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Abstract

We test 494 households participating in the German Socio Economic Panel SOEP to examine risk taking by one household member that affects a second household member. Choices cannot be explained by (short term) strategic behavior. Respect for the risk preference of the counterpart is at best imperfect. Two findings suggest preference dependence: participants do not need explicit information about their counterpart's choice to learn their risk preference. There are characteristic choice patterns not only at the individual, but also at the household level. To define these patterns, based on a theoretical model, we calculate individual risk aversion, sensitivity toward a bad outcome for the other household member, and the willingness to strike a balance between one's own and the other's risk preferences. Using machine learning methods, we find preference patterns, both at the individual and at the household level.

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Keywords: interdependent risk preference, household, reticence to expose others to risk, trade-off between own and others' risk preferences

JEL Classification: C45, D13, D81, D91

1 Introduction

Individual preferences are the backbone of economic theory. However, many economic decisions, such as consumption, investment, labour force participation and childbearing are made by households, not individuals. Even if boiled down to a single-dimensional choice under uncertainty, decision making in households is notoriously difficult to analyse. Family members come to the negotiation table with divergent risk attitudes and degrees of willingness to defer to the other. Due to assortative mating and possibly co-development, their risk attitudes can not be treated as independent and exogenous; their other-regarding preferences are affected by the longer shadow of the future relationship. Deeper even, it is not clear that the standard assumptions of individual rationality, and hence game-theoretic analysis, would apply to choices made within a family. Alternatively, household members might collectively strive for an arrangement that achieves some shared goal.

This paper explores the complex micro-economic foundations of household decision making. We hypothesize that risk taking within the household cannot be fully explained by neither strategic behavior, nor by social preferences, but expect that preferences are interdependent. Our empirical strategy is triangulation. We elicit five decisions from each participant. We define which choice patterns would be incompatible with strategic behavior, and with social preferences. If choice patterns cannot be explained either way, in the spirit of a proof by contradiction, we learn that there must be an additional motive. Two further observations suggest that the missing element is the interdependence of preferences. Choices that affect a second household member are almost identical whether or not participants are explicitly informed about the level of risk their counterpart has chosen when deciding alone. This indicates that household members possess the information necessary for forming risk attitudes in conjunction with the risk attitudes of the remaining household members. Most importantly, we find that choice patterns depend on each other in characteristic ways. This suggests that living together in a household has a formative effect. For pairs of children, the interdependence of preferences must result from being jointly brought up. For pairs of parents, assortative mating is an additional channel.

Specifically we test all the 494 households in the sample of the Innovation Study of the German Socio-Economic Panel (SOEP-IS). In each household, we test two randomly selected members on risk taking. Using the strategy method, we elicit five decisions from each participant. The first decision only affects the decision maker herself and is used to elicit her individual risk preference (the *alone* situation). The remaining decisions (to a different extent) affect outcomes of the other participating household member. The second decision only affects the other household member (the *ruler* situation). In the third decision, one of two household members determines the risk to which both of them are exposed (the *dictator* situation). In the fourth decision, the collective level of risk exposure is determined by the mean of the choices made by both participants (the *compromise* situation). In the fifth decision, the more risk averse of both choices determines the risk exposure for both household members (the *veto* situation). In half of the households, before participants make the second to fifth choices, they learn the decision their partner has made on the first choice. This *transparency* manipulation helps us to test whether household members can precisely estimate each other's risk preferences, even when not explicitly informed.

If a household member exclusively acts strategically, as a *dictator* she makes the same choice as when *alone*; she imposes her own risk preference on the other household member. The same holds in the *veto* condition if she knows or expects to be the more risk averse household member. If the individual holds social preferences, she derives personal utility from the well-being of the other household member. Arguably in the setting of our experiment social preferences imply that the decision maker - at least partly - defers to the known or expected risk preferences of her counterpart. Consequently the more pronounced this social preference, the more her choice moves into the direction of the choice her counterpart has made when alone. In the *ruler* situation, the trade-off between the preferences of both household members is absent. In this situation, even with weak social preferences, *rulers* should implement the choice the other household member has made when *alone*. As *dictators* and in the *compromise* and *veto* conditions, participants should strike a balance between their own risk preference and the risk preferences of the other household member. Preference interdependence could have cognitive and motivational effects. If interdependence results from either mating or co-development in the household, the *transparency* condition should have little effect; participants know each others' risk preferences anyhow. On the motivational side, preference interdependence might lead to preference convergence. Or it might, alternatively, lead to choice patterns that take the known or expected preferences of the counterpart in characteristic ways into account.

Participants do not impose their own risk preferences when *dictators*, or in the *veto* condition when they are the more risk averse household member. The latter finding is particularly remarkable, as household members play a dominated strategy and hence violate one of the most basic assumptions underlying game theory. Both observations speak against (ad hoc) strategic behavior. (In our field setting, we can however not exclude that these choices are motivated by the longer shadow of the future that results from household membership.) As *rulers*, only very few participants make the choice they know or expect their counterpart to make. This rules out social preferences in the sense introduced above.

Since neither (straightforward) strategic play, nor (straightforward) social preferences can explain the data, we investigate whether preferences are interdependent. *Transparency* turns out immaterial, which supports this interpretation. Yet we do not find convergence. To investigate whether there are choice patterns that might be the result of mating or co-development, we need a precise and reliable way of characterizing choices. We proceed in two steps. First, we develop a formal utility model, which we apply to the five choices made by each participant. This gives us three parameters that characterize each participant: her own risk preference, her willingness to respect the risk preference of the other household member, and a parameter that characterizes the relative weight to her own versus the risk preferences of the other household member, provided they are in conflict. Second, we use a standard machine learning algorithm (k-means), running over those three parameters, to find systematic patterns.

Using this procedure, we find systematic clusters of preferences, both at the individual level, and, most importantly for our research question, at the level of households. In particular, we can identify four distinct household types. The clustering among the pairs of adults is consistent with preference dependence resulting from mating. A similar pattern among the pairs of children is consistent with preference dependence resulting from co-development. In a further step, we use the rich background data from the current and past waves of the SOEP-IS survey to find correlation patterns of our model parameters and observed characteristics of the experiment participants. Correlations with demographic and personality variables suggest that participants use their rich context knowledge as a proxy for risk preferences. In particular, we document that the model parameters are associated with socio-economic and health characteristics, psychological traits and cognitive skills of both experiment participants.

Households are not randomly composed; actually this non-randomness is what we investigate in terms of preference interdependence. Strictly speaking we cannot exclude that our findings are driven by differences between households that are unrelated to the effects of mating or (co-)development. This is why, in two related respects, it is fortunate that we can run our experiment on SOEP-IS: (a) after our experiment, households have responded to the current interview wave; in earlier years the same households have responded to a host of further questions. If there is an uncorrelated cause, we therefore stand a serious chance to find it. (b) The 496 households in SOEP-IS are a carefully selected representative sample of the German population (Richter and Schupp, 2012).

The remainder of this paper is organized as follows: section 2 relates the paper to the literature. Section 3 presents the design of the experiment. Section 4 develops hypotheses. Section 5 describes the dataset. Section 6 investigates strategic behavior, Section 7 social preferences, and Section 8 preference dependence. This section also introduces the formal framework for characterizing preferences and uses it to classify participants and households. Section 9 concludes with discussion.

2 Literature

One aspect of risky choice embedded in households is relatively easy to study experimentally: one can replace a randomly selected individual by a randomly composed, anonymously interacting group. This has been shown to matter: groups are less prone to cognitive biases; they suffer less from self-control problems; they are more likely to take risk if this choice maximizes profit (Charness and Sutter, 2012); they are less likely to violate first order stochastic dominance (Charness et al., 2007) and are more likely to maximize profit (Baillon et al., 2016). If individual risk preferences in the group are heterogeneous, the individual with the median risk preference tends to have the strongest effect on group decision-making (Ambrus et al., 2015; also see the meta-study by Wildschut et al., 2003). If a representative decides on behalf of an entire group, her choices are more risk averse than when deciding on her own (Wang et al., 2018).

Decisions on behalf of others exhibit less loss aversion (Polman, 2012; Pahlke et al., 2015). Andersson et al. (2014) find that participants are less averse to making losses when deciding on behalf of others, rather than putting their own money at risk. Yet the effect does not replicate if the choice matters for both the decision maker and a third party (Füllbrunn and Luhan, 2017, also see Vieider et al., 2016). Yet the evidence for risk aversion is inconclusive. In a meta-analysis Polman finds that, overall, choices on behalf of others are slightly more risky, yet the variance between studies is pronounced. Individual studies partly show this risky shift (e.g. Agranov et al., 2014), while others show a cautious shift (e.g. Charness and Jackson, 2009), and yet others do not find a significant effect (e.g. Stone and Allgaier, 2008; Eriksen et al., 2017).

Taking risk on behalf of others has also been studied in dictator games. Recipients receive more if it is uncertain whether they deserve help (Fong, 2007; Fong and Oberholzer-Gee, 2011). They receive most if there is a risk that they leave the lab with nothing (Engel and Goerg, 2018). If transfers influence the probability of winning a lottery, dictators give less than in a traditional dictator game (Brock et al., 2013). They also give less if it is uncertain how much the recipient will benefit from the transfer

(Cettolin et al., 2017).

Several studies look at the interdependence of risk attitudes resulting endogenously from matching. For instance, Legros and Newman (2007) and Chiappori and Reny (2016) provide game-theoretic foundations for negative assortativeness in couples' risk attitudes, provided that risk sharing is the main purpose of matching. However, positive assortative matching may emerge when commitment is limited (Gierlinger and Laczó, 2017) or when sorting occurs on multiple dimensions (Dupuy and Galichon, 2014).

Observational data on household choices is available from surveys like the German Socio Economic Panel SOEP. Risky choices can be correlated with indicators for household composition. That way one for instance finds that married individuals take significantly less risk in general (Halek and Eisenhauer, 2001; Dohmen et al., 2011; Necker and Ziegelmeyer, 2016), but take larger mortgages on their houses (Donkers and Van Soest, 1999); that married females take more risk than females who are single parents (Halek and Eisenhauer, 2001; but see Jianakoplos and Bernasek, 2008); that the risk attitudes of couples tend to correlate (Brown et al., 2012; Bacon et al., 2014). But all these findings rely on self reports that may be biased. Explanatory variables have not been randomly assigned. Most importantly, extant research has not addressed what we test: is risk taking affected by knowing that choices impact on other household members?

Three earlier experiments have studied how couples decide about risk, and have compared their collective choice with the choices they make individually. All three experiments force couples to agree on a decision, and leave it to the couple how to reach this agreement. All experiments allow the couple to communicate. All papers want to estimate the utility function "of the household". Bateman and Munro (2005) want to learn whether the decisions made by couples come closer to expected utility maximization. De Palma et al. (2011) are additionally interested in the power relation within the couple. Abdellaoui et al. (2013) want to find out whether the probability weighting component of cumulative prospect theory extends to decisions made by couples. The main difference between these earlier results and our approach is the research question. Our unit of observation is not the household, but the individual household member.

We use households as a testbed to study how individual choices are affected by being embedded into a stable social context. Specifically, we want to understand whether choices in such a context can be explained by strategic interaction and social preferences, or whether preferences are interdependent. To find this out, we manipulate the way how the decision made by one household member affects the well-being of another household member. Our analysis is not confined to couples, but encompasses pairs of children. We use multiple choices we have from individuals and pairs to classify them into types, using a machine learning algorithm. And we add context with additional information from the SOEP.

3 Design

Our experiment was run in the SOEP-IS, a subsample of the German Socio Economic Panel that is open for supplementary investigations by independent teams of researchers. We report details of the implementation, and of the remaining survey instruments that are available from this sample, in section 5 below. In this section we focus on the experiment.

From each household, two members are selected. We had to accept a limitation of the survey design, which is why no persons underage (i.e. nobody below age 18) is in our sample. If only two household members are present, these two household members are tested. Otherwise household members are randomly selected. Participants know who is the second participant in their household. As the experiment was run as part of the regular survey interview, the composition of pairs within households was beyond our control. We had only 48 pairs of one parent interacting with one child, but 177 parent - parent pairs, and 269 child - child pairs.

The experiment consists of two parts. At the outset, participants only know that a second part is to follow, but do not know what this second part will be about. The two household members earn money with a probability of 20 %, determined by a virtual dice.

If they earn money, both parts of the experiment are paid out for both participants.[1] All feedback from the entire experiment, including payments, is withheld until participants have responded to the complete survey instrument. It is also at this point that all random draws are made. Participants do so themselves, by activating a random number generator on a touchpad. All options have equal probability. Participants are informed about these risks as the pertinent design feature is explained. This design makes sure that answers to the survey are not contaminated by the individual outcomes from the experiment.

We have a 2x5 factorial design, with two between subjects (transparency and intransparency) and five within subjects conditions. In the first part of the experiment (*alone*), participants decide on their own. This part is meant to measure their individual risk preference. Participants see a list with 11 lotteries (see Appendix A). Each lottery consists of a high and a low outcome. Both outcomes obtain with probability 50%. Outcomes are given by

$$x_{low} = 10 - q_i$$
$$x_{high} = 10 + 2q_i$$

with $q_i \in \{0..10\}$ representing investment in a risky asset. Participants choose their preferred lottery (investment). This part of the experiment is the same for all participants.

