Emotions, Risk Attitudes, and Patience

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Abstract

Previous work has shown that preferences are not always stable across time, but surprisingly little is known about the reasons for this instability. I examine whether variation in people's emotions over time predicts changes in preferences. Using a large panel data set, I find that within-person changes in happiness, anger, and fear have substantial effects on risk attitudes and patience. Robustness checks indicate a limited role of alternative explanations. I further address potential endogeneity concerns by exploiting information about the death of a parent or child. This identification strategy confirms a large causal impact of emotions on preferences.

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1 Introduction

Economists assume that changes in behavior result from changes in constraints individuals face, such as prices, rather than from preference changes (Stigler and Becker, 1977). Recent research, however, demonstrates that time and risk preferences are not always stable over time (see, e.g., Meier and Sprenger, 2015; Mata et al., 2018; Schildberg-Hörisch, 2018).[1] Changes in preferences over time could have a large and lasting impact on credit card borrowing, investment, addictive behavior, and job search behavior. Knowing why the changes occur is fundamental to understanding and predicting economic behavior.

Why do preferences vary over time? In *The Theory of Moral Sentiments*, Adam Smith suggested emotions as one driver of preference instability (Ashraf, Camerer and Loewenstein, 2005). Yet, surprisingly little is known about the reasons for variation. Previous work documents that changes in sociodemographics fall short of consistently predicting observed variability (Meier and Sprenger, 2015; Chuang and Schechter, 2015; Guiso, Sapienza and Zingales, 2018). While emotions are a leading candidate for explaining this instability in preferences (Loewenstein, 2000; DellaVigna, 2009), there has been little evidence in economics that links changes in emotions to changes in preferences over time.

This paper provides direct field evidence of how changes in emotions in individuals relate to changes in risk attitudes and patience over time. I exploit large-scale panel data from the German Socio-Economic Panel (SOEP). The data consist of 169,964 observations from a representative sample of 34,176 individuals from the German population surveyed in the years 2008 to 2016. The data provide unique information on the frequency of recently experienced happiness, anger, and fear. Importantly, the data also contain questions on risk attitudes (2008 to 2016) and patience (2008, 2013) that are experimentally validated measures of risk and time preferences. Both measures strongly predict behavior in high-stakes laboratory experiments, and risk and time preferences have been shown to correlate with a range of risky behaviors, such as smoking (Dohmen et al., 2011; Vischer et al., 2013; Falk et al., 2016, 2018).

[1] For further evidence on variation in preferences over time, see, for example, Schurer (2015); Chuang and Schechter (2015); Golsteyn and Schildberg-Hörisch (2017).

I find that within-individual changes in happiness, anger, and fear correlate with changes in risk attitudes and patience. The correlations are statistically significant conditional on individual, age, year, and month fixed effects, as well as sociodemographics. First, I find that emotions relate to risk attitudes in different ways: Happiness and anger relate to higher willingness to take risks, and fear relates to lower willingness to take risks, conditional on the other emotions. Second, I document a nuanced relationship between emotions and patience: Happiness relates to more patience, anger robustly relates to less patience, and fear may relate to less patience, conditional on the other emotions. The estimated relationships between emotions and attitudes are large when compared to the associations of age or income with risk attitudes and patience.

The above evidence suggests substantial causal effects of emotions on risk attitudes and patience. To address potential concerns about endogeneity, I exploit detailed information on the death of a parent or child in an event study. Using instrumental variable estimation, I find that negative emotions starkly reduce the willingness to take risks in the survey wave immediately after the death when compared to the whole period after the death. The estimated causal impact of emotions is larger than the relationships from the fixed-effect specifications suggest.

Do alternative economic or psychological explanations drive the observed changes in risk attitudes and patience? I examine an array of alternative explanations and do not find that changes in wealth, income, or macroeconomic conditions can consistently explain the emotion–preference relationships. The event study on the death of a parent or child also suggests at best a negligible role of economic explanations. I examine whether changes in living circumstances could drive the effect of the death of a parent or child, but I do not find evidence in favor of this alternative explanation. Alternative psychological explanations fall short of fully rationalizing the results as well. For instance, while increases in life satisfaction relate to higher willingness to take risks, life satisfaction only partly explains the relationship between recently experienced happiness and risk attitudes.

I provide field evidence on three potential mechanisms for how emotions alter risk attitudes and patience: expectations (DellaVigna, 2009), impulsivity (Loewenstein, 2000), and

feelings of control (Lerner et al., 2015). The results suggest that emotions may affect risk attitudes directly, rather than affecting expectations about the future, and that self-control does not moderate all emotion–preference relationships. They also offer support for the prominent psychological Appraisal-Tendency Framework, which predicts that emotions affect risk attitudes through feelings of control (Lerner and Keltner, 2000). In addition, I examine heterogeneous effects of emotions and find that individuals with lower socioeconomic status exhibit a stronger relationship between anger and willingness to take risks, consistent with predictions of limited coping resources from the literature on decision making under scarcity (Haushofer and Fehr, 2014).

This paper relates to four strands of literature. First, this paper most closely relates to the economics literature on how emotions affect risk and time preferences in the field. Field evidence on the link is limited: "it remains incompletely understood exactly which psychological aspects of stress, and which types of negative affect, influence economic behaviors. In addition, the evidence on this link is currently restricted to laboratory studies" (Haushofer and Fehr, 2014; p. 866).

Existing literature in economics focuses on how fear affects risk taking: Cohn et al. (2015) conduct a lab-in-the-field experiment with financial professionals and show that financial investors tend to be more risk averse when primed with a crisis scenario.[2] By eliciting fear with electroshocks they test fear as a potential mechanism for countercyclical risk aversion in a student sample. Similarly, Guiso, Sapienza and Zingales (2018) show that surveyed measures of risk aversion increased during the 2008 financial crisis in a way that cannot be explained by income and wealth shocks. They propose fear as a mechanism and test it in a laboratory experiment with students where they induce fear with a horror movie. Like Cohn et al. (2015), they argue that reduced willingness to take risks because of fear may be the reason for countercyclical risk aversion. However, the data in Guiso, Sapienza and Zingales (2018) and Cohn et al. (2015) prevent the authors from directly linking changes in risk attitudes over time to changes in fear in the field. In contrast to the relationship

[2]In a similar vein, Callen et al. (2014) use a convenience sample of Afghan voters to examine the relationship between violence, fear, and risk preferences using priming of individuals with experienced past violence.

of fear with risk attitudes, the relationships between happiness, anger, and risk attitudes have received barely any attention.[3] Yet, different impacts of emotions on risk attitudes may be crucial for predicting economic behavior. In addition, I present novel evidence of the relationship between changes in life satisfaction and changes in risk attitudes as well as patience (Goudie et al., 2014).

Second, this paper relates to the literature examining the temporal stability of preferences. The literature predominantly relies on laboratory measures of risk and time preferences, measured over up to 2 years (Meier and Sprenger, 2015; Chuang and Schechter, 2015; Galizzi, Machado and Miniaci, 2016). While the extent of preference variation over time is still debated (Schildberg-Hörisch, 2018), the review by Chuang and Schechter (2015) suggests that laboratory measures of risk preferences and time preferences show variation over time that cannot be explained by changes in sociodemographics. Using panel data covering 8 years, I find that risk attitudes and patience show similar variation within individuals over time when compared to measures from the laboratory (see also Mata et al., 2018; Salamanca, 2018), and I examine correlates of this variation.[4]

Third, this paper complements evidence from laboratory experiments in psychology by providing novel evidence from natural emotional experiences in a large, representative sample from the field.[5] The debate about how emotions affect preferences is not settled. I discuss the corresponding evidence from the laboratory in more detail in Section 2.[6]

[3] In recent work, Kessler, McClellan and Schotter (2017) use a lab-in-the-field experiment to show that National Football League fans are more risk taking while happy about game outcomes.

[4] A growing number of studies examine the reasons for cross-sectional differences in risk aversion and highlight past experiences, age, or genes as drivers (see, e.g., Cesarini et al., 2009; Malmendier and Nagel, 2011; Bucciol and Zarri, 2015; Dohmen et al., 2017; Dohmen, Quercia and Willrodt, 2018). Using panel data, Hanaoka, Shigeoka and Watanabe (2018) document that the Great East Japan Earthquake affected men's risk aversion and Jakiela and Ozier (2018) link post-election violence in Kenya to lower risk aversion and less optimistic beliefs about the economy. Recent working papers examine the reduced form impact of life events such as changes in financial cirumstances, child birth, family loss, or property crime on risk attitudes (see, e.g., Kettlewell, 2018; Browne et al., 2016).

[5] Using field data may alleviate concerns about external validity (Levitt and List, 2007; Charness and Fehr, 2015). Al-Ubaydli, List and Suskind (2017) argue that findings in student samples may sometimes not generalize to representative samples and that effects from stimuli in the laboratory may not always transfer to relevant natural settings.

[6] More generally, this paper adds to the literature that explores how contextual factors shape preferences; see, e.g., Goette and Huffman (2007*b*,*a*); Andersson et al. (2014); Imas (2016); Baillon, Koellinger and Treffers (2016).

Fourth, the results provide a potential explanation for prominent, but seemingly contradictory, findings in economics on the effect of emotions on behavior. While negative emotions arguably promote risk taking in the field with respect to domestic violence, in high-stakes TV game shows, professional sports, and political unrest (Post et al., 2008; Card and Dahl, 2011; Foellmi, Legge and Schmid, 2016; Passarelli and Tabellini, 2017), they seem to inhibit risk taking in investment, dangerous environments, and voting (Kamstra, Kramer and Levi, 2003; Guiso, Sapienza and Zingales, 2018; Callen et al., 2014; Cohn et al., 2015; Meier, Schmid and Stutzer, 2016). The discrepancy may be driven by distinct experienced emotions across the two sets of studies: While Card and Dahl (2011) argue that college football game losses cause anger, Cohn et al. (2015) argue that electroshocks cause fear. This paper provides direct evidence on the differential relationships between anger and fear with risk attitudes, offering a potential explanation for the differential effects of negative emotions on behavior.[7] Taking into account nuanced effects of emotions may be crucial for predicting economic behavior in high-stakes settings.

Section 2 provides a review and discussion of predicted relationships between emotions, risk attitudes, and patience based on evidence from laboratory experiments in psychology. Section 3 describes the data on attitudes and emotions and shows corresponding tests of the validity of the measures. It also documents the substantial variation in risk attitudes and patience within individuals over time and correlates of those changes. Section 4 presents the main results on the relationships between emotions and risk attitudes. It includes an event study exploiting the death of a parent or child and a battery of robustness checks. Section 5 then presents the results on the relationship between emotions and patience, followed by Section 6, which discusses three psychological mechanisms that could be responsible for the effects of emotions on preferences. In conclusion, Section 7 highlights the relevance of emotions for economic behavior and offers avenues for future research.

[7]See Lerner et al. (2015) for a similar argument with respect to findings from laboratory experiments in psychology.

2 Evidence from the Laboratory

Feelings and emotions color how individuals perceive their environment and evaluate their actions (Loewenstein, 2000; Lerner et al., 2015). Emotions also affect the readiness to take action to increase the probability of survival, among other reasons, and are therefore deeply biologically rooted (Keltner and Gross, 1999; Bach and Dayan, 2017). Accordingly, emotions are closely tied to trade-offs between now and later, as well as to choice under risk (Loewenstein et al., 2001; Haushofer and Fehr, 2014; Engelmann and Hare, 2018).[8]

Emotions and Risk Attitudes — Yet, how exactly emotions relate to the willingness to take risks is still debated. There are three frameworks that aim to explain the relationships between emotions and the willingness to take risks, summarized in Table 1.

The conflicting predictions across frameworks stem from heterogeneous evidence on emotions and willingness to take risks. The mixed evidence could be a result of three challenges associated with eliciting emotions in the laboratory: First, short-term emotion elicitations used in experiments vary, from movie clips (Ifcher and Zarghamee, 2011) to autobiographical texts (Callen et al., 2014). Second, the measures used in psychological experiments to capture willingness to take risks are very heterogeneous (Mauss and Robinson, 2009; Angie et al., 2011). Third, it is difficult to manipulate just one emotion. For instance, it is difficult to differentially elicit fear and anger with movie clips (Schaefer et al., 2010). While the debate in psychology about which of the frameworks is most useful in predicting changes in preferences and behavior is not settled, recent evidence from laboratory experiments in psychology is most consistent with the Appraisal-Tendency Framework (Lerner et al., 2015).

The Appraisal-Tendency Framework highlights how specific emotions change individuals' appraisals of a situation (Lerner and Keltner, 2000, 2001; Han, Lerner and Keltner, 2007). For instance, while happiness and anger go together with a feeling of high individual control and therefore more optimistic appraisals, fear, characterized by feelings of low individual control, leads to more cautious appraisals. Accordingly, the Appraisal-Tendency Framework

[8]For a recent review that focuses on how emotions triggered in the field have been used to examine behavior in the laboratory, see Bhanot et al. (2017).

Table 1: Predictions for the Relationship of Emotions and Risk Attitudes

Psychological Framework	Effect on Willingness to Take Risks		
	Happiness	Anger	Fear
Appraisal-Tendency Framework	Positive	Positive	Negative
Feelings-as-Information	Positive	Negative	Negative
Mood Maintenance	Negative	Positive	Positive

Note: The Appraisal-Tendency Framework was proposed by Lerner and Keltner (2000); Feelings-as-Information originates in the work of Schwarz and Clore (1983); Mood Maintenance was developed by Isen and Patrick (1983). See Lerner et al. (2015) for a review.

predicts that happiness and anger lead to more willingness to take risks (Lerner and Keltner, 2000; Ferrer et al., 2017).

In contrast, Feelings-as-Information and Mood Maintenance only distinguish positive and negative mood. The two frameworks predict that all negative or positive emotions have the same effect on behavior. Feelings-as-Information argues that individuals overweight emotion-congruent information. Accordingly, when in a bad mood, individuals tend to overweight adverse effects of risky choices and the opposite happens when they are in a good mood (Schwarz and Clore, 1983; Schwarz, 2012). Mood Maintenance argues that individuals who feel positive emotions do not want to take any risks, in order to avoid potential negative consequences of a risky choice, while individuals who feel negative emotions have nothing to lose (Isen and Patrick, 1983; Isen, 2001). In sum, the most prominent psychological frameworks agree that emotions affect preferences, but they differ in their predictions.

Emotions and Patience — The evidence on emotions and patience is more limited and restricted to the dichotomy of positive versus negative mood (Haushofer and Fehr, 2014). Two prominent studies document that happiness increases patience when emotions are elicited with a movie clip (Ifcher and Zarghamee, 2011; Lerner, Li and Weber, 2013). Ifcher and Zarghamee (2011) highlight that fear and anger may have differential effects on patience, but their experimental setting does not allow them to distinguish these emotions.

Two arguments on how positive and negative emotions could affect patience have been suggested: Reward Replacement and Information Processing; see Table 2. Both frameworks

make predictions for positive versus negative mood, but not for specific emotions, such as fear and anger.[9]

Table 2: Predictions for the Relationship of Emotions and Patience

Psychological Framework	Effect on Patience		
	Happiness	**Anger**	**Fear**
Reward Replacement	Positive	—	—
Information Processing	Positive	—	—

Note: Reward Replacement was formulated by Lerner, Small and Loewenstein (2004) and Information Processing originates in the work of Isen (2008).

Lerner, Li and Weber (2013) argue that unhappiness causes individuals to crave a reward in order to compensate for their negative emotions (see also Lerner, Small and Loewenstein, 2004). Isen (2008) argues that individuals who feel happy are more open to information that they would usually neglect. This could mean happy individuals give more weight to negative outcomes resulting from impatient behavior (Ifcher and Zarghamee, 2011). An alternative explanation could be that positive mood strengthens willpower (Ifcher and Zarghamee, 2011; Haushofer and Fehr, 2014).

3 Data and Method

3.1 Data

I use unique large-scale data from the German Socio-Economic Panel (SOEP) that contain yearly survey responses from a representative sample of the German population. I restrict the sample to observations with risk attitudes (2008 to 2016) or patience (2008, 2013), all emotions (available from 2008), life satisfaction, the main controls, and the month of the interview. The final sample contains 169,964 observations from 34,176 individuals. I provide

[9]Daly, Delaney and Harmon (2009) show that blood pressure and heart rate variability relate to discount rates, which can be taken as an indication that emotions with different arousal may differentially relate to discount rates.

summary statistics for the dependent variables, emotions, and main controls in Table A.1 in the Appendix.[10]

3.1.1 Risk Attitudes

Individuals respond to the question (emphasis in original): "How would you describe yourself: Are you generally willing to take risks, or do you try to avoid risks? *Please answer on a scale from 0 to 10, where the value 0 means* ***risk averse*** *and the value 10 means* ***fully prepared to take risks***." Figure A.1 gives the questions for risk attitudes, patience, and emotions in English translated from the German questionnaire.[11] The average willingness to take risks is 4.5, with 80% of the answers ranging from 1 up to and including 7; see Figure A.2. For ease of exposition, I use the raw measure multiplied by 10 as the dependent variable in the analysis.

