a sure payment?

    (a) lottery

    (b) sure payment

13. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 110 Euro as a sure payment?

    (a) lottery

    (b) sure payment

14. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 140 Euro as a sure payment?

    (a) lottery → *go to question 15*

    (b) sure payment → *go to question 16*

15. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 150 Euro as a sure payment?

    (a) lottery

    (b) sure payment

16. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 130 Euro as a sure payment?

    (a) lottery

    (b) sure payment

17. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 240 Euro as a sure payment?

    (a) lottery → *go to question 25*

    (b) sure payment → *go to question 18*

18. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 200 Euro as a sure payment?

    (a) lottery → *go to question 22*

    (b) sure payment → *go to question 19*

19. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 180 Euro as a sure payment?

    (a) lottery → *go to question 20*

    (b) sure payment → *go to question 21*

20. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 190 Euro as a sure payment?

    (a) lottery

    (b) sure payment

21. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 170 Euro as a sure payment?

    (a) lottery

    (b) sure payment

22. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 220 Euro as a sure payment?

    (a) lottery → *go to question 23*

    (b) sure payment → *go to question 24*

23. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 230 Euro as a sure payment?

    (a) lottery

    (b) sure payment

24. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 210 Euro as a sure payment?

    (a) lottery

    (b) sure payment

25. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 280 Euro as a sure payment?

    (a) lottery → *go to question 29*

    (b) sure payment → *go to question 26*

26. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 260 Euro as a sure payment?

    (a) lottery → *go to question 27*

    (b) sure payment → *go to question 28*

27. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 270 Euro as a sure payment?

    (a) lottery

    (b) sure payment

28. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 250 Euro as a sure payment?

    (a) lottery

    (b) sure payment

29. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 300 Euro as a sure payment?

    (a) lottery → *go to question 31*

    (b) sure payment → *go to question 30*

30. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 290 Euro as a sure payment?

    (a) lottery

    (b) sure payment

31. What would you prefer: a 50 percent chance of winning 300 Euro when at the same time there is 50 percent chance of winning nothing, or would you rather have the amount of 310 Euro as a sure payment?

    (a) lottery

    (b) sure payment

The staircase procedure is illustrated in Figure 2.