Approximately half of the households (474 participants, 47.98 %) are in the *transparency* condition. Before the beginning of the second part of the experiment, these participants

[1] We accept the possibility of hedging for the following reasons: (a) We wanted to make sure that participants take choices seriously and, specifically, are not exposed to too many random choices. After all we could only pay one out of five households. (b) Hedging is usually interpreted as self-insurance. Participants are more likely to accept risk if it originates in two independent draws, rather than a single draw with the same expected value. This argument would at most hold for choices by the more risk averse household members. It would not motivate that the more risk loving household member reduces the exposure to risk. Yet this is the most pronounced effect. (c) There is no room for hedging in the ruler condition, and in the veto condition if the household member is more risk loving. (d) When deciding alone, participants did not know the second part of the experiment. Hence if it all hedging could only be present in the second part of the experiment.

learn the choice that the other household member has made in part 1 of the experiment. In the *intransparency* condition, this information is withheld. Transparency is our between subjects manipulation. Within subjects, using the strategy method (Selten, 1967), in the second part of the experiment each household member makes four choices. Participants cannot communicate with their partner before choosing. At the very end of the interview, the situation is randomly determined that is payoff relevant. If situation 2 or 3 is singled out, another random draw determines which household member has the active role. Participants again see the list of the same 11 lotteries. They pick a lottery for each of the four situations. If one of situations 3-5 is randomly determined to be payoff relevant, both household members split earnings evenly.[2]

In the *ruler* condition, the active household member decides on behalf of the passive household member. In the *dictator* condition, the active household member decides on behalf of both household members. In the *compromise* condition, the mean of the choices made by both household members determines the identical degree of risk exposure for both of them. Finally in the *veto* condition, both household members make a choice, but only the more risk averse choice is implemented and affects both household members. Table 1 summarizes the within subjects manipulations.

situation	1 alone	2 ruler	3 dictator	4 compromise	5 veto
who decides?	A	A	A	A and B	A and B
who is affected?	A	B	A and B	A and B	A and B
how is the outcome determined?	A decides	A decides	A decides	mean of A's and B's decision	minimum of A's and B's decision

Table 1: Within Subjects Manipulation

[2]The decision sheet participants receive is available in Appendix A. We of course cannot say whether household members have compensated each other privately. This is the inevitable price we have to pay for the ability to test real households.

4 Hypotheses

Strategic Behavior When a participant decides *alone*, she chooses the level of risk that matches her idiosyncratic risk preference. When she decides as *ruler*, her own payoff is not affected. She is indifferent. In the *dictator* condition, her own payoff is affected. She makes the same decision as when deciding alone, if her preferences display constant relative risk aversion. As we explain in the appendix, in the *compromise* condition there are multiple equilibria. A participant exaggerates her own choice, the more so the more she expects the other household member to do the same. In the *veto* condition a strategically minded household member is indifferent if she expects the other household member to accept less risk than herself. In the opposite situation she imposes her own preference and makes the same choice as when *alone*. This gives us:

Hypothesis 1. Strategic Behavior
Participants make the same choice when alone, as dictators and in the veto condition (if they are more risk averse than their counterpart). They exaggerate their choice, in the opposite direction of their counterpart, in the compromise condition.

Social Preferences In our context, neither outcomes nor intentions are critical, but the degree of risk to which the other household member is exposed. We define a participant as having social preferences if she pays full or partial respect to the known or expected risk preference of her counterpart. In the *ruler* condition, there is no conflict between the participant's own risk preference and the risk preference of her counterpart. If she holds social preferences in the defined sense, however weak, she chooses the level of risk that she knows or expects her partner to prefer. In the *dictator* condition, she strikes a balance between her own risk preference and the known or expected risk preference of her counterpart. In the *compromise* condition she aims at the same outcome, but must now factor in whether she expects her counterpart to strategically exaggerate her choice. If so, she counteracts this move by exaggerating her own choice as well, by the same degree, and in the opposite direction. If the participant knows or expects to be less averse to risk than her counterpart, she is indifferent in the *veto* condition. Otherwise she makes the same choice as in the *dictator* condition. This gives us:

Hypothesis 2. Social Preferences
In the ruler condition, participants make the choice their counterpart has made when alone. In the dictator condition, the choice is between the choices both household members have made when alone. Participants make this same choice when they are in the veto condition and are more averse to risk than their counterpart. In the compromise condition their choice is bounded away from this choice, in the direction opposite to their counterpart's choice when alone. There is no prediction for the veto condition if they are less risk averse than their counterpart.

Interdependent Preferences Arguably, living in the same household makes it easy to estimate the preferences of other household members. If true, we should support

Hypothesis 3. Transparency
Choices in the transparency condition do not significantly differ from choices in the intransparency condition.

Moreover, arguably the preferences of members from the same household converge. If true, we should see

Hypothesis 4. Convergence
Choices of household members when alone are not significantly different from each other.

Alternatively, choices of household members might be different from each other, both when deciding on their own and when (also) deciding on behalf of the other household member, but there might be a systematic relationship between their choices.

5 Data

The experiment is implemented in the Socio-Economic Panel Innovation Sample (SOEP-IS 2016), which is an extension of the renowned longitudinal survey Socio-Economic Panel (SOEP).[3] The requirements on the sampling are the same as for the SOEP, including representativeness both of cross sections as well as longitudinal perspectives. The SOEP-IS was launched in 2012 to conduct pre-tests of new survey instruments and variables, and it also allows to conduct experiments. All proposed survey questions and experiments undergo both an implementation check as well as a quality assessment and ethical clearance by an independent expert and the SOEP Survey Committee. The current study was run with the 2016 wave.

Our experiment involves all available households with two or more members aged above 12, which was our only eligibility criterion. 494 households (988 individuals) participated in our experiment.[4] Households are spread all over Germany. The experiment was run in the beginning of the interview session. For participating in the survey (being a member of the panel), households received a fixed fee. Based on a random pre-determined rule, the interviewer invited two household members to participate in the experiment. Participants were not allowed to communicate with each other.

Participants first made their choice in part 1 of the experiment, by selecting their preferred lottery on a decision sheet (see Appendix A). After having been instructed about the four decisions in part 2 (*ruler*, *dictator*, *compromise* and *veto*), verbally and by a table equivalent to Table 1, for each situation they determine the lottery they would choose if having the active role. To this end they again receive a decision sheet (see Appendix A). The details of the instructions can be found in appendix A. Table 2 reports sample characteristics.

[3]More details on SOEP-IS can be found here:
https://www.diw.de/documents/publikationen/73/diw_01.c.407141.de/diw_sp0463.pdf.

[4]We lose three households because one member did not participate in the part of the survey that collects individual information.

	N	mean	median	min	max	sd
female	988	.502	1	0	1	.500
partnership	988	.772	1	0	1	.420
duration	988	27.172	24	0	72	18.528
children	988	.582	1	0	1	.493
religion	988	.640	1	0	1	.480
age	988	54.270	55	19	97	17.219
job	988	.584	1	0	1	.493
net personal income[a]	988	996.919	450	0	10000	1255.155
effective working hours	988	20.392	15	0	73	20.427
regular employment	988	.386	0	0	1	.487
manager	988	.154	0	0	1	.361
debt	988	.253	0	0	1	.435
not on time with payments	988	.047	0	0	1	.211
elementary school	891	.329	0	0	1	
middle school	891	.380	0	0	1	
high school	891	.291	0	0	1	

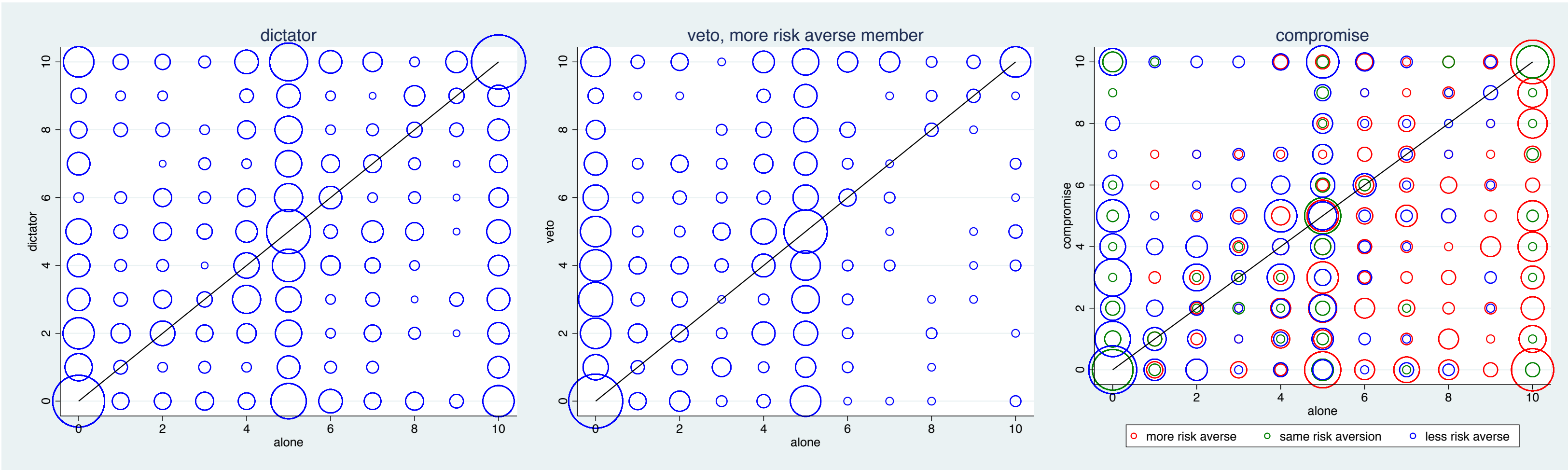
Data: SOEP-IS 2016, own calculations.
Notes: the table contains information on the distributions of the following variables: *female*: dummy that is 1 for females; *partnership*: dummy that is 1 if person lives in stable partnership; *duration*: of partnership, in years; *children*: dummy that is 1 if individual has children; *religion*: dummy that is 1 if individual declares membership in a religious community; *age*: in years; *job*: dummy that is 1 if person has any paid occupation; *regular employment*: dummy that is 1 if person has a regular paid job; *net personal income*: per month, in €; *effective working hours*: per week; *manager*: dummy that is 1 if person has responsibility for other employees; *debt*: dummy that is 1 if person has taken out credit; *not on time with payments*: dummy; *school variables*: smaller N due to missing information.

Table 2: Sample Characteristics

[a]Income per month. If we drop children, the mean is 1,280.94, and the median is 1,200.

6 Strategic Behavior

If participants act strategically (in the short run), they impose their own risk preferences on the other household member, provided the design of the treatment makes this possible. Hence choices in the *dictator* condition should be the same as when participants decide *alone*. In the left panel of Figure 2, almost all choices should be on the diagonal. This is patently not the case. As the middle panel shows, participants do also not impose their own risk preference if, in the *veto* condition, they are the household member with higher aversion to risk; again only few choices are on the diagonal. This is a striking finding, as the household member who is more risk averse herself even violates the most basic principle of game theory, and plays a dominated strategy. Finally, if choices were predominantly motivated strategically, in the *compromise* condition participants should exaggerate choices in the direction of their own risk preferences. Hence in the right panel of Figure 2 red bubbles (choices from more risk averse participants) should mostly be below the diagonal, and blue bubbles (choices from less risk averse participants) should mostly be above the diagonal. If at all, descriptively we find the opposite.



Data: SOEP-IS 2016, own calculations.
Notes: bubble size indicates frequency. Higher choices accept more risk.

Figure 1: Choice of Lottery Across Conditions

The regressions in Table 3 provide a statistical test of Hypothesis 1. Model 1 seems to suggest that choices in the *dictator* and *veto* conditions do not differ from choices participants make when *alone*, which would be in line with Hypothesis 1. Yet Model 2 shows that this impression is misleading. As soon as we control for the relative degree of risk aversion among the two interacting household members, we find clear and strong effects of all treatments. Less risk averse participants (the reference category) accept much more risk when deciding *alone* (constant). Yet whenever they know that their choice matters for the other household member, they reduce the risk exposure (strongly negative, significant treatment main effects). When they are *alone*, a participant that has the same or even a more pronounced aversion to risk than her counterpart accepts substantially and significantly less risk than the more risk averse participants (main effects of having the same or a higher aversion to risk). Yet all interaction effects are positive and significant: when they know that their choices also affect the outcome for the more risk averse household member, participants with the same or a more pronounced aversion to risk increase the exposure to risk.

Hence we squarely refute Hypothesis 1. Choices are not motivated strategically. We conclude

Result 1. Strategic Behavior
As dictators, participants shift their choice in the direction of the risk preference of the other household member. In the veto condition, household members with lesser tolerance for risk accept more risk than when alone. In the compromise condition, participants shift their choices in the direction of the risk preference of the other household member.