Validation of Risk Attitudes — Dohmen et al. (2011) show that the response to the survey question predicts behavior in incentivized, high-stakes choices under risk in a representative sample of the German population. Galizzi, Machado and Miniaci (2016) also validate the question in a representative panel from the United Kingdom and Vieider et al. (2015) confirm these findings in a sample of more than 2,900 subjects in 30 countries. Furthermore, Falk et al. (2016) document that while the test–retest correlation for experimentally elicited risk preferences is 0.35, the correlation of risk attitudes with experimentally elicited risk preferences is also 0.35.

How does this measure relate to risk attitudes across domains and to behavior outside of the laboratory? First, evidence from Dohmen et al. (2011) and Vieider et al. (2015) suggests that the general measure of risk attitudes strongly correlates with risk attitudes and behaviors across domains ranging from health to finance (see also Huck, Schmidt and Weizsäcker, 2014). I confirm these findings in the panel dimension by regressing general willingness to take risks on domain specific willingness to take risks (available in 2009 and

[10]Tables and figures with an alphabetic prefix can be found in the Appendix. Appendix Section A.5 refers to the data sources.

[11]The questions were usually separated by multiple items, see Figure A.1 for more details.

2014) regarding finance, driving, leisure, job, health, and trusting other people. The estimates are statistically significantly positive at $p < 0.01$ for all domains conditional on individual, age, and year fixed effects; see Table A.3, column (5). The standardized coefficients suggest that a 1-standard deviation shift in domain specific willingness to take risks relates to a 2-point change in general willingness to take risk.

Second, the measure relates to behavior outside of the laboratory: Dohmen et al. (2011) find that a 1-point higher value of risk attitudes relates to a 4 percentage point higher likelihood of smoking, and Jaeger et al. (2010) show that the measure predicts emigration. Moreover, a composite measure for risk preferences with more than 50% weight on the survey question used here strongly correlates with business ownership, plans to start a business, and smoking intensity (Falk et al., 2018). In sum, risk attitudes seem to offer a valid approximation of incentive-compatible measures of risk preferences and predict behavior outside the laboratory.[12]

3.1.2 Patience

Individuals answer the following question (emphasis in original): "How would you describe yourself: Are you generally an impatient person, or someone who always shows great patience? *Please answer on a scale from 0 to 10, where the value **0** means **very impatient** and the value **10** means **very patient**.*" The data contain answers from the 2 years 2008 and 2013 when 10,947 individuals answered this question. The lack of more comprehensive data restricts the analyses I can conduct. In particular, an event study on the death of a child or parent is not feasible.[13] The average patience is 6.2, with around 80% of the answers between 3 and 10; see Figure A.2. I use the raw measure multiplied by 10 as the dependent variable.

[12]Studies use this or similar measures to study how risk attitudes are transmitted across generations (Dohmen et al., 2012), evolve over the life cycle (Dohmen et al., 2017; Schurer, 2015; Mata, Josef and Hertwig, 2016), and correlate with unemployment (Hetschko and Preuss, 2015). For a review see Falk et al. (2016). For psychometric evidence on surveyed risk preferences, see Frey et al. (2017).

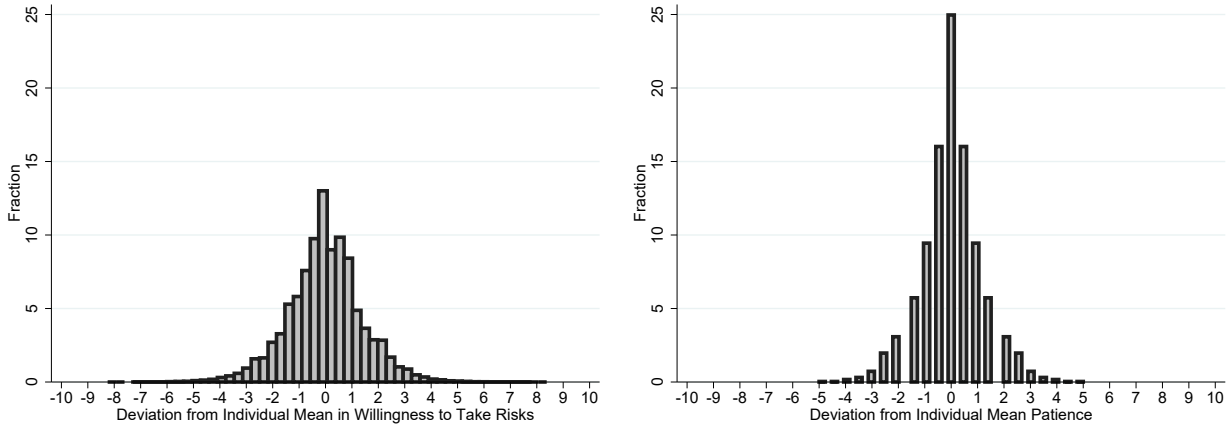
[13]This is because I do not observe an individual before, at, and after a death, as well as because of the low number of deaths of a parent or child in the 2 years and the restricted variation in patience over the 2 years.

Validation of Patience — This measure of patience correlates with time preferences elicited in the lab: A 1-point higher patience attitude relates to a 1 percentage point lower internal rate of return (Vischer et al., 2013). In addition, Falk et al. (2016) show that a similar survey question also strongly correlates with behavior in the lab, and Falk et al. (2018) find that a higher average of a composite measure of surveyed and experimentally elicited time preferences correlates with economic development.

3.2 Temporal Variation in Risk Attitudes and Patience

Variation — How strongly do these preference measures vary within individuals over time? Figure 1 shows the within-individual deviations from the mean willingness to take risks in panel (a) and from the mean patience in panel (b). The standard deviations in residuals on the scale from 0 to 10 are larger for risk attitudes ($sd = 1.4$) than for patience ($sd = 1.1$).

Figure 1: Temporal Variation in Risk Attitudes and Patience



(a) Risk Attitudes **(b) Patience**

Note: The graphs show the residuals from OLS regressions of the willingness to take risks [0,10] or patience [0,10] on dummy variables for each of the individuals (individual fixed effects). An observation is an individual–year residual. The residual is 0 if the individual did not deviate from her mean value of risk attitudes or patience. The within-individual standard deviation of the residuals is 1.4 for risk attitudes and 1.1 for patience.

More than 65% of individuals exhibit a maximum residual larger than 1 point in risk attitudes. The correlation in risk-attitude measures is 0.58 ($p < 0.01$) at 1 year apart and 0.54 ($p < 0.01$) at 3 years apart; see Table A.2. This is similar to previously reported year-

to-year correlations of elicited preferences in the laboratory of 0.21 to 0.48 according to the surveys by Chuang and Schechter (2015) and Mata et al. (2018).

A quarter of the respondents deviate more than 1 point from their average patience of 2008 and 2013. The correlation in patience within individual over time between the 2 years is 0.49 ($p < 0.01$). The correlation is equivalent to that documented by Meier and Sprenger (2015), who find a correlation of 0.5 ($p < 0.01$) in 203 individuals who were tested in the lab over two subsequent years. The within-individual correlation in patience also lies within the range of correlations reported by Chuang and Schechter (2015).[14] In sum, while risk attitudes and patience correlate highly over time, there is considerable within-individual variation.

Correlates of Changes — I assess how the documented variation in risk attitudes and patience relate to changes in household income, employment status, marital status, presence of children in the household, changes in wealth (approximated by an interaction of real estate prices with real estate ownership), changes in health, and domain specific willingness to take risks conditional on individual and age fixed effects; see Table A.3. Unemployment or marriage do not consistently relate to both risk attitudes and patience. However, I find that higher income concavely relates to higher patience and willingness to take risks. A 1-standard deviation shift of monthly household income that is more than €2,000 (∼$2,340) relates to a roughly 0.5-point higher willingness to take risks on a 0 to 100 scale and a 1-point change in patience. Similarly, a wealth increase for owners of real estate relates to higher willingness to take risks. A child in the household also relates to lower willingness to take risks. In addition, I document that higher subjective health goes together with higher patience and higher risk attitudes. Finally, like in the cross-section (Dohmen et al., 2011), domain specific willingness to take risks strongly correlates with general willingness to take risks in the panel.

The findings for sociodemographics are in contrast to previous evidence summarized by Chuang and Schechter (2015), who barely find systematic relationships between variables

[14]It is higher than the correlation in patience found by Hjördis (2017) but lower than the test–retest reliability of experimentally elicited discounting in Falk et al. (2016).

such as income or health and preferences. Here, changes in income and health correlate with risk attitudes and patience.

3.2.1 Emotions

The data contain unique information on the frequency of emotions felt within the last 4 weeks: happiness, sadness, anger, and fear. Individuals respond to the following item: "I will now read to you a number of feelings. Please indicate for each feeling how often or rarely you experienced this feeling in the last four weeks," which they can then answer with "Very Rarely, Sometimes (Occasionally), Often, Very Often."

Psychologists predict the same effects of higher happiness or lower sadness on risk attitudes and patience (Lerner, Small and Loewenstein, 2004; Lerner, Li and Weber, 2013). I therefore combine the happiness and sadness responses in a happiness index for ease of exposition. The index is simply {(happiness - sadness)/2}+3 which leads to an index with the same range as the other emotions.[15] Most responses indicate a low frequency of fear and low happiness; see Figure A.3. The frequency of experienced anger shows a less skewed distribution, centering around "Sometimes."

Figure A.4 gives the within-individual deviations across the emotion measures. The individuals deviate up to 3 points from their mean emotional state. Importantly, while the emotions covary, they are not linearly dependent. The highest absolute correlations are -0.46 ($p < 0.01$) between fear and happiness and -0.31 ($p < 0.01$) in changes within individuals between fear and happiness; see Tables A.4 and A.5.

Validation of Emotions — Do the survey measures capture relevant variation in emotions? I provide evidence by relating emotions to recent live and external events. I use recent unemployment, unemployment because of firm closure, employment, marriage, divorce, and an indicator for whether the individual was interviewed a day after an actual or planned terrorist attack or an actual or planned school rampage. For instance, recent unemployment

[15]The results are qualitatively equivalent when using both emotions separately. The relationship of the happiness index with willingness to take risks and patience seems to be mostly driven by happiness.

is 100 if an individual transitioned from employment in the survey in the previous year to unemployment in the current year and 0 otherwise.

I relate these events to the residual variation in each emotion conditional on all other emotions, fixed effects, and controls in Table A.6. Recent unemployment relates to higher fear as well as lower levels of anger. The happiness estimate is not statistically significant, presumably because of the high variation in the effects of unemployment across individuals who did and who did not self-selected into unemployment (see also Knabe et al., 2010). The negative estimate for happiness for individuals who were laid off because of factory closures sustains this interpretation. Conversely, the point estimates for recent employment suggest a reduction of fear and an increase in happiness. Recent marriage goes together with higher experienced happiness. Recent divorce, on average, also relates to higher levels of happiness. The relationships between divorce, marriage, and emotions are consistent with evidence from psychological studies on affective well-being (Luhmann et al., 2012).[16] The day after a planned or actual school shooting or terrorist attack, happiness decreases. The estimates seem particularly plausible for three events where self-selection plays a minor role: unemployment because of a factory closure and recent school shooting or terrorist attack. As a further check, I also relate the emotions to life satisfaction on a scale from 0 to 10 and find that happiness relates positively to life satisfaction while the negative emotions relate negatively to life satisfaction.

Evidence from psychology also suggests that the use of retrospective judgments of emotions is sensible in the context of this study. For instance, Barrett (1997) reports that individuals accurately recall emotions experienced within the last 90 days. I provide a short discussion about the reliability of the emotion measure in Appendix A.1.

3.3 Specification

I exploit within-individual variation in emotions, risk attitudes, and patience over time as follows:

[16]The findings are not entirely consistent with the effects of these events on life satisfaction (Odermatt and Stutzer, 2018). This divergence likely occurs because life satisfaction and short-term emotional measures capture different aspects of well-being (Krueger and Schkade, 2008; Luhmann et al., 2012).

$$\mathrm{Y}_{iym} = \eta_i + \gamma_a + \delta_y + \tau_m + \mathrm{Emotions}'_{iy}\alpha \ + X'_{iy}\beta + \varepsilon_{iym}$$

where i indexes individuals; y indexes survey years; m indexes months; Y_{iym} is risk attitudes or patience ranging from 0 to 100, derived from the raw measures multiplied by 10; and η_i are individual fixed effects. In addition, I include age fixed effects γ_a, year fixed effects δ_y, and month fixed effects τ_m. The coefficients of interest are denoted by vector α, which gives the estimated effects of a vector $\mathrm{Emotions}'_{iy}$ containing the frequency of experienced emotions within the last 4 weeks ranging from very rarely (1) to very often (5). The vector of covariates X'_{iy} includes household income, household income squared, a dummy indicating unemployment, a dummy indicating marriage, and an indicator for the presence of children in the household. Clustered standard errors ε_{yim} allow for correlation in emotions within individuals over time.

4 Emotions and Risk Attitudes

4.1 Main Results

I show the relationships between emotions and the willingness to take risks in Figure 2. The gray dots in panels (a) through (c) show binned averages of the residuals in willingness to take risks against the residual frequency of felt emotions. The residuals stem from regression of willingness to take risks on all other emotions and individual and age fixed effects. The data reveal clear linear relationships between happiness, anger, fear, and the willingness to take risks. The slopes are statistically significantly different from 0 at $p < 0.01$.

When respondents move 2 points up on the fear scale, for instance, from sometimes felt fear to very often felt fear, their willingness to take risks decreases by more than 1 point on the scale from 1 to 100. Conversely, anger relates to a higher willingness to take risks of 0.5 points when an individual moves 2 points on the scale, for instance, from sometimes to often felt anger. A 2-point upwards change in happiness relates to a predicted 1.8-point higher willingness to take risks.

The relationships are large when compared to a 1-standard deviation shift of €2,000 (∼$2,340) in household income. Such a shift relates to an only 0.5-point higher willingness to take risks, while a 1-standard deviation shift in happiness (0.76 points) relates to a 0.7-point higher willingness to take risks. The relationships are also substantial when compared to the well-documented association between age and willingness to take risks or domain specific willingness to take risks and general willingness to take risks.[17] An additional year of age relates to a 0.18-point ($se = 0.01$) reduction in the willingness to take risks conditional on all emotions, controls, year fixed effects, and month fixed effects. Accordingly, a 1-point change in happiness can compensate for up to 5 years in age difference. A one standard deviation shift in one of the domain specific willingness to take risk measures relates to a 1.6- to 2.3-point change in general willingness to take risks. The relationship between happiness and willingness to take risks is a third as large. The comparisons indicate sizeable emotion-risk attitudes relationships.

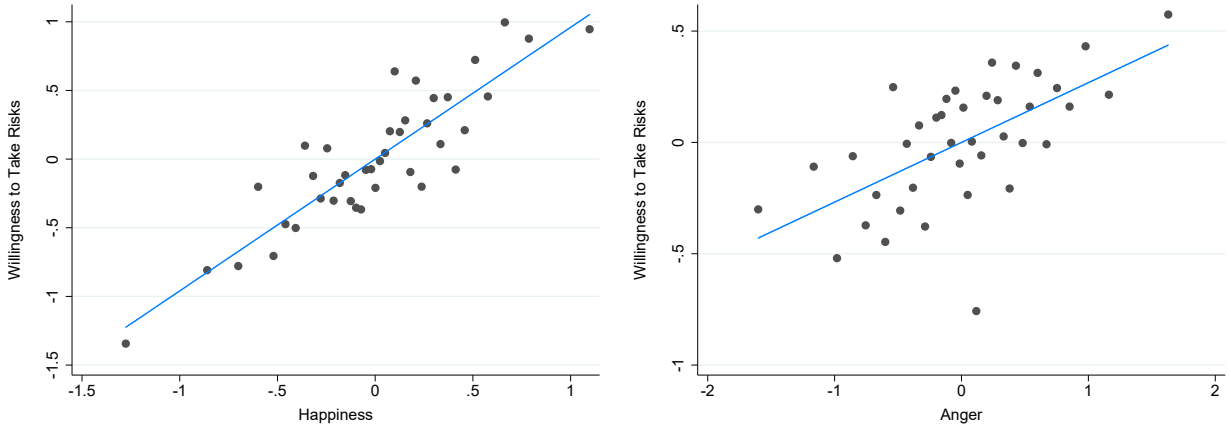
The effect of fear on risk attitudes is consistent with recent findings in economics and psychology (Cohn et al., 2015; Lerner et al., 2015; Guiso, Sapienza and Zingales, 2018) and confirms the prediction from the Appraisal-Tendency Framework (Lerner and Keltner, 2000). The effects of anger and happiness are also consistent with the Appraisal-Tendency Framework prediction. Because of the differential relations of anger and fear with risk attitudes, neither Mood Maintenance nor Feelings-as-Information predict the observed pattern.

