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ABSTRACT

Willingness to Take Risk: The Role of Risk Conception and Optimism*

We show that the disposition to focus on favorable or unfavorable outcomes of risky situations affects willingness to take risk as measured by the general risk question. We demonstrate that this disposition, which we call risk conception, is strongly associated with optimism, a stable facet of personality and that it predicts real-life risk taking. The general risk question captures this disposition alongside pure risk preference. This enlightens why the general risk question is a better predictor of behavior under risk across different domains than measures of pure risk preference. Our results also rationalize why risk taking is related to optimism.

JEL Classification: D91, C91, D81, D01

Keywords: risk taking behavior, optimism, preference measures, risk conception

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1 Introduction

Most decisions in economic and social life are taken under risk or uncertainty. Expected utility theory posits that risk preference determines behavior in these situations; and non-expected utility theory allows for reference points and risk perception (e.g. probability weighting) to matter for risky choice. In this paper, we demonstrate that risk taking behavior is also determined by the disposition to focus on favorable or unfavorable outcomes of risky choice, an important factor beyond curvature of utility and departures from linearity in probabilities. This disposition, which we call risk conception, is akin to a trait; it is strongly related to optimism, an enduring facet of personality (Carver and Scheier, 2014). We show that individuals differ systematically in the way how they conceive risky situations, and that these differences map into heterogeneity in risk taking behavior.

When it comes to predicting risky behavior across contexts, it is advantageous to have measures of all stable characteristics that determine risky choice, including risk conception. We argue that instruments and methods designed to reveal risk preference capture risk conception to different degrees. Typically these risk preference measures are based on a risky choice R that is a function of the underlying latent risk preference parameter r and a vector of other relevant factors X, i.e.,$R = f(r, X)$. Standard practice in economics is to create environments and elicitation mechanisms that control for X as much as possible in order to elicit r (see Charness et al., 2013, for a review). A prime example is an incentivized lottery choice in controlled environment. While such measures may be suited to reveal parameter r, their predictive power for real life risk taking may be comparatively low precisely because of their tight control of other factors that systematically and persistently affect decision making under risk or uncertainty. In contrast, survey instruments that lack this control, e.g., with respect to stake size and probabilities, may capture these elements and have stronger predictive power for different risky behaviors R across situations.

We focus on one such instrument, the "general risk question", which asks subjects "Are you generally a person who is willing to take risks or do you try to avoid taking risks?" on an 11-point Likert scale ranging from "not at all willing to take risks" to "very willing to take risks". This question has been shown to be a good predictor of risk taking behavior across different domains (e.g., Bonin et al., 2007; Caliendo et al., 2009; Grund and Sliwka, 2010; Jaeger et al., 2010; Dohmen et al., 2011; Lönnqvist et al., 2015).

We hypothesize that part of the variation in answers to the general risk question depends on respondents' disposition to focus on positive or negative outcomes of risk, and that this disposition is stable and systematic.

Our experimental results support these hypotheses. We find that the degree to which respondents focus on the positive or negative outcomes of risk when answering the general risk question is a strong predictor of their responses. We further show that this disposition is systematically related to optimism, a stable character trait whose importance has been long recognized in personality psychology (e.g., Carver et al., 2010; Carver and Scheier, 2014).[1] Furthermore, we show that optimism affects responses to the general risk question but that it does so mostly through respondents' focus on the positive or negative outcomes of risk rather than directly.

In light of this result, we use optimism as a proxy for people's disposition to focus on favorable/unfavorable outcomes of risk taking, and in the second step of our analysis, we examine whether optimism relates to risk taking behavior. We do so using (i) an incentivized measure of risk taking contained in our experimental dataset and (ii) self-reported real life behaviors from the German Socio-Economic Panel (henceforth SOEP). For both datasets, we find a significant association between risk taking behavior and optimism. We conclude that, in addition to being a proxy for pure risk preferences, the general risk question captures important personality characteristics

[1] In line with much of the personality psychology literature (Carver et al., 2010), we view optimism as a stable disposition (i.e., a personality trait) that affects beliefs in specific environments. There is initial evidence that this character trait also manifests itself in differential beliefs about uncertain events (see Felton et al., 2003, who show that in males optimism increases investment in stocks).

relevant for risk taking behavior, thereby providing a broader representation of the factors that should be taken into account when studying decision making under risk.

The remainder of the paper is structured as follows. Section 2 introduces the design of our experiment. Section 3 establishes the link between the way how people conceive risk, their responses to the general risk question, and optimism. Section 4 investigates the relationship between optimism, the general risk question and risk taking behavior. Section 5 discusses the results and concludes.

2 The Experiment

The data we analyze in this paper were collected during a longitudinal experiment consisting of three one-hour sessions run in three consecutive weeks. The experiment was computerized using z-Tree (Fischbacher, 2007). Participants were invited from the BonnEconLab subject pool using hroot (Bock et al., 2014). Most of the 348 participants were students (95%) from various fields of study. 61% of subjects were female, and the average age was 22.4 years. In what follows, we describe the variables relevant to our research question.

General risk question. Our main variable of interest is the general risk question which was validated in Dohmen et al. (2011) (see also Section 1). We used the same wording as in the SOEP (see for example Wagner et al., 2007). The question was administered to subjects at the beginning of the session in the third week.[2]

Risk conception questions. After subjects had responded to the general risk question, we asked them what aspects of risk they focused on while answering. We use the following four questions (7-point Likert scale).[3]

- Did you rather think of the negative or positive sides of risk? [Risk - neg/pos; scale: "[1] only of the negative sides" to "[7] only of the positive sides"]

[2] It was also asked at the beginning of the other weeks' sessions. But since the "risk conception" questions were only asked in the third week to avoid interference with later risk-related tasks, we focus on week 3 here.

[3] All questions are translated from German.

- Did you rather think of small everyday situations or large important ones? [Risk - stake size; scale: "[1] small everyday situations" to "[7] large important situations"]
- Did you rather think of situations in which there are small or large gains? [Risk - stake size (gains); scale: "[1] small gains" to "[7] large gains"]
- Did you rather think of situations in which there are small or large losses? [Risk - stake size (losses); scale: "[1] small losses" to "[7] large losses"]

Before responding to these questions, subjects reported in free-form text what they thought of when answering the general risk question. To code the free-form text, we used a similar procedure as Brandts and Cooper (2007): two research assistants independently coded the free-form answers along the dimensions of positive/negative valence and stake size (see Section A.2 in the Online Appendix for details on the coding procedure). Spearman rank correlations between the resulting variables and the corresponding risk conception questions are $\rho = .39$ for "Free form - neg/pos"($p < .001$), $\rho = .42$ for "Free form - stake size" ($p < .001$), $\rho = .14$ for "Free form - stake size (gains)" ($p = .007$), and $\rho = .14$ for "Free form - stake size (losses)" ($p = .011$).[4]

Optimism measures. Our main optimism measure is the so-called SOP questionnaire (Kemper et al., 2015). It consists of two items eliciting self-reported degrees of optimism and pessimism (7-point Likert scale). The first item is: "Optimists are people who look to the future with confidence and who mostly expect good things to happen. How would you describe yourself? How optimistic are you in general?". The second item reads as "Pessimists are people who are full of doubt when they look to the future and who mostly expect bad things to happen. How would you describe yourself? How pessimistic are you in general?".