7 Social Preferences

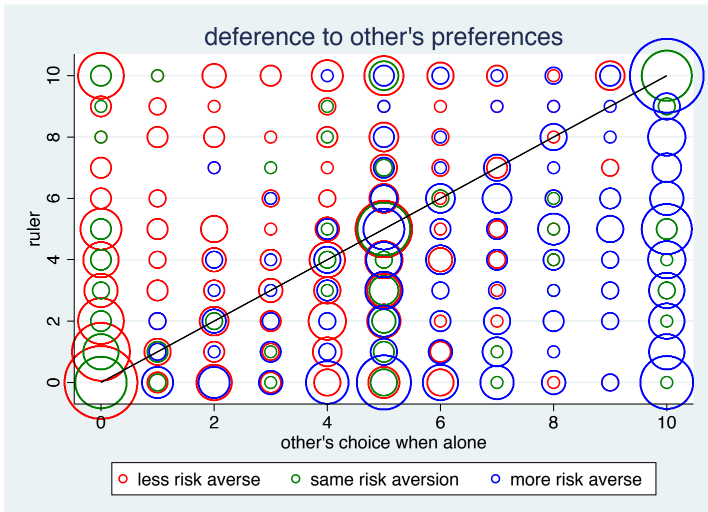
If participants are strictly motivated by social preferences (in the sense of the term we use in this paper), as *rulers* they should choose the level of risk that their counterpart had chosen when alone. In Figure 4, most choices should be on the diagonal. This is

	model 1	model 2	model 3	model 4
ruler	-.972***	-4.117***	-3.999***	-4.249***
	(.192)	(.281)	(.385)	(.410)
dictator	.053	-3.168***	-3.233***	-3.090***
	(.191)	(.281)	(.387)	(.408)
compromise	-1.073***	-4.393***	-4.339**	-4.453***
	(.191)	(.281)	(.385)	(.411)
veto	-.121	-3.163***	-3.538***	-2.731***
	(.191)	(.281)	(.385)	(.407)
same risk aversion		-4.185***	-3.292***	-4.982***
		(.515)	(.711)	(.742)
more risk averse		-6.122***	-5.831***	-6.442***
		(.285)	(.389)	(.419)
ruler*same risk		4.498***	3.740***	5.240***
		(.554)	(.786)	(.783)
dictator*same risk		4.213***	3.445***	4.926***
		(.554)	(.784)	(.782)
compromise*same risk		4.345***	3.766***	4.915***
		(.556)	(.790)	(.785)
veto*same risk		3.558***	3.721***	3.351***
		(.552)	(.785)	(.776)
ruler*more risk		5.825***	5.479***	6.234***
		(.398)	(.543)	(.583)
dictator*more risk		6.075***	5.898***	6.287***
		(.398)	(.544)	(.581)
compromise*more risk		6.297***	5.959***	6.695***
		(.397)	(.541)	(.583)
veto*more risk		5.883***	5.657***	6.152***
		(.396)	(.541)	(.580)
cons	4.878***	8.110***	8.337***	7.851***
	(.178)	(.239)	(.322)	(.352)
N	4940	4940	2570	2370

dv: choice of lottery; Tobit (lower bound 0, upper bound 10). Standard errors for choices nested in individuals nested in households in parenthesis. Model 3: intransparency condition only, Model 4: transparency condition only. *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 3: Choices Across Situations

clearly not the case. Statistically we also find a clear difference between both choices.[5]



Data: SOEP-IS 2016, own calculations.
Notes: bubble size indicates frequency. Higher choices accept more risk.

Figure 2: Choice of Lottery Across Conditions

Yet in a weaker sense we support Hypothesis 2. Overall, rulers' choices move into the direction of the choices their counterparts have made when alone. In Model 2 of Table 3 we find a significant main effect of the *ruler* condition: the less risk averse household members take 4.117 (of 10) points less risk as *rulers* than when *alone*. The effect is considerably smaller though for the less risk averse household members. They take 1.708 points more risk as *rulers* than when *alone* (Wald test of main effect of *ruler* treatment plus interaction with participant being more risk averse, $p < .001$). We will come back to this asymmetry in the next section.

The less risk averse household member also substantially and significantly reduces the exposure to risk when deciding as *dictator*, and in the *compromise* and *veto* condition (main effects of treatments in Model 2 of Table 3). Conversely, the more risk

[5]Tobit regression of the choices *rulers* make on the choices their counterparts have made when deciding alone, lower level 0, upper level 10, standard errors for choices nested in groups, coef .244, $p < .001$. This additional regression is available from the authors upon request.

averse household member substantially and significantly increases the exposure to risk whenever her choice also matters for the other household member (interactions between treatment and being more risk averse). We thus have partial support for Hypothesis 2 and conclude

Result 2. Social Preferences
When deciding as rulers, dictators, in the compromise and in the veto condition, the more risk averse household member accepts more risk than when deciding alone. When deciding as rulers, dictators and in the compromise condition, the less risk averse household member accepts less risk than when deciding alone.

8 Preference Dependence

8.1 Transparency

In Hypothesis 3 we had expected that household members would not need to be explicitly informed about the choices their partners have made when deciding alone. As Models 3 and 4 of Table 3 show, this is indeed what we find. Coefficients are very similar in the *intransparency* (Model 3) and in the *transparency* condition (Model 4). In the mirror model to Model 2 in which we interact all effects with *transparency*, neither the main effect of *transparency* nor any of the interaction effects turns out significant.[6] As we had expected, household members have enough signals to infer the choice their counterpart has made.

8.2 Convergence

Is being a member of the same household not only informative, but also formative? Do preferences thus converge within households, as we had predicted in Hypothesis

[6]This additional regression is available from the authors upon request.

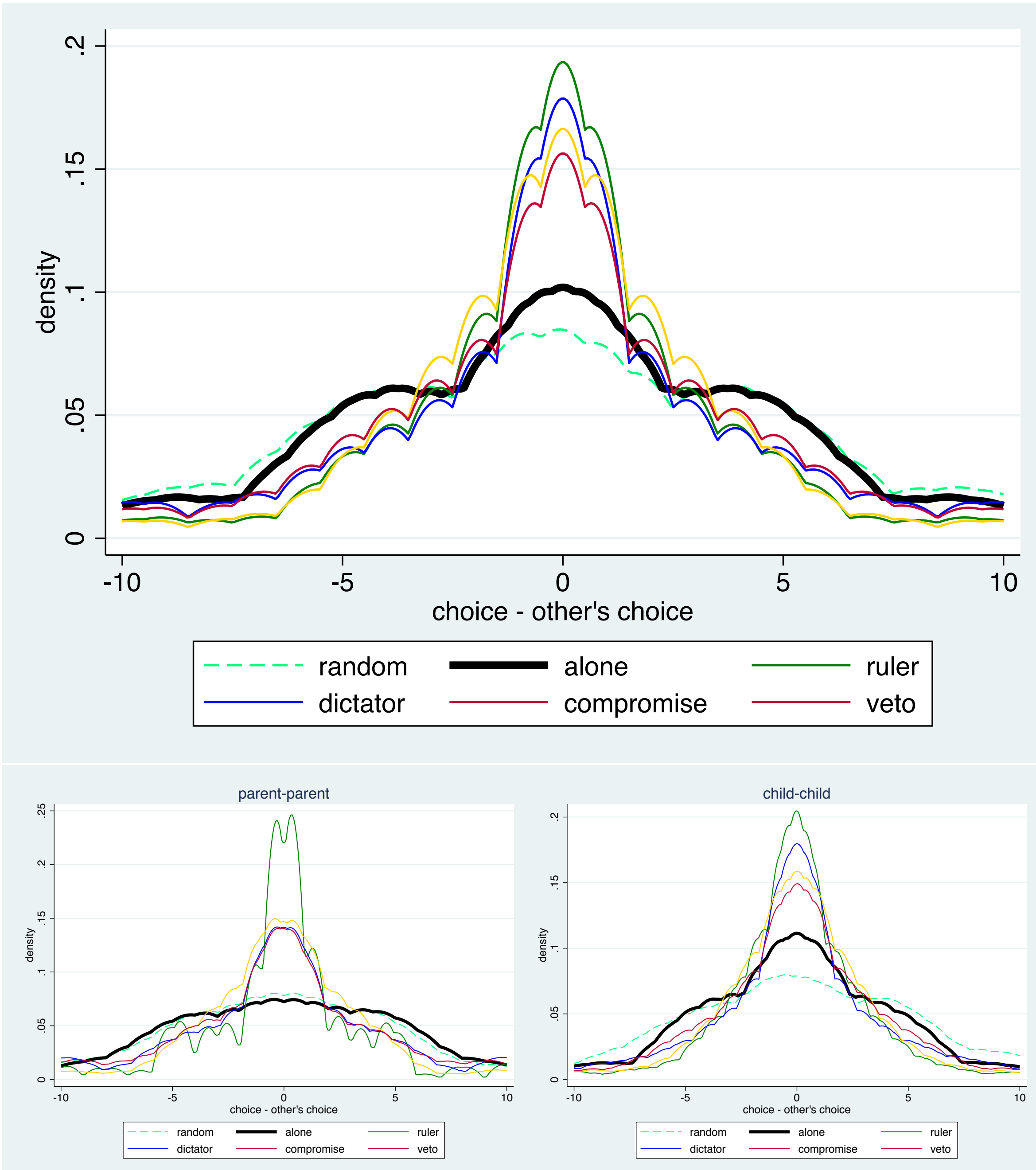
4? The upper panel of Figure 3 shows that this is not the case. Divergence within households is pronounced. Actually the distribution of divergence between the two true members of each household (bold black line) is almost as flat as the distribution if one replaces the choice of the true counterpart by the choice a random participant from our sample has made (mint dashed line).[7] Statistically, the two densities are indistinguishable.[8] The powerful homogenizer is not living together (i.e. choices when *alone*), but our experimental manipulations. Homogeneity is most pronounced (the density curve is steepest in the middle) when household members decide as *rulers*, followed by their choices as *dictators*. Divergence increases a bit in the *compromise* and even a bit more in the *veto* conditions, but stays well above choices made when *alone*. It is not preferences that converge, but choices. Within households, members respect that preferences differ, and adjust their own choices if other household members are affected.

Comparing the lower panels of Figure 3 shows a pronounced difference between parent-parent and child-child pairs. If parents from the same household decide on their own, their choices are as different as among a random pair of parents (the bold black line almost perfectly coincides with the mint dashed line). By contrast, two children from the same family are already more homogenous when deciding alone, compared with random pairs of children. This difference is also statistically significant.[9] Choice patterns in the treatments also differ between these pairs. Parents only respect their spouse's risk preference to a large degree when *rulers*. This is also the situation in which children respect their sibling's risk preference most pronouncedly. Yet they also do as *dictators*.

[7]We are grateful to an anonymous referee for suggesting this approach. We randomly reshuffle choices of participants 1000 times and calculate the distance between their choice and the choice made by this randomly matched other participant. The density curve is from the mean of these distances, separately per participant.

[8]Kolmogorov Smirnov, p = .355 one-sided, p = .678 two-sided.

[9]Kolmogorov Smirnov, p = .023 one-sided, p = .046 two-sided.

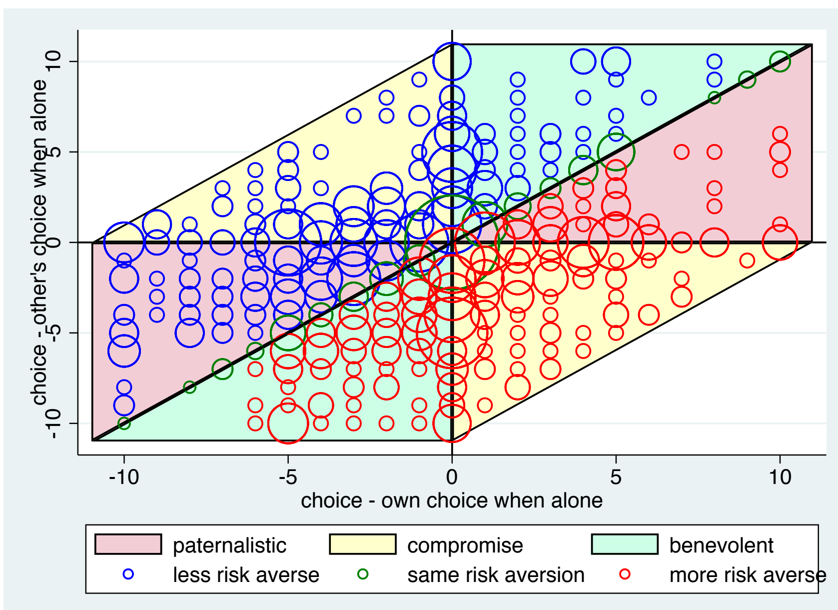


dv: choice - other's choice

Figure 3: Divergence of Choices in Households

8.3 Heterogeneity

As Figure 3 shows, choices are more homogeneous than preferences. But that is not to say that choices are fully aligned. Figure 4 takes a closer look at heterogeneity in the choices of *rulers*. There are paternalistic choices (the areas shaded in red): more risk averse rulers accept even less risk than when alone; less risk averse rulers accept even more risk than when alone. But there are also benevolent choices (areas shaded in green): less risk averse rulers accept even less risk than their counterparts had accepted when alone; more risk averse rulers accept even more risk than their counterparts had accepted when alone. Finally there are choices that strike a balance between the ruler's and the counterpart's risk preferences (areas shaded in yellow).



dv: own choice when ruler - other's choice when alone; bubble size indicated frequency

Figure 4: Heterogeneity of Ruler's Choices

We now propose a formal framework to precisely characterize the heterogeneity in our data. From each participant, we have five choices. Our design allows for heterogeneity in three dimensions: (1) the individual's own risk preference; it matters for all five choices; (2) the individual's respect for the known or estimated risk preferences of her counterpart; it matters for the four choices in which the individual is not *alone*; (3) the relative weight the individual assigns to her own vs. the preferences of her counterpart; it matters in the *dictator, compromise* and *veto* conditions.

