THE VARIABILITY IN THE ANSWERS TO THE GENERAL RISK QUESTION

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Abstract

This paper analyzes the source of measurement error in the answers to the general risk question exploiting a nationally representative survey data. Using a question asking people about their willingness to take risk in general, we find that year to year differences in life events such as changes in education years, academic degree, employment status, monthly income, marital status and the number of kids do not have significant effects on the variability. However, the next step conducted to see measurement errors shows that most of the big five personality traits and a cognitive skill measured by different tests affect to the instability in risk attitudes. Furthermore, we investigate the effects of these variables with a different group where respondents answering the medium score 5 are excluded, assuming that this response pattern is related to the source of measurement errors. As a result, it shows no considerably remarkable change compared to the previous outcomes except the change in the significance of neuroticism.

1 Introduction

Choice under uncertainty characterizes most of situations people confront with in their daily life. This implies that risk attitude is an important factor to understand and predict individual's behavior. Several documents identified that the risk attitude works as a predictor of behaviors (e.g. Guiso and Paiella, 2005; Anderson and Mellor, 2008). On the other hand, there is still an unsolved question regarding to source of variability in risk attitude which previous studies have investigated in various ways (e.g. Dohmen et al., 2010; Eckel et al., 2009; Hanaoka et al., 2015).

In this paper, we analyze the source of volatility in risk attitude. In other words, this research tests which variables systematically vary individuals' risk attitude. The measure of risk attitude used in this paper is based on self-reported survey data which could dispute its reliability as a measure. However, it was verified by some literature (Barsky et al., 1997; Dohmen et al., 2011) addressing that the measure obtained by survey can be valid predictors of actual risk-taking behavior. Furthermore, Dohmen et al (2011) verified that "the question about risk taking in general generates the best all-round predictor of risk behavior" across contexts such as holding stocks, occupational choice, participation in active sports and smoking. Nevertheless, one can

observe a substantial variability in answers to the risk question which affect its usability in further research. As we show in Table 10 in the Appendix, the general risk question is less predicitive for most of the risky outcomes used by Dohmen et al. (2011) when it is measured with a lot of noise then when it's measured accurately.[1] This provides motivation for us to take a closer look at the measuremement error in the general risk quesion and its determinants.

To explore factors resulting in variability in risk attitude, this research approaches from the perspective of determinants and measurement error. Firstly, we have a look at the effect of year-to-year difference of variables on risk attitude. The hypothesis that life events such as wealth fluctuation or starting parenthood can provoke changes in risk attitude was empirically investigated by several papers (Brunnermeier et al., 2008; Goerlitz et al., 2015). Thus, education years, employment status, marital status and parenthood which we mainly focus on in the first part are considered as important events in one's life. However, the result showed that the life events mentioned above overall do not explain the individual variation in risk attitude.

Secondly, we probe instability in individual's response assuming that determinants except risk preference are fixed. That is, aggregation variability per person over time is the main focus in this part. Since the exogenous determinants that were used in the first part seem to be irrelevant in describing the variability, other approach would be to investigate whether the respondents' personality have an effect on the variability in the answers to the general risk question. The majority of the personal characteristics explain the variability in the answers, except openness and all specifications in this category. Regarding to cognitive skills, one of the two cognitive tests shows significant negative effect. After checking whether the concentration in the most frequent response "5" is random, to have a closer look at measurement error, we exclude respondents called "type 5" who reported medium score of 5 in general risk question at least one time. The regressions are conducted in the same way with the previous ones except exclusion of type 5. Except the change in significance of neuroticism, there was no considerably remarkable difference overall compared to the previous result.

The remainder of the paper is structured as follows. Section 2 describes the data and proxies exploited in this research to measure interested subjects. Section 3 presents results from each approaches mentioned above. Section 3.1 explains the effects of year to year changes in life events on risk attitudes. Section 3.2 investigates the volatility in risk attitude from a viewpoint of individual level measurement error. Section 3.3 assesses this instability in risk attitude under detailed condition relative to the response pattern. Section 4 suggests the conclusion and discussion regarding the implication of the results.

2 Data

The data come from the German Socio-Economic Panel (SOEP v35) survey, which is conducted on the residents of Germany starting from 1984. The sample of the SOEP is constructed to be the representative of the adult population living in Germany. The SOEP conducts surveys on the head of the household to gather information about households and on all individuals over the age of 17 for their personal informations. While participants are asked for a wide range of questions, our focus is especially on the personal and household informations, risk attitudes, personality traits and cognitive abilities of the participants. Our analysis uses the data of the SOEP after 2004, which includes 329 573 observations, due to the availability of the data on the general risk question.

[1] Concretely, we regress these outcomes on the general risk question and a set of controls once for a sample with a high variability in answers and once for a sample with low variability in answers. Coefficients of the general risk question are larger and/or measured with less noise except for holding financial assets. For the construction of the measure of variability, see Section 3.2.1

Our analysis mostly focuses on the general risk question in the SOEP. The general risk question asks respondents to evaluate their willingness to take a risk between 0 and 10, where 0 means "not at all willing to take a risk" and 10 means "very willing to take a risk". Table 1 shows the number of observations, means and standard deviations of the answers to the general risk question over different years. It can be easily noticed that the mean response does not change significantly between years. In comparison with the other years, the considerable fall of the risk response variable in 2009 can be explained by the financial crisis of 2008. While the standard deviations of the variable over the years are also quite stable, the number observations increase year by year. In addition, the correlation table of the risk responses for different years can be found in the Table 9 of the appendix A. It states that the correlations of the risk answers in different years are stable around 0.5.

Year	**Mean**	**Std. Dev.**	**Obs.**
2004	4.418	2.379	21 881
2006	4.772	2.291	22 210
2008	4.457	2.306	19 639
2009	3.741	2.212	20 707
2010	4.423	2.349	26 628
2011	4.535	2.270	21 011
2012	4.859	2.258	27 903
2013	4.515	2.492	24 059
2014	4.769	2.420	27 275
2015	4.871	2.435	27 116
2016	4.865	2.607	28 765
2017	4.662	2.604	32 247
2018	4.291	2.618	30 132

Note: Own calculations using SOEP data

Table 1: Summary statistics for the answers to the general risk question year by year

In the first part of the analysis, the independent variables consist of changes in life events like marital status, years of education, educational level, employment status, monthly income and the number of kids. Since we are focusing on the measurement error, the year-to-year changes in variables are used in order to see to what extent the changes in life events can explain the changes in the risk responses. The summary statistics of the variables which are used to construct our independent variables for the changes in life events is shown below in the table 2. Since variables like marital status and employment status are categorical, adding their means and standard deviations in the table 2 makes no sense. Moreover, taking the differences of those variables is also not informative. That is why we generate additional dummy variables as indicators of the changes in life events such as "was employed in previous year, became unemployed in the current year", "was unemployed in the previous year, became employed in the current year", "was either employed or unemployed in the previous year, became retired in the current year", "was married, got divorced", "was single, got married" and "was married, became widowed".