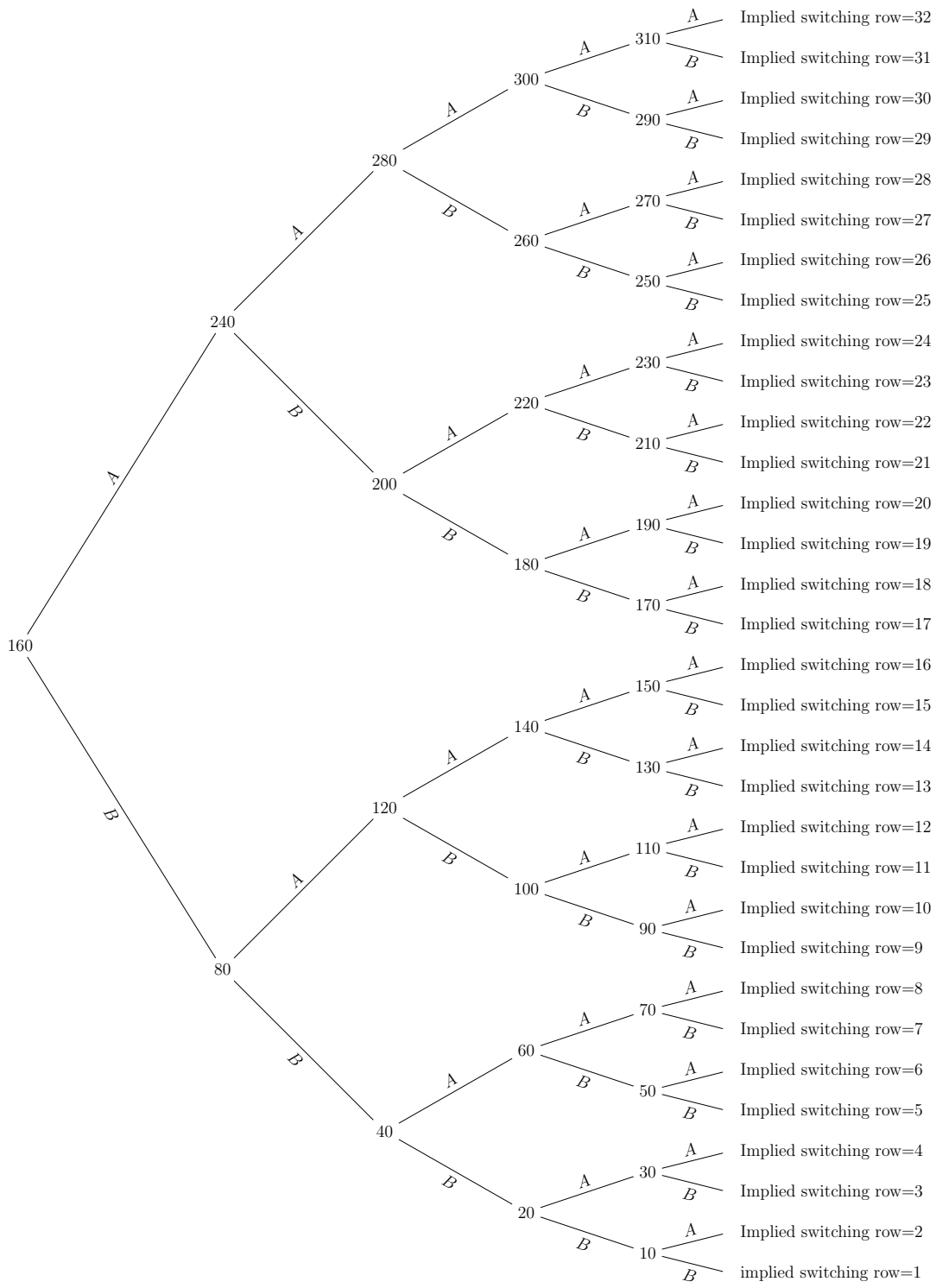

Figure 2: Tree for the staircase risk task (numbers = sure payment, A = choice of sure payment, B = choice of lottery)

Notes. The staircase procedure worked as follows. First, each respondent was asked whether they would prefer to receive 160 euros for sure or whether they preferred a 50:50 chance of receiving 300 euros or nothing. In case the respondent opted for the safe choice ("B"), the safe amount of money being offered in the second question decreased to 80 euros. If, on the other hand, the respondent opted for the gamble ("A"), the safe amount was increased to 240 euros. Working further through the tree follows the same logic.

F Staircase Time

Start with the first question. Depending on whether the participant chooses the earlier or the delayed option, go to the respective next question. This procedure is repeated four times.

Suppose you were given the choice between the following: receiving a payment today or a payment in 12 months. We will now present to you five situations. The payment today is the same in each of these situations. The payment in 12 months is different in every situation. For each of these situations we would like to know which you would choose.

1. Would you rather receive 100 Euro today or 153.8 Euro in 12 months?
   (a) today → *go to question 17*
   (b) in 12 months → *go to question 2*
2. Would you rather receive 100 Euro today or 125.4 Euro in 12 months?
   (a) today → *go to question 10*
   (b) in 12 months → *go to question 3*
3. Would you rather receive 100 Euro today or 112.4 Euro in 12 months?
   (a) today → *go to question 7*
   (b) in 12 months → *go to question 4*
4. Would you rather receive 100 Euro today or 106.1 Euro in 12 months?
   (a) today → *go to question 6*
   (b) in 12 months → *go to question 5*
5. Would you rather receive 100 Euro today or 103.0 Euro in 12 months?
   (a) today
   (b) in 12 months