There are two participants A and B. Let q_i, $i \in \{A, B\}$, denote i's investment decision. $x(q, \xi)$ is the game's payoff that depends on the investment and realization of a random draw ξ. The participants' utility functions $u_i(x) \equiv u(x; r_i)$, $i \in \{A, B\}$, are known up to a single parameter r_i. This parameter r_i is a measure of i's risk-aversion and at the outset is the participant's private information.

When *alone*, the individual maximizes (1)

$$\max_{q_i \in \{0..10\}} \{E_\xi u(x(q_i, \xi), r_i)\}. \tag{1}$$

In the *ruler* condition, a participant exclusively motivated by (1) is indifferent. If she minimally cares about j's payoff or utility, she breaks the indifference by making the choice that reflects j's known or estimated degree of risk aversion r_j and solves (2)

$$\max_{q_i \in \{0..10\}} \{E_\xi u(x(q_i, \xi), r_j)\}. \tag{2}$$

That would lead her to the same choice that her counterpart j made for herself. Yet this is not what we observe, even with transparency. Figure 4 demonstrates significant heterogeneity; moreover, substantially more choices are below, rather than above the horizontal 0 line. *Rulers* are more inclined to reduce, rather than increase, the level of risk to which they expose their counterpart. This suggests that participants shy away from being responsible for the realization of a particularly bad outcome. This would lead a *ruler* to maximize the partner's utility in expectation over a subjective distribution function, different from the true one. We denote the expectation operator associated with subjective probability weighting $\hat{E}^i_\xi$. Operator $\hat{E}^i_\xi$ applied to a random function $g(\xi)$ is defined as

$$\hat{E}^i_\xi g(\xi) = \hat{p}_i g(L) + (1 - \hat{p}_i) g(H), \tag{3}$$

where $\hat{p}_i$ is the weight A puts on the bad outcome L, rather than the good outcome H when her choice affects alter's payoff. The more $\hat{p}$ is bounded away from .5, the more pronounced the asymmetry between being responsible for a bad rather than a good outcome. (3) replaces $E(.)$ in (2).

In the *dictator* condition, the participant has to strike a balance between her own risk preference and the risk preferences of her counterpart. This changes her problem to (4)

$$\max_{q_i \in \{0..10\}} \left\{ E_\xi \mu_i u\left(x\left(q_i, \xi\right)/2, r_i\right) + \hat{E}^i_\xi \left(1 - \mu_i\right) u\left(x\left(q_i, \xi\right)/2, r_j\right) \right\}, \tag{4}$$

where $\mu_i \in [0, 1]$ is the weight that participant i attaches to her own utility.

In the *compromise* case, both participants' decisions are averaged, and the proceeds from the lottery are equally split. For participant i, the problem then looks as follows:

$$\max_{q_i \in \{0..10\}} \left\{ E_\xi \mu_i u\left(x\left(\frac{q_i + q_j}{2}, \xi\right)/2, r_i\right) + \hat{E}^i_\xi \left(1 - \mu_i\right) u\left(x\left(\frac{q_i + q_j}{2}, \xi\right)/2, r_j\right) \right\}. \tag{5}$$

In the *veto* condition, the problem is the same as in the *compromise* condition, except that the effective decision is the minimum of both participants' decisions, and not the average thereof. Consequently participant i solves:

$$\max_{q_i \in \{0..10\}} \left\{ E_\xi \mu_i u\left(x\left(\min\left\{q_i, q_j\right\}, \xi\right)/2, r_i\right) + \hat{E}^i_\xi \left(1 - \mu_i\right) u\left(x\left(\min\left\{q_i, q_j\right\}, \xi\right)/2, r_j\right) \right\}. \tag{6}$$

In Appendix C we explain how we parameterize this model. We find that participants are on average mildly risk averse (median $r_i = .5$, mean $r_i = 1.327$, sd $= 1.776$, min $= 0$, max = 5), sensitive towards being responsible for a bad outcome for their counterpart (median $\hat{p}_i = .569$, mean $\hat{p}_i = .480$, sd = .229, min = 0, max = .667), and put about the same weight on their own and on the risk preference of their counterpart when choices affect both of them (median $\mu_i = .431$, mean $\mu_i = .488$, sd = .471, min = 0, max = 1). To organize this multidimensional heterogeneity, we use a standard machine learning algorithm. With k-means, we find four distinct types.[10]

154 Type 1 participants are extremely risk averse themselves (mean $q_i = 0$), are hesitant to expose the other household member to risk (mean $\hat{p}_i = .600$), and do care little about the outcome of their counterpart when their own choice impacts them (mean $\mu_i = .712$). Consequently as *rulers*, they are not very inclined to make more risky choices (mean $q_i = 1.909$). This type makes slightly more risky choices as *dictator* (mean $q_i = 3.292$) and when choices are defined by the mean of both decisions (mean $q_i = 2.591$). Interestingly when the minimum of both decisions is decisive, choices are substantially more risky (mean $q_i = 3.636$). This suggests that type 1 participants find it more problematic to explicitly override the express will of their counterpart, rather than deviating from her known or estimated risk preference.

All remaining types are not chiefly characterized by their own risk aversion (189 type 2 participants: mean $r_i = .992$; 287 type 3 participants: mean $r_i = .658$; 358 type 4 participants: mean $r_i = .461$), but by the way how they react to treatment. Type 2 participants are not concerned about being held responsible for bad outcomes (mean $\hat{p}_i = .062$), but balance out the outcome for themselves and for their counterpart when there is a conflict between their own and their counterpart's utility (mean $\mu_i = .464$). As *rulers* (mean $q_i = 6.402$) and as *dictators* (mean $q_i = 5.534$), quite a few of them make fairly risky choices. Their choices are more moderate in the *compromise* (mean $q_i = 3.571$) and *veto* settings (mean $q_i = 4.582$).

Types 3 and 4 have similar risk preferences (type 3 mean $r_i = .658$, type 4 mean

[10] We standardize all three variables to make sure that they have symmetric impact on the classification. We repeat the procedure 20 times with randomly selected starting points and use majority vote for classification, to make sure that results do not depend on starting points. We use Euclidean distance. Classification is done in `R` with the `kmeans` command.

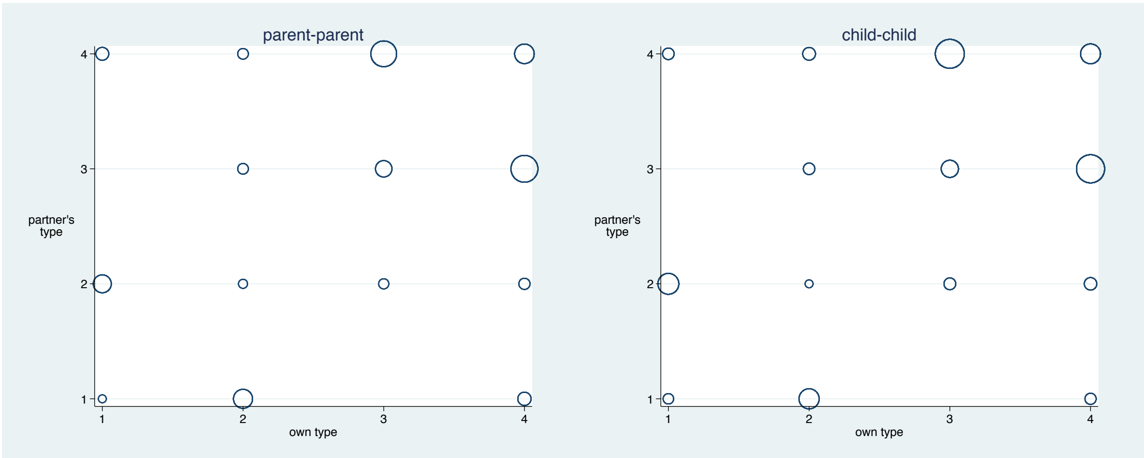
r_i = .460) and almost identical sensitivity towards responsibility for a bad outcome (type 3 mean $\hat{p}_i = .594$, type 4 mean $\hat{p}_i = .559$). Yet they radically differ in the weight they attach to their own outcome. Type 3 puts almost all the weight on her own utility (mean $\mu_i = .949$), while type 4 puts almost all the weight on her counterpart's utility (mean $\mu_i = .037$).

The final step is most important for our research question. We investigate whether preferences in households exhibit systematic patterns. If they do, this suggests that the missing motivational element is preference dependence. As a further safeguard, we split Figure 5 up by channels. In the case of a parent interacting with another parent, sorting through mating is a possible source of dependence. By contrast, if one child interacts with another, the only possible channel is co-development.

As Figure 5 shows, preference dependence is indeed pronounced. Type 1 individuals are typically together with a second individual that is moderately risk averse herself, but attentive to the extreme risk aversion of her counterpart (48 type 1 + type 2 pairs). Pairs of two type 3 (34 households) or two type 4 participants are more frequent (47 households). But type 3 + type 4 pairs are more prevalent (94 households). Matches of a type 1 or type 2 participant on the one hand with a type 3 or type 4 participant on the other hand are rare. We thus find two distinct types of households. In the first type of household, an extremely risk averse person lives together with another person who is considerate of this extreme preference. In the second type of household, both members are not extremely risk averse, but typically one of them is very sensitive to the preferences of the other, while the other is not. Whether pairs consist of parents or children has no discernible effect: the distributions are almost perfectly identical.

These visual impressions are supported by the regression of Table 4.[11] The reference category is an individual deciding *alone* that is paired with an individual of type 1. Recall that type 1 individuals are very risk averse. But as long as the other household

[11] Results are virtually the same if we add dummies that are 1 if the pair is composed of two parents, or of two children. The coefficients of the two dummies are far from significant. This shows that also statistical results do not depend on the composition of the pair, and hence on the channel on which preferences depend.



bubble size indicates frequency

Figure 5: Distribution of Types in Households

member decides on her own, she has no reason to take this preference into account. As the constant shows, the partners of type 1 individuals are typically quite prepared themselves to accept risk. Yet as *rulers* and in the *compromise* condition, they strongly reduce the level of risk (main effects of these two conditions), while they do less so as *dictators* and in the *veto* condition (main effects of these treatments). As Figure 5 shows, such individuals are often paired with type 1 individuals. Hence type 1 individuals are often deciding on behalf of a type 2 individual. Consistent with this explanation, choices of individuals paired with a type 2 individual are much less risky when *alone* (main effect of interacting with a type 2 individual). Yet they pay deference to the other risk preference of their partner whenever they decide on behalf of their counterpart (interactions with all other conditions).

Again from Figure 5 we see that individuals interacting with a type 3 individual frequently have type 4 themselves. When *alone*, these individuals accept even more risk than those interacting with a type 1 individual (main effect of interacting with a type 3 individual). Yet they reduce the risk exposure whenever they decide on behalf of the other household member (interactions with conditions). Finally those interacting

ruler	-2.769***	(.467)
dictator	-1.109*	(.462)
compromise	-2.547***	(.465)
veto	-1.047*	(.461)
type j 2	-7.065***	(.483)
type j 3	2.466***	(.454)
type j 4	-1.570***	(.424)
ruler * type j 2	7.807***	(.645)
ruler * type j 3	-1.540**	(.578)
ruler * type j 4	2.233***	(.552)
dictator * type j 2	6.395***	(.640)
dictator * type j 3	-2.328***	(.552)
dictator * type j 4	1.821**	(.548)
compromise * type j 2	5.880***	(.640)
compromise * type j 3	-1.427*	(.577)
compromise * type j 4	2.250***	(.550)
veto * type j 2	5.030***	(.637)
veto * type j 3	-2.023***	(.574)
veto * type j 4	1.624**	(.546)
cons	6.042***	(.369)
N		

dv: choice of lottery; Tobit (lower bound 0, upper bound 10). Standard errors for choices nested in households in parenthesis. *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 4: Respect for Other's Type

with a type 4 individual are predominantly of type 3 themselves. They accept less risk than those interacting with type 1 or type 3 individuals when alone (main effect of interacting with a type 4 individual). But whenever their choice affects their (type 4) counterpart, they adjust the level of risk upwards.