In the second part of the analysis, personality traits and cognitive abilities are used as independent variables to find out to what extent the variability in the risk attitude variable is driven by the personal characteristics. The personality traits variables consist of five sets

Variable	Mean	Std. Dev.	Obs.	Min	Max
Gender	1.53	0.49	387 791	1	2
Age	48.5	17.7	354 546	16	105
Marital Status	-	-	361 901	1	7
Employment Status	-	-	387 778	1	7
Monthly income	2489.31	23388.77	234 317	0	196 000
Years of Education	12.15	2.76	368 843	7	18
Number of Kids	1.7	1.54	43 845	0	19
Risk attitude	4.57	2.33	329 573	0	10

Note: Own calculations using SOEP data

Table 2: Summary statistics for variables of the first part

of variables which are related to conscientiousness, extraversion, agreeableness, openness and neuroticism. Each of these variables is calculated as the summation of three related sub-variables and standardized. These sub-variables take values from 1 to 7 and can only be found in 2005, 2009, 2013 and 2017 questionnaires. On the other hand, there are also two additional variables on cognitive abilities, the number of animals and the number of symbols one can name in 90 seconds. These variables are obtained by tests which were conducted only in 2006 and aimed for testing the fluid intelligence. The summary statistics of variables of the personality traits and cognitive abilities are given in the table 3. The number of observations falls dramatically in comparison with the analysis for our first part, mainly because we combine observations to only one observation per each person due to the fact that both personality traits and cognitive ability tests were surveyed only in a few years.

Variable	Mean	Std. Dev.	Obs.	Min	Max
Conscientiousness	17.5	2.82	96 596	3	21
Extraversion	14.63	3.41	96 828	3	21
Agreeableness	16.28	2.94	96 907	3	21
Openness	13.75	3.63	96 131	3	21
Neuroticism	11.51	3.69	96 941	3	21
Number of animals	28.09	12.36	387 791	0	93
Number of symbols	21.39	14.37	387 791	0	99

Note: Own calculations using SOEP data

Table 3: Summary statistics for variables of the second part

Since our focus is on the errors in the answers to the general risk question, we construct six additional variables using the risk response variable in order to compare different results. We denote these variables as absolute deviation from mode, squared deviation from mode, absolute deviation from mean, squared deviation from mean, absolute deviation from year-fixed effect corrected mean and squared deviation from year-fixed effect corrected mean. The summary statistics of these variables are given in the results section (Table 5).

3 Results

The results section consists of 3 parts: 3.1 explains the variability in the general risk question using real life events, 3.2 explains the variability using personality traits and cognitive abilities, while 3.3 zooms in on individuals who report 5 to the general risk question.

3.1 Explaining variability in answers using life events

In the first part of our analysis, we focus on whether the changes in the risk attitude stemming from the real life events can explain the variability of our risk question responses or not. In order to do it, we construct a year-to-year difference variable which shows the absolute changes in the answers to the general risk question as our variability measure. Then we use a variety of variables from some real life events which can change the risk attitude of people to find out what factors drive this year-to-year differences and to what extent we can illuminate this variability in the responses to the general risk question. By this way, we investigate if the variability of the responses depends on extrinsic changes or not.

3.1.1 Construction of the variability measure and independent variables

Firstly, we construct our dependent variable which measures the variability in the responses to the general risk question by taking one-year differences for the years after 2008 for each individual. For the years of 2004, 2006 and 2008 we use the same procedure but with two year differences since we do not have risk question data in 2005 and 2007. As it can be seen below in Figure 2, the distribution of the changes in risk responses are quite similar over time. While the most frequent change from year to year is 0, the changes in risk responses bigger than 3 and smaller than -3 are noticeably rare.

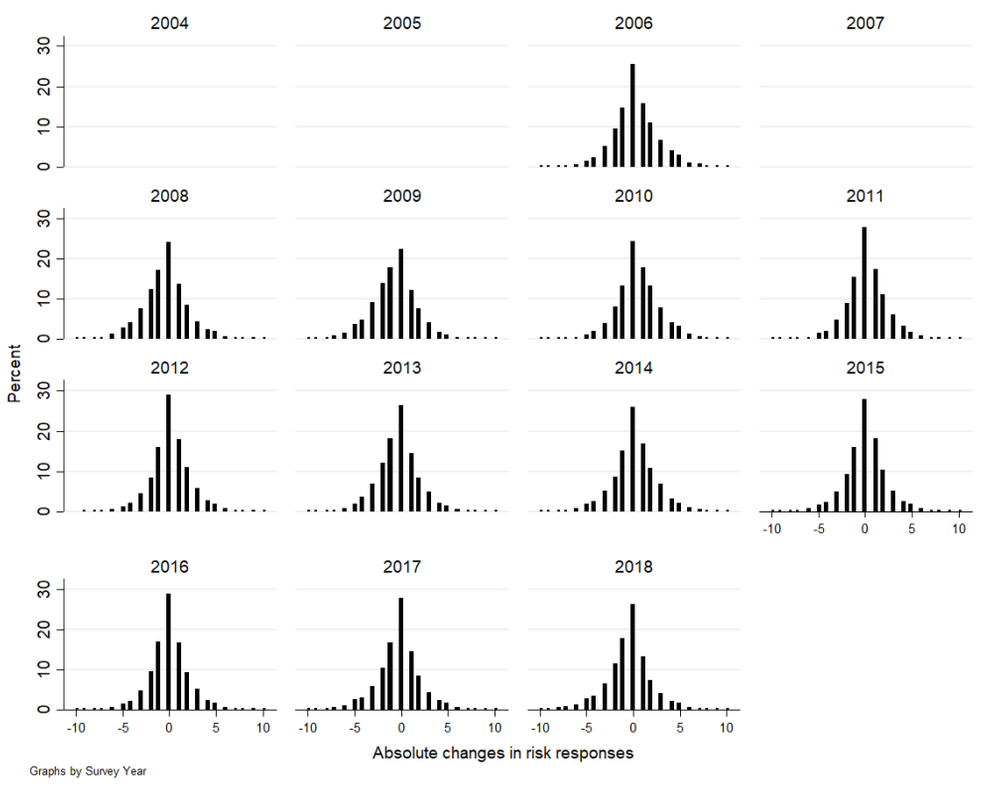

Figure 1: The histograms of the absolute changes in risk responses

In order to analyze whether the changes in life events can be accountable for the variability in risk responses, we use employment status, marital status, educational level, years of education, number of children and monthly income variables as determinants. We construct dummy variables, which are taking 1 if the indicated life event occurred in that year and taking 0 if there is no change happened in that year for each individual, for the shifts in employment status, marital status and educational level. For instance, if a person is marked as married in the marital status variable for that year and indicated as single for the previous year, our "married" dummy is taking the value of 1 for that year. In addition to these, we use year-to-year difference variables for the changes in years of education, number of children and monthly income variables.

3.1.2 Regression Results

Table 4 shows the result of our regression for real life events and year-fixed effects. We include year-fixed effects to control for the aggregate effects like financial crises.

	(1)
	Year-to-year difference in risk responses
1 if separated	-0.064
	(0.148)
1 if married	-0.003
	(0.105)
1 if widowed	-0.607
	(0.467)
1 if unemployed	0.180
	(0.180)
1 if employed	-0.350
	(0.208)
1 if retired	-0.446
	(1.036)
Difference in years of education	-0.253*
	(0.126)
1 if got university degree	0.933*
	(0.381)
1 if got doctoral degree	0.218
	(0.337)
1 if got abitur	0.052
	(0.729)
1 if got professional degree	0.238
	(0.289)
Difference in income	0.000
	(0.000)
Difference in number of kids	-0.067
	(0.036)
Survey Year=2009	-0.606***
	(0.040)
Survey Year=2010	0.504***
	(0.041)
Survey Year=2011	0.204***
	(0.041)
Survey Year=2012	0.203***
	(0.038)
Survey Year=2013	-0.335***
	(0.040)
Survey Year=2014	0.382***
	(0.038)
Survey Year=2015	0.116***
	(0.027)
Survey Year=2016	0.045
	(0.028)
Survey Year=2017	-0.262***
	(0.029)
Survey Year=2018	-0.304***
	(0.029)
Observations	39123
Adjusted R^2	0.021

Note: OLS estimates for year-to-year differences in answers to the risk question. Standard errors in parentheses. Dummies indicate if the change occurred from the previous to the current year.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Regression results for Life Events

While nearly all of the variables related to the life events reveal as insignificant, we find that

almost all variables which stand for the year-fixed effects are highly significant in explaining the variability leading to the conclusion that the changes in risk responses could not be explained by extrinsic factors, at least by the variables at our disposal.