[4] Some free-form text answers were not classifiable according to our categories. This is especially prominent for the three variables referring to stake size where 50%, 56%, and 62%, respectively, of coded answers take the value 0, compared to 42% for "Free form - neg/pos" (see Table A.2.) This suggests that it is rather the positive or negative sides of risk than stake sizes that subjects think about when answering the general risk question.

The SOP scale is based on the established Life Orientation Test (henceforth LOT; Scheier et al., 1994; Herzberg et al., 2006), which we also include in our questionnaire. Similar to Kemper et al. (2015), we find a convergent Spearman rank correlation between SOP and LOT of $\rho = .76$ ($p < .001$). In the main text of the paper, we restrict our analyses to the SOP measure but results are virtually the same if LOT is used (see Section A.4 and Section A.8 in the Online Appendix for the LOT questionnaire and these results, respectively).

Optimism was elicited at the end of the session in the third week after subjects had completed several incentivized tasks without having received feedback. This makes spillover effects between the risk-related questions and the optimism measures unlikely. We also elicited SOP and LOT in the second week session of our longitudinal experiment. The Spearman rank correlation of measured optimism across weeks is $\rho = .81$ for SOP and $\rho = .84$ for LOT (Spearman, $p < .001$ for both). All the results presented in the paper are robust to using these previously elicited optimism measures (see Section A.8 in the Online Appendix).

Risk taking behavior. Our behavioral risk measure is based on the risk premia for three different lotteries. We elicited certainty equivalents of these lotteries in week 1 and week 3 using a multiple price list format. In both weeks, subjects went through the same three choice lists (see Section A.5 in the Online Appendix). In all tables, subjects chose between a safe payment and a lottery paying €15 with probability p and €0 with probability $1 - p$. The probability p was 0.25, 0.5, and 0.75 in tables 1, 2, and 3, respectively. The safe payment increased from 0€ to 15€ in steps of 0.50€. For each lottery, we average over the risk premia across weeks to reduce noise in our measure of risk taking. Furthermore, we construct a risk premium index aggregating the risk premia for the three lotteries for each subject.

Controls. We control for sociodemographics that were elicited in the first week of the experiment and a proxy for cognitive ability that was elicited in the third week. This proxy is based on ten Raven matrices (see Section A.6 of the Online Appendix for

the distribution of responses). In addition, in some specifications we also use the Big Five personality characteristics that we elicited in every session using the 15 item questionnaire developed for the SOEP (Schupp and Gerlitz, 2008).

3 Conception of Risk and the General Risk Question

There are two noteworthy patterns in our data. First, there is considerable heterogeneity in answers to risk conception questions, as is reflected by standard deviations in responses. Averages and standard deviations are 3.53 and 1.43, respectively, for "Risk - neg/pos"; 4.06 and 1.56 for "Risk - stake size"; 4.18 and 1.51 for "Risk - stake size (gains)"; as well as 4.49 and 1.58 for "Risk - stake size (losses)". The correlational pattern between the different risk conception questions suggests that valence and stake size are orthogonal, as "Risk - neg/pos" and "Risk - stake size" are uncorrelated (Spearman's $\rho = -.071$, $p = .185$), while all other risk conception questions are significantly correlated with one another (see Table A.1 for details). Second, pairwise Spearman rank correlations between the general risk question and each of the conception questions are significant except for "Risk - stake size".[5]

Ordinary least squares regressions confirm that answers to the risk conception questions are systematically related to responses to the general risk question, even when controlling for gender and cognitive ability. [6] Column (1) of Table 1 indicates that subjects who focus on positive rather than negative sides of risk are significantly more willing to take risk. The effect sizes of all other risk conception questions are smaller. Thinking about higher gains is associated with a significantly higher willingness to take risk and thinking about higher losses with a significantly lower willingness to take risk.

Whether subjects focus on the positive or negative aspects of risk also has by far the highest explanatory power. This is evident from comparing the R^2 of the regres-

[5] The correlations are $\rho = 0.63$ and $p < .001$ for "Risk - neg/pos",$\rho = -.04$ and $p = .488$ for "Risk - stake size", $\rho = .27$ and $p < .001$ for "Risk - stake size (gains)", $\rho = -.28$ and $p < .001$ for "Risk - stake size (losses)".

[6] We do not control for age since there is very little variation in a student sample.

Table 1. Relationship between the general risk question and risk conception.

	General risk question					
	(1)	(2)	(3)	(4)	(5)	(6)
Risk - neg/pos	0.826***	0.951***				
	(0.070)	(0.064)				
Risk - stake size	0.118*		-0.019			
	(0.065)		(0.075)			
Risk - stake size (gains)	0.147**			0.373***		
	(0.065)			(0.075)		
Risk - stake size (losses)	-0.264***				-0.421***	
	(0.067)				(0.071)	
Female	-0.300	-0.314	-0.627**	-0.510**	-0.624***	-0.626***
	(0.187)	(0.191)	(0.243)	(0.236)	(0.231)	(0.242)
IQ (Raven)	-0.147***	-0.125***	-0.127**	-0.132**	-0.164***	-0.127**
	(0.045)	(0.045)	(0.058)	(0.056)	(0.056)	(0.058)
Constant	3.272***	2.644***	6.273***	4.589***	8.257***	6.193***
	(0.532)	(0.365)	(0.476)	(0.471)	(0.484)	(0.352)
R^2	0.44	0.41	0.03	0.09	0.12	0.03
N	348	348	348	348	348	348

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. The dependent variables is the general risk question elicited on an 11-point scale. The independent variables "Risk - neg/pos" to "Risk - stake size (losses)" consist of the answers to questions eliciting what subjects thought of while answering the general risk question along the dimensions of valence and stake size.

sions in columns (2) to (5), in which we successively regress the general risk question on one of the risk conception questions and the set of control variables ($R^2 = 0.44$ and $R^2 = 0.41$ for models (1) and (2), respectively, and $R^2 = 0.03$, $R^2 = 0.09$ and $R^2 = 0.12$, respectively, for models (3) to (5)). In summary, this indicates that conception of risk is strongly related to self-assessed willingness to take risk.

Table 1 also reveals an interesting finding regarding the gender effect in willingness to take risk. Not controlling for risk conception, women report to be significantly less willing to take risk than men (model (6)). This is consistent with the gender difference in willingness to take risk reported in many previous studies using representative population samples of particular countries (e.g., Dohmen et al., 2011) and across the globe (Falk et al., 2017) as well as in various non-representative population studies (Vieider et al., 2015).[7] However, once we condition on whether respondents think about positive or negative aspects of risk when answering the general risk question, the gender difference becomes small and insignificant (models (1) and (2)). This indicates that

[7] For reviews and meta-studies see Eckel and Grossman (2008), Croson and Gneezy (2009), Charness and Gneezy (2012), and Buser et al. (2014).

Table 2. Relationship between risk conception and optimism.