8.4 Personality, Household, and Demographic Characteristics

We conclude with exploratory analysis. Team composition was random and beyond our control. We only had 48 parent-child pairs, but 177 parent-parent pairs, and 269 child-child pairs. In the introduction we explain why the composition of the team might matter, in particular for the source of preference interdependence. Yet for neither of the five roles in which participants decide in the main experiment (*Alone, Ruler, Dictator, Compromise, Veto*) do we find that team composition has a significant effect.[12]

We further exploit the fact that our study is an integral part of a panel with very rich data. We use regression analysis to find out with which personality traits and demographic patterns our three model parameters are associated. Hence we regress r_i (own risk aversion), $\hat{p}$ (sensitivity towards being responsible for a bad outcome for their counterpart) and μ_i (the relative weight the individual assigns to her own preferences vs. those of the counterpart) on personality traits (Big 5), cognitive test scores, health status, labor market characteristics and socio-demographics. Whereas information on personality traits and cognitive tests comes from past waves of the survey, the information on labor market, health and socio-demographics comes from the same wave in which we perform our experiment.

Results are reported in an online appendix and an overview table can be found in appendix D. We see the following patterns: own risk aversion r_i is associated with agreeableness and neuroticism of ego, and extraversion of alter. It does not correlate with ego's cognitive ability, but correlates with the cognitive ability of alter. Moreover, r_i is strongly correlated with the current health status both of alter and ego, labor market characteristics of ego, and socio-demographics, especially the gender of each of the interacting partners. Sensitivity towards a bad outcome for the counterpart ($\hat{p}$) correlates with egos's openness and neuroticism, some labor market characteristics, and the gender of ego. Once we have controlled for ego's characteristics in the respective domain, we do not find significant correlations of $\hat{p}$ with alter's characteristics. The relative weight of ego's vs. alter's preferences (μ_i) exhibits correlations with cognitive abilities of ego, health status of both ego and alter, and also differs if ego is the child of alter. These correlation patterns suggest that the preference structure behind household

[12]Separately for each of these five roles, we regress choices on being a child, being of a different generation than the other household member, and the interaction of both. These additional regressions are available from the authors upon request.

decisions about taking risk is the product of a complex interplay of influences from different domains.

9 Discussion

Economic theory builds on methodological individualism. Individuals are assumed to maximize utility. The theory is interested in situations where an individual interacts with one or more other individuals. The preferences of the interaction partners matter. Yet in the standard model, the preferences of others exclusively matter as constraints. The individual is assumed to maximize her own utility, given this constraint. The individual is assumed to act strategically, and exploit any advantage the opportunity structure might provide. Remarkably, we find no sign of such behavior within households; participants even play dominated strategies.

An important strand of behavioural theory focuses on non-standard preferences. It assumes a richer utility function. One prominent extension is social preferences. The utility of ego partly depends on outcomes of alter, or on the way how alter will perceive ego's intentions. Preferences are still assumed to be independent. But ego derives utility from taking alter's preferences into account when choosing her action. We adapt the concept of social preferences to our setting and define an individual as holding social preferences if she adapts her choice to the known or expected risk preferences of another household member with whom she interacts. In a strict sense, a model of social preferences is also clearly violated in our data. When participants decide on behalf of another household member, with no material consequences for themselves, many of them choose a level of risk exposure that deviates from the known risk preference of the other household member. Yet, they at least exhibit some sensitivity towards the risk preferences of their counterpart if their choices also affect the risk exposure of their counterpart.

Our data suggest that, for understanding risk taking in households, one should allow for the interdependence of preferences. Dependence may originate on two channels: sorting, and preference formation. On the first channel, preferences have formed exogenously, but individuals have taken the preferences of their future partner into account when mating. On the second channel, one allows for preferences to be shaped or changed over time by interacting with other household members.

While we find strong signs of preference dependence, on both channels, the risk preferences of household members do not seem to simply converge: when deciding on their own, the choices of the two household members are substantially more divergent than when their decision affects the other household member. Living together does not homogenize, but it makes sensitive. Using a formal model, and machine learning methods, we find patterned heterogeneity. There are four characteristic types of preferences, and, most importantly, two predominant ways how individuals match.

We also make use of the rich information in the SOEP to explore potential factors behind subjects' estimated preferences towards risk. We find that risk aversion, the willingness to defer to the preferences of the other household member, and to expose her to risk, correlate with personality traits, performance in cognitive tests, health, labour market status, demographic characteristics and the relationship between both subjects. Common history seems to matter.

The main limitation of this study is inherent in the research question: household composition, the personality of mating partners, and the longterm influences household members have on the (risk) preferences of each other, cannot be randomly assigned. Preference dependence can only be observed, not manipulated. In this paper we parry the methodological challenge with triangulation. We elicit five choices per participant, and can exclude that predominant choice patterns are exclusively driven by the (short run) maximization of individual risk preferences, and by social preferences in the form of respect for the known or expected risk preference of a second household member. Two further observations suggest that the missing element is indeed preference dependence: household members do not need explicit information about another household member's choice when *alone* to estimate her risk preference. And there are characteristic choice patterns not only at the individual, but also at the household level. We further benefit from the fact that we could study risk taking of household members in a large, representative sample. This is best we could do to make it likely that our findings extrapolate beyond our sample.

In and of itself, each of the five choices is straightforward. The decision sheets made it very easy to see both the risk, and the potential for gain, when choosing any one of the lotteries (see Appendix A). The decision sheet for part 2 of the experiment made it also very transparent in which ways the four scenarios differ (see Appendix A). Verbal instructions made it clear that only one of these four situations would ultimately be payoff relevant, and that roles would only be determined after the entire interview (for the protocol followed by interviewers, see Online Appendix C.3). Still we use the strategy method, and only 1 of 5 households is remunerated. This makes the decisions more "cold". Yet it has been shown that, generally, the strategy method is behaviorally valid (Fischbacher et al., 2012).

As Figure 3 shows, choices in the second part of the experiment are substantially more homogeneous than in the first part. We do, however, have no reason to be concerned about regression to the mean. If choices are noisy, or only measured with error, this disturbance should affect *all five* choices. Regression to the mean cannot explain why all choices which affect the other household members are systematically more homogeneous than choices participants make when alone.

We have offered a formal way of characterizing the heterogeneity in the choices household members make if these choices also affect another household member. This invites an interesting next endeavour. In the first step, one uses this formalization, and tests identical with or similar to ours, to classify household members and households. In the second step one uses this information to assign individuals or households to different tasks in which this individual or joint trait should make a difference. Does the trait have predictive power in other domains, like health risk, or risk for social reputation, or even beyond risk taking? It would be particularly interesting to learn how the patterns that characterize risk taking within households translate to risks households, or household members, take when this affects third parties. We leave this to future work.

With our design, we can exclude (short run) strategic behavior, and strict respect for the risk preference of the counterpart. We find indicators of preference dependence. An important next step would be defining and isolating the exact effect of preference dependence. Are household members merely refraining from ignoring the risk preferences of each other? Are they exploiting the opportunity for influencing the further development of the risk preference? Are they reacting to a perceived difference in risk preferences by acting paternalistically?

For many individually and socially important problems, individuals do not decide as atoms. They are embedded into a more or less stable social context. As our experiment shows, this context is more than a constraint for the individual maximization of profit. It is also only imperfectly captured by social preferences. The context shapes the preferences the individual expresses. Yet not all contexts are alike. This is particular holds for households. If an analyst, or a policy maker for that matter, is interested in the choices that can be attributed to households, it is important to open the black box of the household, and to discern typical choices patterns within the household. Our paper has done so for one practically important domain: decisions about financial risk.

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A Games

For complete wording of the instructions, please see the online appendix.

First Part of the Experiment

Please tick the lottery you want to chose. You can only tick a single lottery.

Nr. of lottery	event (probability)	payoff	your chosen lottery
1	high (50%)	10 €	
	low (50%)	10 €	
2	high (50%)	12 €	
	low (50%)	9 €	
3	high (50%)	14 €	
	low (50%)	8 €	
4	high (50%)	16 €	
	low (50%)	7 €	
5	high (50%)	18 €	
	low (50%)	6€	
6	high (50%)	20 €	
	low (50%)	5 €	
7	high (50%)	22 €	
	low (50%)	4 €	
8	high (50%)	24 €	
	low (50%)	3 €	
9	high (50%)	26 €	
	low (50%)	2 €	
10	high (50%)	28 €	
	low (50%)	1 €	
11	high (50%)	30 €	
	low (50%)	0 €	

Second Part of the Experiment

In this part of the experiment, you are making 4 choices. After you have made your choices, it is randomly determined which of the 4 choices is relevant. Please do therefore take all 4 choices seriously.

In this part of the experiment, the choice you make also matters for the second member of the household who participates in the experiment.

For choices 1 and 2, eventually only the choice of one of the participants is relevant. In the table below we have called this participant A. Who of you has this role is, however, only determined afterwards and randomly. Please do therefore make a choice as if you knew that it is relevant.

The four situations differ in two dimensions: whose choice is relevant (only A's choice, or the choices of both participants?). And for who do these choices matter (only for B, or for A and B?). If eventually the choices matter for A and B, the four situations differ by the way that the lottery is selected that will be paid out. For detail, please consult the header of the table below.

Please select for each of the four situations one lottery. The Interviewer will have chance decide which situation is relevant, and will play it out.

B Strategic Behavior

There are two participants A and B. Let q_i, $i \in \{A, B\}$, denote i's investment decision. $x(q, \xi)$ is the game's payoff that depends on the investment and realization of a random draw ξ. The participants' utility functions $u_i(x) \equiv u(x; r_i)$, $i \in \{A, B\}$, are known up to a single parameter r_i. This parameter r_i is a measure of i's risk-aversion and at the outset is the participant's private information. When *alone*, i's choice q_i^* is determined by (7)

$$\max_{q_i \in \{0..10\}} \{E_\xi u(x(q_i, \xi), r_i)\}. \tag{7}$$

	situation		1	2	3	4
	who decides?		A	A	A and B	A and B
	who is affected?		B	A and B	A and B	A and B
	how is the outcome determined?		A's decision	A's decision	mean	lowest number of lottery
Nr. of lottery	event (probability)	payoff				
1	high (50%)	10 €				
	low (50%)	10 €				
2	high (50%)	12 €				
	low (50%)	9 €				
3	high (50%)	14 €				
	low (50%)	8 €				
4	high (50%)	16 €				
	low (50%)	7 €				
5	high (50%)	18 €				
	low (50%)	6€				
6	high (50%)	20 €				
	low (50%)	5 €				
7	high (50%)	22 €				
	low (50%)	4 €				
8	high (50%)	24 €				
	low (50%)	3 €				
9	high (50%)	26 €				
	low (50%)	2 €				
10	high (50%)	28 €				
	low (50%)	1 €				
11	high (50%)	30 €				
	low (50%)	0 €				

In the *compromise* condition, both participants' decisions are averaged, and the proceeds from the lottery are equally split. For participant i, the problem now looks as follows:

$$\max_{q_i \in \{0..10\}} \left\{ E_\xi u \left(x \left(\frac{q_i + q_j}{2}, \xi \right) /2, r_i \right) \right\}. \tag{8}$$

The change in the participant's choice between problems (7) and (8) reflects on her expectation of her partner's behavior when she solves the same problem (8).[13] If i expects her partner j to make an investment lower than i's choice in (7), then i will compensate it by investing more herself. In the other direction, if the partner's choice is expected to be higher, then i will diminish her investment compared to (7).

If both participants are perfectly prevoyant, they anticipate and try to counteract this compensation. The game has multiple equilibria, with corresponding degrees of compensation. As participants decide simultaneously, and cannot communicate, there is a risk of coordination failure. In the *transparency* condition, choices q_i^*, q_j^* can be inferred. In the *intransparency* condition, the participant can work with her belief $E(q_{-k}^*)$. If $q_i^* < q_j^*$, j would counteract any attempt by i to misrepresent her risk preference and set $\hat{q}_i = q_i^* \pm x_i$ by choosing $\hat{q}_j = q_j^* \mp x_j$. $\bar{q}$ remains unchanged as long as both choose the same x. Now the action space is constrained to $\hat{q}_k \in [0, 10]$. If $q_i^* < 5, q_j^* > 5$ the constraint binds for both household members, so that $\bar{q} = 5$. Yet if $q_i^* < 5, q_j^* < 5, q_i^* < q_j^*$ or if $q_i^* > 5, q_j^* > 5, q_i^* > q_j^*$, the constraint only binds for i. The equilibrium outcome is $\bar{q}^* = \hat{q}_j$ in both cases implying that j gets her preferred choice. There are still multiple equilibria.

C Parameterization of the Model

Closed-form solutions for r_i, $\hat{p}_i$ and μ_i can be obtained once we fix the functional form of theutility function $u_i(x) \equiv u(x; r_i)$. For parameterization, we use CRRA[14] and hence assume

$$u(x; r_i) = \frac{1}{1 - r_i} x^{1 - r_i}$$

[13]To obtain the partner's problem, interchange indices i and j in (8).