Thus, we switch our focus to the intrinsic measures which may explain the measurement error and the variability of responses to the general risk more comprehensively. Additionally, we noted that it may be useful to analyze the effects of intrinsic measures after we construct a risk response variable which is disentangled by the year-fixed effects.

3.2 Explaining variability in answers using cognitive abilities and personality traits

As the first part of our analysis has shown that events in the life of people can hardly explain any of the changes in answers to the general risk question, in a next step of the analysis we switch our focus from looking at year-to-year changes in answers to looking at the average volatility in answers to the risk question a person exhibits while taking part in the survey. To do this, we construct different measures that express a person's average volatility in answers to the general risk question for all years. This is achieved by summing up the deviations of given answers from the true value estimates of a person's risk attitude and normalizing the result by the times a person answered in the survey. In a second step, we then investigate if the degree of variability in answers varies systematically across persons. For this, we explain the constructed variability measures by personal characteristics, concretely self-reported personality traits and cognitive abilities obtained by a test.

3.2.1 Construction of the variability measure

As documented in Section 3.1, events in the lives of people do not contribute to explaining year-to-year changes in answers to the risk question. Thus, it is worth investigating if respondents' personality, rather than extrinsic factors, play a role when it comes to variability in answers. We thus condense these year-to-year changes in answers by person to one measure that captures the aggregate volatility that a person exhibits while taking part in the survey. Hence, we collapse our panel from before to a cross-sectional structure that contains only one observation per person.

Our measure for variability in answers is equal to the average distance of answers from a person's "true" answer. As distance measures we use both the specification with the $\mathcal{L}_1$ and the $\mathcal{L}_2$ norm. As a person's true value of risk attitude is complex to determine, we approximate it by two different statistics, the mode and the mean of a person's answers in all years. These approximations can be expected to be valid because as Part 1 of our analysis shows, there seems to be a fairly stable underlying risk attitude trait. We did not find any significant effects of life events (for example getting children, becoming self-employed or getting married) on changes in answers to the risk question. Instead, we found year-fixed effects to be significant. To account for this, i.e. circumstances over time that affect all people equally, additionally to using the reported answers directly, we also create a measure of variability where we control for year-fixed effects. For this, we correct each given answer by the respective year's effect and then calculate the deviations of these answers from the mean by person of corrected answers.[2]

Thus, we obtain different measures depending on how the true answers are approximated (i.e. by taking the mean or the mode), which distance measure is used ($\mathcal{L}_1$ or $\mathcal{L}_2$ norm), and if we correct for year-fixed effects or not. As there does not exist an unique mode for each person,

[2]As the year-fixed effects are not integers, there will be multiple modes for each persons and thus we can not create deviations from the corrected mode anymore as before.

we lose about one fourth of our observations when using the mode. As we have an unbalanced panel where the number of observations per person differs, after summing up all deviations we divide it by the number of a person's answers in order to get comparable values. For example, our measure for non-corrected squared deviations from the mean takes the form

$$\theta_i = \frac{1}{obs_i} \sum_{t_i} (R_{it} - \mu_i)^2, \tag{1}$$

where t_i stands for all years in which person i answered, $obs_i = \sum_i t_i$ is the number of observations from person i, μ_i is the mean of person i's answers, and R_{it} is the answer to the risk question of person i in year t.

To correct for year-fixed effects, using OLS we estimate the equation

$$R_{it} = \alpha + \sum_{t=2006}^{2018} \lambda_t d_{it} + \varepsilon_{it}, \tag{2}$$

where d_{it} is equal to one if the observation for individual i was made in year t, in order to obtain the average effect that each year has on all person's answers together, taking 2004 (the first year where the general risk question was part of the survey) as the base year. As an example, the financial crisis caused answers in 2009 being on average around 0.68 points lower than in 2004. The fixed effects regression is shown in Appendix C. The following table reports summary statistics for our constructed variability measures.

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**Obs.**
Abs. dev. from mode	0.932	0.637	0	4.615	15628
Abs. dev. from mean	1.076	0.636	0	5	22344
Sq. dev. from mode	2.752	3.196	0	36.75	15628
Sq. dev. from mean	2.12	2.148	0	25	22344
Corr. abs. dev. from mean	1.066	0.613	0	5.177	22344
Corr. sq. dev. from mean	2.052	2.077	0	26.799	22344

Note: Own calculations using SOEP data.

Table 5: Summary statistics for deviation measures

When looking at the correlations between the measures, one can already note their connectedness.[3] The strong weight that the $\mathcal{L}_2$ norm gives to large outliers - accidentally reversing the scale in one year and answering 10 instead of 0 will, even when answering 0 in all other years, lead to a comparably high deviation measure - suggests the absolute deviations being a more robust measure for our analysis.

A big issue when constructing the measures is that our panel for the analysis is unbalanced - we do not have the same number of observations for all persons. We can thus only to a certain degree compare the volatility in answers as naturally the variability will be higher when having only few observations for a person. Additionally, it is to expect that the longer people participate in the survey, the more they will think about the question and thus one can expect that answers will stabilize. The special case that a person participates only once in the survey which means zero deviations is taken care of by excluding these people from the analysis.

[3]The correlation coefficients range from 0.87 (correlation between the squared deviation from the mode and the year FE-corrected absolute deviation from the mean) up to 0.973 for the correlation between corrected and non-corrected absolute deviations from the respective mean.

3.2.2 Personality traits and cognitive abilities

To analyze to what degree the variability in answers is driven by personal characteristics, we make use of two blocks of variables: cognitive abilities and personality traits. The former were assessed in the SOEP for the first time in 2006 by means of two tests. Both tests mainly aim at measuring fluid instead of cristallized intelligence, i.e. the rather innate part of intelligence which is not mostly determined by cultural and biographical factors. The two tests we make use of are first a word test - to name as many animals as possible in 90 seconds - and a symbol correspondence test where again all right answers in 90 seconds count.

The personality trait variables we use are based on the big five traits conscientousness, extraversion, agreeableness, openness, and neuroticism (Gerlitz Schupp, 2005). In the SOEP, there are three particular questions related to each of these five traits which have been asked four times during our period of analysis (namely 2005, 2009, 2013 and 2017). To construct the big five variables, we first take the averages by each person for each question and then again take the average for each triple of questions related to one big five trait, respectively. In our analysis, we use both a specification with the big five variables and with the individual traits in order to see if particular components of the traits are driving the variability in answers to the risk question.

As the cognition tests were conducted only in few years and only for a selected group of survey participants and we also have missing values for the personality questions, in order not to lose too many observations, we replace missing values by zero and, for each variable we treat like this, add a dummy indicating that the observation is missing. In that way, we can keep these observations in the analysis and test if observations are missing at random.