	Risk - neg/pos	Risk - stake size	Risk - stake size (gains)	Risk - stake size (losses)
	(1)	(2)	(3)	(4)
Optimism (SOP)	0.261***	-0.018	0.036	-0.177***
	(0.061)	(0.068)	(0.066)	(0.068)
Female	-0.317**	-0.075	-0.308*	-0.004
	(0.156)	(0.173)	(0.168)	(0.174)
IQ (Raven)	-0.006	-0.027	0.013	-0.084**
	(0.037)	(0.042)	(0.040)	(0.042)
Constant	3.506***	4.252***	4.271***	5.056***
	(0.232)	(0.259)	(0.250)	(0.259)
R^2	0.06	0.00	0.01	0.03
N	348	348	348	348

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. The dependent variables consist of the answers to questions eliciting what subjects thought of while answering the general risk question along the dimensions of valence and stake size.

the gender difference in self-assessed willingness to take risk is largely driven by gender differences in disposition to focus on positive or negative outcomes of risk taking, and not so much by gender differences in curvature of the utility function.

Our findings are corroborated when we measure risk conception in an alternative way, using the variables constructed from the free-form text question that was elicited before the risk conception questions (see Section 2 for details on variable construction). [8] When we replicate the regressions reported in Table 1 using variables derived from free-form text we find qualitatively very similar results (see Table A.3 in the Online Appendix).

As a next step, we investigate to what extent conception of risk is systematically related to stable individual characteristics. For this purpose, we regress answers to the four questions described in Section 2 on the optimism measure (SOP), our main proxy for personality characteristics, controlling for gender and cognitive ability. The results are shown in Table 2. The coefficient associated with optimism is significantly different from zero only for the regressions using "Risk - neg/pos" and "Risk - stake size (losses)", which were also the strongest predictors of answers to the general risk question. In line

[8] The Spearman rank correlation between the general risk question and "Free form - neg/pos" is positive and significant ($\rho = .265$, $p < .001$), while this is not the case for "Free form - stake size"($\rho = -.024$, $p = .652$),"Free form - stake size (gains)"($\rho = -.003$, $p = .949$) and "Free form - stake size (losses)"($\rho = .043$, $p = .420$).

with the findings from Table 1, women exhibit a significantly lower propensity to think of the positive rather than the negative sides of risk, even when optimism is not controlled for (see Table A.4 in the Online Appendix). This supports the conjecture that gender differences in risk taking are partly due to systematic gender differences in risk conception.

The data enable us to perform a number of robustness checks on the relationship between conception of risk and optimism (see Table A.8 to Table A.11 in the Online Appendix). A potential concern is that measurement error in optimism might be correlated with answers to the risk conception questions. For example, subjects' momentary psychological state might affect the optimism measure and answers to the risk conception questions, and hence introduce a spurious relationship between the measures, which does not reflect a relationship between the trait component of optimism and risk conception. We address this in several ways. First, we regress the answers to the risk conception questions on self-stated mood elicited at the beginning of the session (see model (5) in each of the aforementioned tables). Additionally, we regress the answers to the four risk conception questions on the optimism measures elicited one week prior to asking the risk conception questions (see model 2 in each of the aforementioned tables). Further, to correct for measurement error in the optimism measure we (i) aggregate the SOP measures elicited in week 2 and 3 and (ii) we instrument SOP elicited in week 3 with SOP elicited in week 2 using a two stage least squares estimation (see models (3) and (4) of each table). Finally, to validate the importance of optimism as a relevant personality characteristic in our context, we run the same specifications of models (3) and (4) adding the Big 5 personality traits also corrected for measurement error (see models (6) and (7) of each table).[9] Similar to the results in Table 2, the coefficient associated with optimism is significantly different from zero across all additional

[9] In personality psychology, optimism is viewed as a distinct trait that cannot be readily mapped into the Big Five inventory, even though there is a partial overlap between optimism and some dimensions of the Big Five (in particular agreeableness and extraversion; see Carver and Scheier (2014)). In our setup, optimism seems ex-ante an aspect of personality that can be used as a reliable proxy people's disposition to focus on favorable or unfavorable outcomes of risk taking. The models reported in Table A.8 to Table A.11 confirm this.

specifications when we use ”Risk - neg/pos” and ”Risk - stake size (losses)” as dependent variables, while it is not for the other two risk conception variables.

Since our hypothesis is that optimism is a reliable proxy (and might be causal) for people's disposition to focus on favorable/unfavorable outcomes of risk taking, which in turn affects responses to the general risk question, we next study whether optimism has a direct effect on measured risk attitudes and how risk conception mediates this relationship.

In Table 3 we regress the general risk question on the SOP optimism measure. When we only include SOP and controls as explanatory variables (model (1)), the coefficient on optimism is sizable and significantly different from zero. However, once the question on whether subjects thought about the positive or negative sides of risk is added in the regression, the coefficient on optimism decreases considerably (model (2) and (3)). This pattern is weaker or non-existent for the other risk conception questions (models (4) to (6)).

The coefficient on “Risk - neg/pos” in models (2) and (3) is significantly different from zero and of the same order of magnitude as in Table 1, when optimism was not included. This suggests that it is not optimism itself but rather its influence on subjects' conception of the general risk question, in terms of positive or negative outcomes of risk taking, that affects stated risk attitudes.

4 Optimism and Risk Taking Behavior

So far, we have shown that responses to the general risk question are affected by aspects beyond parameters of a standard utility function. In fact, one crucial aspect is whether people have a disposition to focus on the positive or negative outcomes of risk taking. This disposition has persistence as it is related to optimism, an important and stable character trait. An intriguing question that extends beyond the relationship between risk conception and self-assessed willingness to take risk is whether actual risk taking behavior is also affected by risk conception. If this was not the case, answers to the

Table 3. Relationship between the general risk question and optimism controlling for risk conception.

	General risk question					
	(1)	(2)	(3)	(4)	(5)	(6)
Optimism (SOP)	0.406***	0.149**	0.166**	0.405***	0.392***	0.337***
	(0.093)	(0.075)	(0.076)	(0.093)	(0.090)	(0.090)
Risk - neg/pos		0.799***	0.919***			
		(0.071)	(0.065)			
Risk - stake size		0.112*		-0.014		
		(0.065)		(0.074)		
Risk - stake size (gains)		0.151**			0.363***	
		(0.065)			(0.074)	
Risk - stake size (losses)		-0.253***				-0.385***
		(0.067				(0.070))
Female	-0.609**	-0.302	-0.318*	-0.610**	-0.497**	-0.610***
	(0.236)	(0.186)	(0.190)	(0.237)	(0.230)	(0.227)
IQ (Raven)	-0.134**	-0.149***	-0.128***	-0.134**	-0.139**	-0.166***
	(0.057)	(0.045)	(0.045)	(0.057)	(0.055)	(0.055)
Constant	5.839***	3.195***	2.619***	5.900***	4.288***	7.784***
	(0.353)	(0.531)	(0.363)	(0.472)	(0.464)	(0.492)
R^2	0.08	0.45	0.42	0.08	0.14	0.15
N	348	348	348	348	348	348

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

general risk question would simply contain information irrelevant for risky behavior.[10] Below, we analyze data from our experiment and from a representative sample, and show that this disposition to focus on positive/negative outcomes of risk, proxied by optimism, is in fact related to risk taking behavior.