[14]See Chiapopri, Paiella (2008) on the validity of assuming CRRA in this setting.

where $r_i \in (0,1)$.

Solving for r_i. Problem 7 becomes:

$$\max_{q_i \in \{0..10\}} \{E_\xi u(x(q_i,\xi), r_i)\} = \max_{q_i \in \{0..10\}} \frac{1}{2}\left(\frac{1}{1-r_i}(10-q_i)^{1-r_i} + \frac{1}{1-r_i}(10+2q_i)^{1-r_i}\right)$$

The objective function is concave, the first order condition is given by

$$(10-q_i)^{-r_i} = 2(10+2q_i)^{-r_i},$$

which is equivalent to

$$r_i \ln\left(\frac{10+2q_i}{10-q_i}\right) = \ln 2.$$

Hence, observing investment choice q_i^1 in the first part of the experiment (*alone*), we can calculate i's risk aversion coefficient $r_i = \ln 2/\ln\left(\frac{10+2q_i}{10-q_i}\right)$. The values of r_i for integer q_i^1's are given in Table 5.[15]

q_i^1	0	1	2	3	4	5	6	7	8	9	10
r_i	$+\infty$	2.41	1.24	0.84	0.63	0.50	0.41	0.33	0.27	0.21	0

Table 5: Stage 1 choices and the corresponding relative risk aversion coefficients if utility functions are of CRRA type

Solving for $\hat{p}_i$

From (3) we have

$$\hat{p}_i(10-q_i)^{-r_j} = 2(1-\hat{p}_i)(10+2q_i)^{-r_j},$$

[15]In order not to lose data from participants who choose $q_i^1 = 0$ in estimating $\hat{p}_i$ and μ_i, in our estimations we set $r_i(q_i^1 = 0)$ to 5.)

which is equivalent to[16]

$$\hat{p}_i = \frac{2\,(10-q_i)^{r_j}}{2\,(10-q_i)^{r_j} + (10+2q_i)^{r_j}}.$$

Solving for μ_i. With CRRA utility functions, Problem (7) becomes

$$\max_{q_i \in \{0..10\}} \left\{ E_\xi \left[\mu_i u\left(x\left(q_i,\xi\right)/2, r_i\right) + \left(1-\mu_i\right) u\left(x\left(q_i,\xi\right)/2, r_j\right)\right]\right\}$$

$$= \max_{q_i \in \{0..10\}} \left\{ \frac{\mu_i}{2}\left(\frac{1}{1-r_i}\left(\frac{10-q_i}{2}\right)^{1-r_i} + \frac{1}{1-r_i}\left(\frac{10+2q_i}{2}\right)^{1-r_i}\right) + \frac{1-\mu_i}{2}\left(\frac{1}{1-r_j}\left(\frac{10-q_i}{2}\right)^{1-r_j} + \frac{1}{1-r_j}\left(\frac{10+2q_i}{2}\right)^{1-r_j}\right)\right\}$$

The objective function is concave, the first order condition is given by

$$\frac{\mu_i}{2}\left(-\frac{1}{2}\left(5-0.5q_i\right)^{-r_i} + \left(5+q_i\right)^{-r_i}\right) + \frac{1-\mu_i}{2}\left(-\frac{1}{2}\left(5-0.5q_i\right)^{-r_j} + \left(5+q_i\right)^{-r_j}\right) = 0, \quad (9)$$

which implies

$$\mu_i = \frac{-o_l^{-r_j} + 2o_h^{-r_j}}{-o_l^{-r_j} + 2o_h^{-r_j} - 2o_h^{-r_i} + o_l^{-r_i}}, \quad (10)$$

using $o_l := 5 - \frac{1}{2}q_i$ and $o_h := 5 + q_i$.[17]

D Background Information and Model Parameters

[16] With our design, r_i can be 0, and mathematically $0^{q_i<1}$ is ∞ in the limit. As $\hat{p}_i \in [0,1]$, we map $\hat{p}(r_i = 0, q_i < 1)$ into 1.

[17] We again need adjustments to make sure we do not lose data. Mathematically, with $r_i > 0$, $0^{-r} \in \mathbb{C}$. To keep such datapoints, we use $o_l^{-r} = .1$. Mathematically, the denominator of (10) can be 0. We would lose datapoints as we cannot divide by 0. In such cases, we set the denominator to .1. Finally, as our model defines $\mu_i \in [0,1]$, we map $\tilde{\mu}_i < 0 \rightarrow \mu_i = 0$, and $\tilde{\mu}_i > 1 \rightarrow \mu_i = 1$.

ego	alter	μ_i	$\hat{p}$	rra
Personality Traits (Big 5):				
openness			+	
agreeableness				+
neuroticism			+	+
	extraversion			-
Cognitive Tests:				
	symbol correspondence	+		
	word recognition			-
Health Characteristics:				
good health		+		+
balanced				-
	pain	+		+
Labor Market Characteristics:				
income			-	-
hours at work				-
atypical job			+	
typical job				-
Socio-Demographics:				
child of alter		-		
female			+	+
has children				+
	female			-

Table 6: Significant (positive or negative) correlations

E Online Appendix

E.1 Background Information, in Detail

	(1)	(2)	(3)	(4)	(5)	(6)
	μ_i	μ_i	$\hat{p}$	$\hat{p}$	rra	rra
Openness (ego)	-0.00	0.00	0.00	0.00	0.01	0.01
	(0.01)	(0.01)	(0.00)	(0.00)	(0.02)	(0.02)
Conscientiousness (ego)	-0.01	-0.01	-0.00	-0.00	0.01	0.01
	(0.01)	(0.01)	(0.00)	(0.00)	(0.03)	(0.03)
Extraversion (ego)	0.01	0.01	-0.00	-0.00	-0.04	-0.04
	(0.01)	(0.01)	(0.00)	(0.00)	(0.03)	(0.03)
Agreeableness (ego)	0.00	0.00	0.00	0.01	0.08**	0.08**
	(0.01)	(0.01)	(0.00)	(0.00)	(0.03)	(0.03)
Neuroticism (ego)	0.01	0.01	0.01**	0.01**	0.06***	0.06***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.02)	(0.02)
Openness (alter)		-0.01		0.01*		0.03
		(0.01)		(0.00)		(0.02)
Conscientiousness (alter)		0.01		-0.00		0.04
		(0.01)		(0.00)		(0.03)
Extraversion (alter)		0.00		-0.00		-0.05*
		(0.01)		(0.00)		(0.03)
Agreeableness (alter)		-0.00		-0.01		-0.01
		(0.01)		(0.00)		(0.03)
Neuroticism (alter)		-0.00		-0.00		-0.03
		(0.01)		(0.00)		(0.02)
Constant	0.42***	0.48***	0.41***	0.44***	-0.09	-0.24
	(0.12)	(0.17)	(0.06)	(0.08)	(0.45)	(0.61)
Observations	951	924	951	924	951	924
R^2	0.00	0.01	0.01	0.02	0.02	0.03

Table 7: Explaining μ, $\hat{p}$ and r with Big5

	(1) μ_i	(2) μ_i	(3) $\hat{p}$	(4) $\hat{p}$	(5) rra	(6) rra
Symbol correspondence 30sec (ego)	-0.00	-0.01	0.00	-0.00	-0.01	-0.01
	(0.00)	(0.01)	(0.00)	(0.00)	(0.02)	(0.02)
Words recognition (ego)	0.00	0.01	0.00	0.00	-0.01	-0.00
	(0.00)	(0.01)	(0.00)	(0.00)	(0.02)	(0.02)
Symbol correspondence 30sec (alter)		0.01**		0.00		-0.01
		(0.01)		(0.00)		(0.02)
Words recognition (alter)		0.00		-0.00		-0.04**
		(0.01)		(0.00)		(0.02)
Constant	0.43***	0.22	0.44***	0.43***	1.85***	2.87***
	(0.14)	(0.18)	(0.07)	(0.09)	(0.52)	(0.67)
Observations	871	802	871	802	871	802
R^2	0.00	0.01	0.00	0.00	0.00	0.01

Table 8: Explaining μ, $\hat{p}$, and r with SOEP measures for cognitive ability

Table 9: Explaining μ, $\hat{p}$, and r with SOEP measures for health

	(1) μ_i	(2) μ_i	(3) $\hat{p}$	(4) $\hat{p}$	(5) rra	(6) rra
Sleep 7 or 8 hours per night (ego)	-0.01	-0.00	0.02	0.02	-0.10	-0.09
	(0.03)	(0.03)	(0.02)	(0.02)	(0.12)	(0.12)
No health problems after stairs (ego)	-0.01	-0.02	0.00	-0.00	-0.15	-0.17
	(0.03)	(0.03)	(0.02)	(0.02)	(0.13)	(0.13)
Good health self-assessed (ego)	0.09***	0.10***	-0.01	-0.01	0.22*	0.22*
	(0.03)	(0.03)	(0.02)	(0.02)	(0.13)	(0.13)
Time pressure often or always (ego)	-0.05	-0.05	0.03	0.03	-0.09	-0.11
	(0.04)	(0.04)	(0.02)	(0.02)	(0.14)	(0.14)
Feeling low (ego)	0.04	0.04	-0.01	-0.01	0.04	0.05
	(0.04)	(0.04)	(0.02)	(0.02)	(0.14)	(0.14)
Feeling balanced (ego)	0.02	0.02	0.01	0.02	-0.27**	-0.24*
	(0.04)	(0.04)	(0.02)	(0.02)	(0.14)	(0.14)
Medium or higher energy levels (ego)	-0.07*	-0.07*	-0.00	-0.00	-0.02	-0.01
	(0.04)	(0.04)	(0.02)	(0.02)	(0.14)	(0.14)
Being in pain sometimes or more often (ego)	-0.01	-0.01	-0.01	-0.01	0.02	0.02
	(0.03)	(0.03)	(0.02)	(0.02)	(0.13)	(0.13)

Sleep 7 or 8 hours per night (alter)		0.01		0.01		-0.10
		(0.03)		(0.02)		(0.12)
No health problems after stairs (alter)		0.06		0.02		0.16
		(0.03)		(0.02)		(0.13)
Good health self-assessed (alter)		-0.06		-0.02		0.08
		(0.03)		(0.02)		(0.13)
Time pressure often or always (alter)		-0.01		0.03*		0.09
		(0.04)		(0.02)		(0.14)
Feeling low (alter)		0.03		0.01		0.11
		(0.04)		(0.02)		(0.14)
Feeling balanced (alter)		0.00		0.01		0.00
		(0.04)		(0.02)		(0.14)
Medium or higher energy levels (alter)		0.03		-0.02		0.07
		(0.04)		(0.02)		(0.14)
Being in pain sometimes or more often (alter)		0.07**		0.00		0.30**
		(0.03)		(0.02)		(0.13)
Constant	0.50***	0.43***	0.47***	0.45***	1.53***	1.23***
	(0.05)	(0.07)	(0.02)	(0.03)	(0.19)	(0.26)
Observations	985	982	985	982	985	982
R^2	0.01	0.02	0.00	0.01	0.01	0.02

	(1)	(2)	(3)	(4)	(5)
Net personal income (ego)	-0.00	-0.00			-0.00
	(0.00)	(0.00)			(0.00)
Contractual working hours (ego)	-0.00		-0.00		-0.00
	(0.00)		(0.00)		(0.00)
Atypical employment (ego)	-0.04			-0.05	-0.06
	(0.04)			(0.04)	(0.05)
Typical employment (ego)	0.00			-0.01	0.00
	(0.05)			(0.03)	(0.05)
Net personal income (alter)					0.00
					(0.00)
Contractual working hours (alter)					0.00
					(0.00)
Atypical employment (alter)					-0.04
					(0.05)
Typical employment (alter)					0.01
					(0.05)
Constant	0.50***	0.49***	0.49***	0.50***	0.49***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Observations	988	988	988	988	988
R^2	0.00	0.00	0.00	0.00	0.01

Table 10: Explaining μ with SOEP measures for labour

	(1)	(2)	(3)	(4)	(5)
Net personal income (ego)	-0.00**	-0.00**			-0.00**
	(0.00)	(0.00)			(0.00)
Contractual working hours (ego)	0.00		-0.00		0.00
	(0.00)		(0.00)		(0.00)
Atypical employment (ego)	0.05**			0.04**	0.04*
	(0.02)			(0.02)	(0.02)
Typical employment (ego)	0.02			-0.01	0.02
	(0.02)			(0.02)	(0.02)
Net personal income (alter)					0.00*
					(0.00)
Contractual working hours (alter)					-0.00
					(0.00)
Atypical employment (alter)					-0.01
					(0.02)
Typical employment (alter)					0.02
					(0.02)
Constant	0.48***	0.49***	0.48***	0.47***	0.47***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	988	988	988	988	988
R^2	0.01	0.00	0.00	0.01	0.02