Table 3 shows the corresponding regression estimates. The coefficients for happiness, anger, and fear are precisely estimated, robust to a battery of fixed effects, and do not move when adding controls. Columns (1) through (5) show the results from regressions of willingness to take risks on whether an emotion was felt from very rarely, 1, to very often, 5. Column (1) gives the raw correlations.[18] Column (2) gives the results conditional on individual fixed effects. Individual fixed effects are the main driver of willingness to take risks and they also absorb some of the relationship between emotions and willingness to take risks. However, the relationships for fear, anger, and happiness remain precisely estimated

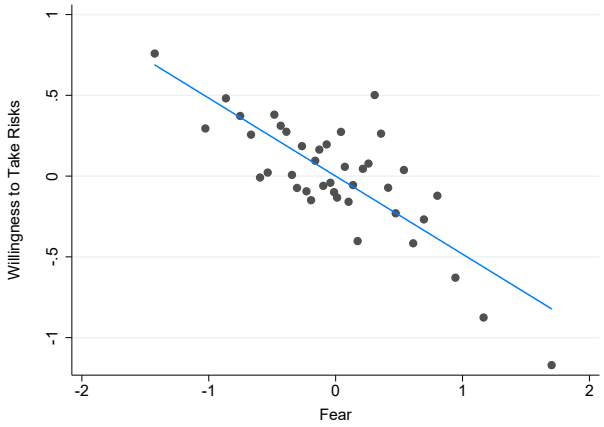
[17]See, for instance, Dohmen et al. (2017); Mata, Josef and Hertwig (2016); Josef et al. (2016); Pachur, Mata and Hertwig (2017); Schurer (2015).

[18]The raw correlations are graphically depicted in Figure A.5.

Figure 2: Emotions and Risk Attitudes



(a) Happiness **(b) Anger**



(c) Fear

Note: The figure shows the relationships between the residual willingness to take risks and residual emotions. The residuals stem from regressions of willingness to take risks ranging from 0 to 100 on all emotions other than the one depicted, individual fixed effects, and age fixed effects. The gray dots show the binned averages across 40 quantiles of residual willingness to take risks against the residual emotion. The blue line shows the linear fit from OLS regressions using all data. The slopes for fear, anger, and happiness are statistically significant at $p < 0.01$.

even when I just exploit within-individual variation in columns (2) through (5). In column (3) I account for age fixed effects, which increases the coefficient estimate for anger. This is because age correlates with less anger and lower willingness to take risks. In column (4) I include year and month fixed effects, and I then add controls, such as a dummy for unemployment and income, in column (5). Column (5) serves as the main specification for the rest of the paper.

Table 3: Emotions and Risk Attitudes

Dependent Variable	Willingness to Take Risks [0,100] – Avg.: 45				
	(1)	(2)	(3)	(4)	(5)
Happiness	3.90***	0.97***	0.96***	0.90***	0.90***
	(0.13)	(0.09)	(0.09)	(0.09)	(0.09)
Anger	2.76***	0.17***	0.27***	0.25***	0.25***
	(0.09)	(0.06)	(0.06)	(0.06)	(0.06)
Fear	-2.54***	-0.40***	-0.48***	-0.51***	-0.51***
	(0.10)	(0.07)	(0.07)	(0.07)	(0.07)
Individual FE		X	X	X	X
Age FE			X	X	X
Year FE				X	X
Month FE				X	X
Controls					X
Observations	169,964	169,964	169,964	169,964	169,964
Individuals	34,176	34,176	34,176	34,176	34,176
R-squared	0.03	0.64	0.64	0.65	0.65

Note: The table shows the estimated relationships between the frequency of emotions felt on a scale from 1 to 5 and willingness to take risks using OLS. Standard errors (in parentheses) are based on clustering at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.2 Alternative Explanations

4.2.1 Alternative Economic Explanations

Wealth and Income — In Table 4 I examine whether there is evidence for wealth and income shocks as drivers of the emotion–risk attitude relationships. In a first step, I analyze whether changes in wealth drive the results as follows: splitting the sample into individuals

who held financial assets in 2012 and those who did not (columns 1 and 2), controlling for wealth shocks because of changes in real estate prices (column 3), splitting the sample into individuals who owned real estate in 2007 and those who did not (columns 4 and 5), splitting the sample according to changes in asset income, a proxy for wealth (column 6 and 7), and controlling for income from assets (column 8).[19]

If the emotion–risk attitude relation is driven by wealth shocks, individuals with no financial assets or no wealth changes should show no or consistently smaller relationships between emotions and risk attitudes. However, across the board, I observe strong relationships between risk attitudes, happiness, and fear. If anything, the results suggest stronger relationships between anger and risk attitudes for individuals who experience less variation in wealth.

I examine household income shocks as a potential driver in more detail in columns (9) and (10). Note that I control for household income in the baseline specification, which arguably absorbs much of the income-driven covariation between emotions and risk attitudes. However, the linear inclusion of the variable may not be sufficient. Therefore, I also split the sample according to income changes from one year to another. I classify observations as small income changes if the income changed less than 9% — the median income change between observations — from the last observed year to the current year. This sample partition would yield larger relationships for the individuals with substantial income changes if income changes were the main driver. However, the estimated relationships point in the same direction. Using only observations with small income shocks yields large coefficient estimates for anger and for happiness. In light of the results it seems unlikely that wealth or income shocks explain the relationships between emotions and risk attitudes.

Economic Uncertainty and the Business Cycle — General or local economic circumstances might drive the documented relationships. I address this concern in Table A.7. I first split the sample into data collected during the financial crisis or after. Column (1) shows the estimates for the noncrisis years, 2011–2016, and column (2) shows the estimates for

[19]I classify individuals with small wealth change as those individuals who never lost in capital investment and earned less than 500 euros of dividend income (lower than the 70th percentile) in any year.

crisis years, 2008–2010. This allows for crisis-specific correlations of controls with emotions and risk attitudes. If these crisis-specific correlations were to drive the emotion–risk attitude relationship, I should find smaller effects of emotions in noncrisis years. Yet, I find that, if anything, the relationships of emotions with risk attitudes are stronger in noncrisis years. Consistent with this, the point estimates barely change when I take into account proxies for the economic environment such as economic policy uncertainty in the month of the interview (Baker, Bloom and Davis, 2016) and a sentiment index for the German economy in the month of the interview in column (3), or trading volume and stock market returns within the last week and the last day in column (4).

Alternatively, the relationships may be driven by the business cycle in a way that the controls do not capture. For instance, there may be variation in the business cycle across the 16 German states. I address the two concerns with the use of month-of-survey-year fixed effects in column (5), week-of-survey-year fixed effects in column (6), or state-specific month-of-survey-year fixed effects in column (7). If the relationships were driven by aggregate changes in the German economy or the economies across states, the relationships should diminish with the inclusion of these fixed effects. But, the coefficient estimates barely change. Taken together, the results so far do not suggest economic factors as a driver of the relationships.

Background Risk: Job Security and the Financial Situation — It could be that individuals face background risk not captured by the examined measures for general and personal economic circumstances. For instance, the company they work for might have lost an important customer, which would lead to a higher likelihood of future income loss. The background risk could affect both emotions and risk attitudes. I therefore examine whether job security or worries about one's personal financial situation drive the relationships. First, I exploit information on how worried individuals are about their financial situation and their job security (on a 1 to 3 scale from "not concerned at all" to "very concerned"); see Table A.8. Worries about the financial situation strongly relate to lower willingness to take risks but leave the coefficient estimates for emotions virtually unchanged. Accounting for worries about job security also does not change the emotion coefficient estimates substantially.

Table 4: Alternative Economic Explanations — Income and Wealth

Dependent Variable	Willingness to Take Risks [0,100]									
	Financ. Assets		Real Estate	Owns Real Estate		Wealth Change		Asset Inc.	Househ. Inc. Change	
	No	Yes	Yes	No	Yes	No	Yes	Yes	Small	Large
Avg.	47	44	45	46	44	46	45	46	44	47
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Happiness	1.03***	0.77***	0.88***	0.97***	0.77***	1.07***	0.81***	0.89***	0.78***	0.76***
	(0.16)	(0.11)	(0.09)	(0.13)	(0.14)	(0.16)	(0.11)	(0.09)	(0.14)	(0.15)
Anger	0.43***	0.19**	0.29***	0.44***	0.09	0.41***	0.16**	0.26***	0.36***	0.15
	(0.11)	(0.08)	(0.07)	(0.09)	(0.10)	(0.11)	(0.08)	(0.06)	(0.10)	(0.10)
Fear	-0.55***	-0.52***	-0.53***	-0.48***	-0.59***	-0.60***	-0.46***	-0.51***	-0.39***	-0.52***
	(0.12)	(0.09)	(0.07)	(0.10)	(0.11)	(0.12)	(0.08)	(0.07)	(0.11)	(0.11)
House Owner x Real Est. Prices			0.03***							
			(0.01)							
Real Estate Prices			0.01							
			(0.03)							
Ln Capital Inv. Loss								-0.00		
								(0.04)		
Ln Dividend Income								0.04		
								(0.03)		
Rent Income Indicator								-0.02		
								(0.26)		
Individual FE	X	X	X	X	X	X	X	X	X	X
Age FE	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X
Month FE	X	X	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X	X	X	X
Observations	55,073	93,778	149,158	78,961	70,197	61,176	108,788	169,783	79,032	77,530
Individuals	11,281	15,145	26,512	14,835	11,677	15,132	19,044	34,176	27,130	28,543
R-squared	0.63	0.64	0.64	0.64	0.64	0.66	0.65	0.65	0.72	0.73

Note: The table shows the estimated relationships between the frequency of emotions felt on a scale from 1 to 5 and willingness to take risks using OLS. Standard errors (in parentheses) are based on clustering at the individual level. Financ. Assets is an indicator based on individuals stating that they held financial assets in 2012 (the only available year). Real estate ownership is based on whether individuals indicated that they owned parts of their apartments or houses in 2007 or, if the information is missing, in 2002 (even after substituting for older values, there are still some missing values). Real estate prices for apartments and houses stem from the vdp-Immobilienpreisindex. House Owner x Real Estate Prices is an interaction of real estate prices with real estate ownership in 2007. I classify individuals with small wealth change as those individuals who never lost in capital investment and earned less than a dividend income of 500 euros in any year. Asset Inc. refers to the inclusion of controls for asset income. Ln Capital Inv. Loss refers to the ln of capital investment losses. The rent income indicator is 1 if the individual indicated income from renting out apartments or houses. I also include a dummy variable indicating whether rent income is missing (not shown in regression output). There are some missing values for returns from assets (Ln Capital Inv. Loss and Ln Dividend Income). I classify individuals as experiencing small income changes, Househ. Inc. Change–Small, if the income changed less than 9% (the median change in income) from the last survey wave to the current survey wave. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Second, I examine people at or above retirement age who face less background risk than younger individuals who are likely to continue working, in the spirit of Guiso, Sapienza and Zingales (2018). Splitting the sample into individuals who are younger than 46 and older than 64, I find similar coefficient estimates for happiness, anger, and fear. In sum, I find no evidence pointing to a straightforward explanation of the relationships between emotions and risk attitudes because of background risk.

Health — Bad health relates to higher risk aversion (Decker and Schmitz, 2016) and to a higher incidence of fear and lower incidence of happiness (regressions not shown). Accordingly, it is a candidate for driving the results. But, when I include subjective health as a control, the coefficient estimates remain very similar; see column (8) in Table A.7. The effect of happiness slightly decreases, which hints at the potential role of general well-being or life satisfaction as an alternative explanation for the happiness–risk attitude relationship.

4.2.2 Alternative Psychological Explanations

Life Satisfaction — It seems highly likely that not just recently experienced emotions relate to risk attitudes and patience but also more general evaluative well-being. I consider changes in life satisfaction in Table A.9. First, I add general satisfaction as a control variable in column (1). The effects for fear and anger remain stable. Notably, the inclusion of dummies for each realization of life satisfaction reduces the estimate of recently felt happiness by 40 percent from 0.90 ($se = 0.09$) to 0.50 ($se = 0.09$) in column (2). I find that higher life satisfaction relates to higher willingness to take risks. While changes in general well-being matter for risk attitudes, more short-term emotional experiences relate to risk attitudes even conditional on general evaluative well-being.

Past Risk Attitudes — It may also be that past risk attitudes predict emotions, because, for example, more risk taking individuals feel better when they have taken risks in the last year. A naive regression of current risk attitudes on all emotions controlling for lagged

risk attitudes does not affect the coefficient estimates of emotions; see column (4).[20] The empirical results thus suggest that past risk attitudes do not drive current emotions. It is not just differences in past risk attitudes that cause emotional experiences today and therefore mechanically lead to a relationship between today's emotions and risk attitudes.

Past Emotions and Daily Mood Swings — Past emotions might lead to more risk taking in the future, driving the contemporaneous effect. To examine this, I also take lags of each emotion into account. Intuitively, I would expect smaller effects of lagged emotions, but not necessarily zero effects. Fear in the previous survey relates to risk attitudes in addition to the contemporaneous relationships without controlling for life satisfaction. However, as expected, the coefficient sizes are much smaller in magnitude and also statistically significantly smaller than the estimates of concurrent emotions. Controlling for life satisfaction, the coefficient estimate of lagged fear is statistically insignificant, -0.12 ($se = 0.08$), while the coefficient of contemporaneous fear is -0.61 ($se = 0.08$). For fear and happiness the coefficient estimates for the contemporaneous relationships are at least 3 times larger than the lags. For lagged anger I observe a small and statistically insignificant coefficient. The results show that recently experienced emotions drive most of the effects of emotions on risk attitudes.

Do daily swings in mood drive the relationships? I include date fixed effects for every interview date in the sample to test this. The inclusion of these fixed effects barely affects the coefficient estimates. In conclusion, the results document that alternative psychological explanations cannot explain the relationships between emotions and risk attitudes.

4.3 Further Results and Robustness Checks

Heterogeneity in the Population — The effects of emotions on risk attitudes are stable across specifications. Are the effects homogeneous across the population? Table A.10 presents the results from sample splits into different groups of the population according to gender and socioeconomic status.

[20] Interestingly, conditional on individual fixed effects lagged willingness to take risks relates negatively to current willingness to take risks.

I split the sample according to three proxies for socioeconomic status: income, employment, and education. Individuals with lower socioeconomic status tend to have a stronger relationship between anger and the willingness to take risks than individuals with higher socioeconomic status. This may be because individuals with low socioeconomic status may have fewer cognitive resources with which to cope with negative emotions (Haushofer and Fehr, 2014). The relationship between emotions and risk attitudes is similar for men and women.

Heterogeneity Across Domains of Willingness to Take Risks — The data also contain information about domain-specific risk attitudes, which allow me to assess the degree of heterogeneity of the emotion effects across domains. Dohmen et al. (2011) show that the general willingness to take risk question reflects decision-making in the laboratory most accurately and is highly predictive of domain specific risktaking. Still, specific risk attitudes could contain valuable information. Individuals answered the survey questions about domain-specific risk attitudes in only 2 years: 2009 and 2014. Accordingly, the within-individual variation in risk attitudes is considerably smaller. The domains encompass finance, driving, leisure, job, health, and trust in other people.

Table A.11 shows results across the domains. The coefficient estimates for anger have the same sign and similar magnitudes across domains. For happiness all but two point estimates are positive.[21] In particular, happiness seems to lead to higher willingness to take risks when it comes to trusting other individuals. The coefficient estimates for fear are more volatile and not statistically precisely estimated. The results have to be taken with a grain of salt because of the limited power, but the estimates suggest relationships between emotions and domain specific willingness to take risks in domains such as finance or driving.

Functional Form and First Differences — I show nonparametric estimates using dummy variables for each emotion realization with reference to experienced a particular emotion

[21]Higher happiness goes together with a higher willingness to take risks in the domain of driving, which is in contrast to the cross-sectional evidence by Goudie et al. (2014). Goudie et al. (2014) find that happier people more often wear seat belts.

"Sometimes"; see Figure A.6. While extreme emotion realizations have the strongest effects, for instance, the effects of happiness on risk attitudes are also statistically distinguishable from 0 for often and rarely experienced happiness. The largest coefficient estimate stems from the dummy experienced fear "very often" which relates to a more than 2 point reduction in willingness to take risks.

In a further check, I regress changes in risk attitudes on changes in emotions; see Table A.12. The resulting point estimates are very similar to the main estimates.

Unconditional Relationships and Participation — The main specification isolates the marginal relation of each emotion conditional on the other emotions. I show the estimated relation when I include each emotion separately in Table A.13 columns (1) through (3). This provides some insight into the covariance between emotions. The effects of fear and happiness are similar. Anger does not statistically significantly relate to risk attitudes unconditional on happiness and fear. This is because anger correlates strongly with fear, which has opposing effects but is omitted from the regression.