As a measure of risk taking behavior among our student sample, we use the risk premium index derived from three incentivized lottery choices (see Section 2). We regress this index on the SOP optimism measure, the general risk question, and basic control variables. Model (1) in Table 4 shows a significant association between risk taking behavior and optimism. Model (2) replicates findings from the previous literature and shows that the general risk question is a significant predictor of risk taking in lottery choice. When in model (3), we include both optimism and the general risk question in the regression, the coefficient on optimism is smaller and not statistically significant. This indicates that the general risk question captures the optimism component, thus

[10] Such information unrelated to risk taking behavior would generate measurement error in responses to the general risk question lowering its predictive power(Beauchamp et al., 2017).

making it a useful predictor for risk taking behavior. A similar pattern arises when using each risk premium separately rather than the risk premium index as a dependent variable (see Table A.15 and Table A.16 in the Online Appendix).

Table 4. Optimism and Risk Taking Behavior.

	Risk premium index		
	(1)	(2)	(3)
Optimism (SOP)	-0.096**		-0.055
	(0.041)		(0.041)
General risk question		-0.107***	-0.100***
		(0.022)	(0.023)
Female	0.431***	0.368***	0.370***
	(0.103)	(0.102)	(0.102)
IQ (Raven)	0.008	-0.008	-0.006
	(0.025)	(0.024)	(0.024)
Constant	-0.197	0.385*	0.389*
	(0.154)	(0.202)	(0.201)
R^2	0.064	0.108	0.113
N	348	348	348

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. The variable "risk premium index" is created by standardizing the risk premia (aggregated over measurements in week 1 and 3), averaging, and then standardizing again.

Next, we investigate whether the association between optimism and risk taking behavior extends to real life behavior in a representative sample of the German population. For this purpose we use information on self-reported behaviors in the 2014 wave of the German Socio Economic Panel (SOEP). In particular, we focus on two domains that are relevant for economics and directly related to risk taking: portfolio choice and career choice. As a proxy for portfolio choice, we use information about household stock holdings. In particular, the variable "Stocks" takes value 1 if at least one household member holds stocks, shares, or stock options and zero otherwise. Since the question is only administered to the household head, the regressions involving this variable use the subsample of household heads. The variable "Self-employed" takes value 1 if an individual is self-employed and zero for individuals who are in other employment. As a proxy for optimism we use the following question: "If you think about the future: Are you..."(translated from German). Respondents could answer on a scale from 1 to 4,

where 1 = “optimistic”, 2 = “rather optimistic than pessimistic”, 3 = “rather pessimistic than optimistic", and 4 = “pessimistic”. For ease of interpretation, we reverse the scale, such that, a higher scores means higher optimism. The general risk question has the exact same wording as in our experiment. We standardize both variables to ensure comparability. As expected from our experimental data, the correlation between the willingness to take risk as measured by the general risk question and optimism is positive and significant ($\rho = .165$, $p < .0001$).

To investigate whether optimism is also predictive of real life risk taking we run a series of linear probability models reported in Table 5 where we regress the aforementioned measures of risk taking on the optimism measure, the general risk question, and a set of control variables[11]. In line with the results from our experiment, models (1) and (4) show that optimism is a significant predictor of both holding stocks and being self-employed. In particular, an increase by one standard deviation in the response to the optimism question raises the probability of holding stocks (being self-employed) by 1.2 (1.2) percentage points.

When we use the general risk question (models (2) and (5)) as a predictor of holding stocks or being self-employed, we find that an increase by one standard deviation in willingness to take risk raises the probability of holding stocks (being self-employed) by 1.9 (3.2) percentage points. These results are consistent with Dohmen et al. (2011), who find similar effects for the 2004 wave of SOEP.

Finally, when we include both optimism and the general risk question (models (3) and (6)), the optimism coefficients are reduced, similar to the regressions reported in Table 4, indicating that the general risk question is also partly capturing the optimism component.

[11] We control for gender, age, and height which have been shown to predict risk taking in the previous literature (Dohmen et al., 2011). We also control for parents' education (*Abitur* mother and *Abitur* father) rather than own education to avoid the reverse causality problem that would occur with regard to self-employment. These variables are equal to 1 if a parent has “Abitur” or “Fachabitur”, high school degrees that are awarded after 12 or 13 years of schooling and that grant access to (specific types of) university education. Further controls are logarithmic household wealth, logarithmic household debt, and logarithmic net household income. We also control for the number of adults (defined as older than 17) in the household in the stock-holding regression.

Table 5. Relationship between risk taking behavior and optimism.

	Risk taking: Stocks			Risk taking: Self-employed		
	(1)	(2)	(3)	(4)	(5)	(6)
Std. Optimism	0.012***		0.009**	0.012***		0.007**
	(0.004)		(0.004)	(0.003)		(0.003)
Std. General risk question		0.019***	0.017***		0.032***	0.031***
		(0.004)	(0.004)		(0.004)	(0.004)
Female	0.008	0.011	0.011	-0.021**	-0.012	-0.013
	(0.012)	(0.012)	(0.012)	(0.009)	(0.009)	(0.009)
Age	0.001**	0.001**	0.001***	0.004***	0.004***	0.004***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Height	0.002***	0.002**	0.002**	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.0005)	(0.0005)	(0.0005)
Abitur mother	-0.030*	-0.028	-0.031*	0.055***	0.051***	0.053***
	(0.018)	(0.018)	(0.018)	(0.013)	(0.013)	(0.013)
Abitur father	0.076***	0.076***	0.077***	0.037***	0.042***	0.040***
	(0.014)	(0.014)	(0.014)	(0.010)	(0.010)	(0.010)
Log househ. wealth	0.011***	0.012***	0.012***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log househ. debt	-0.006***	-0.006***	-0.006***	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log net househ. income	0.205***	0.203***	0.203***	0.001	0.002	0.001
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Number of adults in hh	-0.046***	-0.045***	-0.044***			
	(0.007)	(0.007)	(0.007)			
Constant	-1.675***	-1.663***	-1.648***	-0.189*	-0.212*	-0.199*
	(0.134)	(0.134)	(0.135)	(0.109)	(0.108)	(0.109)
R^2	0.138	0.138	0.139	0.032	0.041	0.041
N	9,324	9,325	9,267	8,593	8,573	8,537

Notes. OLS regressions. Standard errors in parentheses. $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. The samples in columns 1 to 3 include only household heads. The dependent variable takes a value of 1 if the household holds stocks and 0 otherwise. The dependent variable in columns 4 to 6 takes a value of 1 if respondent is self-employed and 0 otherwise. Here, we limit the sample to individuals under 66 years who are part of the labor force.

5 Conclusion

In this paper, we have provided evidence that responses to the general risk question (Dohmen et al., 2011) are influenced by factors that extend beyond parameters of a standard utility function. The way how people conceive risk and in particular whether they have a tendency to focus on favorable or unfavorable outcomes of risk taking is a crucial determinant of their responses. We have shown that heterogeneity in this disposition

is systematic as it is related to optimism, a stable character trait. While optimists tend to focus on the positive outcomes associated with risk, pessimists tend to focus on the potential negative outcomes of risky decisions, leading to divergent responses.