6. Would you rather receive 100 Euro today or 109.2 Euro in 12 months?

   (a) today

   (b) in 12 months

7. Would you rather receive 100 Euro today or 118.8 Euro in 12 months?

   (a) today → *go to question 8*

   (b) in 12 months → *go to question 9*

8. Would you rather receive 100 Euro today or 122.1 Euro in 12 months?

   (a) today

   (b) in 12 months

9. Would you rather receive 100 Euro today or 115.6 Euro in 12 months?

   (a) today

   (b) in 12 months

10. Would you rather receive 100 Euro today or 139.2 Euro in 12 months?

    (a) today → *go to question 14*

    (b) in 12 months → *go to question 11*

11. Would you rather receive 100 Euro today or 132.3 Euro in 12 months?

    (a) today → *go to question 13*

    (b) in 12 months → *go to question 12*

12. Would you rather receive 100 Euro today or 128.8 Euro in 12 months?

    (a) today

    (b) in 12 months

13. Would you rather receive 100 Euro today or 135.7 Euro in 12 months?

    (a) today

(b) in 12 months

14. Would you rather receive 100 Euro today or 146.4 Euro in 12 months?

    (a) today → *go to question 16*

    (b) in 12 months → *go to question 15*

15. Would you rather receive 100 Euro today or 142.8 Euro in 12 months?

    (a) today

    (b) in 12 months

16. Would you rather receive 100 Euro today or 150.1 Euro in 12 months?

    (a) today

    (b) in 12 months

17. Would you rather receive 100 Euro today or 185.0 Euro in 12 months?

    (a) today → *go to question 18*

    (b) in 12 months → *go to question 25*

18. Would you rather receive 100 Euro today or 201.6 Euro in 12 months?

    (a) today → *go to question 22*

    (b) in 12 months → *go to question 19*

19. Would you rather receive 100 Euro today or 193.2 Euro in 12 months?

    (a) today → *go to question 20*

    (b) in 12 months → *go to question 21*

20. Would you rather receive 100 Euro today or 197.4 Euro in 12 months?

    (a) today

    (b) in 12 months

21. Would you rather receive 100 Euro today or 189.1 Euro in 12 months?

(a) today

(b) in 12 months

22. Would you rather receive 100 Euro today or 210.3 Euro in 12 months?

(a) today → *go to question 23*

(b) in 12 months → *go to question 24*

23. Would you rather receive 100 Euro today or 214.6 Euro in 12 months?

(a) today

(b) in 12 months

24. Would you rather receive 100 Euro today or 205.9 Euro in 12 months?

(a) today

(b) in 12 months

25. Would you rather receive 100 Euro today or 169.0 Euro in 12 months?

(a) today → *go to question 29*

(b) in 12 months → *go to question 26*

26. Would you rather receive 100 Euro today or 161.3 Euro in 12 months?

(a) today → *go to question 28*

(b) in 12 months → *go to question 27*

27. Would you rather receive 100 Euro today or 157.5 Euro in 12 months?

(a) today

(b) in 12 months

28. Would you rather receive 100 Euro today or 165.1 Euro in 12 months?

(a) today

(b) in 12 months

29. Would you rather receive 100 Euro today or 176.9 Euro in 12 months?

    (a) today → *go to question 31*

    (b) in 12 months → *go to question 30*

30. Would you rather receive 100 Euro today or 172.9 Euro in 12 months?

    (a) today

    (b) in 12 months

31. Would you rather receive 100 Euro today or 180.9 Euro in 12 months?

    (a) today

    (b) in 12 months

The staircase procedure is illustrated in Figure 3.