I examine the coefficient estimates for individuals I observe at least three times in column (4). The point estimates for individuals who participate more regularly are similar.[22]

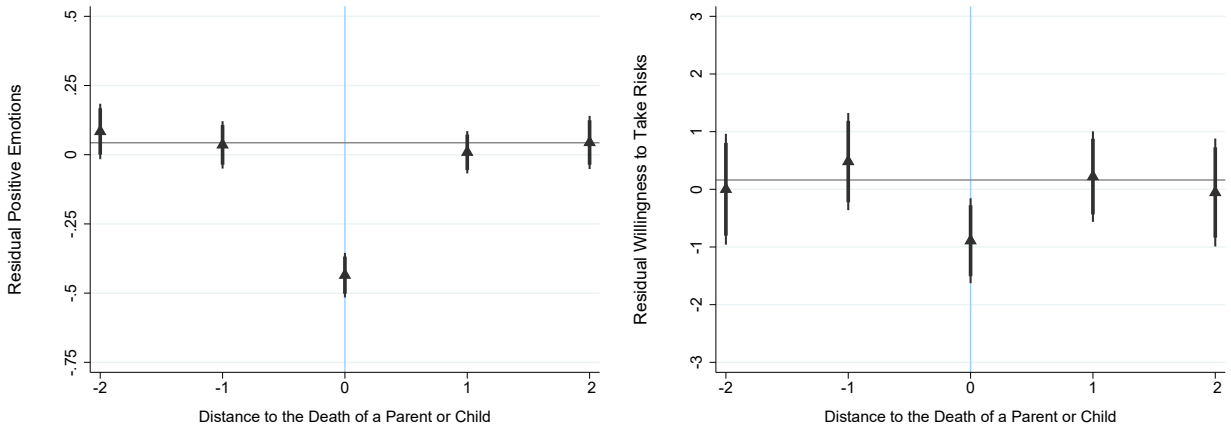
4.4 Event Study: Death of a Parent or Child

The link between emotions and risk attitudes withstands an array of alternative explanations and robustness checks. To address potential remaining endogeneity concerns, I study the death of a child or parent. It is known that the death of a relative reduces mental health and life satisfaction (see, e.g., Liberini, Redoano and Proto, 2017; Persson and Rossin-Slater, 2018). I exploit the emotional shock induced by the death of a parent or child to identify the effects of emotions on willingness to take risks.[23]

[22]I use this restriction since new individuals were added in 2014 and I can observe those individuals at most three times.

[23]Liberini, Redoano and Proto (2017) use death of a partner as an instrument for life satisfaction to assess the robustness of the relationship between life satisfaction and voting behavior. In recent working papers Kettlewell (2018) and Browne et al. (2016) examine the reduced form relationship between family loss and risk attitudes. The authors mainly rely on spousal death, but Kettlewell (2018) also adds child death to the bereavement indicator and Browne et al. (2016) separately consider parental death. The authors document

Figure 3: Death of a Parent or Child



(a) Residual Positive Emotions **(b) Residual Willingness to Take Risks**

Note: These graphs show the relationships between risk attitudes, emotions, and distance to the death of a parent or child. Each triangle shows the average residual of the dependent variable for the corresponding distance. The 95% confidence intervals for the averages are shown as thin black lines, the 90% confidence intervals as thick black lines. Distance to death means the distance in survey waves. Zero indicates the first survey wave after the death, highlighted with the light blue line. The horizontal gray line depicts the average residual for distances that are not 0, that is, not the first survey wave immediately following the death. The residuals stem from regressions of risk attitudes or positive emotions on all fixed effects for individuals who experience the death of a parent or child in the sample period, do not inherit money, and whom I observe before the death, at the time of the death, and after the death.

4.4.1 Identification Strategy

Sample and Reduced Form — I study how emotions and risk attitudes change around 1,242 deaths of a parent or child experienced by 1,118 individuals, yielding 8,250 observations.[24] All specifications consider individuals who experienced the death of a child or parent during the sample period. Moreover, I drop all individuals who inherited money at some point during the sample period, mainly because inheritance can result in temporary wealth shocks that threaten identification.[25] Furthermore, I examine only those individuals who I

an imprecisely estimated reduction in willingness to take risks because of bereavement. One reason for why the estimates are less precise may be the smaller sample sizes. In my application, using the death of a parent or child exclusively seem particularly well suited because of the lower likelihood of the violation of the exclusion restriction through, e.g., complementarities in household production.

[24]Of the 1,118 individuals, 112 individuals experienced 2 deaths, and 6 individuals experienced 3 deaths. I observe 79 child deaths.

[25]Including the individuals who inherited money in the sample does not change the main conclusion. The second-stage estimates for the full sample conditional on the difference before and after the death yields a coefficient estimate of positive emotions of 1.94 ($se = 0.9$).

observe in the survey wave immediately before, at, and after a death. This allows me to absorb level differences between before and after a death.

I use an index for positive emotions that is: (happiness×2)–fear. The reason is that the t-values and the first stage coefficients are more than two times larger for happiness when compared to fear. Overweighting happiness thus yields more precision on the first stage.[26] The estimates show death does not affect anger in the aggregate; see Table A.14. It also holds true across most groups partitioned by age and socioeconomic status; see Table A.15. Only for the unemployed do I observe a reduction in experienced anger. I examine the estimates for an alternative index including anger when discussing the results.

Figure 3 shows that the death of a parent or child leads to a pronounced drop in positive emotions in the survey wave immediately after the death, denoted as a distance of 0 to the death. Contemporaneously, I also observe lower willingness to take risks.

Specification — I exploit the strong effect of death on emotions in instrumental variable estimations of the following form:

$$\begin{aligned} \text{PosEm}_{iym} =& \eta_i + \gamma_a + \delta_y + \tau_m + \alpha \text{Bereavement}_{iy} \\ & \psi \text{AfterBer}_{iy} + X'_{iy}\beta + \varepsilon_{iym} \end{aligned} \qquad \text{(1st stage)}$$

$$\begin{aligned} \text{WTR}_{iym} =& \eta_i + \gamma_a + \delta_y + \tau_m + \lambda \widehat{\text{PosEm}}_{iy} \\ & + \psi \text{AfterBer}_{iy} + X'_{iy}\beta + \varepsilon_{iym} \end{aligned} \qquad \text{(2nd stage)}$$

where WTR_{iym} is the willingness to take risks; η_i, γ_a, and δ_y, τ_m are individual, age, year, and month fixed effects; and α indicates the effect of bereavement on the first stage. Bereavement_{iy} is 1 if it is the first survey wave after the death of a parent or child and 0 otherwise. The effect of positive emotions on the second stage is denoted with λ. AfterBer_{iy} is a dummy indicating after bereavement, being 1 if the distance to the death of a parent or child is $\geqslant 0$. In some specifications I account for X'_{iy}, which is a matrix of covariates includ-

[26] The results are qualitatively similar when giving equal weight to happiness and fear.

ing household income, household income squared, and income from assets (rent income, ln dividend income, and ln of losses at capital markets).

Using an index of positive emotions rather than a single emotion has two advantages: First, I do not need two credible instruments for happiness and fear to show a causal impact of emotions on risk attitudes. Second, by using a function of the two affected emotion variables I avoid an obvious violation of the exclusion restriction.

The effect estimates from the specification rely on variation in the timing of the death of a parent or child within individuals who experienced a death. Differencing out the average level of risk attitudes and emotions before and after the death isolates the immediate effect of the death from long-term effects of the death. This helps alleviate concerns about potential violations of the exclusion restriction.

Identifying Assumptions — To identify the causal effect of positive emotions on willingness to take risks the main identifying assumptions are:

I. *Exclusion restriction*: Only the emotional shock drives the difference between an individual's risk attitudes at the death of a parent or child when compared to the risk attitudes after the death of a parent or child.

II. *Monotonicity*: The death of a parent or child weakly reduces the incidence of positive emotions for all individuals.

I examine potential violations of the exclusion restriction in the result section below. Since I compare the shock at bereavement with the whole period after bereavement, permanent income or wealth shocks do not violate the exclusion restriction. Only shocks that exclusively accrue at bereavement could potentially violate the exclusion restriction. However, it is generally difficult to assess the validity of the exclusion restriction in this context. One has to be careful not to mistake outcomes of an emotion effect for causes of the emotion effect. For instance, it could be that temporary unemployment is a direct result of the death because one of the parents owned the company the individual works for. However, it could also be that the strength of the emotional shock leads to temporary unemployment. Distinguishing between direct and indirect effects is particularly delicate here, since economics so

far lacks a theoretical foundation for the interplay of emotions with other outcomes, such as unemployment. This should be kept in mind when interpreting both the results from instrumental variable estimates and the examination of competing explanations.

Monotonicity would only be violated if some people are happy about the death of one of their parents or children. Because little is known about how to partition the sample into people who may be happy about their parent's or child's death on the basis of observables, this assumption is difficult to test. I examine heterogeneities across age, income, and employment status in Table A.15 and find similarly sized negative emotional impacts of the death of a parent or child across groups. Similarly, I do not find heterogeneous effects on the first stage across the restricted samples I use for testing the exclusion restriction (regressions not shown). This suggests that individuals generally experience a negative emotional shock after the death of a parent or child.

4.4.2 Results

As suggested by the graphical evidence, the death of a parent or child is a highly relevant instrument for positive emotions. Across all specifications, the smallest absolute t-value for the effect of a death of a parent or child is 8.61, which clearly surpasses the rule-of-thumb threshold for weak instruments of a 3.2 t-value ($F > 10$); see Table A.14. The death of a parent or child causes a 0.52-point drop in positive emotions on the scale of -3 to 9 ($avg. = -5.25, sd = 2.2$).

Table 5 gives the main results from the event study. First, column (1) shows that positive emotions relate to higher willingness to take risks for the event study sample: A 1-point change relates to a 0.65-point higher willingness to take risks. Second, column (2) shows that the death of a parent reduces the willingness to take risks statistically significantly at the time of death when compared to the whole period after the death.

Columns (3) and (4) give the instrumental variable estimates. A 1-point change in positive emotions increases the willingness to take risks by 2.68 ($se = 1.14$). The estimate is similar when conditioning on income and wealth. The estimates of the causal impact unconditional on the level difference before and after the death, using an index of (happiness$\times$2)–

Table 5: Death of a Parent or Child

Dependent Variable	Willingness to Take Risks [0,100]			
	OLS	Red.-Form	IV	
	(1)	(2)	(3)	(4)
Positive Emotions	0.65***		2.68**	2.64**
	(0.14)		(1.14)	(1.14)
Death of a Parent or Child		-1.40**		
		(0.58)		
After Death	-0.07	0.55	0.77	0.75
	(0.59)	(0.72)	(0.79)	(0.79)
Individual FE	X	X	X	X
Age FE	X	X	X	X
Year FE	X	X	X	X
Month FE	X	X	X	X
Income & Wealth Controls				X
Observations	8,250	8,250	8,250	8,241
Individuals	1,118	1,118	1,118	1,118
R-squared	0.62	0.62	0.60	0.60

Note: The table shows the estimated relationship between the frequency of emotions felt and willingness to take risks using OLS or instrumental variable (IV) estimates as indicated. Standard errors (in parentheses) are based on clustering at the individual level. Red.-Form refers to reduced-form. After Death is an indicator variable that is 1 from the survey wave at bereavement onward. Income & Wealth Controls contain household income, household income squared, and income from assets (rent income, an indicator for missing rent income, ln dividend income, and ln of losses at capital markets). There are 9 missing values for returns from assets (Ln Capital Inv. Loss and Ln Dividend Income). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

fear+anger, or when controlling for the level of risk attitudes around the time of death lie within the confidence intervals of the main instrumental variable estimates; see Table A.16.

The estimated effect is larger than the one suggested by ordinary least squares estimates. One reason may that individuals with strong emotional reactions to the death do also react stronger to emotions. That is, compliers may be different from the general population the OLS estimates rely on. Another reason may be that IV reduces measurement error in emotions. In any case, the instrumental variable estimates suggest a causal effect of positive emotions on risk attitudes.

4.4.3 Competing Explanations and Life Satisfaction

Changes in Income, Wealth, Unemployment, and Marital Status — It could be that other changes in the first survey wave after the death affect emotions and risk attitudes. To examine the robustness of the instrumental variable results I first control for changes in asset income and household income in column (4) of Table 5. I then examine changes at the time of death in Table A.17. Table A.17 reveals no statistically significant effects of bereavement when compared to the whole period after the death on household income, income from assets, income from rent, real estate value, unemployment, or marital status.[27] The effects are arguably small. For instance, average monthly household income is only €11 ($se = 25$) lower at the first survey after the death. In comparison, the standard deviation in household income across the sample here is €1,941 while the median income is €2,700.[28]

Changes in Beliefs and Background Risk — Similarly, concurrent changes in background risk or beliefs about one's financial situation could drive the effect. But I do not find higher worries about finances or about job security at bereavement compared to after bereavement; see Table A.17. Dropping individuals from the sample who are younger than

[27] The signs on the dummy indicating the period after the death is consistent with van den Berg, Lundborg and Vikström (2017), who find permanent effects of the death of a child on unemployment and marital status.

[28] One further concern may be burial costs, which can exceed €1,500. Yet, a €1,000 reduction in income relates to only a 0.25-point ($se = 0.43$) decrease in the willingness to take risks in the subsample used here. This comparison reveals that even high burial costs are unlikely to substantially drive the estimates.

45 years and therefore might arguably face more severe changes in background risk because of the death, if anything, leads to a higher estimated effect (Table A.18).

Changes in Other Living Circumstances — In Table A.18 I provide additional checks on whether a temporary change in living circumstances drives the effect. It could be that the effect appears because a death forces individuals to deviate from their original plans. To test this, I drop all individuals for whom I know that they stated "I have to order my life in a new way" because of the death as opposed to "Some things will change now" or "Nothing will change because of that."[29] The resulting instrumental variable estimate is 3.48 ($se = 1.28$) and larger than the full-sample estimates. Similarly, dropping individuals who changed their employment status does not dampen the estimated effect. In conclusion, these indirect tests of the exclusion restriction suggest limited changes in other variables exactly in the survey after the death when compared to the whole period after the death.

Anticipation — The main specification used here exploits the variation in the timing of the death among the bereaved. It could be that this timing is not entirely exogenous to the living circumstances of the bereaved person or the dead person. To assess whether potential endogeneity of the timing of death affects the estimates, I drop all individuals for whom I know that their deceased relative was in need of care or was less than "satisfactorily healthy" 3 months before death. This does not alter the instrumental variable estimates substantially; see Table A.18, column (4).[30]

Life Satisfaction — General well-being and positive emotions closely relate, but not perfectly so (Luhmann et al., 2012). Clearly, a negative impact on life satisfaction in the survey

[29]The survey responses to this question, as well as to the questions about the deceased person's health and whether the person was receiving medical care before death, are available only for 2009 onward. I keep all observations with nonresponses (including all observations in 2008) or responses that are different from the ones excluded in the estimation sample.

[30]As an alternative instrument one might want to use the more surprising occurrence of terrorist attacks or school shootings which I used to validate the emotion measures. A drawback is that this is a relatively weaker instrument for positive emotions with a first stage estimate of -0.12 ($t = -3.17$), which is substantially smaller than bereavement and considerably less precise. The second-stage estimate is 3.35 ($se = 3.5$), which points in the same direction as the estimates from the death of a parent or child.

wave immediately after bereavement versus the whole period after bereavement would not necessarily indicate a violation of the exclusion restriction. It would just mean that life satisfaction and negative emotions are not easily separable outcomes after the death of a parent or child.

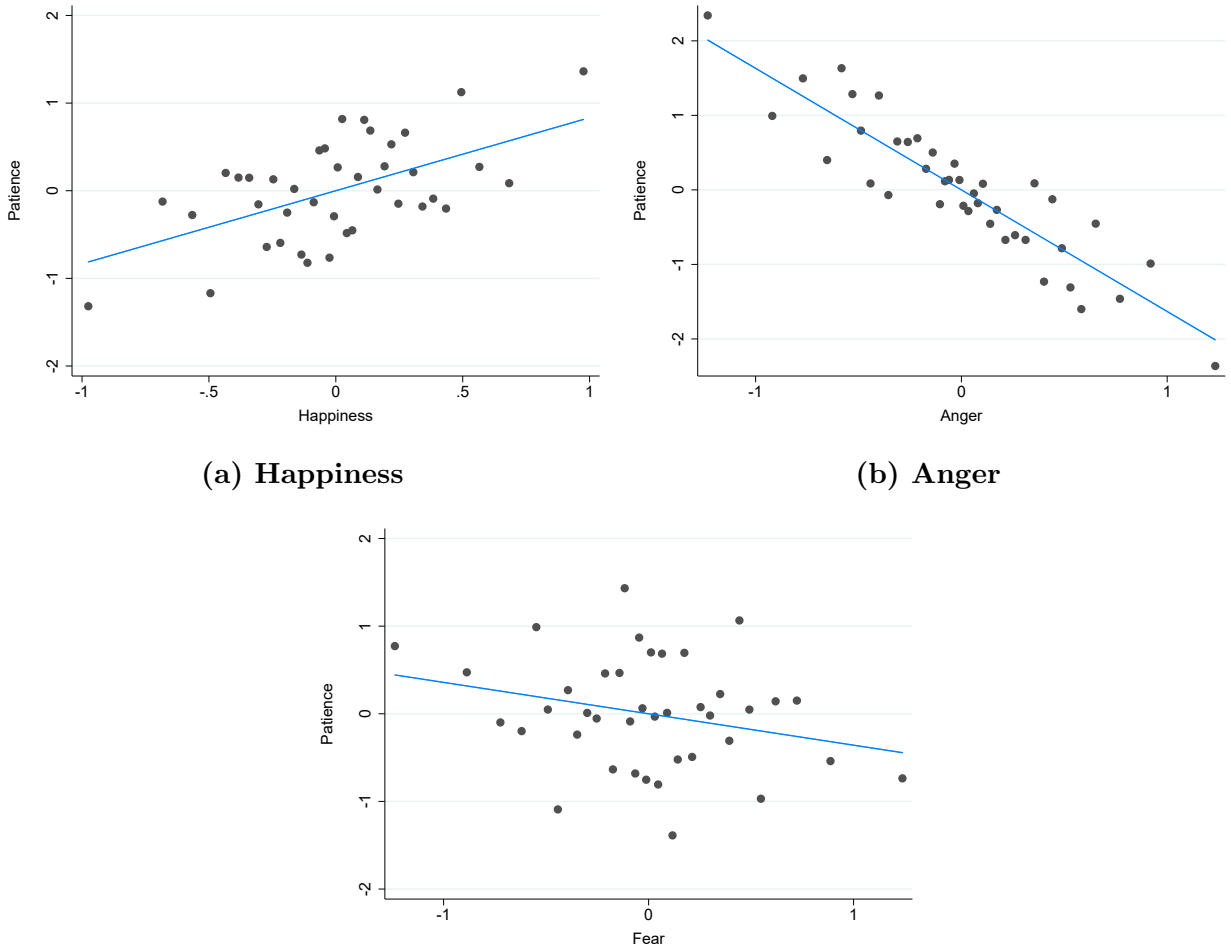
Table A.17, column (10) shows coefficient estimates of the effect of the death of a parent or child on life satisfaction. When compared to the whole period after the death, the level of life satisfaction is slightly and statistically insignificantly lower in the survey immediately after the death (-0.07, $se = 0.05$).[31] In the whole period after death, life satisfaction is substantially lower with a coefficient estimate of -0.12 ($se = 0.06$). That is, there is a level shift in life satisfaction but not a particularly large shock at the time of death when compared to the whole period after death. The effect on risk attitudes in the first survey wave after the death seems to operate primarily through emotions, rather than through large changes in life satisfaction.