Our data strongly suggest that the disposition to focus on positive or negative aspects of risks affects actual risk taking behavior. In our student sample and in a representative sample, we find that optimism, which predicts this disposition, is related to risk taking behavior. In the student sample it predicts lottery choices and in the representative sample investing in the stock market or being self-employed. The fact that the general risk question captures the disposition to focus on favorable or unfavorable outcomes of risky alternatives and that this factor is relevant for risk taking behavior, may explain why the general risk question is a better predictor of risk taking behavior across contexts than other measures of risk preferences that control more tightly risk conception, stakes and probabilities.

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A Supplementary material (for online publication)

A.1 Correlations between responses to risk conception questions

Table A.1. Spearman rank correlations between responses to risk conception questions

	Risk - neg/pos	Risk - stake size	Risk - stake size (gains)
Risk - stake size	-0.071		
	(0.185)		
Risk - stake size (gains)	0.278	0.205	
	(<0.001)	(<0.001)	
Risk - stake size (losses)	-0.288	0.449	0.133
	(<0.001)	(<0.001)	(0.013)

Notes. N= 348. p-values in parentheses

A.2 Coding of free-form responses

Before answering the four risk conception questions described in the main text, subjects were asked to report in free-form text what they thought about when answering the general risk question. Answers varied substantially, with some subjects stating financial risk, others considering the risk of being the victims of crime, or risk taking in sports. We coded the answers employing a strategy similar to that used by Brandts and Cooper (2007). Two research assistants unfamiliar with the research question and the rest of the dataset coded the answers independently such that coding errors would be uncorrelated. They created four categorical variables for each answer, one referring to the positive/negative valence and three referring to the stake size in general, stake size in the gains dimension, and stake size in the loss dimension respectively . "Free form - neg/pos" could be either positive (1) or negative (-1), while "Free form - stake size", "Free form - stake size (gains)" and "Free form - stake size (losses)" could be large (1) or small (-1). Furthermore, each variable took the value 0, if answers were mixed or not classifiable[12]. We found significant cross-coder Spearman rank correlations of $\rho = .49$, $\rho = .71$, $\rho = .61$, and $\rho = .38$ ($p < .001$ for all four) for valence, stake size, stake size (gains), and stake size (losses), respectively. For the analysis reported in the paper,

[12] Mixed answers can occur in situations where subjects state more than one risky situation.

following Brandts and Cooper (2007), we average the values across coders. Average responses to the risk conception questions split by coded free-form question response are reported in Table A.2 below.

Table A.2. Responses to selected risk conception questions (by coded answer to free form question)

	Free form - neg/pos			Free form - stake size		
Value	Frequency	Mean	SD	Frequency	Mean	SD
-1	44	2.682	1.137	74	3	1.365
-0.5	43	2.767	1.231	42	3.571	1.548
0	146	3.479	1.266	175	4.325	1.391
0.5	93	4.097	1.533	36	5.028	1.464
1	22	4.545	1.405	21	4.905	1.411
	Free form - stake s. (gains)			Free form - stake s. (losses)		
Value	Frequency	Mean	SD	Frequency	Mean	SD
-1	40	3.675	1.269	30	3.333	1.583
-0.5	42	4.095	1.559	54	4.5	1.587
0	194	4.175	1.472	217	4.631	1.498
0.5	48	4.708	1.557	44	4.545	1.745
1	24	4.125	1.801	3	4.333	1.154

A.3 Regression on coded free form variables

Table A.3. Robustness check to Table 1

	General risk question				
	(1)	(2)	(3)	(4)	(5)
Free form - neg/pos	1.345***	1.090***			
	(0.237)	(0.211)			
Free form - stake size	-0.023		-0.074		
	(0.277)		(0.213)		
Free form - stake size (gains)	0.931***			0.381	
	(0.322)			(0.235)	
Free form - stake size (losses)	-0.223				0.466
	(0.356)				(0.296)
Female	-0.602***	-0.628***	-0.622**	-0.614**	-0.620**
	(0.232)	(0.234)	(0.243)	(0.242)	(0.242)
IQ (Raven)	-0.131**	-0.127**	-0.127**	-0.127**	-0.119**
	(0.0557)	(0.056)	(0.058)	(0.058)	(0.058)
Constant	6.195***	6.184***	6.178***	6.201***	6.194***
	(0.339)	(0.340)	(0.355)	(0.351)	(0.351)
N	348	348	348	348	348
R^2	0.130	0.099	0.029	0.036	0.036

Notes. OLS regressions. Standard errors in parentheses * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. The dependent variable is the general risk question elicited on an 11-point scale. The independent variables are generated by coding the answer to the free form question "What kind of risk did you think of while answering the general risk question?"

A.4 LOT-R questionnaire

For the validation of the German version we used refer to Herzberg et al. (2006).

English version by Scheier et al. (1994): Please state to what extent your opinion agrees with the following statements (7 point Likert Scale from "does not apply to me at all" to "applies to me exactly").

1. In uncertain times, I usually expect the best.
2. It's easy for me to relax.
3. If something can go wrong for me, it will. (R)
4. I'm always optimistic about my future.
5. I enjoy my friends a lot.
6. It's important for me to keep busy.

7. I hardly ever expect things to go my way. (R)
8. I don't get upset too easily.
9. I rarely count on good things happening to me. (R)
10. Overall, I expect more good things to happen to me than bad.

Items marked with *(R)* are reverse-scaled, while items 2, 5, 6 and 8 are fillers.

A.5 Risk behavior measure - Lottery choice lists

Figure A.1. Exemplary Choice list: Certainty equivalent of lottery "15 €with 25% and 0 €with 75%"
Translation from German: "TABLE 1 - Please choose an alternative in each row."

A.6 Measurement of cognitive ability

The appropriateness of the level of difficulty for a student population is confirmed by the roughly normal distribution of the number of correctly solved matrices displayed in Figure A.2.

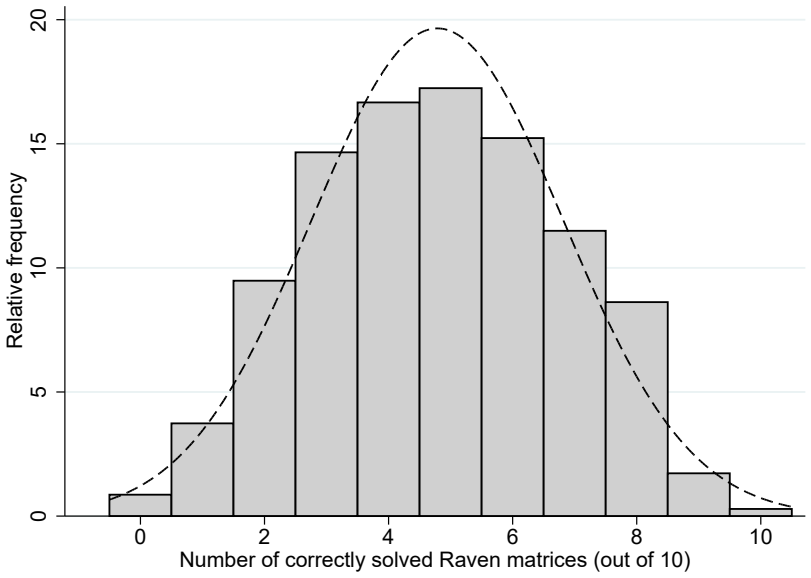

Figure A.2. Distribution of proxy for cognitive ability.