3.2.3 Regression results

Table 6 shows our results of regressing the different variability measures on cognition and the big five personality traits. Columns (1) to (4) use the original answers as given in the SOEP, columns (5) and (6) correct these answers by year-fixed effects as described above. First of all, it is done to observe that our results are independent of the measurement of the dependent variable. We find conscientiousness, extraversion, neuroticism and agreeableness to be highly significant with a positive sign in most of the specifications while openness does not seem to contribute to explaining variability in answers. The negative coefficient for the animal naming test throughout all specifications shows that individuals with higher cognitive abilities exhibit a lower variability in answers. However, this finding is not supported by the coefficient of the number symbol test: even if probably the latter provides a better measurement of a person's cognitive abilities than merely naming animals, its coefficient is not significant in any of the specifications. However, a possible explanation for this is that the animal naming test is a good approximation of a person's overall performance in surveys - just because every person can be expected to name many animals, those that perform bad on the test probably have problems in general of answering to surveys.

Taking a more detailed look at the personality trait variables, one can see that even if all traits except openness are related to a higher variability in answers, meaning that individuals that are more conscientiousness, more extroverted, more neurotic and more agreeable will exhibit a higher variability in answers to the risk question, these effects are quite small. As we report coefficients on standardized variables, the results from column (1) imply that a person with a self-reported conscientiousness score that is two standard deviations higher than another person with the same characteristics, will have a score of variability that is 1.5 points higher (being roughly 15% of the score's mean). For extraversion, agreeableness and neuroticism an upward jump of two standard deviations in the respective self-reported score will result in an increase of the deviation measure of around 9%, 4%, and 2% of its mean, respectively. This also

implies that for two individuals being the same in all aspects except from their conscientiousness score, the person that lies two standard deviations above the mean will only have an deviation from the mean that lies around 30% of the mean higher than the one for the person that lies two standard deviations below. These results are very similar when calculating them for the other regression specifications.

Comparing columns (3) to (5) and (4) to (6), respectively, shows that the results hardly change when correcting answers by year-fixed effects. That shows that the particular time of participating in the survey has a negligible effect for variability in answers and thus our problem of having an unbalanced panel reduces to the period of a person's participation in the survey, but not on the particular point in time.

The coefficients of dummies indicating missing values show that people who did not participate in the cognition test have lower variability in answers than those who participated. For people who did not answer the questions on their agreeableness, we get an even larger effect with more noise. This clearly shows that these variables are not missing at random, but in a way that affects our results.[4] What this shows is that we are probably having an omitted variable bias here. As the cognition test was only conducted with persons interviewed in a particular way[5], those people probably differ from others in many ways. Thus, controlling for the survey mode would be part of a remedy.

As our big five variables combine three questions from the survey each, the question how the effects of the particular questions drive variability is of interest. Section D in the Appendix contains our regression table for these individual traits. The results shed more lights on the results from Table 6. Apparently, particular elements of the big five traits drive its relevance for explaining variability in answers. As an example, for conscientiousness considering oneself as *thorough worker* does not correlate with a higher variability to the risk question. In turn, the unclear results on openness can be explained by only one of the questions pertaining to it, if a person values artistic experiences, has explanatory power for the variability in answers. We can also get more insight on the dummies for missing variables: the dummy for not participating in the cognition test is still highly significant with a similar size as in the regression on the big five traits; the dummy on missing answers to agreeableness can be explained by unwillingness to answer to the question if one is sometimes too coarse with others.

[4]The observations missing at random was a condition for our method of replacing missing variables by zero being a valid treatment. As a result, we can expect our results to be biased, however as we are mainly interested in qualitative results and not the accurate size of the different effects, it does not invalidate our results fully. Additionally, as the cognition test was only conducted on about a tenth of total participants, only including people who participated would bias our results as well by keeping only one particular group of individuals in the analysis. As the dummy for a missing cognition test will be 1 for roughly 90% of observations, it may collect parts of the constant term as well.

[5]using Computer Assisted Personal Interviews (CAPI)

	(1) Abs. dev. from mode	(2) Sq. dev. from mode	(3) Abs. dev. from mean	(4) Sq. dev. from mean	(5) Corr. abs. dev. from mean	(6) Corr. sq. dev. from mean
Std. Conscientiousness	0.074***	0.390***	0.064***	0.236***	0.056***	0.206***
	(0.006)	(0.034)	(0.005)	(0.018)	(0.005)	(0.018)
Std. Extraversion	0.044***	0.238***	0.041***	0.159***	0.039***	0.150***
	(0.006)	(0.034)	(0.005)	(0.0185)	(0.00499)	(0.018)
Std. Agreeableness	0.018**	0.159***	0.024***	0.098***	0.024***	0.088***
	(0.006)	(0.033)	(0.005)	(0.018)	(0.005)	(0.018)
Std. Openness	-0.006	-0.073*	-0.004	-0.009	-0.007	-0.021
	(0.006)	(0.033)	(0.005)	(0.018)	(0.005)	(0.017)
Std. Neuroticism	0.011	0.118***	0.013**	0.062***	0.019***	0.075***
	(0.006)	(0.031)	(0.005)	(0.017)	(0.005)	(0.017)
Cognition	0.0006	-0.0009	0.0001	-0.0002	0.0001	0.0003
(Number Symbol Test)	(0.0009)	(0.005)	(0.0007)	(0.0026)	(0.0007)	(0.00250)
Cognition	-0.002	-0.010*	-0.002***	-0.010***	-0.002***	-0.010***
(Animal Test)	(0.0009)	(0.005)	(0.0007)	(0.003)	(0.0007)	(0.003)
Missing Conscientiousn.	-0.288**	-0.786	-0.165*	-0.361	-0.097	-0.253
(1 if missing)	(0.088)	(0.470)	(0.072)	(0.254)	(0.069)	(0.246)
Missing Extraversion	-0.082	-0.378	0.173	0.417	0.147	0.353
(1 if missing)	(0.132)	(0.704)	(0.095)	(0.336)	(0.091)	(0.326)
Missing Agreeableness	-0.276*	-0.854	-0.307**	-0.910*	-0.274**	-0.755*
(1 if missing)	(0.140)	(0.747)	(0.106)	(0.376)	(0.101)	(0.364)
Missing Openness	-0.136	-0.341	-0.007	0.098	-0.012	0.076

(1 if missing)	(0.110)	(0.591)	(0.081)	(0.287)	(0.077)	(0.278)
Missing Neuroticism	-0.099	-0.219	0.087	0.084	0.056	-0.035
(1 if missing)	(0.135)	(0.722)	(0.104)	(0.371)	(0.100)	(0.359)
Missing Cog. Test	-0.109***	-0.664***	-0.130***	-0.496***	-0.123***	-0.467***
(1 if missing)	(0.017)	(0.091)	(0.014)	(0.050)	(0.014)	(0.049)
Constant	1.096***	3.522***	1.242***	2.659***	1.224***	2.560***
	(0.016)	(0.086)	(0.013)	(0.048)	(0.013)	(0.046)
Corrected by Year FE	No	No	No	No	Yes	Yes
Observations	14541	14541	21257	21257	21257	21257
Adjusted R^2	0.041	0.029	0.024	0.026	0.021	0.022

Note: OLS estimates for different deviation measures. Standard errors in parentheses. Columns (5) and (6) use answers to the risk question that were corrected by year-fixed effects.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Regression results for big five traits

3.3 Zooming in on individuals who answer "5"

The distribution of the general risk attitude shows substantial heterogeneity in the answers across the population. Figure 2 in the appendices shows the histogram of the risk attitude in 2004, all years of the panel have approximately the same histograms for the general risk question. Respondents' self-reported risk answers vary broadly over the scale, but it can be seen that the most frequent response is 5. Since the survey collects the self-reported answers and there is no option like 'I do not know', there may be a reason to believe that not all of the respondents answering 5 are risk neutral. In that case, people who are uncertain about their level of willingness to take a risk distort the actual volatility of the risk variable by choosing the average answer.