[31]One reason for this finding may be the relatively short panel, which prevents full adaptation that, presumably, would raise the average life satisfaction after the death; see, e.g., Odermatt and Stutzer (2018).

5 Emotions and Patience

5.1 Main Results

Figure 4: Emotions and Patience



(a) Happiness **(b) Anger**

(c) Fear

Note: The figure shows the relationships between patience and residual emotions. The residuals stem from regressions of patience ranging from 0 to 100 on all emotions other than the one depicted, individual fixed effects, and age fixed effects. The gray dots show the binned averages across 40 quantiles of residual patience against the residual emotion. The blue line shows the linear fit from OLS regressions using all data. The slopes for anger and happiness are statistically significant at $p < 0.05$. The slopes for fear is not statistically significant at $p < 0.1$.

I show the relationships between emotions and patience in Figure 4. The residuals stem from regressions of patience on all other emotions and individual and age fixed effects. The data reveal linear relationships between happiness, anger, and patience that are statistically significantly different from 0 at $p < 0.05$. Fear does not statistically significantly affect

patience. The gray dots in panels (a) through (c) show binned averages of the residuals in patience against the residual frequency of felt emotions.

The relationships are large compared to the relationship between age and patience of 0.09 ($se = 0.01$) or income and patience, as a 1-standard deviation change in income associates with a roughly 1-point higher patience. Experiencing a 1-standard deviation increase in anger (roughly 1 point) is similar to a loss of 20 years of age or a more than €3,000 lower income. The effect of happiness on patience is consistent with previous findings from laboratory experiments that focus on positive mood more generally (Ifcher and Zarghamee, 2011; Lerner et al., 2015).

Table 6 shows the estimates for anger and happiness, which are robust to fixed effects and do not move with additional controls.[32] The robustness checks show that the relationship between anger and patience is the most stable.

Table 6: Emotions and Patience

Dependent Variable	Patience [0,100]				
	(1)	(2)	(3)	(4)	(5)
Happiness	0.90***	0.81***	0.83***	0.83***	0.84***
	(0.26)	(0.31)	(0.31)	(0.31)	(0.31)
Anger	-4.38***	-1.83***	-1.63***	-1.65***	-1.65***
	(0.19)	(0.23)	(0.23)	(0.23)	(0.23)
Fear	-1.13***	-0.28	-0.36	-0.36	-0.35
	(0.20)	(0.24)	(0.24)	(0.24)	(0.24)
Individual FE		X	X	X	X
Age FE			X	X	X
Year FE				X	X
Month FE				X	X
Controls					X
Observations	21,894	21,894	21,894	21,894	21,894
Individuals	10,947	10,947	10,947	10,947	10,947
R-squared	0.05	0.75	0.75	0.75	0.75

Note: The table shows the estimated relationships between the frequency of emotions felt on a scale from 1 to 5 and patience using OLS. Standard errors (in parentheses) are based on clustering at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[32]The unconditional raw correlations are graphically depicted in Figure A.7.

5.2 Alternative Explanations

5.2.1 Alternative Economic Explanations

Risk Attitudes — Table A.19 shows the robustness of the results to a first set of alternative economic explanations. An obvious explanation for the effects of emotions on patience could be risk attitudes that may not be separable from patience. Yet, the correlation between risk attitudes and patience is only 0.02 ($p < 0.01$). The result is consistent with the separability of time and risk preferences in the laboratory (Andreoni and Sprenger, 2012). Accordingly, when I add risk attitudes to the estimating equation in column (1) the size of the coefficient estimates barely change. Emotions thus distinctly relate to risk attitudes and patience.

Wealth and Income — I show several sample splits on wealth and income variables to address this set of alternative economic explanations in Table A.19. Note that these are much more demanding tests than the corresponding tests with risk attitudes, because of the limited sample size. Across the board the coefficient estimate of anger is negative. The coefficient estimates for happiness are usually positive but smaller for individuals do not own real estate or experience small household income changes. This suggests that the happiness–patience relationship could be driven by changes in wealth or income that are not captured by controlling for income, changes in real estate value, column (4), or income from wealth, column (9).

Economic Uncertainty, the Business Cycle, Health, and Background Risk — Table A.20 also shows that the economic environment and personal health circumstances do not fully explain the relationships between happiness, anger, and patience. Taking into account economic sentiment, recent stock market returns, or business cycle variation leaves the size of the point estimates virtually unchanged. The point estimates for happiness slightly decrease when accounting for individual health. But even so, the coefficient estimates for anger and happiness remain statistically significant at conventional levels.

Table A.21 shows whether heterogeneous exposure to background risks drive the relationships. Even when accounting for respondents' worries about their personal situation,

however, the relationships between happiness, anger, and patience remain stable. The relationship between anger and patience are robust across all specifications. It seems that retirees show less patience when happy, but the coefficient is statistically imprecisely estimated. This could point to background risk as one explanation for the relationship between happiness and patience. In sum, while parts of the relationship between happiness and patience may be driven by other factors, the data show anger reduces patience consistently.

5.2.2 Alternative Psychological Explanations

Life Satisfaction and Daily Mood Swings — While the relationship between life satisfaction and patience is interesting in itself, it may also be an alternative psychological explanation for the relationships between the various emotions and patience; see Table A.22.

Life satisfaction largely drives the relationship between recently experienced happiness and patience; see columns (1) and (2). Adding dummies for each realization of life satisfaction as control variables reduces the coefficient estimate from 0.84 ($se = 0.31$) to 0.19 ($se = 0.31$). While this is still a sizable coefficient estimate when compared to the relationship between age and patience, it is substantially smaller and statistically insignificant. The finding suggests that higher life satisfaction increases patience, potentially more so than emotional happiness shocks.

I also check if aggregate daily mood swings can explain the relationships between emotions and patience; see column (3). Yet, the inclusion of date fixed effects does not change the coefficient estimates substantially.

5.3 Further Results

Unconditional Relationships — The main specification isolates the marginal relation of each emotion conditional on the other emotions. In columns (4) through (6) of Table A.22, I show the estimates when I include each emotion separately. Each emotion strongly relates to patience, and the relationships are precisely estimated. Again, anger and happiness have the largest absolute coefficients. But, fear is also statistically significant, likely because of a higher incidence of anger and lower incidence of happiness in periods of experienced

fear. These results may be interesting for comparisons to evidence from studies that use one emotional measure at a time and therefore inherently measure the effect of compound emotional experiences.

Functional Form — Furthermore, I show nonparametric estimates using dummy variables for each emotion realization with reference to "Sometimes" experienced a particular emotion in Figure A.8. The relationships of anger and happiness with patience are monotonic. For fear, I observe a statistically significantly lower patience for often and very often experienced fear. The functional form relationships seems consistent with the general sensitivity of the results, where anger yields the most robust coefficient estimates.

5.4 Heterogeneity

Table A.23 presents the results from sample splits into different groups of the population according to gender and socioeconomic status. There are no marked and consistent differences across groups with different socioeconomic statuses. Interestingly, women seem to drive the happiness–patience relationship. Anger has large and negative coefficients for all groups.

6 Mechanisms

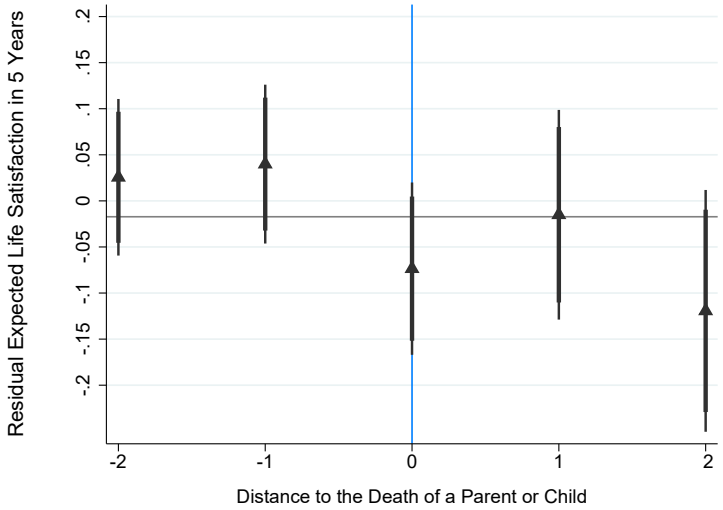
6.1 Expectations

Economists agree on at least two potential channels for how emotions could affect behavior: Emotions could affect either individuals' expectations about the future or individuals' preferences directly (Elster, 1998; Loewenstein et al., 2001; DellaVigna, 2009). To address whether emotions affect behavior through a change in expectations or by directly affecting preferences I exploit a unique question about expected life satisfaction in 5 years, answered on a scale ranging from 0 (completely not satisfied) to 10 (completely satisfied).[33] Expected life satisfaction is particularly appealing because it provides a general summary measure of

[33]This information is available for 2008, 2009, 2011, and 2013.

expectations (Odermatt and Stutzer, 2018). This information therefore allows a direct test of whether emotions affect preferences through expectations.

Figure 5: Death of a Parent or Child and Expected Life Satisfaction



Note: The figure shows the relationship between residual expected life satisfaction in 5 years (on a scale from 0, completely not satisfied, to 10, completely satisfied) and distance to the death of a parent or child. Each triangle shows the average residual for the corresponding distance. The 95% confidence intervals for the averages are given with thin black lines, the 90% confidence intervals with thick black lines. Distance to death means the distance in survey waves. Zero indicates the first survey wave after the death, highlighted with the light blue line. The horizontal gray line depicts the average residual for distances that are not 0, that is, not the first survey wave immediately following death. The residuals stem from regressions of risk attitudes or positive emotions on all fixed effects for individuals who experience the death of a parent or child in the sample period, do not inherit money, and whom I observe before the death, at the time of the death, and after the death. The reduced-form estimate of expected life satisfaction on an indicator variable indicating the first survey after the death, an indicator for the whole period after bereavement, and all fixed effects yields a coefficient estimate of -0.08 ($se = 0.09$). The instrumental variable estimate for positive emotions in the sample where expected life satisfaction is available is 3.3 ($se = 1.6$).

In the survey wave immediately after the death of a parent or child, when compared to the whole period after the death, the expected life satisfaction is not statistically significantly lower; see Figure 5. In contrast, willingness to take risks and positive emotions are substantially lower immediately after the death of a parent or child when compared to the period after the death.

Consistent with this, Table A.24 shows that the coefficient estimates for anger and happiness prevail when taking into account expected life satisfaction. Interestingly, expected higher life satisfaction goes together with a higher propensity to be willing to take risks and be patient. If the effects of emotions on preferences were driven exclusively by expec-

tations about future well-being, the emotion–preference relationships should be close to 0 when taking into account these expectations. But, the results suggest that emotions, at least in the case of anger and happiness, directly affect preferences rather than operating through expectations.

6.2 Impulsivity

It could be that impulse control can mitigate the effects of emotions (Loewenstein, 2000). If that is the case, a reasonable prior would be close to zero emotion relationships with preferences for nonimpulsive individuals and large emotion relations with preferences for impulsive individuals with low emotion regulation. I examine this prediction using a proxy for emotion regulation stemming from a question about self-reported general impulsiveness in 2008.[34] I then split the sample into impulsive individuals (at or above median impulsiveness) and nonimpulsive individuals.

Table A.24 shows sample splits for the relationships of emotions with both willingness to take risks and patience, depending on individuals' impulsiveness. Impulsive individuals have a stronger relationship of anger with preferences. The difference is particularly strong for risk attitudes, where impulsive individuals completely drive the main relationship. However, for the other emotion–preference relationships, being a less impulsive individual does not completely mitigate the relationships. Accordingly, even individuals with high emotion regulation may be affected by emotions in their decisions. This implies that emotions play a distinct role beyond self-control.

6.3 Feelings of Control

Rather than through expectations or impulsivity, emotions may change risk attitudes through perceived control over the situation (Lerner et al., 2015). According to the Appraisal-Tendency Framework, emotions with high perceived control, such as anger and happiness,

[34]The question was also asked in 2013, but I use only the year 2008 for the categorization to avoid changing categorization over time due to a change in impulsiveness.

increase risk taking because they lead to an overestimation of individual control over getting a good outcome.

I exploit a question about perceived control over one's life, answered on a scale from 1 to 7, to look at within-individual variation in feelings of control and emotions. The prediction from the Appraisal-Tendency Framework (Lerner and Keltner, 2000; Lerner et al., 2015) is as follows: Fear goes together with lower perceived control; anger and happiness go together with higher perceived control. The results are not entirely consistent with the Appraisal-Tendency Framework (see Table A.24). Namely, anger relates to lower feelings of control, which is in contrast to the prediction from the Appraisal-Tendency Framework. The Appraisal-Tendency Framework yields the correct predictions on the relationship between anger and risk attitudes, but it does not seem that this is because of elevated feelings of control. Yet, it is important to note that the relationship between perceived control is least negative for anger when compared to the other negative emotion, fear. In conclusion, emotions seem to impact attitudes directly, rather than operating through expectations. Impulsiveness and perceived control also play some role but can not entirely explain the observed effects of emotions.

7 Conclusion

This paper shows direct field evidence of the link between emotions, risk attitudes, and patience. The results reported in the paper indicate that preferences, at least partly, depend on a person's emotional state. Taking the emotional state into account can yield opposing predictions about behavior, as highlighted by differential effects of happiness and anger on risk attitudes.

Why should economists care about an effect of emotions? Previous research and this paper highlight four properties of emotions that underscore the relevance of emotions for economics: First, individuals have difficulties anticipating the influence of emotions on their decisions (Loewenstein, 2000). Second, individuals usually underestimate the influence of emotions on their behavior conditional on the occurrence of an emotion (Loewenstein, 2000). Third, emotions create an urge to act (Elster, 1998). For example, emotions triggered by cues

may have long-lasting effects by fostering addiction (Bernheim and Rangel, 2004). Fourth, emotions might affect economic expectations (DellaVigna, 2009) and do affect preferences. Taken together, the four factors provide strong arguments for taking emotions into account when analyzing economic decision making.

Given the pervasiveness of emotions and the fundamental role that risk attitudes and patience play in most economic decisions, these results could bear relevance for diverse fields such as labor economics, health economics, and public economics. For instance, emotions could affect patients' treatment choices (Kszegi, 2003). Future research could examine when emotions play a particularly influential role, assess the relative influence of cognitive factors such as attention versus emotional influences, and investigate in more detail how individuals shield themselves from emotional decisions.