Table 11: Explaining $\hat{p}$ with SOEP measures for labour

	(1)	(2)	(3)	(4)	(5)
Net personal income (ego)	-0.00**	-0.00***			-0.00**
	(0.00)	(0.00)			(0.00)
Contractual working hours (ego)	-0.00		-0.01**		-0.00
	(0.00)		(0.00)		(0.00)
Atypical employment (ego)	0.09			-0.01	0.06
	(0.16)			(0.15)	(0.17)
Typical employment (ego)	-0.09			-0.34***	-0.10
	(0.18)			(0.13)	(0.19)
Net personal income (alter)					0.00
					(0.00)
Contractual working hours (alter)					0.00
					(0.00)
Atypical employment (alter)					-0.03
					(0.17)
Typical employment (alter)					-0.03
					(0.19)
Constant	1.48***	1.49***	1.44***	1.46***	1.46***
	(0.09)	(0.07)	(0.08)	(0.09)	(0.10)
Observations	988	988	988	988	988
R^2	0.01	0.01	0.01	0.01	0.01

Table 12: Explaining r with SOEP measures for labour

	(1)	(2)	(3)	(4)	(5)
Being child of alter	-0.01	-0.12*			
	(0.14)	(0.07)			
Being parent of alter	0.16		0.03		
	(0.15)		(0.07)		
Being partner of alter	0.19			0.06	
	(0.13)			(0.05)	
Relationship lengths in years	-0.01				-0.02
	(0.03)				(0.02)
Relationship length, squared	0.00				0.00
	(0.00)				(0.00)
Constant	0.31*	0.49***	0.49***	0.43***	0.56***
	(0.17)	(0.02)	(0.02)	(0.05)	(0.08)
Observations	988	988	988	988	988
R^2	0.01	0.00	0.00	0.00	0.00

Table 13: Explaining μ with SOEP measures for relationship

	(1)	(2)	(3)	(4)	(5)
Being child of alter	-0.09	-0.05			
	(0.07)	(0.04)			
Being parent of alter	-0.08		-0.04		
	(0.07)		(0.04)		
Being partner of alter	-0.05			0.03	
	(0.07)			(0.02)	
Relationship lengths in years	-0.00				-0.00
	(0.01)				(0.01)
Relationship length, squared	0.00				0.00
	(0.00)				(0.00)
Constant	0.54***	0.48***	0.48***	0.45***	0.50***
	(0.08)	(0.01)	(0.01)	(0.02)	(0.04)
Observations	988	988	988	988	988
R^2	0.00	0.00	0.00	0.00	0.00

Table 14: Explaining $\hat{p}$ with SOEP measures for relationship

	(1)	(2)	(3)	(4)	(5)
Being child of alter	-0.02	0.30			
	(0.55)	(0.27)			
Being parent of alter	-0.34		0.00		
	(0.55)		(0.27)		
Being partner of alter	-0.43			-0.19	
	(0.51)			(0.19)	
Relationship lengths in years	-0.06				-0.03
	(0.10)				(0.09)
Relationship length, squared	0.00				0.00
	(0.01)				(0.01)
Constant	1.96***	1.31***	1.33***	1.49***	1.42***
	(0.65)	(0.06)	(0.06)	(0.18)	(0.31)
Observations	988	988	988	988	988
R^2	0.00	0.00	0.00	0.00	0.00

Table 15: Explaining r with SOEP measures for relationship

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age (ego)	0.00	0.00		0.00			0.00
	(0.00)	(0.00)		(0.00)			(0.00)
Female =1 (ego)	0.06		0.00	0.06			0.02
	(0.10)		(0.03)	(0.10)			(0.11)
Has children =1 (ego)	0.04				0.04		0.09*
	(0.04)				(0.03)		(0.05)
Married =1 (ego)	-0.01					-0.00	-0.03
	(0.04)					(0.04)	(0.08)
Age (alter)							-0.00
							(0.00)
Female =1 (alter)							-0.04
							(0.07)
Has children =1 (alter)							-0.07
							(0.05)
Married =1 (alter)							0.01
							(0.08)
Constant	0.45***	0.47***	0.49***	0.44***	0.47***	0.49***	0.50***
	(0.07)	(0.05)	(0.02)	(0.07)	(0.02)	(0.03)	(0.09)
Observations	988	988	988	988	988	988	988
R^2	0.00	0.00	0.00	0.00	0.00	0.00	0.01

Notes: Analogous tables for $\hat{p}$ and r produce insignificant coefficients.

Table 16: Explaining μ with SOEP measures for socio-demographics

E.2 Complete Translated Instructions

B001: Experiment Lottery Part 1

Begin block

Q001 - E01: Start Lottery

Single-coded

Before we begin the actual interview, I would like to ask you both whether you would be willing to participate in a small lottery. With a bit of luck, you can even win money.

Remark in case someone does not want to participate: Please read aloud: However, the lottery only works with 2 participants. Perhaps you, (INT: person who does not want to participate) would like to participate after all? If a person wants to participate in the lottery only, but not in the actual interview, there will be no lottery. Important: as long as the person can/wants to do the actual interview on any other day, the lottery can still take place. If no person present is willing to participate and other persons from the random selection are available, please ask these persons about their willingness to participate.

Normal

1. Both persons take part in the lottery.

2. One person takes part, or both take part, in the lottery.

Scripter notes: If E01=2, experiment abandoned, continue with actual interview.

Participation in experiment: exp_resp

Q002 - E02: Decision sheet 1 Distribution

Single-coded

First of all, I would like to explain what the lottery is about: The lottery consists of two parts: In each of the two parts, you will be asked to make different decisions that will allow you to make money. At the end of the lottery, a random number generator in the computer will decide whether the money will be paid out. The amount is influenced both by your choices and by a virtual coin toss at the end of the lottery. But I will tell you more about that later. Let us now begin with the first part. I will now give you both a decision sheet.

Please hand out a decision sheet to each participant.

Normal

1. Decision sheet 1 distributed (continue interview).

Q003 - E03: Decision sheet 1 Explanation

Single-coded

Before we start, I would like briefly to explain something about this decision sheet: As you can see, there are 11 games here. With each game, you can win two different amounts of money, with a 50/50 chance. In Game 1, for example, the possible win in both cases is 10 Euro. In Game 11, on the other hand, you can win either 30 Euro or 0 Euro. You can see what you can win in each game in the "Payout" column. A virtual coin toss later decides which of the two amounts wins in each game. With "Tails", the first amount from the payout column wins; with "Heads", the second amount from the payout column wins.

For now, however, it is only a question of choosing one of the 11 games. I would ask you please to sit facing away from each other, so that neither of you can look into the other's decision sheet. It is also important that you do not talk about your decision. Subjects should sit in such a way that no one can look into the other person's decision sheet.

Normal

1. Subjects sit in such a way that no one can look into the other person's decision sheet (continue interview).

Q004 - E04: Decision sheet 1 Processing

Single-coded

Please write your name on the decision sheet. Whether you are player 1 or 2 is irrelevant for the time being.

Wait briefly until the subjects have written their name on the decision sheet. Then continue reading:

Please tick the game for which you have opted. Please begin now.

Please make a note of the time (as surreptitiously as possible) and count one minute. Subjects have already spent one minute. Please make your decision now.

Normal

1. Decisions were made by both subjects (continue interview).

Q005 - E05A: Decision sheet 1 Secrecy

Single-coded

When you have finished, please turn the page and return it to me.

Advise subjects that they may sit once again as they did at the beginning of the lottery.

I would like to ask you once again not to discuss the game.

Please collect the decision sheet as soon as it has been placed face-down on the table.

Normal

1. Both decision sheets have been collected (continue interview).

Scripter notes: If exp_split=1 Secrecy

Q006 - E05B: Decision sheet 1 Disclosure

Single-coded

Advise subjects that they may sit once again as they did at the beginning of the lottery.

Please inform the other player of your decision and discuss this. You have 2 minutes in total for this. Please start now. Please look at time and end the discussion after 2 minutes.

Normal

1. The 2 minutes are up (continue interview).

Scripter notes: If exp_split=2 Disclosure

Q007 - E06: Decision sheet 2 Distribution

Single-coded

I will now hand out another decision sheet to you. Before you start filling out the decision sheet, I would like to tell you something about the procedure. Please sit down again in such a way that nobody can look into the other person's decision sheet. Please do not talk while you are filling out the decision sheet.

As soon as the subjects are seated facing away from each other, please hand out the second decision sheet. Important: Make sure that the same person is player 1.

Normal

1. Decision sheet 2 distributed (continue interview).

Q008 - E07: Decision sheet 2 Explanation

Single-coded

First, please write your name again on the decision sheet.

Wait briefly until the subjects have written their name on the decision sheet.

In contrast to the first decision sheet, you will now find 4 scenarios, in each of which you will have to decide on a game. As you can see, Scenarios 1 and 2 have an "A" in the first place. A is the one whose game decision will be considered at the end. A virtual coin toss will decide at the end who is A. So at the moment we do not know who A is. However, both of you should decide as though you were A, i.e., the game decider.

In "Who gets a payout?", you will see who can win the money. Let's use an example: [name of player 1], let's say at the end of the lottery a random number generator in the computer decides that you are A. In scenario 1, you decide to play game 3, and a virtual coin toss at the end of the lottery indicates whether the first or second amount will be paid out. However, it is not you, but [name of player 2] who will get it. In scenario 2, once again, your decision to choose, [name of player 1], will again be taken into account. Here, however, you will also benefit: half of the amount won will be paid out to you and half to [name of player 2].

In scenarios 3 and 4, both your games will be taken into account. Scenario 3 averages the amount won, and this average is paid out to both of you. In scenario 4, the lowest game is taken into account and the amount is also paid out to both of you. If you, [name of player 1], have opted for game 2 and you, [name of player 2], for game 8, the game of [name of player 1] will be paid out. But again, a virtual coin toss will decide here how much the amount will be: in game 2, you would both receive 9 Euro for heads, and 12 Euro for tails.

In total you have to decide on 4 games, i.e., one game per scenario. That simply means one cross per column. When you are done with this, please turn the sheet over again and give it to me. Please start now.

Please make a note of the time (as surreptitiously as possible) and count two minutes. Should the subject not have finished after 2 minutes, please read:

Please finish up now.

Please collect the decision sheet as soon as it has been placed face-down on the table. Ask subjects to sit once again as they did at the beginning of the lottery.

Normal

1 Decision sheet 2 collected (continue interview).

Scripter notes: Please show names of players 1 and 2 at the appropriate point.

Q009 - E08: End of Part 1

Single-coded

The first part of the lottery is now over. I will just quickly transfer your games marked on the decision sheets to the computer. Then I will conduct the actual interview with you one after the other. After that I will ask the two of you to sit down at a table together again so that we can determine if you have won any money, and how much.

Please ascertain briefly which of the two persons wishes to be interviewed first. That person will need to be patient for a moment, while you transfer the results. The other person will be needed only once the first interview has ended. Please transfer all games from decision sheets 1 and 2 into the CAPI.

Normal

Continue interview.

Q010 - exp_erg1: Decision sheet 1: Decision player 1

Single-coded

Decision sheet 1

Player 1 (name of player 1)

Please transfer the decision made by (name of player 1) from paper to the computer.

Please click the number of the lottery that test C has chosen.

Normal

1 Game 1

2 Game 2

3 Game 3

4 Game 4

5 Game 5

6 Game 6

7 Game 7

8 Game 8

9 Game 9

10 Game 10

11 Game 11

Scripter notes: After "Player 1", please show the name of the player.

Q011 - exp_erg2: Decision sheet 1: Decision player 2

Decision sheet 1

Player 2 (name of player 2)

Please transfer the decision made by (name of player 2) from paper to the computer.

Please click the number of the lottery that test C has chosen.

Normal

1 Game 1

2 Game 2

3 Game 3

4 Game 4

5 Game 5

6 Game 6

7 Game 7

8 Game 8

9 Game 9

10 Game 10

11 Game 11

Scripter notes: Please show player 2s name.

Q012 - exp_erg3: Decision sheet 2: Decision scenario 1 player 1

Single-coded

Decision sheet 2

Player 1 (name of player 1)

Scenario 1

Please transfer scenario 1 for (name of player 1) from paper to the computer.

Please click the number of the lottery that (name of player 1) has chosen for scenario 1!

Normal

1 Game 1

2 Game 2

3 Game 3

4 Game 4

5 Game 5

6 Game 6

7 Game 7

8 Game 8

9 Game 9

10 Game 10

11 Game 11

Scripter notes: Please show player 1's name.

Q013 - exp_erg4: Decision sheet 2: Decision scenario 2 player 1

Single-coded

Decision sheet 2

Player 1 (name of player 1)

Scenario 2

Please transfer scenario 2 for (name of player 1) from paper to the computer.

Please click the number of the lottery that (name of player 1) has chosen for scenario 2!

Normal

1 Game 1

2 Game 2

3 Game 3

4 Game 4

5 Game 5

6 Game 6

7 Game 7

8 Game 8

9 Game 9

10 Game 10

11 Game 11

Scripter notes: Please show player 1's name.

Q014 - exp_erg5: Decision sheet 2: Decision scenario 3 player 1

Single-coded

Decision sheet 2

Player 1 (name of player 1)

Scenario 3

Please transfer scenario 3 for (name of player 1) from paper to the computer.