3.3.1 Calculating the fraction of 5 answers

Several new variables are generated in order to check whether people report 5 to the general risk question systematically or randomly. Firstly, the dummy variable is created in such a way that it takes 1 if the participant answers 5 to the general risk question and 0 otherwise. Secondly, the fraction of answer 5 is calculated as the number of 5 answers divided by the total number of answers given to the general risk question for each person. The summary statistics of different fractions of the number of 5 answers are given in the table 7.

The first row shows the fraction of 5 answers for each person in the whole sample and the remaining ones represent the sample which consist of people giving answer 5 at least 100%, 90%, 75%, 50%, 25% of the total number of answers, respectively. As it is expected, the mean decreases and the standard deviation increases when the fraction of 5 answers decline in the sample.

Variable	Mean	Std. Dev.	Min.	Max.	Obs.
Fraction of 5 answers - all	0.209	0.234	0	1	22 210
Fraction of 5 answers - 1	1	0	1	1	527
Fraction of 5 answers - 0.9	0.998	0.119	0.90	1	539
Fraction of 5 answers - 0.75	0.931	0.101	0.75	1	792
Fraction of 5 answers - 0.5	0.642	0.180	0.50	1	3297
Fraction of 5 answers - 0.25	0.500	0.195	0.25	1	8176

Note: Own calculations using SOEP data. 'Fraction of answer 5 - 0.90' means an agent reported 5 to the general risk question at least 90% of the total number of answers.

Table 7: Summary statistics for the fractions of 5 answers

Table 12 in the appendices shows the results of the regressing different fractions of 5 answers on the big five personality traits and cognitive abilities variables. Regressions (1) to (4) contain people who answer 5 to the general risk question at least 90%, 75%, 50% and 25% of the time, while regression (5) is for the whole population of fraction 5 answers. It can be noticed from regression (1) that none of the independent variables are significant. If we decrease the share of 5 answers in the sample to 75% (regression (2)), the agreeableness and neuroticism become significant at the 1% significance level. The signs of these variables suggest that agreeableness and neuroticism increase the fraction of the 5 answers, but both of the variables make very slight changes due to their small coefficients. When we decrease the fraction of 5 answers more, neuroticism shows up significant in all regressions. However, agreeableness is only significant when the sample contains people who are giving 5 as an answer at least 75% of the time. One

of the possible explanations of why regression (1) is completely different from the others is that it contains either only true risk neutral people or people who mistakenly believe that they are risk neutral, but do not think like that later. Because when the sample is increased by adding people who at least 75% of the time giving the answer 5, some variables turn out to be significant. We believe that the sample in regression (2) consist of people who initially did not know their willingness to take a risk and choose the average level, but by answering to the general risk question every year, they realized their actual level and deviated from 5. Since there are significant variables in the regressions except regression (5), there is a chance that people report 5 to the general risk question systematically. Thus, we decide to exclude some proportion of "type 5" individuals and re-run the regressions in the part 3.2.

3.3.2 Regression results

Table 8 shows our results of regressing the effect of cognition and the big five personality traits on different variability measures without respondents who reported 5 at least 75% of the time. The variability measures are the same as in the Table 6. This part distinguished from part 2 in that suspicious type 5 respondents are excluded in the regressions.

Regarding to the variables related to the personality traits, the result shows that conscientiousness, extraversion, agreeableness and openness are generally statistically significant across specifications, whereas neuroticism does not explain the variability. On the other hand, there are some differences compared to the Table 6 for the personality traits variables. Firstly, the significance levels of the personality traits variables in both analyses are changed. Conscientiousness and extraversion tend to have less effects on the variability compared to the result in Table 6. Agreeableness, rather, shows bigger effects on it across all specifications. Secondly, there are some remarkable changes in significance. While openness was insignificant in the previous result, it becomes significant across all specifications and have mostly positive effect on the variability in this regression results. For the case of neuroticism, it becomes insignificant in most of specifications, while it was entirely significant before. Furthermore, neuroticism was statistically significant in four regression with different fractions of 5 answers in Table 12. That is, neuroticism is systematically involved in causing the response pattern of answering 5. Therefore, that change in significance of neuroticism in Table 6 suggests that bias in Table 6 is partially corrected.

Cognition tests coefficients have similar patterns as it is described in the second part with a lower level of significance and slightly less size of effects over all specifications. Recalling that the animal name test result was significant only when the type 5 respondents occupy enough portion in the sample (i.e. the group where fraction of answer 5 is not less than 0.75), the tendency of less significance of animal name test is a plausible and expected result. On the other hand, there are changes in significance of missing agreeableness which indicate respondents who did not answer to agreeableness questions. In contrast with Table 6, it becomes insignificant over most specifications. Our concern in the second part was large effect of non-participants of cognitive skill test on risk attitude. However, as we showed Table 12 participation decision in cognitive skill test seems not to affect to type 5 response pattern.

The results from the first column imply that an increase in conscientiousness score by two standard deviations will lead to a variability roughly 10% higher of the mean, considering that all other traits are the same. For extraversion and openness two standard deviations growth in the respective self-reported score will result in an increase of the deviation measure of around 5% and 6% of the mean correspondingly.

	(1) Abs. dev. from mode	(2) Sq. dev. from mode	(3) Abs. dev. from mean	(4) Sq. dev. from mean	(5) Corr. abs. dev. from mean	(6) Corr. sq. dev. from mean
Std. Conscientousness	0.047***	0.238***	0.049***	0.255***	0.040***	0.158***
	(0.011)	(0.061)	(0.010)	(0.020)	(0.010)	(0.035)
Std. Extraversion	0.022*	0.150*	0.040***	0.147***	0.038***	0.139***
	(0.011)	(0.060)	(0.010)	(0.020)	(0.010)	(0.035)
Std. Agreeableness	0.021	0.175**	0.024*	0.114***	0.025**	0.091**
	(0.011)	(0.061)	(0.010)	(0.020)	(0.010)	(0.035)
Std. Openness	0.028*	0.164**	0.031**	-0.096***	0.027**	0.103**
	(0.011)	(0.060)	(0.010)	(0.020)	(0.010)	(0.035)
Std. Neuroticism	0.004	0.047	0.006	0.104***	0.008	0.035
	(0.010)	(0.056)	(0.010)	(0.019)	(0.009)	(0.033)
Missing Conscientousn. (1 if missing)	-0.359**	-1.282*	-0.254*	0.268	-0.162	-0.466
	(0.118)	(0.648)	(0.109)	(0.368)	(0.103)	(0.375)
Missing Extraversion (1 if missing)	0.013	0.046	0.294	-0.211	0.264	0.723
	(0.196)	(1.080)	(0.160)	(0.419)	(0.152)	(0.553)
Missing Agreeableness (1 if missing)	-0.175	-0.510	-0.132	-1.924***	-0.139	-0.380
	(0.183)	(1.007)	(0.170)	(0.508)	(0.161)	(0.585)
Missing Openness (1 if missing)	-0.103	-0.264	-0.056	0.765	-0.065	-0.094
	(0.143)	(0.784)	(0.117)	(0.451)	(0.112)	(0.405)
Missing Neuroticism (1 if missing)	-0.074	-0.189	0.030	0.188	0.016	-0.136
	(0.192)	(1.056)	(0.174)	(0.464)	(0.166)	(0.601)
Cognition	0.002	0.002	0.001	-0.002	0.000	0.001