> "Hence, in order to have anything like a complete theory of human rationality, we have to understand what role emotion plays in it." Herbert A. Simon (1983, p. 29)

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A Appendix

A.1 Data

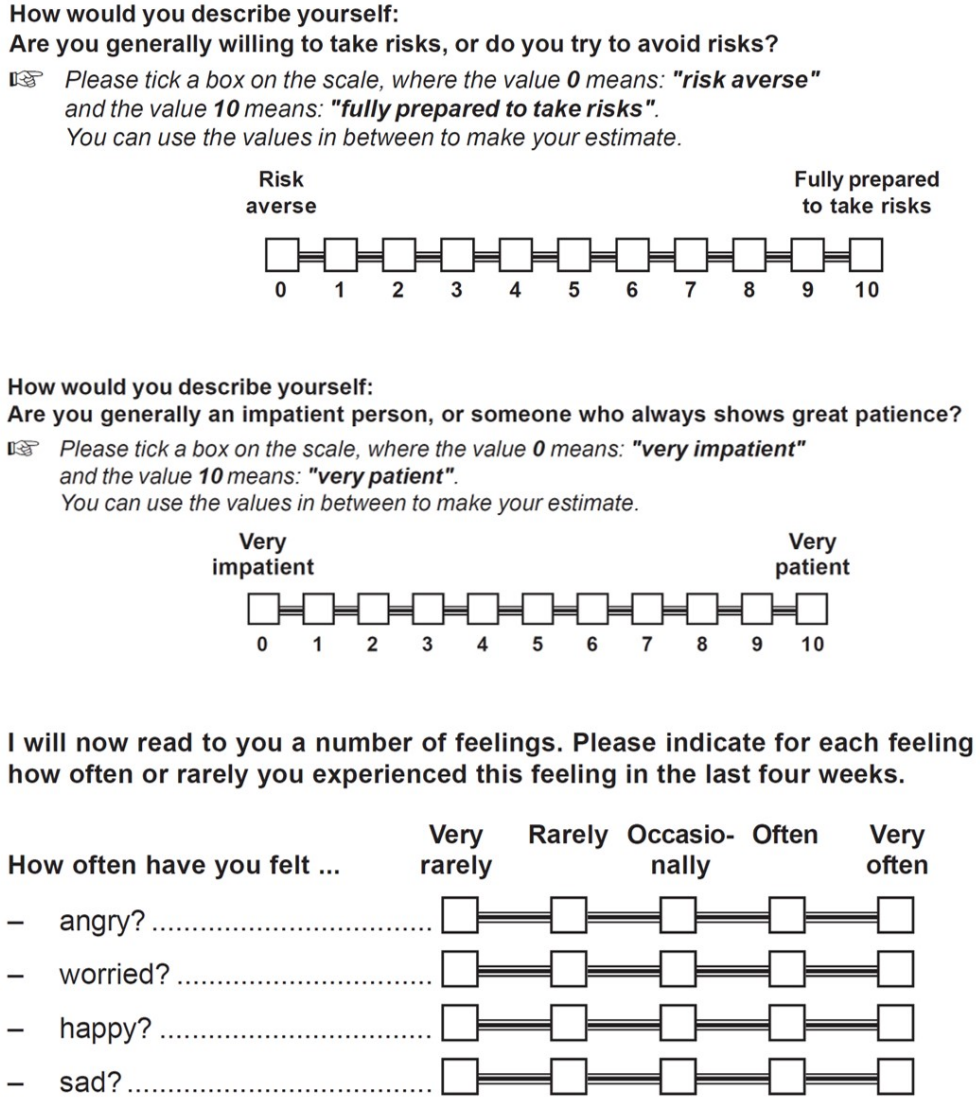
Measurement of Emotions

Robinson and Clore (2002) and others (for a review, see Ciuk, Troy and Jones, 2015) argue that a self-reported, retrospective assessment of emotions following an emotional event reflects the felt emotions if the retrospective assessment does not go beyond "a few weeks." However, there is a trade-off between present anchoring and personality anchoring in retrospective emotion assessments.

The trade-off depends on the time horizon of the retrospective assessment, whereby a longer time horizon leads to a recall of emotional experiences that is more consistent with one's personal emotional disposition (Parkinson et al., 1995; Mill, Realo and Allik, 2015). But, even these long-term assessments can be affected by recent events. Individuals being present-biased is potentially helpful here since I am interested in emotional shocks. In contrast, a bias toward emotional dispositions would reduce the variance I can exploit and bias my estimates toward 0 due to the within-individual comparisons over time. A similar effect can be expected by noisy measurement (Krueger and Schkade, 2008). If measurement error is large, my estimates are biased toward 0 and less precise (Krueger and Schkade, 2008). In sum, while imperfect, the emotion measures in the data seem a reasonable approximation of individuals' feelings and, if anything, work against finding a relationship.

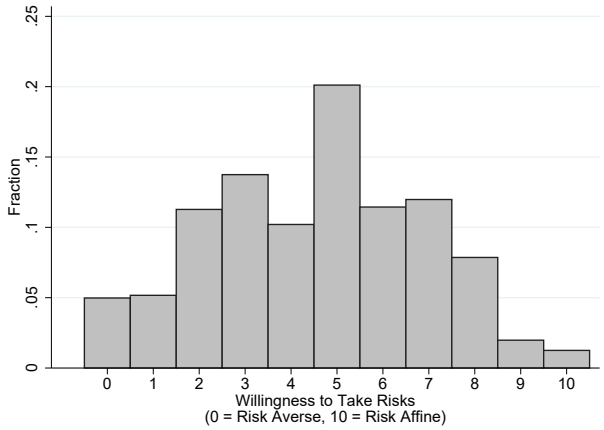
Figures

Figure A.1: Translated Questions from the German Socio-Economic Panel

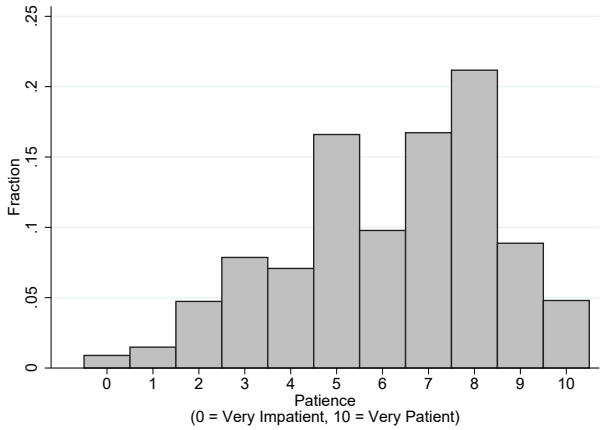


Note: The figure gives the original questions translated to English asked every year from 2008 through 2015. Note that worried is not an appropriate translation for what was asked in German. The question was about how often a person felt "Angst", for which the usual translation is fear. The questions about emotions and attitudes were normally separated by several items. The question order and the distance between questions changed over time as follows: 2008, emotions question number (qn) 2, patience qn 9, risk attitudes qn 10; 2009, emotions qn 117, risk attitudes qn 121; 2010, emotions qn 125, risk attitudes qn 123; 2011, emotions qn 150, risk attitudes qn 121; 2012, emotions qn 2, risk attitudes qn 148; 2013, emotions qn 2, patience qn153, risk attitudes qn 154; 2014, emotions qn 3, risk attitudes qn 4; 2015, emotions qn 2, risk attitudes qn 4; 2016, emotions qn 2, risk attitudes qn 5.

Figure A.2: Distribution of the Willingness to Take Risks and Patience

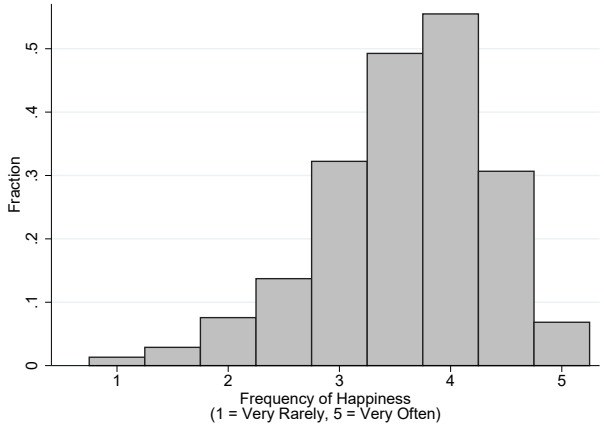


(a) Willingness to Take Risks

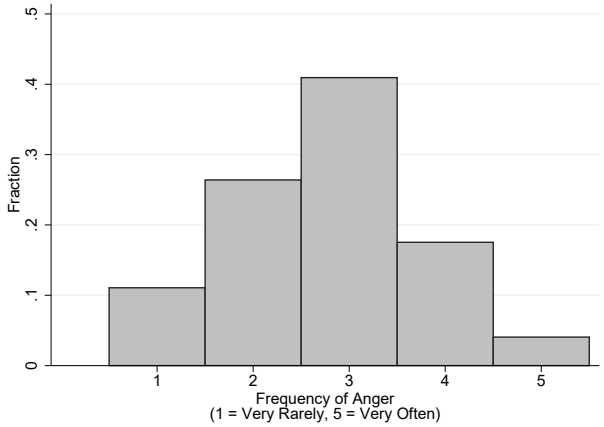


(b) Patience

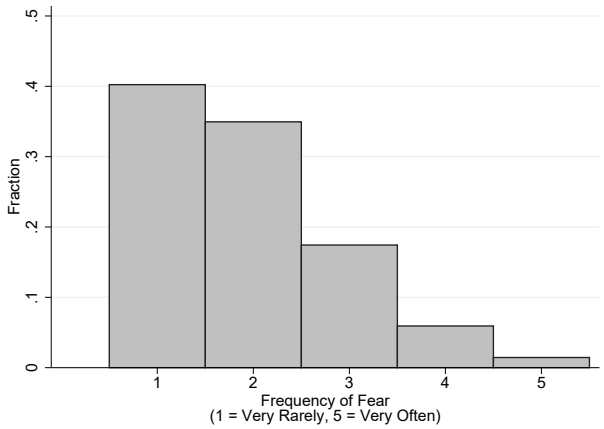
Figure A.3: Distribution of the Emotions



(a) Happiness

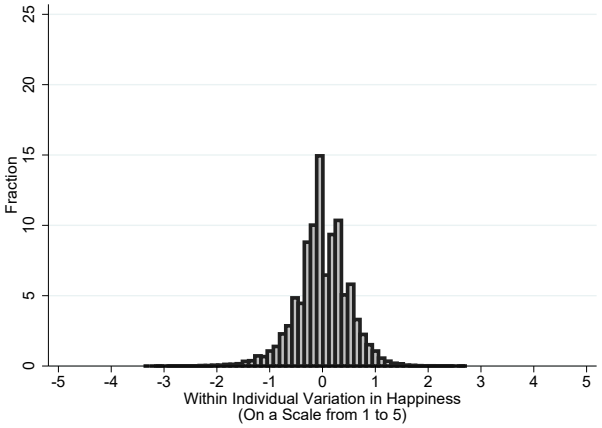


(b) Anger

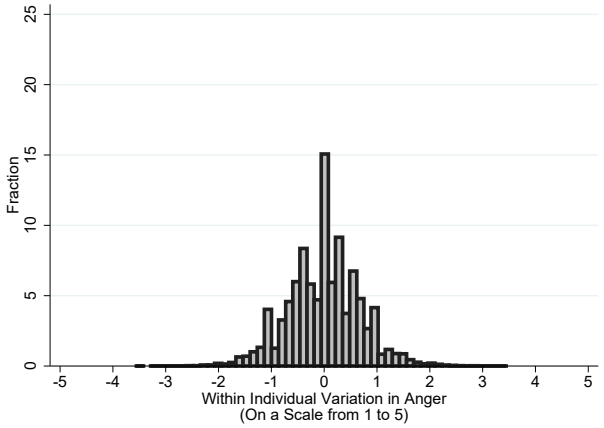


(c) Fear

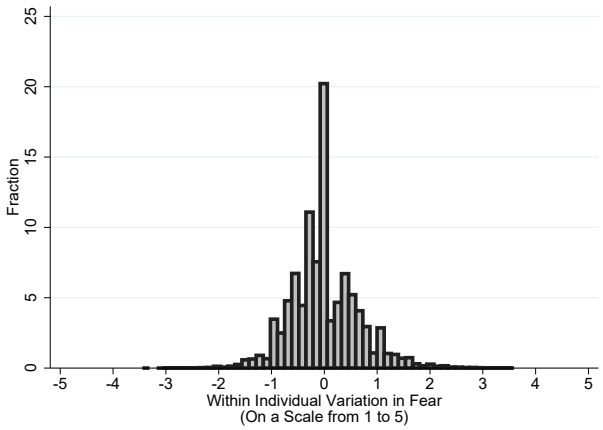
Figure A.4: Within Individual Variation in Emotions



(a) Happiness



(b) Anger



(c) Fear

Note: The figure shows the residuals from OLS regressions of each emotion on dummy variables for each of the individuals (individual fixed effects). An observation is an individual–year residual. The residual is 0 if the individual did not deviate from her mean value of the corresponding emotion.

Tables

Table A.1: Summary Statistics

Variable	Mean	SD	Min.	Max.	N
Dependent Variables					
Willingness to Take Risks	45.61	23.40	0	100	169,964
Patience	61.88	22.70	0	100	21,894
Main Independent Variables					
Happiness	3.59	0.76	1	5	169,964
Anger	2.77	1.00	1	5	169,964
Fear	1.93	0.97	1	5	169,964
Positive Emotions	5.25	2.16	-3	9	169,964
Main Controls					
Househ. Net Inc. in 1,000	3.03	2.12	0	200	169,964
Unemployed	0.41	0.49	0	1	169,964
Married	0.61	0.49	0	1	169,964
Child in Househ.	0.31	0.46	0	1	169,964
Life Satisfaction	7.15	1.73	0	10	169,964

Note: Patience is only available for the years 2008 and 2013. Househ. Net Inc. in 1,000 denotes household income in 1,000 euros. Child. in Househ. refers to an indicator variable that is 1 if there are children living in the household from 2008 through 2015 or 1 if the household received "Kindergeld" in 2016 where the indicator for children living in the household is not available.

Table A.2: Time Series Correlations Willingness to Take Risks (WTR)

	Willingness to Take Risks	Lag 1 WTR	Lag 2 WTR	Lag 3 WTR
Willingness to Take Risks	1.00			
Lag 1 WTR	0.58	1.00		
Lag 2 WTR	0.56	0.57	1.00	
Lag 3 WTR	0.54	0.55	0.55	1.00

Note: All correlations are stat. sign. at $p < 0.01$.

Table A.3: Correlates of Changes in Risk Attitudes and Patience

Dependent Variable	Will. to Take Risks [0,100] Avg.: 45					Patience [0,100] Avg.: 62			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Househ. Net Inc. in 1,000	0.51***	0.26***	0.20***	0.26***		0.90***	0.56**	0.57**	0.55**
	(0.05)	(0.05)	(0.06)	(0.05)		(0.27)	(0.28)	(0.28)	(0.28)
Househ. Net Inc. Sq./10	-0.02***	-0.01***	-0.01***	-0.01***		-0.39**	-0.28*	-0.29*	-0.27*
	(0.00)	(0.00)	(0.00)	(0.00)		(0.16)	(0.16)	(0.16)	(0.16)
Unemployed	0.20	-0.40**	-0.48**	-0.36*		-0.04	-0.25	-0.25	-0.18
	(0.18)	(0.19)	(0.20)	(0.19)		(0.56)	(0.60)	(0.60)	(0.60)
Married	-0.00	0.03	0.08	0.05		-0.81	-1.11	-1.15	-1.10
	(0.29)	(0.30)	(0.31)	(0.30)		(0.77)	(0.79)	(0.79)	(0.79)
Child in Househ.	-1.43***	-1.22***	-1.15***	-1.23***		-1.84***	-0.79	-0.76	-0.83
	(0.22)	(0.23)	(0.24)	(0.23)		(0.63)	(0.68)	(0.68)	(0.68)
House Owner x Real Est. Prices			0.03***					0.04	
			(0.01)					(0.04)	
Real Estate Prices			0.01					0.02	
			(0.03)					(0.15)	
Subjective Health				0.95***					1.74***
				(0.08)					(0.27)
Financial Domain					1.92***				
					(0.29)				
Driving Domain					2.33***				
					(0.33)				
Leisure Domain					2.25***				
					(0.34)				
Job Domain					2.06***				
					(0.31)				
Health Domain					1.54***				
					(0.28)				
Trust Domain					1.61***				
					(0.27)				
Individual FE	X	X	X	X	X	X	X	X	X
Age FE		X	X	X	X		X	X	X
Year FE		X	X	X	X		X	X	X
Observations	169,964	169,964	149,158	169,818	15,134	21,894	21,894	21,856	21,876
Individuals	34,176	34,176	26,512	34,176	7,567	10,947	10,947	10,928	10,947
R-squared	0.64	0.65	0.64	0.65	0.80	0.75	0.75	0.75	0.75

Note: The table shows the correlates of risk attitudes and patience. Standard errors (in parentheses) are based on clustering at the individual level. Househ. Net Inc. Sq. refers to squared household income (Househ. Net Inc. in 1,000). House Owner is one if individuals owned parts of their apartment or house in 2007 or, if missing, in 2002. This still leaves some missing values, which leads to fewer observations in columns (3) and (5). Real estate prices (Real Est. Prices) for apartments and houses are taken from the vdp-Immobilienpreisindex. Domain specific measures of willingness to take risks are only available for 2009 and 2014. Values for the domain specific willingness to take risks are standardized. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: Raw Correlations Between Emotions and Life Satisfaction

	Happiness	Anger	Fear	Life Satisfaction
Happiness	1.00			
Anger	-0.36	1.00		
Fear	-0.46	0.34	1.00	
Life Satisfaction	0.53	-0.30	-0.33	1.00

Note: All correlations are stat. sign. at $p < 0.01$.

Table A.5: Correlations of Changes in Emotions

	Happiness Res.	Anger Res.	Fear Res.	Life Satisfaction Res.
Happiness Res.	1.00			
Anger Res.	-0.25	1.00		
Fear Res.	-0.31	0.23	1.00	
Life Satisfaction Res.	0.32	-0.16	-0.19	1.00

Note: All correlations are stat. sign. at $p < 0.01$. The above correlations give the correlations between residuals (Res.) from regressions of each emotion on individual fixed effects.