A.7 Gender differences in risk conception

Table A.4. Relationship between gender and risk conception

	Risk - neg/pos	Risk - stake size	Risk - stake size (gains)	Risk - stake size (losses)
	(1)	(2)	(3)	(4)
Female	-0.328**	-0.074	-0.310*	0.003
	(0.159)	(0.173)	(0.167)	(0.175)
IQ (Raven)	-0.002	-0.027	0.014	-0.087**
	(0.038)	(0.042)	(0.040)	(0.042)
Constant	3.733***	4.236***	4.303***	4.902***
	(0.231)	(0.252)	(0.243)	(0.254)
R^2	0.05	0.00	0.00	0.02
N	348	348	348	348

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ The dependent variables consist of the answers to questions eliciting what subjects thought of while answering the general risk question along the dimensions of valence and stake size.

A.8 Robustness of results to use of different specifications

Table A.5. Robustness check to Table 2.

	Risk - neg/pos	Risk - stake size	Risk - stake size (gains)	Risk - stake size (losses)
	(1)	(2)	(3)	(4)
Optimism (SOP) - week 3	0.263***	-0.019	0.040	-0.182***
	(0.061)	(0.068)	(0.066)	(0.069)
Constant	3.278***	4.078***	4.141***	4.655***
	(0.095)	(0.105)	(0.102)	(0.106)
R^2	0.05	0.00	0.00	0.02
N	348	348	348	348

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ The dependent variables consist of the answers to questions eliciting what subjects thought of while answering the general risk question along the dimensions of valence and stake size.

Table A.6. Robustness check to Table 2.

	Risk - neg/pos	Risk - stake size	Risk - stake size (gains)	Risk - stake size (losses)
	(1)	(2)	(3)	(4)
Optimism (SOP) - week 3	0.263***	-0.019	0.040	-0.182***
	(0.061)	(0.068)	(0.066)	(0.069)
Constant	3.278***	4.078***	4.141***	4.655***
	(0.095)	(0.105)	(0.102)	(0.106)
R^2	0.05	0.00	0.00	0.02
N	348	348	348	348

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ The dependent variables consist of the answers to questions eliciting what subjects thought of while answering the general risk question along the dimensions of valence and stake size.

Table A.7. Robustness check to Table 2.

Specification 1	Risk - neg/pos	Risk - stake size	Risk - stake size (gains)	Risk - stake size (losses)
	(1)	(2)	(3)	(4)
Optimism (LOT) - week 3	0.283***	-0.003	0.080	-0.239***
	(0.074)	(0.084)	(0.081)	(0.084)
Female	-0.327**	-0.052	-0.360**	0.058
	(0.158)	(0.180)	(0.172)	(0.179)
IQ (Raven)	-0.007	-0.022	-0.010	-0.082*
	(0.038)	(0.043)	(0.042)	(0.043)
Constant	2.355***	4.214***	4.056***	6.002***
	(0.409)	(0.466)	(0.446)	(0.462)
R^2	0.06	0.00	0.02	0.04
N	326	326	326	326
Specification 2	Risk - neg/pos	Risk - stake size	Risk - stake size (gains)	Risk - stake size (losses)
	(1)	(2)	(3)	(4)
Optimism (SOP) - week 2	0.293***	0.004	0.025	-0.266***
	(0.060)	(0.068)	(0.065)	(0.067)
Female	-0.340**	-0.023	-0.316*	0.077
	(0.157)	(0.178)	(0.171)	(0.175)
IQ (Raven)	-0.003	-0.023	0.004	-0.076*
	(0.038)	(0.042)	(0.041)	(0.042)
Constant	3.451***	4.190***	4.305***	5.049***
	(0.235)	(0.265)	(0.255)	(0.261)
R^2	0.08	0.00	0.01	0.06
N	335	335	335	335
Specification 3	Risk - neg/pos	Risk - stake size	Risk - stake size (gains)	Risk - stake size (losses)
	(1)	(2)	(3)	(4)
Optimism (LOT) - week 2	0.327***	0.026	0.033	-0.243***
	(0.073)	(0.082)	(0.079)	(0.082)
Female	-0.343**	-0.021	-0.316*	0.082
	(0.158)	(0.178)	(0.171)	(0.177)
IQ (Raven)	-0.017	-0.024	0.002	-0.067
	(0.038)	(0.043)	(0.041)	(0.043)
Constant	2.258***	4.078***	4.179***	5.894***
	(0.398)	(0.446)	(0.429)	(0.444)
R^2	0.07	0.00	0.01	0.04
N	335	335	335	335

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.The dependent variables consist of the answers to questions eliciting what subjects thought of while answering the general risk question along the dimensions of valence and stake size. The optimism measure varies by specification. LOT-R is the Life Orientation Test. SOP is a two-item measure assessing subjects self-stated optimism and pessimism. Both were elicited in weeks 2 and 3.

Table A.8. Robustness check: Relationship between optimism and risk conception questions

	Risk - neg/pos						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	OLS	2SLS	OLS	OLS	2SLS
Optimism (SOP - week 3)	0.261***			0.366***			0.231**
	(0.061)			(0.076)			(0.095)
Optimism (SOP - week 2)		0.293***					
		(0.060)					
Optimism (SOP - agg)			0.305***		0.304***	0.167**	
			(0.064)		(0.066)	(0.095)	
Female	-0.317**	-0.340**	-0.340**	-0.337**	-0.340**	-0.113	-0.136
	(0.156)	(0.157)	(0.158)	(0.160)	(0.158)	(0.169)	(0.173)
IQ (Raven)	-0.006	-0.003	-0.004	-0.006	-0.004	0.024	0.018
	(0.037)	(0.038)	(0.038)	(0.038)	(0.038)	(0.037)	(0.038)
Mood (week 3)					0.0004		
					(0.037)		
Conscientiousness (agg)						-0.168**	
						(0.076)	
Extraversion (agg)						0.225***	
						(0.068)	
Openness(agg)						0.0152	
						(0.061)	
Agreeableness (agg)						-0.174**	
						(0.085)	
Neuroticism (agg)						-0.200***	
						(0.069)	
Conscientiousness (week 3)							-0.101
							(0.084)
Extraversion (week 3)							0.194**
							(0.076)
Openness (week 3)							0.0390
							(0.066)
Agreeableness (week 3)							-0.192**
							(0.096)
Neuroticism (week 3)							-0.164**
							(0.078)
Constant	3.506***	3.451***	3.447***	3.401***	3.445***	4.754***	4.378***
	(0.232)	(0.235)	(0.236)	(0.240)	(0.321)	(0.749)	(0.810)
R^2	0.06	0.08	0.08	0.06	0.08	0.16	0.15
N	348	335	335	335	335	335	335

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. While "Risk - neg/pos" was elicited in week 3, models 1 and 2 use the SOP measures from weeks 3 and 2, respectively. Models 3,5 and 6 use the SOP measure aggregated over these two weeks, with model 5 including mood (beginning of session in week 3) and model 6 including the Big Five (aggregated across weeks 2 and 3) as controls. Models 4 and 7 are two-stage least squares estimations using the variables for SOP and the Big Five from week 2 as instruments for those from week 3.