Please click the number of the lottery that (name of player 1) has chosen for scenario 3!

Normal

1 Game 1

2 Game 2

3 Game 3

4 Game 4

5 Game 5

6 Game 6

7 Game 7

8 Game 8

9 Game 9

10 Game 10

11 Game 11

Scripter notes: Please show player 1s name.

Q015 - exp_erg6: Decision sheet 2: Decision scenario 4 player 1

Single-coded

Decision sheet 2

Player 1 (name of player 1)

Scenario 4

Please transfer scenario 4 for (name of player 1) from paper to the computer.

Please click the number of the lottery that (name of player 1) has chosen for scenario 4!

Normal

1 Game 1

2 Game 2

3 Game 3

4 Game 4

5 Game 5

6 Game 6

7 Game 7

8 Game 8

9 Game 9

10 Game 10

11 Game 11

Scripter notes: Please show player 1's name.

Q016 - exp_erg7: Decision sheet 2: Decision scenario 1 player 2

Single-coded

Decision sheet 2

Player 2 (name of player 2)

Scenario 1

Please transfer scenario 1 for (name of player 2) from paper to the computer.

Please click the number of the lottery that (name of player 2) has chosen for scenario 1!

Normal

1 Game 1

2 Game 2

3 Game 3

4 Game 4

5 Game 5

6 Game 6

7 Game 7

8 Game 8

9 Game 9

10 Game 10

11 Game 11

Scripter notes: Please show player 2's name.

Q017 - exp_erg8: Decision sheet 2: Decision scenario 2 player 2

Single-coded Decision sheet 2

Player 2 (name of player 2)

Scenario 2

Please transfer scenario 2 for (name of player 2) from paper to the computer.

Please click the number of the lottery that (name of player 2) has chosen for scenario 2!

Normal

1 Game 1

2 Game 2

3 Game 3

4 Game 4

5 Game 5

6 Game 6

7 Game 7

8 Game 8

9 Game 9

10 Game 10

11 Game 11

Scripter notes: Please show player 2's name.

Q018 - exp_erg9: Decision sheet 2: Decision scenario 3 player 2

Single-coded

Decision sheet 2

Player 2 (name of player 2)

Scenario 3

Please transfer scenario 3 for (name of player 2) from paper to the computer.

Please click the number of the lottery that (name of player 2) has chosen for scenario 3!

Normal

1 Game 1

2 Game 2

3 Game 3

4 Game 4

5 Game 5

6 Game 6

7 Game 7

8 Game 8

9 Game 9

10 Game 10

11 Game 11

Scripter notes: Please show player 2's name instead of *.

Q019 - exp_erg10: Decision sheet 2: Decision scenario 4 player 2

Single-coded

Decision sheet 2

Player 2 (name of player 2)

Scenario 4

Please transfer scenario 4 for (name of player 2) from paper to the computer.

Please click the number of the lottery that (name of player 2) has chosen for scenario 4!

Normal

1 Game 1

2 Game 2

3 Game 3

4 Game 4

5 Game 5

6 Game 6

7 Game 7

8 Game 8

9 Game 9

10 Game 10

11 Game 11

Scripter notes: Please show player 2's name.

Q020 - E19: Interview Parking

Text

Dear Interviewer. Please park the interview here! You can park the interview by entering any date in the near future via "Actions" -> "Date" and then ending the CAPI call.

–> Then please call up the project "110461 SOEP IS 2016" and conduct the "normal" interview with both participants one after the other.

–> After that, please call up the experiment parked with the date option again and continue the experiment with both participants.

B001: Experiment lottery Part 1

End block

B002: Experiment lottery Part 2

Begin block

Q021 - E20: Overview decisions

Text

Please hand the two decision sheets to each of the two people.

Now, let us get back to the lottery.

Reminder:

(Name of player 1), you chose game number (game number) on decision sheet 1.

On decision sheet 2, you chose games (game number), (game number), (game number), and (game number).

(Name of player 2), you chose game number (game number) on decision sheet 1.

On decision sheet 2, you chose games (game number), (game number), (game number), and (game number).

Scripter notes: Please enter the names of players 1 & 2 and the numbers of the lotteries chosen on decision sheets 1 & 2.

Q022 - exp_z1: Random decision Tails/Heads Decision sheet 1 player 1

Single-coded

Now, a series of random decisions will be made to find out what amounts of money you can both win. Whether you actually win this amount will be decided in the end.

First, decision sheet 1: We will now use the computer to make a coin toss for [name of player 1]. This means that we have programmed a random number generator in the computer, which will determine, with a probability of 50 to 50, whether the result is heads or tails. If the result is "tails", the first amount of the game you selected wins. If the result is "heads", the second amount wins. Please turn the screen in such a way that the subject can click "Continue to virtual coin toss", in order to start the random decision.

Player 1: (name of player 1), please click "Continue to virtual coin toss" to start the random decision.

The result of the random coin toss is:

Normal

1 Tails

2 Heads

Scripter notes: Please show player 1's name.

Q023 - exp_euro1: Amount Decision sheet 1 for player 1

Numeric

At this point, you would win (sum).

Scripter notes: If "Go back" has been clicked, please show the following screen after "Continue to virtual coin toss": "Warning: You may only carry out each random decision once. The result was (heads/tails)."

Sum that can be won: exp_euro1

Q024 - exp_z2: Random decision Tails/Heads Decision sheet 1 player 2

Single-coded

Now we get to (name of player 2): Please click "Continue to virtual coin toss", in order to start the random decision.

The result of the random coin toss is:

Normal

1 Tails

2 Heads

Scripter notes: Please show player 2's name and the corresponding sum.

Q025 - E23 Result decision sheet 1 player 2

Numeric

At this point, you would win (sum).

Scripter notes: If "Go back" has been clicked, please show the following screen after "Continue to virtual coin toss": "Warning: You may only carry out each random decision once. The result was (heads/tails)."

Q026 - exp_z3 Random decision scenario for decision sheet 2

Single-coded

For decision sheet 2, we first need to determine which of the four scenarios will be used. To do this, we will throw the dice virtually. We have again programmed a random generator that will randomly select one of the four scenarios. Please click now on "Continue to random selection".

The result of the random selection is scenario...

Normal

1 Scenario 1

2 Scenario 2

3 Scenario 3

4 Scenario 4

Q028 - exp_z4: Random decision for scenarios 1 & 2: Who is player A?

Single-coded

So we will play scenario (1/2). We will first randomly determine which of you will become player A, i.e., whose decision becomes relevant for the result. Again, the computer will make a random choice.

Please click "Continue to random selection".

Normal

1 Player 1

2 Player 2

Scripter notes: Please show the names of player 1 and player 2.

Q029 - E24_2: Result player A

Text

Not back

The result of the random selection is: (name of player 1/name of player 2) will become player A.

Scripter notes: If "Go back" has been clicked, please show the following screen after "Continue to random selection": "Warning: You may only carry out each random decision once. The result was (name of player 1/name of player 2)."

Q030 - exp_z5: Random decision Tails/Heads Decision sheet 2: Scenario 1 or 2

Single-coded

The decision made by (name of player 1/name of player 2) will become relevant, so we are going to play the game (number of game) in scenario (1/2).

Now we will proceed to another virtual coin toss, in order to determine whether the first or the second sum will win. If the result is "Tails", the first sum wins. If the result is "Heads", the second sum wins. (Name of player A), please now click "Continue to virtual coin toss", in order to start the random decision.

The result of the random coin toss is ...

Normal

1 Tails

2 Heads

Scripter notes: If scenario = 1,2

Please show the number of the game, the name of player A, and the number of the scenario.

Q031 - exp_euro2-3: Sum decision sheet 2. Scenario 1-2

Numeric

Not back

At this point, you would win (sum).

Scripter notes: If "Go back" has been clicked, please show the following screen after "Continue to virtual coin toss": "Warning: You may only carry out each random decision once. The result was (tails/heads)."

Sum that can be won for scenario 1: exp_euro2

Sum that can be won for scenario 2: exp_euro3

Q032 - exp_z6: Random decision Tails/Heads Decision sheet 2: Scenario 3 or 4

Single-coded

So we will play scenario (3/4).

We will toss the virtual coin once again, in order to determine whether the first or the second sum wins. If the result is "Tails", the first sum wins. If the result is "Heads", the second sum wins. Please now click "Continue to virtual coin toss".

The result of the random coin toss is:

Normal

1 Tails

2 Heads

Scripter notes: If scenario = 3,4

Please show the number of the scenario.

Q033a - exp_euro4: Sum Decision sheet 2: Scenario 3 for "Tails"

Numeric

Not back

At this point, you would win (sum).

Scripter notes: If "Go back" has been clicked, please show the following screen after "Continue to virtual coin toss": "Warning: You may only carry out each random decision once. The result was "Tails"."

Sum that can be won for scenario 3, coin toss shows Tails=exp_euro4

Q033b - exp_euro5: Sum decision sheet 2: scenario 3 for "Heads"

Numeric

Not back

At this point, you would win (sum).

Scripter notes: If "Go back" has been clicked, please show the following screen after "Continue to virtual coin toss": "Warning: You may only carry out each random decision once. The result was "Heads"."

Sum that can be won for scenario 3, coin toss shows Heads=exp_euro5

Q033c - exp_no Which player has the lowest number in scenario 4?

Single-coded

Which player has the lowest number in scenario 4?

Normal

1 Player 1

2 Player 2

3 Both players

Scripter notes: If "Go back" has been clicked, please show the following screen after "Continue to virtual coin toss": "Warning: You may only carry out each random decision once. The result was "Heads"."

Lowest number in scenario 4=exp_Nr

Q033d - exp_euro6: Sum decision sheet 2: scenario 4

Numeric

Not back

At this point, you would win (sum).

Scripter notes: If "Go back" has been clicked, please show the following screen after "Continue to virtual coin toss": "Warning: You may only carry out each random decision once. The result was "Heads"."

Sum that can be won for scenario 4=exp_euro6

Q034 - E27_1: Depiction of results Scenarios 1 & 2

Single-coded

Here, once again, all data and results are presented. This overview is intended as an aid, if there are any questions about how the money amounts won are achieved.

Depiction of results:

Decision sheet 1

PLAYER 1 = (name of player 1)

Chosen game: (no. of game)

Result of coin toss: (Heads/Tails)

Sum won in game: (sum)

PLAYER 2 = (name of player 2)

Chosen game: (no. of game)

Result of coin toss: (Heads/Tails)

Sum won in game: *

Decision sheet 2

Player A: (name of player 1/name of player 2)

Chosen game: (no. of game)

Result of coin toss: (Heads/Tails)

Sum won in game: (sum)

Normal

1 Continue with interview

Scripter notes: Please only show for scenarios 1 & 2.

Q035 - E27_2: Depiction of results Scenarios 3 & 4

Single-coded

Here, once again, all data and results are presented. This overview is intended as an aid, if there are any questions about how the money amounts won are achieved.

Depiction of results:

Decision sheet 1

PLAYER 1 = (name of player 1)

Chosen game: (no. of game)

Result of coin toss: (Heads/Tails)

Sum won in game: (sum)

PLAYER 2 = (name of player 2)

Chosen game: (no. of game)

Result of coin toss: (Heads/Tails)

Sum won in game: (sum)

Decision sheet 2

Chosen game (name of player 1): (no. of game)

Chosen game (name of player 2): (no. of game)

Result of coin toss: (Heads/Tails)

Sum won in game: (sum)

Normal

1 Continue with interview

Scripter notes: Please only show for scenarios 3 & 4.

Q036a - exp_euro7: Exact sum made in game

Numeric

Not back

In total, you have won (total sum) Euro.

Q036b - exp_euro8: Rounded sum made in game

Numeric

Not back

In your case, you would receive (show rounded sum) Euro.

Q036 - exp_z7: Random decision Payment (Number 1 wins)

Single-coded

Unfortunately, we are not able to pay out the prize for all participating households. Therefore, the random generator in the computer will again decide. The probability of your being among the lucky winners of the lottery is twenty percent. Please click "Go to lottery results" to see if you have won.

Normal

1 GO TO exp_euro9

2 GO TO Q8374

3 GO TO Q8374

4 GO TO Q8374

5 GO TO Q8374

Scripter notes: Please show result via answer items.

Q037 - exp_euro9: Sum paid out in case of win

Text

Congratulations!

You have won and will receive (sum) Euro.

Scripter notes: If "Go back" has been clicked, please show the following screen after "Continue to lottery result": "Warning: You may only carry out each random decision once. The result was (Win/No win).

Q038 - Q8374: No payment

Text

Unfortunately, you've been unlucky today.

I hope you had fun anyway!

Scripter notes: If "Go back" has been clicked, please show the following screen after "Continue to lottery result": "Warning: You may only carry out each random decision once. The result was (Win/No win).

B002: Experiment Lottery Part 2

End block

Q039 - ptext: Further information

Open

INFORMATION

Is there any further information about the interview?

Please use keywords

If no information, please click above!

Scripter notes: Please insert button "No information" in the above bar.