Table A.6: Variability in Emotions

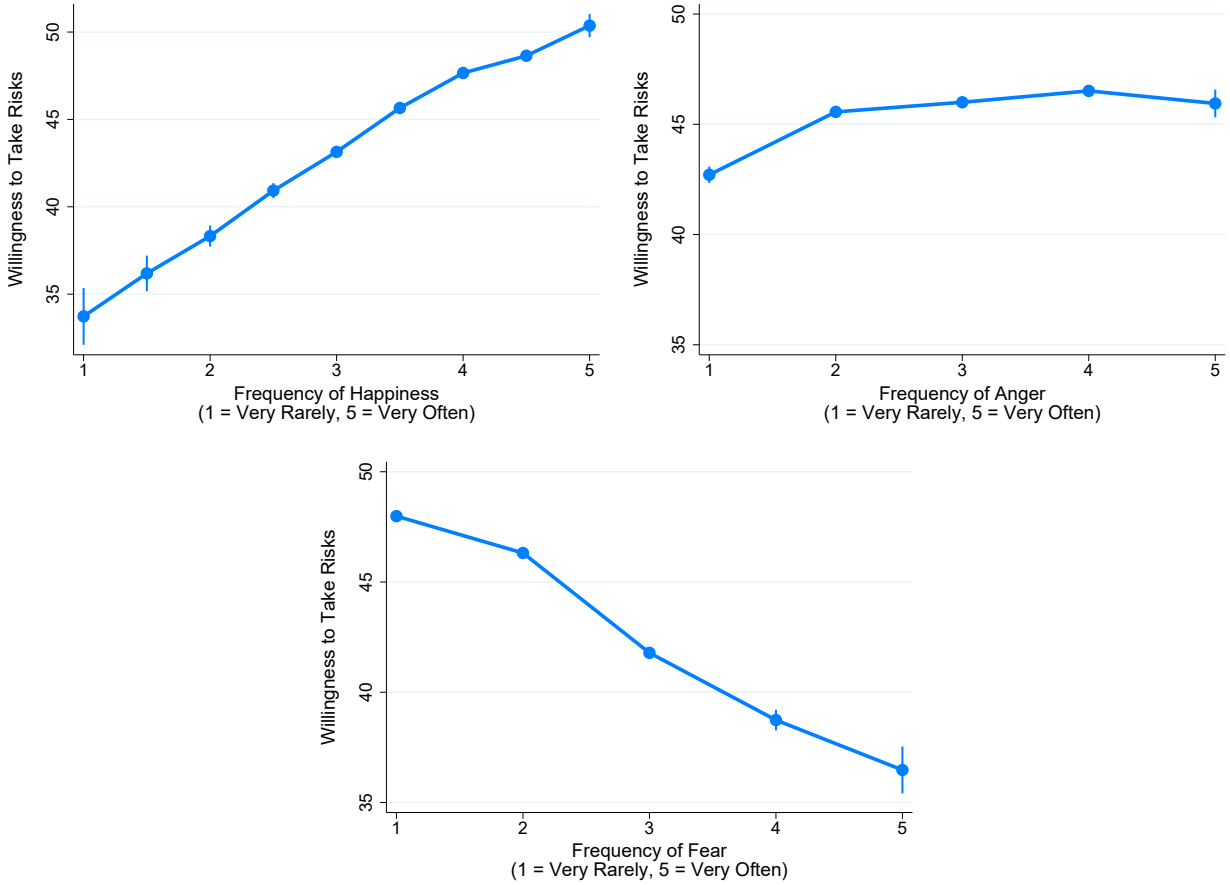
Dependent Variable	Unempl.	Unempl. Firm Cl.	Employment	Marriage	Divorce	Shooting/Terrorism	Life Sat.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Happiness	-0.09	-0.06**	0.24**	0.35***	0.11**	-0.16***	0.57***
	(0.11)	(0.02)	(0.11)	(0.06)	(0.05)	(0.06)	(0.01)
Anger	-0.39***	-0.03**	-0.07	-0.10**	0.06*	-0.06	-0.11***
	(0.08)	(0.01)	(0.08)	(0.04)	(0.03)	(0.04)	(0.00)
Fear	0.68***	0.04**	-0.22***	0.08*	0.01	0.05	-0.14***
	(0.09)	(0.01)	(0.08)	(0.05)	(0.04)	(0.04)	(0.01)
Individual FE	X	X	X	X	X	X	X
Age FE	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X
Month FE	X	X	X	X	X	X	X
Observations	169,964	169,964	169,964	169,964	169,964	169,964	169,964
Individuals	34,176	34,176	34,176	34,176	34,176	34,176	34,176
R-squared	0.21	0.21	0.24	0.20	0.22	0.19	0.68

Note: The table shows the estimated relationships between life events, external shocks, and emotions based on OLS. Standard errors (in parentheses) are based on clustering at the individual level. All dependent variables in column (1) through (5) take the value 100 in the survey wave immediately after the event ocurred. Life satisfaction ranges on a scale from 0 to 10. Unempl. Firm Cl. is an indicator variable that is 100 if an individual transitioned into unemployment because of the firm closing. Shooting/Terrorism indicates the day after all planned or carried out school schootings and terrorist attacks with significant media coverage: Mordanschlag am Frankfurter Flughafen, Sauerland-Gruppe, Düsseldorfer Zelle, Sprengsatzfund am Bonner Hauptbahnhof, Amoklauf von Winnenden, Geplanter Amoklauf Sankt Augustin, and Amoklauf von Ansbach. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.2 Emotions and Risk Attitudes

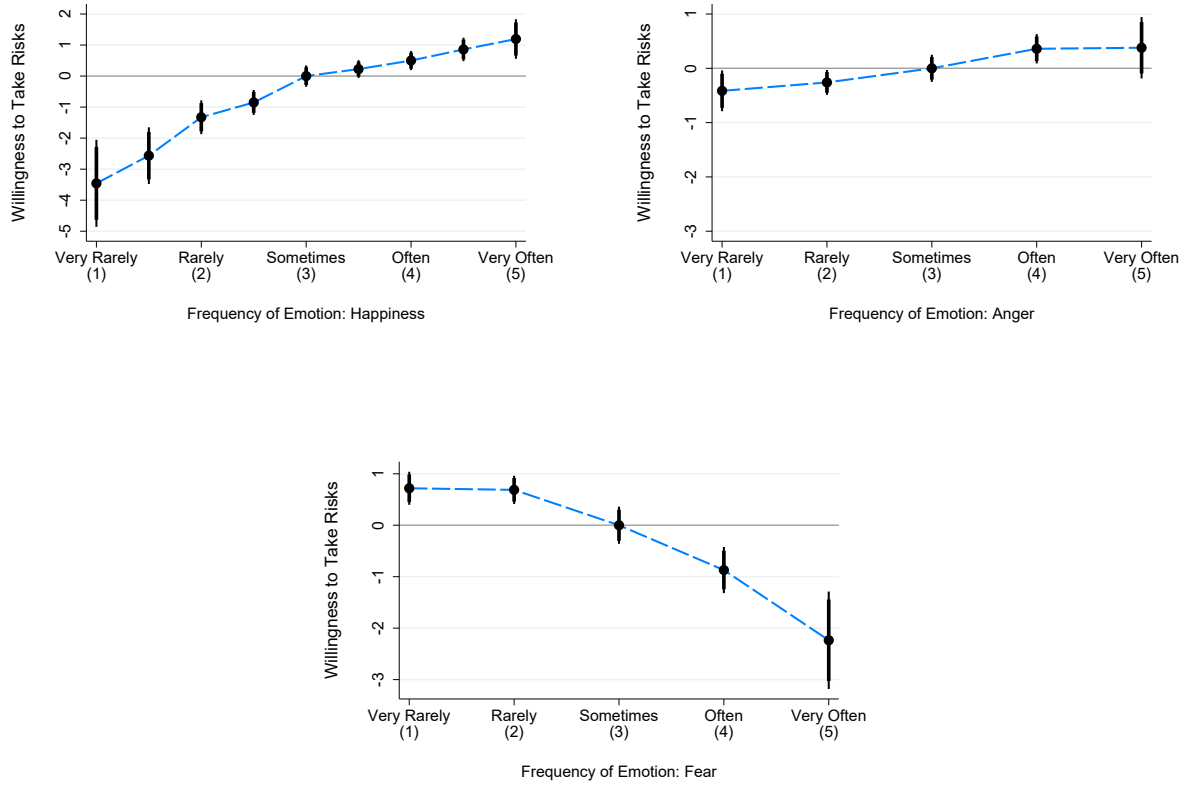
Figures

Figure A.5: Raw Relationship Between Willingness to Take Risks and Emotions



Note: The blue line in all graphs shows the relationships between average willingness to take risks by the frequency of recently experienced emotions. 95% confidence intervals are given by the vertical blue lines.

Figure A.6: Nonparametric Relationships Between Risk Attitudes and Emotions



Note: The black dots are coefficient estimates, depicted with their 90% (thick line) and 95% (thin line) confidence intervals. The coefficient estimates result from regression of the willingness to take risks on all emotion realization dummies, all fixed effects, and controls. The reference category for each emotion is "Sometimes". For expositional reasons, the depicted confidence intervals for the reference category is calculated as the average of the two adjacent categories.

Tables

Table A.7: Alternative Economic Explanations — General Economic Environment, the Business Cycle, and Health

Dependent Variable	Willingness to Take Risks [0,100]							
	Crisis Years		Econ. Env.		Business Cycle			Health
	No	Yes						Yes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Happiness	0.84***	0.84***	0.90***	0.96***	0.90***	0.89***	0.91***	0.78***
	(0.11)	(0.19)	(0.09)	(0.10)	(0.09)	(0.09)	(0.09)	(0.09)
Anger	0.27***	0.13	0.25***	0.27***	0.26***	0.25***	0.25***	0.29***
	(0.08)	(0.14)	(0.06)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)
Fear	-0.67***	-0.27*	-0.51***	-0.52***	-0.51***	-0.50***	-0.50***	-0.45***
	(0.08)	(0.14)	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)
Econ. Policy Uncertainty			0.04					
			(0.14)					
ZEW Sentiment			-0.04					
			(0.04)					
Prev. Week Avg. Trading Volume in 1,000,000				0.03				
				(0.27)				
Prev. Day Trading Volume in 1,000,000				0.31*				
				(0.16)				
Prev. Week Avg. Stock Market Return				0.12				
				(0.12)				
Prev. Day Stock Market Return				0.03				
				(0.05)				
Subjective Health								0.78***
								(0.08)
Individual FE	X	X	X	X	X	X	X	X
Age FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X				X
Month FE	X	X	X	X				X
Year × Month FE					X			
Year × Week FE						X		
Year × Month × State FE							X	
Controls	X	X	X	X	X	X	X	X
Observations	115,849	51,477	169,964	138,859	169,964	169,960	169,964	169,818
Individual Clusters	28,072	18,773	34,176	33,414	34,176	34,176	34,176	34,176
R-squared	0.69	0.68	0.65	0.67	0.65	0.65	0.66	0.65

Note: The table shows the estimated relationships between the frequency of emotions felt and willingness to take risks using OLS. Standard errors (in parentheses) are based on clustering at the individual level. Crisis years are defined as the years from 2008–2010, referring to the financial crisis. Econ. Env. denotes the columns where I take into account variables capturing the economic environment, such as economic policy uncertainty. The monthly Economic Policy Uncertainty Index (Econ. Policy Uncertainty) for Germany is from Baker, Bloom and Davis (2016) and based on the frequency of mentions of economic policy uncertainty in newspaper articles. The ZEW Index for Economic Sentiment (ZEW Sentiment) is based on interviews about the situation of the German economy with economists and analysts. Stock market return and trade volume (in 1 mio.) stem from the DAX, the main German stock market index. Prev. is shorthand for previous. Subjective Health ranges from 1 ("Very Bad") to 5 ("Very Good"). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.8: Alternative Economic Explanations — Background Risk

Dependent Variable	Willingness to Take Risks [0,100]			
	Financ. Worries		Retirement Age	
	Yes	Yes	Yes	No
Avg.	46	48	40	49
	(1)	(2)	(3)	(4)
Happiness	0.89***	0.78***	0.90***	0.87***
	(0.09)	(0.12)	(0.19)	(0.14)
Anger	0.26***	0.16**	0.29**	0.34***
	(0.06)	(0.08)	(0.14)	(0.10)
Fear	-0.49***	-0.41***	-0.52***	-0.56***
	(0.07)	(0.09)	(0.14)	(0.11)
Worried About Personal Financ. Sit.	-0.37***			
	(0.10)			
Worried About Job Security		-0.25**		
		(0.13)		
Individual FE	X	X	X	X
Age FE	X	X	X	X
Year FE	X	X	X	X
Month FE	X	X	X	X
Controls	X	X	X	X
Observations	169,358	96,654	41,128	67,738
Individuals	34,100	21,692	7,867	16,599
R-squared	0.65	0.67	0.63	0.67

Note: The table shows the estimated relationships between the frequency of emotions felt and willingness to take risks using OLS. Standard errors (in parentheses) are based on clustering at the individual level. Financ. Worries refers to either including worries about the personal financial situation (Worried About Personal Financ. Sit.) or worries about job security (Worried About Job Security). Only a subset of individuals was asked about whether they worry about their job security. Worries about the financial situation or job security range from "Not Concerned at All" to "Very Concerned" on a scale from 1 to 3. Retirement Age Yes indicates individuals older than 64, No indicates individuals younger than 46. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.9: Alternative Psychological Explanations

Dependent Variable	Willingness to Take Risks [0,100]					
	(1)	(2)	(3)	(4)	(5)	(6)
Happiness	0.51***	0.50***	0.86***	0.84***	0.44***	0.88***
	(0.09)	(0.09)	(0.10)	(0.10)	(0.11)	(0.09)
Anger	0.33***	0.33***	0.24***	0.24***	0.32***	0.24***
	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)	(0.06)
Fear	-0.41***	-0.40***	-0.61***	-0.61***	-0.50***	-0.50***
	(0.07)	(0.07)	(0.08)	(0.08)	(0.08)	(0.07)
Life Satisfaction	0.69***				0.70***	
	(0.04)				(0.05)	
Risktaking Lag			-0.10***			
			(0.00)			
Lagged Happiness				0.15	0.09	
				(0.10)	(0.10)	
Lagged Anger				0.03	0.04	
				(0.07)	(0.07)	
Lagged Fear				-0.13*	-0.12	
				(0.08)	(0.08)	
Individual FE	X	X	X	X	X	X
Age FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	
Month FE	X	X	X	X	X	
L.-Sat. D.		X				
Date FE						X
Controls	X	X	X	X	X	X
Observations	169,964	169,964	135,788	135,788	135,788	169,960
Individual Clusters	34,176	34,176	34,176	34,176	34,176	34,176
R-squared	0.65	0.65	0.69	0.69	0.69	0.66

Note: The table shows the estimated relationships between the frequency of emotions felt and willingness to take risks using OLS. Standard errors (in parentheses) are based on clustering at the individual level. Lagged refers to the observation of an individual in the last survey wave he or she answered before the current survey. L.-Sat. D. indicate that I account for dummies of all realizations of life satisfaction. Date FE are fixed effects for each date a survey was taken. There are some missing values for the day of the interview. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.10: Heterogeneity in the Population

Dependent Variable	Willingness to Take Risks [0,100]							
Avg.	High Inc. 47	Low Inc. 43	Uni. 47	Nonuni. 45	Employed 48	Unempl. 42	Male 50	Female 42
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Happiness	0.74***	1.22***	0.65***	0.97***	0.76***	1.03***	0.94***	0.87***
	(0.11)	(0.16)	(0.14)	(0.12)	(0.12)	(0.15)	(0.14)	(0.12)
Anger	0.24***	0.23**	0.16	0.30***	0.17**	0.37***	0.18*	0.33***
	(0.08)	(0.12)	(0.10)	(0.08)	(0.08)	(0.11)	(0.09)	(0.09)
Fear	-0.50***	-0.51***	-0.52***	-0.52***	-0.44***	-0.59***	-0.52***	-0.51***
	(0.09)	(0.12)	(0.11)	(0.09)	(0.09)	(0.11)	(0.11)	(0.09)
Individual FE	X	X	X	X	X	X	X	X
Age FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
Month FE	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X	X
Observations	110,309	59,655	61,577	104,679	100,728	69,236	79,349	90,615
Individuals	25,928	16,586	12,294	22,298	24,192	18,002	15,876	18,302
R-squared	0.68	0.66	0.67	0.64	0.68	0.66	0.64	0.64

Note: The table shows the estimated relationships between the frequency of emotions felt and willingness to take risks using OLS. Standard errors (in parentheses) are based on clustering at the individual level. High Inc. refers to above median income of €2,100 of the full SOEP sample. Uni. refers to more than vocational education. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.11: Emotions and Risk Attitudes Across Domains

Dependent Variable	Willingness to Take Risks [0,100]						
Avg.	General 42	Finance 21	Driving 32	Leisure 34	Job 34	Health 29	Trust 34
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Happiness	1.14***	0.32	0.44	0.23	-0.18	-0.29	0.77**
	(0.31)	(0.30)	(0.34)	(0.34)	(0.41)	(0.35)	(0.34)
Anger	0.51**	0.64***	0.53**	0.43*	0.60**	0.97***	0.21
	(0.23)	(0.23)	(0.25)	(0.25)	(0.30)	(0.26)	(0.25)
Fear	-0.37	0.38	0.15	-0.18	-0.40	0.03	0.38
	(0.24)	(0.24)	(0.28)	(0.26)	(0.32)	(0.27)	(0.27)
Individual FE	X	X	X	X	X	X	X
Age FE	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X
Month FE	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X
Observations	20,658	20,266	18,916	19,988	15,924	20,550	20,588
Individuals	10,329	10,133	9,458	9,994	7,962	10,275	10,294
R-squared	0.76	0.74	0.79	0.77	0.75	0.72	0.73