(Number Symbol Test)	(0.002)	(0.009)	(0.002)	(0.003)	(0.001)	(0.005)
Cognition	-0.002	-0.011	-0.003*	-0.009**	-0.003*	-0.014*
(Animal Test)	(0.002)	(0.009)	(0.002)	(0.003)	(0.002)	(0.006)
Missing Cog. Test	-0.086**	-0.532**	-0.129***	-0.538***	-0.129***	-0.475***
(1 if missing)	(0.030)	(0.164)	(0.028)	(0.055)	(0.027)	(0.096)
Constant	0.873***	2.949***	1.144***	2.773***	1.144***	2.427***
	(0.028)	(0.154)	(0.026)	(0.052)	(0.025)	(0.091)
Observations	4605	4605	7212	14045	7212	7212
Adjusted R^2	0.034	0.022	0.017	0.036	0.015	0.016

Note: Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Regression results for big five traits

4 Conclusion

This paper has investigated the important research question related to individual's risk attitude: the source of measurement errors in the risk attitudes. The main finding is that most of personality traits and a cognitive skill contribute to instability in the risk attitude, assuming that other determinants are fixed.

Our first finding suggests that in line with earlier research, the risk attitude is an inherent, relatively stable trait which does not react significantly to events that affect a person's life. While using variables concerning an individual's family situation and employment and wealth indicators we covered a wide range of external factors that could be assumed to change the risk attitude, making use of more variables that possibly change a person's risk attitude one could obtain more support for this hypothesis.

With this evidence pointing to the observed variability in answers to the risk question not being caused by external factors, in a next step we find that personal characteristics, in turn, can explain different levels in variability in answers. Concretely and contrary to our expectations, we find the traits conscientiousness, extraversion, agreeableness and neuroticism to be related with a person exhibiting a higher volatility in answers to the general risk question, while better cognitive skills are related with a lower volatility. This finding is robust across different specifications of the risk attitude and also holds when correcting person's answers by year-fixed effects. In addition, excluding people, who responded 5 at least 75% of the time and thus are potentially unsure about their willingness to take risk, can partially improve our results.

While previous papers have predominantly looked at the importance of the individual's risk attitude and determinants affecting it, our analysis is new in taking a closer look at the determinants and nature of the measurement error in the question, which can help to improve findings of later studies working with the risk question by correcting for this measurement error or excluding people who show a very high variability in answers.

Our study can be improved by solving remained limitations. Firstly, there are some suggestions how to calculate the measures of the variability. They are generated without taking into account different number of responses. This is a problem because one can expect the variability in answers to stabilize over years for statistical reasons as well as for the fact that people who participate many years in the survey have time to think about their answers. Weighting the independent variables with the number of responses can be a solution. We basically used mean or mode of quantified answers in survey data rather than deriving precise estimates of true value of risk attitudes. However, more refined measures of dependent variable like in columns (5) and (6) in Table 6 which are adjusted according to year effects, could estimate the true value and thus help to get better results. In other words, instead of looking at the deviations of reported values from the mean or mode of reported answers, there are various ways to better approximate the true risk attitude of a person which we assumed to be constant over years. For example, it can be observed that a person's risk attitude decreases with age. Thus, one could control for this trend and use a different "true" value for each year.

The representative variables of life events could not be enough to control all possible life events causing changes in risk attitudes correlated to the existing independent variables at the same time. For example, according to Hanoka et al.(2015) experience of a natural disaster can change individual's risk attitudes. Thus, adding more control variables could show different results. Lastly, some of the variables titled as "missing" indicate non-response interviewees and show an significant effect on the variability. It implies that figuring out and controlling appropriate variables related to non-response interviewee group will provide more meaningful results.

In addition, one can calculate the probability of giving 5 as an answer to check whether

people choose it because they are not sure about the level of their willingness to take risk. If it turns out that the probability is decreasing for individuals year by year, people choose the average answer at the first as they do not know their level. Since they are asked the general question every year after 2008, their responses to the general risk question might become more accurate at the later years. Moreover, the additional experiment could be conducted to improve the accuracy of the general risk attitude. The new experiment should ask the general risk question from the same population having an option "I do not know".

To conclude, our analysis is able to provide a starting point for analysing in detail the measurement error in the general risk question. While we could document that life events don't have a significant effect on a person's risk attitude, we could find evidence for personal characteristics explaining some of the variability in answers. While all big five traits except openness in Table 6 and neuroticism in Table 8 lead to a higher variability in answers, these effects are quite small. Individuals with higher cognitive skills have lower variability in answers, but this effect is similarly small. Thus, further research is needed to explore other determinants of variability in answers and, in a second step, to correct the answers to the risk question in order to obtain a more accurate measure.

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1 2 3 4 5 6 7 8 9 10 11 12 13

Appendices

A Data

Corr	2004	2006	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2004	1												
2006	0.50	1											
2008	0.45	0.48	1										
2009	0.45	0.43	0.47	1									
2010	0.45	0.49	0.49	0.50	1								
2011	0.47	0.49	0.5	0.52	0.58	1							
2012	0.46	0.46	0.5	0.50	0.53	0.6	1						
2013	0.42	0.44	0.52	0.48	0.53	0.54	0.58	1					
2014	0.47	0.45	0.52	0.50	0.50	0.56	0.57	0.59	1				
2015	0.44	0.43	0.5	0.48	0.50	0.54	0.55	0.59	0.61	1			
2016	0.44	0.43	0.5	0.48	0.49	0.53	0.54	0.57	0.59	0.63	1		
2017	0.41	0.43	0.49	0.46	0.49	0.52	0.52	0.54	0.55	0.59	0.55	1	
2018	0.39	0.41	0.49	0.44	0.47	0.49	0.50	0.56	0.53	0.56	0.52	0.54	1

Table 9: The correlation of the general risk questions in all years

B Regression of outcomes for samples with high and low variability in answers

	(1) Currently smoking	(2) Currently smoking	(3) Practicing active sports	(4) Practicing active sports	(5) Holding financial assets	(6) Holding financial assets	(7) Self-employed	(8) Self employed
General Risk Question	0.028**	0.079***	0.181***	0.422***	0.027**	0.019	0.567*	0.783*
	(0.009)	(0.009)	(0.011)	(0.017)	(0.009)	(0.010)	(0.246)	(0.329)
Age	-0.021***	-0.011***	0.055***	0.042***	0.023***	0.022***	0.040	0.012
	(0.001)	(0.001)	(0.003)	(0.003)	(0.001)	(0.001)	(0.048)	(0.056)
1 if female	-0.300***	-0.285***	1.654***	1.601***	0.203***	-0.010	0.001	0.350
	(0.058)	(0.058)	(0.082)	(0.105)	(0.057)	(0.059)	(1.669)	(1.811)
Height, cm	-0.004	-0.007*	0.088***	0.083***	0.025***	0.020***	0.243**	0.110
	(0.003)	(0.003)	(0.004)	(0.005)	(0.003)	(0.003)	(0.089)	(0.097)
1 if debts from private loans					-0.570***	-0.756***	3.373	5.057**
					(0.059)	(0.057)	(1.742)	(1.863)
Constant	1.096	0.669	-18.417***	-17.086***	-5.826***	-4.271***	-37.067*	-13.504
	(0.610)	(0.594)	(0.859)	(1.053)	(0.628)	(0.638)	(17.535)	(18.996)
Additional Controls	No	No	No	No	Yes	Yes	Yes	Yes
Sample	High variability	Low variability	High variability	Low variability	High variability	Low variability	High variability	Low variability
Observations	11666	12761	11114	11942	9908	9711	1186	1088
Adjusted R^2							0.017	0.011

Notes: Dependent variables, except for self-employment, are dummy variables that take value 1 if fulfilled and 0 otherwise, and logit estimates are presented. For self-employment, the dependent variable is the self-assessed likelihood to become self-employed in the next two years and we present OLS estimates. Regressions of active sports and being self-employed exclude people older than 65 years. Columns (1) to (4) use data from 2018. As data for financial asset holding and self-employment isn't available for 2018, we use data from 2007 in columns (5) to (8) and answers to the risk question from 2006.
Our sample is split up into two parts: People with a variability in answers to the risk question below the population median and those above it.