Table A.9. Robustness check: Relationship between optimism and risk conception questions

	Risk - stake size						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	OLS	2SLS	OLS	OLS	2SLS
Optimism (SOP - week 3)	-0.018			0.005			-0.055
	(0.068)			(0.084)			(0.111)
Optimism (SOP - week 2)		0.004					
		(0.068)					
Optimism (SOP - agg)			-0.005		-0.001	-0.053	
			(0.072)		(0.075)	(0.086)	
Female	-0.075	-0.022	-0.022	-0.022	-0.022	0.0062	0.036
	(0.173)	(0.178)	(0.178)	(0.178)	(0.178)	(0.197)	(0.201)
IQ (Raven)	-0.027	-0.023	-0.022	-0.023	-0.022	-0.030	-0.030
	(0.042)	(0.042)	(0.042)	(0.042)	(0.043)	(0.044)	(0.044)
Mood (week 3)					-0.007		
					(0.042)		
Conscientiousness (agg)						0.072	
						(0.089)	
Extraversion (agg)						-0.061	
						(0.080)	
Openness (agg)						0.143**	
						(0.071)	
Agreeableness (agg)						0.054	
						(0.099)	
Neuroticism (agg)						-0.101	
							(0.090)
Conscientiousness (week 3)							0.060
							(0.098)
Extraversion (week 3)							-0.061
							(0.089)
Openness (week 3)							0.126*
							(0.076)
Agreeableness (week 3)							0.043
							(0.112)
Neuroticism (week 3)							-0.101
							(0.090)
Constant	4.252***	4.190***	4.198***	4.189***	4.241***	3.554***	3.824***
	(0.259)	(0.265)	(0.265)	(0.268)	(0.362)	(0.876)	(0.940)
R^2	0.002	0.001	0.001	0.001	0.012	0.019	0.021
N	348	335	335	335	335	335	335

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. While "Risk - stake size" was elicited in week 3, models 1 and 2 use the SOP measures from weeks 3 and 2, respectively. Models 3,5 and 6 use the SOP measure aggregated over these two weeks, with model 5 including mood (beginning of session in week 3) and model 6 including the Big Five (aggregated across weeks 2 and 3) as controls. Models 4 and 7 are two-stage least squares estimations using the variables for SOP and the Big Five from week 2 as instruments for those from week 3.

Table A.10. Robustness check: Relationship between optimism and risk conception questions

	Risk - stake size (gains)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	OLS	2SLS	OLS	OLS	2SLS
Optimism (SOP - week 3)	0.036			0.031		-0.060	
	(0.066)			(0.081)		(0.106)	
Optimism (SOP - week 2)		0.025					
		(0.065)					
Optimism (SOP - agg)			0.034		0.023	-0.033	
			(0.069)		(0.072)	(0.083)	
Female	-0.308*	-0.316*	-0.316*	-0.316*	-0.316*	-0.273	-0.257
	(0.168)	(0.171)	(0.171)	(0.171)	(0.171)	(0.189)	(0.193)
IQ (Raven)	0.013	0.004	0.004	0.004	0.002	0.023	0.025
	(0.040)	(0.041)	(0.041)	(0.041)	(0.041)	(0.042)	(0.042)
Mood (week 3)					0.021		
					(0.040)		
Conscientiousness (agg)						-0.009	
						(0.086)	
Extraversion (agg)						0.147*	
						(0.076)	
Openness (agg)						0.015	
						(0.068)	
Agreeableness (agg)						-0.146	
						(0.095)	
Neuroticism (agg)						-0.047	
						(0.078)	
Conscientiousness (week 3)							-0.036
							(0.094)
Extraversion (week 3)							0.159*
							(0.085)
Openness (week 3)							0.018
							(0.073)
Agreeableness (week 3)							-0.113
							(0.107)
Neuroticism (week 3)							-0.048
							(0.087)
Constant	4.271***	4.305***	4.298***	4.301***	4.171***	4.479***	4.375***
	(0.250)	(0.255)	(0.255)	(0.258)	(0.348)	(0.841)	(0.904)
R^2	0.012	0.011	0.011	0.012	0.012	0.033	0.033
N	348	335	335	335	335	335	335

Notes. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. While "Risk - stake size (gains)" was elicited in week 3, models 1 and 2 use the SOP measures from weeks 3 and 2, respectively. Models 3,5 and 6 use the SOP measure aggregated over these two weeks, with model 5 including mood (beginning of session in week 3) and model 6 including the Big Five (aggregated across weeks 2 and 3) as controls. Models 4 and 7 are two-stage least squares estimations using the variables for SOP and the Big Five from week 2 as instruments for those from week 3.

Table A.11. Robustness check: Relationship between optimism and risk conception questions

	Risk - stake size (losses)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	OLS	2SLS	OLS	OLS	2SLS
Optimism (SOP - week 3)	-0.177***			-0.331***			-0.375***
	(0.068)			(0.085)		(0.113)	
Optimism (SOP - week 2)		-0.266***					
		(0.066)					
Optimism (SOP - agg)			-0.248***		-0.217***	-0.264***	
			(0.071)		(0.074)	(0.086)	
Female	-0.004	0.078	0.078	0.075	0.079	0.022	0.051
	(0.174)	(0.175)	(0.176)	(0.179)	(0.176)	(0.197)	(0.205)
IQ (Raven)	-0.084**	-0.076*	-0.075*	-0.072*	-0.072*	-0.073*	-0.067
	(0.042)	(0.042)	(0.042)	(0.043)	(0.042)	(0.044)	(0.045)
Mood (week 3)					-0.061		
					(0.041)		
Conscientiousness (agg)						0.030	
						(0.089)	
Extraversion (agg)						0.002	
						(0.080)	
Openness (agg)						0.060	
						(0.071)	
Agreeableness (agg)						0.060	
						(0.099)	
Neuroticism (agg)						0.0311	
						(0.081)	
Conscientiousness (week 3)							-0.028
							(0.100)
Extraversion (week 3)							0.041
							(0.090)
Openness (week 3)							0.035
							(0.078)
Agreeableness (week 3)							0.079
							(0.114)
Neuroticism (week 3)							0.004
							(0.092)
Constant	5.056***	5.049***	5.028***	5.094***	5.392***	4.171***	4.467***
	(0.259)	(0.261)	(0.263)	(0.269)	(0.358)	(0.875)	(0.957)
R^2	0.032	0.058	0.047	0.020	0.054	0.051	0.017
N	348	335	335	335	335	335	335

Notes. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. While "Risk - stake size (losses)" was elicited in week 3, models 1 and 2 use the SOP measures from weeks 3 and 2, respectively. Models 3,5 and 6 use the SOP measure aggregated over these two weeks, with model 5 including mood (beginning of session in week 3) and model 6 including the Big Five (aggregated across weeks 2 and 3) as controls. Models 4 and 7 are two-stage least squares estimations using the variables for SOP and the Big Five from week 2 as instruments for those from week 3.