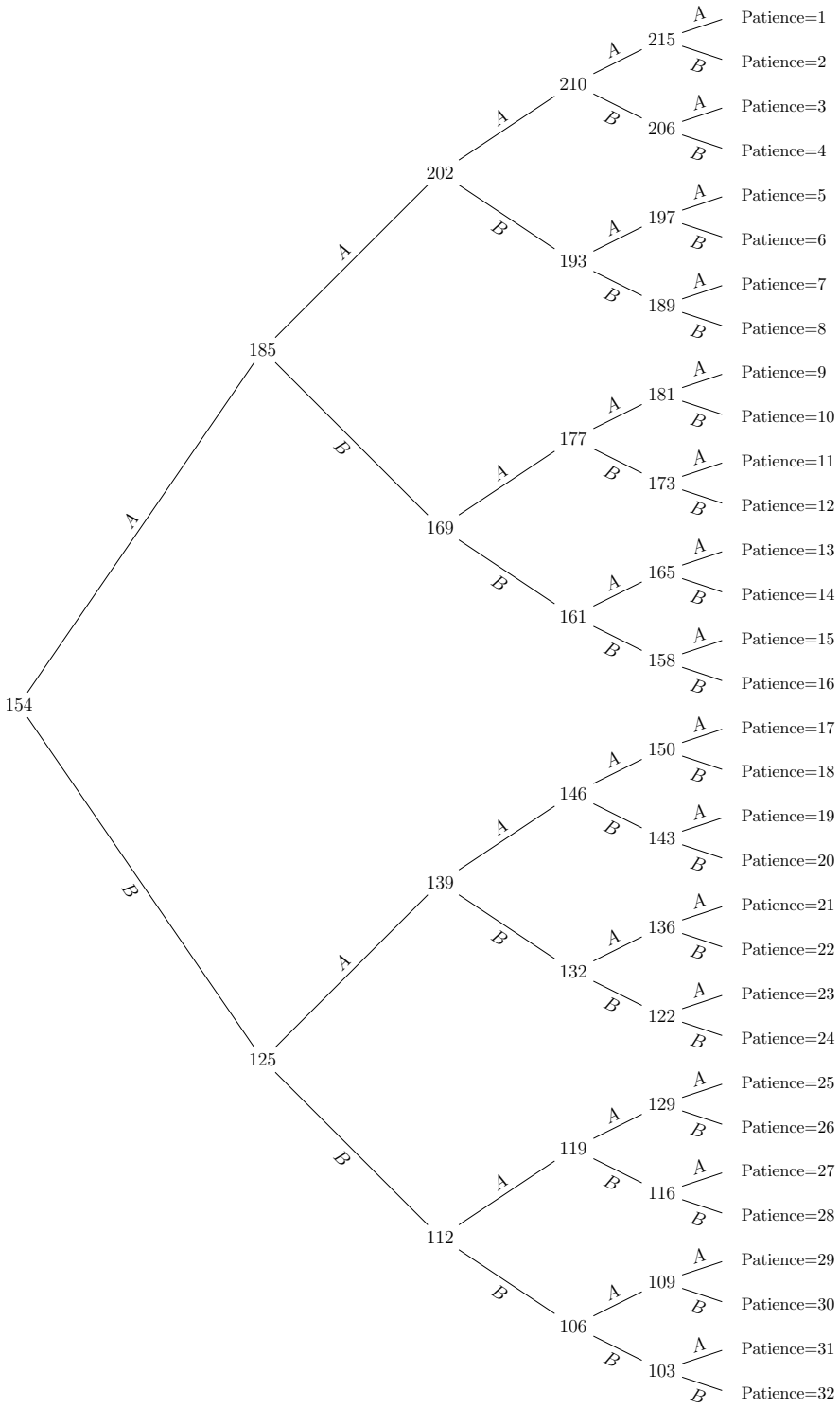

Figure 3: Tree for the staircase time task (numbers = payment in 12 months, A = choice of "100 euros today", B = choice of "x euros in 12 months"

Notes. The staircase procedure worked as follows. First, each respondent was asked whether they would prefer to receive 100 euros today or 154 euros in 12 months from now (leftmost decision node). In case the respondent opted for the payment today ("A"), in the second question the payment in 12 months was adjusted upwards to 185 euros. If, on the other hand, the respondent chose the payment in 12 months, the corresponding payment was adjusted down to 125 euros. Working further through the tree follows the same logic.