Var. in answers is measured as avg. abs. deviation from the mean. Uneven columns use the high-variability sample, even columns the low-variability sample.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

Table 10: Predictive power of a person's risk attitude for risky outcomes, using a sample with a variability in answers higher than the median and lower than the population median.

C Year FE

	(1) Answer to the general risk question
2004	0 (.)
2006	0.354*** (15.32)
2008	0.0384 (1.61)
2009	-0.677*** (-28.83)
2010	0.00496 (0.22)
2011	0.116*** (4.96)
2012	0.441*** (20.14)
2013	0.0965*** (4.26)
2014	0.351*** (15.95)
2015	0.453*** (20.55)
2016	0.446*** (20.50)
2017	0.244*** (11.49)
2018	-0.127*** (-5.92)
Constant	4.419*** (269.77)
Observations	329 573

Note: Statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, >*** $p < 0.001$

Table 10a: Regression results for year fixed effects

D Regression on individual questions

	(1) Abs. dev. from mode	(2) Sq. dev. from mode	(3) Abs. dev. from mean	(4) Sq. dev. from mean	(5) Corr. abs. dev. from mean	(6) Corr. sq. dev. from mean
Std. Conscientousness 1	0.0343***	0.168***	0.0283***	0.113***	0.0215***	0.0901***
(carry out tasks efficiently)	(0.00664)	(0.0355)	(0.00525)	(0.0187)	(0.00504)	(0.0181)
Std. Conscientousness 2	0.00977	0.0149	0.00772	0.00631	0.00798	0.00785
(thorough worker)	(0.00663)	(0.0355)	(0.00527)	(0.0187)	(0.00506)	(0.0181)
Std. Conscientousness 3	0.0251***	0.171***	0.0250***	0.0995***	0.0221***	0.0878***
(reversed lazy)	(0.00611)	(0.0327)	(0.00498)	(0.0177)	(0.00478)	(0.0171)
Std. Extraversion 1	-0.0145*	-0.0628	-0.00882	-0.0279	-0.00970*	-0.0297
(reversed reservedness)	(0.00640)	(0.0342)	(0.00515)	(0.0183)	(0.00494)	(0.0177)
Std. Extraversion 2	0.0307***	0.181***	0.0204***	0.0858***	0.0192***	0.0799***
(communicative)	(0.00729)	(0.0390)	(0.00582)	(0.0207)	(0.00559)	(0.0200)
Std. Extraversion 3	0.0284***	0.120**	0.0291***	0.0963***	0.0292***	0.0935***
(sociable)	(0.00734)	(0.0392)	(0.00588)	(0.0209)	(0.00564)	(0.0202)
Std. Agreeableness 1	0.0204**	0.133***	0.0162**	0.0700***	0.0188***	0.0738***
(friendly with others)	(0.00669)	(0.0358)	(0.00531)	(0.0189)	(0.00509)	(0.0183)
Std. Agreeableness 2	-0.0130*	-0.0557	-0.00448	-0.0261	-0.00777	-0.0401*
(rev. coarse with others)	(0.00623)	(0.0333)	(0.00502)	(0.0179)	(0.00482)	(0.0173)
Std. Agreeableness 3	0.00353	0.0390	0.0105*	0.0434**	0.0105*	0.0409*
(able to forgive)	(0.00587)	(0.0314)	(0.00471)	(0.0167)	(0.00452)	(0.0162)
Std. Openness 1	0.00114	0.0280	0.00187	0.0263	0.00431	0.0312

(lively imagination)	(0.00654)	(0.0350)	(0.00531)	(0.0189)	(0.00510)	(0.0183)
Std. Openness 2	-0.0197**	-0.135***	-0.0226***	-0.0943***	-0.0247***	-0.0984***
(value artistic experiences)	(0.00600)	(0.0321)	(0.00487)	(0.0173)	(0.00468)	(0.0168)
Std. Openness 3	-0.00814	-0.0778*	0.000868	-0.00419	-0.00312	-0.0176
(original)	(0.00684)	(0.0366)	(0.00549)	(0.0195)	(0.00527)	(0.0189)
Std. Neuroticism 1	-0.00180	-0.0304	0.00527	0.0114	0.00520	0.0139
(nervous)	(0.00672)	(0.0359)	(0.00534)	(0.0190)	(0.00513)	(0.0184)
Std. Neuroticism 2	0.0214***	0.223***	0.0220***	0.114***	0.0255***	0.119***
(worry a lot)	(0.00625)	(0.0334)	(0.00499)	(0.0177)	(0.00479)	(0.0172)
Std. Neuroticism 3	-0.0125	-0.0916*	-0.0158**	-0.0690***	-0.0138**	-0.0648***
(rev. deal with stress)	(0.00666)	(0.0356)	(0.00533)	(0.0190)	(0.00512)	(0.0184)
Cognition	0.000408	-0.00171	0.00000354	-0.000653	-0.0000307	-0.000152
(Number Symbol Test)	(0.000854)	(0.00456)	(0.000726)	(0.00258)	(0.000697)	(0.00250)
Cognition	-0.00162	-0.00980*	-0.00238**	-0.0100***	-0.00226**	-0.00995***
(Animal Test)	(0.000869)	(0.00465)	(0.000738)	(0.00262)	(0.000708)	(0.00254)
Missing Cons. 1	-0.294*	-0.892	-0.162	-0.337	-0.118	-0.303
(Dummy)	(0.116)	(0.622)	(0.0966)	(0.344)	(0.0928)	(0.333)
Missing Cons. 2	-0.0199	-0.149	0.173	0.579	0.197	0.586
(Dummy)	(0.156)	(0.834)	(0.124)	(0.439)	(0.119)	(0.425)
Missing Cons. 3	-0.393*	-0.705	-0.0952	-0.0882	-0.0508	-0.0354
(Dummy)	(0.161)	(0.858)	(0.121)	(0.431)	(0.116)	(0.418)
Missing Extraversion 1	-0.301	-1.024	0.291	1.323*	0.217	1.000
(Dummy)	(0.236)	(1.259)	(0.163)	(0.578)	(0.156)	(0.560)