Table A.12. Robustness check to Table 3: Alternative specifications showing the relationship between the general risk question and optimism controlling for the risk conception questions.

Specification 1	General risk question					
	(1)	(2)	(3)	(4)	(5)	(6)
Optimism (LOT - week 3)	0.512***	0.212**	0.252***	0.512***	0.483***	0.421***
	(0.114)	(0.093)	(0.094)	(0.114)	(0.111)	(0.111)
Risk - neg/pos		0.796***	0.919***			
		(0.075)	(0.069)			
Risk - stake size		0.112*		-0.009		
		(0.067)		(0.076)		
Risk - stake size (gains)		0.155**			0.363***	
		(0.068)			(0.076)	
Risk - stake size (losses)		-0.264***				-0.379***
		(0.070)				(0.073)
Female	-0.602**	-0.265	-0.301	-0.602**	-0.471**	-0.580**
	(0.244)	(0.194)	(0.198)	(0.244)	(0.238)	(0.235)
IQ (Raven)	-0.144**	-0.156***	-0.138***	-0.145**	-0.141**	-0.175***
	(0.059)	(0.047)	(0.047)	(0.059)	(0.057)	(0.057)
Constant	3.778***	2.382***	1.613***	3.816***	2.304***	6.055***
	(0.632)	(0.682)	(0.534)	(0.708)	(0.685)	(0.750)
R^2	0.08	0.41	0.08	0.14	0.15	0.44
N	326	326	326	326	326	326

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. The dependent variables consist of the answers to the general risk question elicited on an 11-point scale. The optimism measure LOT is the Life Orientation Test elicited in week 3.

Table A.13. Robustness check to Table 3 - continued: Alternative specifications showing the relationship between the general risk question and optimism controlling for the risk conception questions.

Specification 2	General risk question					
	(1)	(2)	(3)	(4)	(5)	(6)
Optimism (SOP - week 2)	0.442***	0.130*	0.171**	0.442***	0.433***	0.345***
	-0.092	-0.076	-0.076	-0.092	-0.089	-0.091
Risk - neg/pos		0.812***	0.925***			
		-0.073	-0.068			
Risk - stake size		0.130*		-0.006		
		-0.067		-0.075		
Risk - stake size (gains)		0.149**			0.376***	
		-0.067			-0.075	
Risk - stake size (losses)		-0.263***				-0.365***
		-0.069				-0.073
Female	-0.652***	-0.306	-0.338*	-0.652***	-0.533**	-0.624***
	(0.242)	(0.191)	(0.195)	(0.242)	(0.235)	(0.234)
IQ (Raven)	-0.125**	-0.140***	-0.123***	-0.125**	-0.127**	-0.153***
	-0.058	-0.045	-0.046	-0.058	-0.056	-0.056
Constant	5.759***	3.094***	2.568***	5.785***	4.142***	7.604***
	(0.361)	(0.537)	(0.371)	(0.478)	(0.475)	(0.508)
R^2	0.093	0.452	0.422	0.093	0.157	0.156
N	335	335	335	335	335	335

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. The dependent variables consist of the answers to the general risk question elicited on an 11-point scale. The optimism measure SOP was elicited in week 2.

Table A.14. Robustness check to Table 3 - continued: Alternative specifications showing the relationship between the general risk question and optimism controlling for the risk conception questions.

Specification 3	General risk question					
	(1)	(2)	(3)	(4)	(5)	(6)
Optimism (LOT - week 2)	0.543***	0.207**	0.241***	0.543***	0.530***	0.451***
	(0.111)	(0.0904)	(0.0916)	(0.112)	(0.108)	(0.109)
Risk - neg/pos		0.804***	0.922***			
		(0.073)	(0.067)			
Risk - stake size		0.128*		-0.0114		
		(0.067)		(0.075)		
Risk - stake size (gains)		0.151**			0.375***	
		(0.066)			(0.075)	
Risk - stake size (losses)		-0.264***				-0.377***
		(0.069)				(0.072)
Female	-0.654***	-0.307	-0.338*	-0.655***	-0.536**	-0.624***
	(0.242)	(0.190)	(0.194)	(0.242)	(0.234)	(0.233)
IQ (Raven)	-0.149**	-0.150***	-0.133***	-0.149**	-0.150***	-0.174***
	(0.058)	(0.046)	(0.046)	(0.058)	(0.056)	(0.056)
Constant	3.740***	2.326***	1.658***	3.786***	2.174***	5.959***
	(0.606)	(0.651)	(0.507)	(0.680)	(0.664)	(0.722)
R^2	0.094	0.456	0.425	0.094	0.158	0.163
N	335	335	335	335	335	335

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. The dependent variables consist of the answers to the general risk question elicited on an 11-point scale. The optimism measure LOT is the Life Orientation Test elicited in week 2.

Table A.15. Robustness check to Table 4:
Optimism and Risk taking behavior using each risk premium separately.

	Risk premium choice list 1		
	(1)	(2)	(3)
Optimism (SOP)	-0.104**		-0.073*
	(0.040)		(0.041)
General risk question		-0.087***	-0.077***
		(0.023)	(0.023)
Female	0.105	0.055	0.058
	(0.103)	(0.102)	(0.102)
IQ (Raven)	0.080***	0.067***	0.070***
	(0.025)	(0.025)	(0.025)
Constant	-0.314**	0.131	0.136
	(0.153)	(0.203)	(0.202)
R^2	0.047	0.069	0.078
N	348	348	348

	Risk premium choice list 2		
	(1)	(2)	(3)
Optimism (SOP)	-0.067		-0.023
	(0.041)		(0.041)
General risk question		-0.111***	-0.108***
		(0.023)	(0.023)
Female	0.354***	0.288***	0.289***
	(0.105)	(0.102)	(0.102)
IQ (Raven)	-0.026	-0.042*	-0.049*
	(0.025)	(0.025)	(0.025)
Constant	-0.020	0.609***	0.611***
	(0.156)	(0.203)	(0.203)
R^2	0.046	0.102	0.103
N	348	348	348

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$;*** $p < 0.01$. Choice list 1 elicits the risk premium for a lottery with 25% chance of receiving 15€ and 75% chance of receiving nothing, while choice list 2 elicits the risk premium for a lottery with 50% chance of receiving 15€. The dependent variables are aggregates over measurements in weeks 1 and 3.

Table A.16. Robustness check to Table 4 - continued:
Optimism and Risk taking behavior using each risk premium separately.

	Risk premium choice list 3		
	(1)	(2)	(3)
Optimism (SOP)	-0.073*		-0.045
	(0.040)		(0.040)
General risk question		-0.077***	-0.070***
		(0.022)	(0.023)
Female	0.640***	0.596***	0.597***
	(0.101)	(0.101)	(0.101)
IQ (Raven)	-0.034	-0.045*	-0.043*
	(0.024)	(0.024)	(0.024)
Constant	-0.168	0.242	0.245
	(0.151)	(0.199)	(0.199)
R^2	0.125	0.146	0.149
N	348	348	348

Notes. OLS regressions. Standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Choice list 3 elicits the risk premium for a lottery with 75% chance of receiving 15€ and 25% chance of receiving nothing. The dependent variable is an aggregate over measurements in week 1 and 3.