Missing Extraversion 2	-0.112	-0.383	-0.277	-0.845	-0.247	-0.767
(Dummy)	(0.228)	(1.220)	(0.185)	(0.656)	(0.177)	(0.636)
Missing Extraversion 3	0.549*	1.756	0.379*	0.904	0.312*	0.828
(Dummy)	(0.274)	(1.466)	(0.153)	(0.544)	(0.147)	(0.526)
Missing Agreeablen. 1	0.157	-1.069	-0.209	-1.202	-0.182	-0.931
(Dummy)	(0.319)	(1.705)	(0.210)	(0.748)	(0.202)	(0.724)
Missing Agreeablen. 2	0.0300	0.160	0.179	0.618	0.209	0.661
(Dummy)	(0.222)	(1.188)	(0.174)	(0.619)	(0.167)	(0.600)
Missing Agreeablen. 3	-0.331	-0.558	-0.464**	-0.985	-0.441**	-0.896
(Dummy)	(0.205)	(1.097)	(0.156)	(0.555)	(0.150)	(0.537)
Missing Openness 1	0.158	-0.223	-0.0441	-0.632	-0.0414	-0.528
(Dummy)	(0.207)	(1.106)	(0.139)	(0.494)	(0.133)	(0.478)
Missing Openness 2	-0.253	-1.188	-0.0728	-0.0333	-0.0825	-0.168
(Dummy)	(0.154)	(0.823)	(0.116)	(0.412)	(0.111)	(0.399)
Missing Openness 3	-0.0146	0.848	0.126	0.785	0.122	0.792
(Dummy)	(0.180)	(0.962)	(0.129)	(0.460)	(0.124)	(0.445)
Missing Neuroticism 1	-0.429	-1.888	-0.305	-1.240*	-0.307*	-1.209*
(Dummy)	(0.225)	(1.203)	(0.162)	(0.576)	(0.156)	(0.558)
Missing Neuroticism 2	0.376	2.139	0.226	0.193	0.194	0.136
(Dummy)	(0.244)	(1.307)	(0.181)	(0.645)	(0.174)	(0.624)
Missing Neuroticism 3	-0.00941	0.494	0.0345	0.256	0.0398	0.193
(Dummy)	(0.221)	(1.180)	(0.159)	(0.567)	(0.153)	(0.549)
Missing Cognition Test	-0.113***	-0.675***	-0.133***	-0.509***	-0.126***	-0.479***

(Dummy)	(0.0171)	(0.0917)	(0.0142)	(0.0504)	(0.0136)	(0.0488)
Constant	1.100***	3.537***	1.245***	2.670***	1.227***	2.571***
	(0.0162)	(0.0865)	(0.0134)	(0.0476)	(0.0129)	(0.0461)
Corrected by Year FE	No	No	No	No	Yes	Yes
Observations	14541	14541	21257	21257	21257	21257
Adjusted R^2	0.046	0.037	0.029	0.033	0.027	0.030

Note: OLS estimates for different deviation measures. Standard errors in parentheses. Columns (5) and (6) use answers to the risk question that were corrected by year-fixed effects.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Regression results for individual questions

E Results Part 3

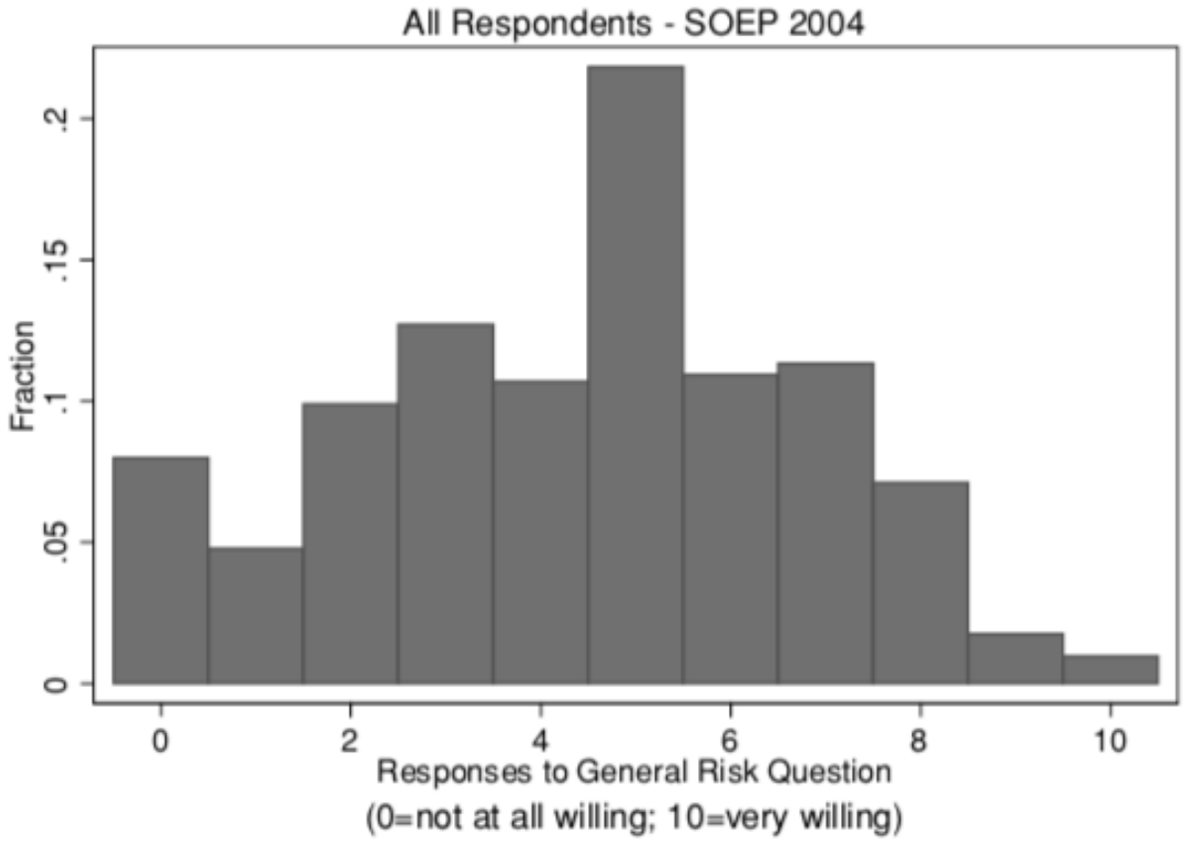

Figure 2: The histogram of the general risk question in 2004

	(1) frac 5 (0.9)	(2) frac 5 (0.75)	(3) frac 5 (0.5)	(4) frac 5 (0.25)	(5) frac 5 (all)
Std. Conscientiousness	-0.000	0.002	-0.003	-0.000	0.003
	(0.001)	(0.005)	(0.004)	(0.003)	(0.002)
Std. Extraversion	-0.001	-0.004	-0.001	0.001	0.005**
	(0.001)	(0.006)	(0.004)	(0.003)	(0.002)
Std. Agreeableness	0.000	0.016**	0.002	0.004	-0.001
	(0.001)	(0.005)	(0.004)	(0.002)	(0.002)
Std. Openness	0.001	0.004	0.003	-0.002	0.002
	(0.001)	(0.006)	(0.004)	(0.003)	(0.002)
Std. Neuroticism	0.001	0.015**	0.008*	0.006*	-0.004*
	(0.001)	(0.005)	(0.003)	(0.002)	(0.002)
Cognition (Number Symbol Test)	0.000	0.002	0.001	0.000	0.001**
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Cognition (Animal Test)	-0.000	-0.002*	-0.000	-0.000	-0.000
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Missing Cog. test	0.000	-0.003	0.018	0.026***	0.021***
1 if missing	(0.004)	(0.020)	(0.011)	(0.007)	(0.005)
Constant	0.996***	0.905***	0.602***	0.425***	0.191***
	(0.004)	(0.019)	(0.011)	(0.007)	(0.005)
Observations	298	550	2926	7767	20755
Adjusted R^2	-0.020	0.029	0.001	0.006	0.002

Note: Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 12: Regression results for 5 answers