Note: The table shows the estimated relationships between the frequency of emotions felt and domain-specific willingness to take risks using OLS. Standard errors (in parentheses) are based on clustering at the individual level. This data is only available for 2009 and 2014. Note that there are some missing values for the domain-specific questions. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.12: First Differences (FD)

Dependent Variable	Willingness to Take Risks (FD) [0,100]			
	(1)	(2)	(3)	(4)
Happiness (FD)	0.78***	0.78***	0.70***	0.60***
	(0.10)	(0.10)	(0.10)	(0.11)
Anger (FD)	0.26***	0.26***	0.25***	0.30***
	(0.07)	(0.07)	(0.07)	(0.08)
Fear (FD)	-0.39***	-0.39***	-0.41***	-0.40***
	(0.08)	(0.08)	(0.08)	(0.08)
Individual FE	FD	FD	FD	FD
Age FE		X	X	X
Year FE			X	X
Month FE			X	X
Controls				FD
Observations	135,788	135,788	135,788	114,898
Individuals	34,176	34,176	34,176	30,804
R-squared	0.00	0.00	0.03	0.03

Note: The table shows the estimated relationships between the frequency of emotions felt and willingness to take risks using first difference estimation. Standard errors (in parentheses) are based on clustering at the individual level. For the Controls, FD denotes first differences in controls. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.13: Unconditional Relationships and Participation

Dependent Variable	Willingness to Take Risks [0,100]			
	(1)	(2)	(3)	Freq. Part. (4)
Happiness	1.02***			0.88***
	(0.08)			(0.09)
Anger		-0.02		0.25***
		(0.06)		(0.07)
Fear			-0.66***	-0.53***
			(0.07)	(0.07)
Individual FE	X	X	X	X
Age FE	X	X	X	X
Year FE	X	X	X	X
Month FE	X	X	X	X
Controls	X	X	X	X
Observations	169,964	169,964	169,964	153,672
Individuals	34,176	34,176	34,176	26,030
R-squared	0.65	0.65	0.65	0.64

Note: The table shows the estimated relationships between the frequency of emotions felt and willingness to take risks using OLS. Standard errors (in parentheses) are based on clustering at the individual level. Freq. Part. indicates individuals that participated 3 times or more often. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.14: Death of a Parent or Child — First Stage

Dependent Variable	Positive Emotions		Happiness	Anger	Fear
	(1)	(2)	(3)	(4)	(5)
Death of a Parent or Child	-0.52***	-0.52***	-0.22***	-0.05	0.08***
	(-8.61)	(-8.63)	(-9.58)	(-1.56)	(2.92)
After Death	-0.08	-0.08	-0.05	0.05	-0.01
	(-1.06)	(-1.04)	(-1.56)	(1.35)	(-0.22)
Individual FE	X	X	X	X	X
Age FE	X	X	X	X	X
Year FE	X	X	X	X	X
Month FE	X	X	X	X	X
Income & Wealth Controls		X			
Observations	8,250	8,241	8,250	8,250	8,250
Individuals	1,118	1,118	1,118	1,118	1,118
R-squared	0.61	0.61	0.57	0.49	0.55

Note: The table shows the estimated relationships between the death of a parent or child and the frequency of emotions felt. Standard errors (in parentheses) are based on clustering at the individual level. After Death is an indicator variable that is 1 from the survey wave at bereavement onward. Income & Wealth Controls contain household income, household income squared, and income from assets (rent income, an indicator for missing rent income, ln dividend income, and ln of losses at capital markets). There are 9 missing values for returns from assets (Ln Capital Inv. Loss and Ln Dividend Income). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.15: Death of a Parent or Child — Monotonicity

Dependent Variable	Positive Emotions						Anger					
	Older	Younger	High Inc.	Low Inc.	Employed	Unempl.	Older	Younger	High Inc.	Low Inc.	Employed	Unempl.
Avg.	-1.2	-.9	-.8	-1.7	-.9	-1.5	2.8	3.1	2.8	2.9	2.9	2.8
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Death of a Parent or Child	-0.45***	-0.65***	-0.51***	-0.44***	-0.51***	-0.43***	-0.03	-0.09	-0.04	-0.07	-0.02	-0.12**
	(-6.71)	(-4.80)	(-7.24)	(-3.55)	(-7.26)	(-3.51)	(-1.03)	(-1.38)	(-1.09)	(-1.32)	(-0.61)	(-2.10)
After Death	-0.06	-0.25	-0.10	-0.12	-0.03	-0.33**	0.03	0.11	0.05	-0.01	0.04	0.07
	(-0.70)	(-1.48)	(-1.11)	(-0.68)	(-0.36)	(-2.01)	(0.70)	(1.53)	(1.22)	(-0.09)	(1.00)	(0.92)
Individual FE	X	X	X	X	X	X	X	X	X	X	X	X
Age FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X
Month FE	X	X	X	X	X	X	X	X	X	X	X	X
Observations	6,195	2,055	5,535	2,715	5,712	2,538	6,195	2,055	5,535	2,715	5,712	2,538
Individuals	919	414	916	576	904	504	919	414	916	576	904	504
R-squared	0.63	0.58	0.62	0.64	0.62	0.65	0.50	0.49	0.52	0.52	0.49	0.57

Note: The table shows the estimated relationships between the death of a parent or child and the frequency of emotions felt. Standard errors (in parentheses) are based on clustering at the individual level. After Death is an indicator variable that is 1 from the survey wave at bereavement onward. High Inc. refers to above median income of €2,100 of the full SOEP sample. Uni. refers to more than vocational education. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.16: Death of a Parent or Child — Specifications

Dependent Variable	Willingness to Take Risks [0,100]				
	Reduced Form		IV		
	(1)	(2)	(3)	(4)	(5)
Death of a Parent or Child	-1.16**	-1.15**			
	(0.49)	(0.48)			
Positive Emotions			2.26**	2.05**	
			(0.98)	(0.86)	
Risky Emotions					2.46**
					(1.04)
Ind. 2 Waves Before – 2 W. After	0.02		0.31		
	(0.44)		(0.49)		
After Death					0.63
					(0.74)
Individual FE	X	X	X	X	X
Age FE	X	X	X	X	X
Year FE	X	X	X	X	X
Month FE	X	X	X	X	X
Observations	8,250	8,250	8,250	8,250	8,250
Individuals	1,118	1,118	1,118	1,118	1,118
R-squared	0.62	0.62	0.61	0.61	0.60

Note: The table shows the estimated relationship between the frequency of emotions felt and willingness to take risks using OLS or IV as indicated. Standard errors (in parentheses) are based on clustering at the individual level. Ind. 2 Waves Before to – 2 W. After is an indicator variable that is one for all surveys ranging from 2 survey waves before death up to and including the third survey wave after death (that is, it is one for distance –2 to +2 in survey waves). Risky Emotions refers to an index of happiness×2–fear+anger ranging from -2 to 14 with an average of 8. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.17: Death of a Parent or Child — Exclusion Restriction I

Dependent Variable	Net. Househ. Income	Ln Dividend Income	Ln Loss Capital Inv.	Married	Unemployed	Income from Rent	Real Estate Value	Worried Financial Sit.	Job Security	Life Satisfaction
Avg.	3.03	4.5	.14	.61	.41	.13	53.97	.84	.54	7.15
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Death of Parent or Child	-0.011	0.013	0.041	0.007	-0.002	-0.004	0.047	0.026	0.008	-0.068
	(0.025)	(0.059)	(0.027)	(0.006)	(0.010)	(0.006)	(0.189)	(0.017)	(0.022)	(0.046)
After Death	-0.012	-0.002	-0.080**	-0.016	0.016	-0.003	-0.481	-0.002	-0.002	-0.120**
	(0.038)	(0.073)	(0.039)	(0.010)	(0.013)	(0.009)	(0.329)	(0.021)	(0.028)	(0.057)
Individual FE	X	X	X	X	X	X	X	X	X	X
Age FE	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X
Month FE	X	X	X	X	X	X	X	X	X	X
Observations	8,250	8,250	8,250	8,250	8,250	8,241	8,020	8,228	5,598	8,250
Individuals	1,118	1,118	1,118	1,118	1,118	1,118	1,064	1,118	917	1,118
R-squared	0.88	0.70	0.29	0.90	0.79	0.81	0.99	0.63	0.60	0.61

Note: The table shows the relation between the death of a parent or child and an array of outcome variables. Standard errors (in parentheses) are based on clustering at the individual level. After Death is an indicator variable that is 1 from the survey wave at bereavement onward. Household income (Net. Househ. Income) is denoted in €1,000. The rent income indicator is 1 if the individual indicated income from renting out apartments or houses (this information is not available for all individuals). Real estate value denotes the interaction between real estate prices and home ownership in 2007 or 2002 if missing in 2007. Only a subset of individuals was asked about whether they worry about their job security. Worries about the financial situation (Worried Financial Sit.) or job security (Job Security) range from "not concerned at all" to "very concerned" on a scale from 1 to 3.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.18: Death of a Parent or Child — Exclusion Restriction II

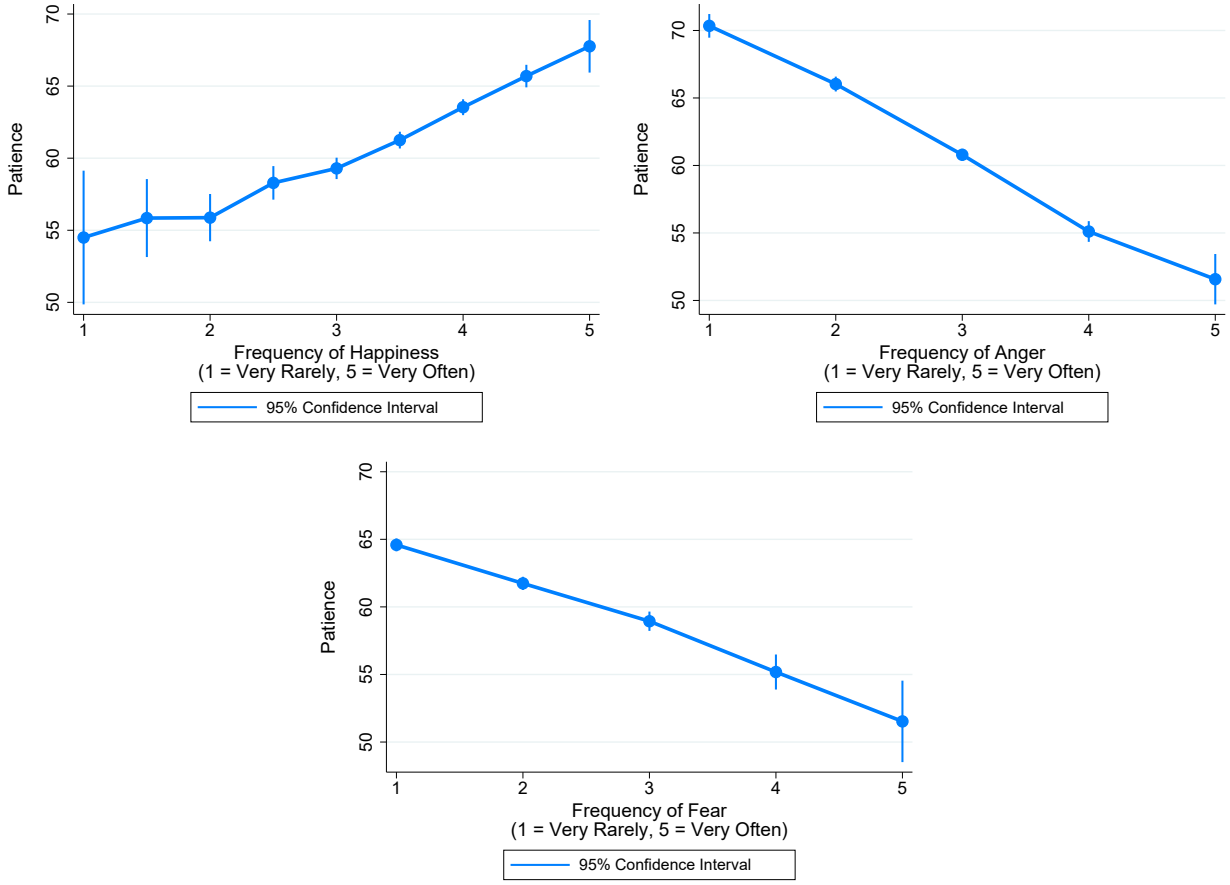
Dependent Variable	Willingness to Take Risks [0,100]			
	Young Dropped	Life Changing Dropped	Employm. Change Dropped	Unhealthy Dropped
Avg.	44	45	45	45
	(1)	(2)	(3)	(4)
Positive Emotions	3.27**	3.48***	3.76*	3.10**
	(1.47)	(1.28)	(2.13)	(1.43)
After Death	1.30	1.24	0.49	1.14
	(0.91)	(0.85)	(1.17)	(1.20)
Individual FE	X	X	X	X
Age FE	X	X	X	X
Year FE	X	X	X	X
Month FE	X	X	X	X
Observations	6,195	7,798	3,783	4,573
Individuals	919	1,057	546	620
R-squared	0.60	0.59	0.62	0.60

Note: The table shows the estimated relationship between the frequency of positive emotions felt and willingness to take risks using IV. Standard errors (in parentheses) are based on clustering at the individual level. I drop individuals younger than 45 (1), who stated their life changed completely because of death (2), individuals that switched the employment status any time during the sample period (3), and all individuals which experience at least one death where I know that the dead were either "less than satisfactorily" healthy 3 months before they died or in need of care (according to the interviewed relative) in column (4). Information on (2) and (4) are only available from 2009 onward and contain a lot of missing values. I only drop the individuals where I know that life changed or which indicated that the person who died was unhealth. Therefore, I leave all individuals from 2008 in the sample. After Death is an indicator variable that is 1 from the survey wave at bereavement onward. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.3 Emotions and Patience

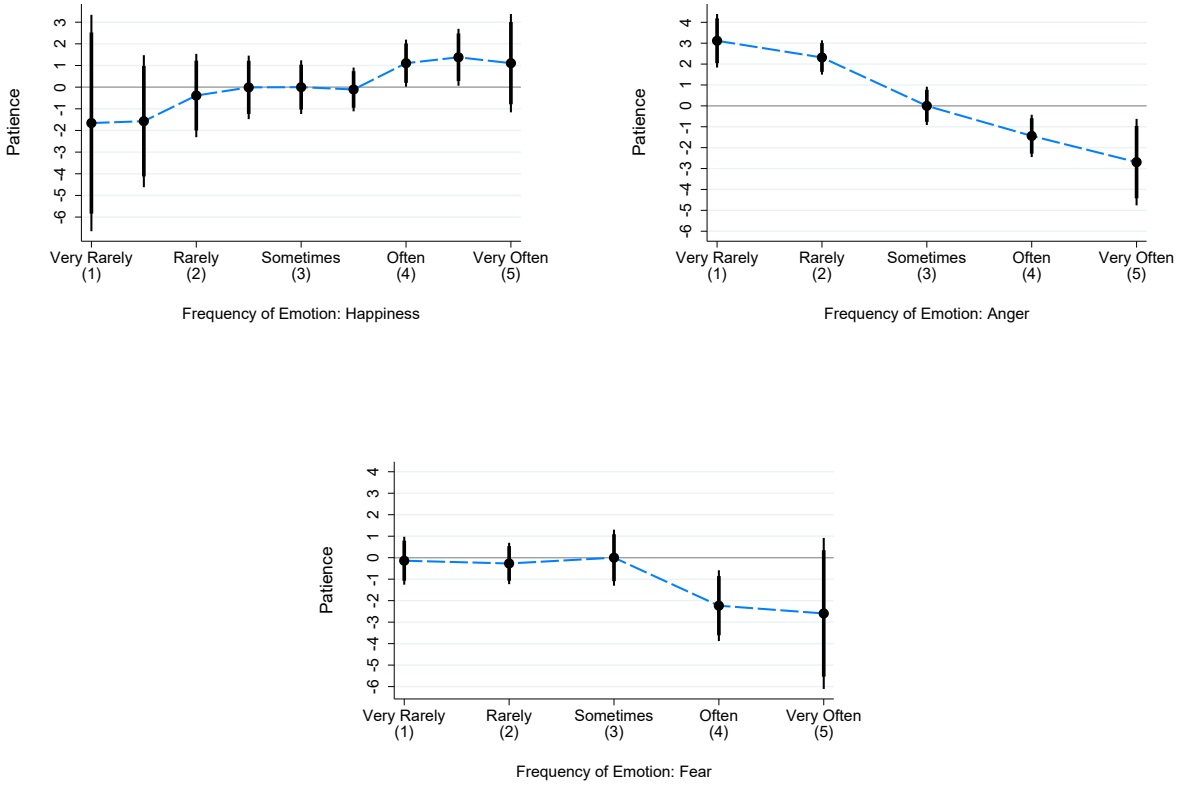
Figures

Figure A.7: Raw Relationship Between Patience and Emotions



Note: The blue line in all graphs shows the relationships between average patience by the frequency of recently experienced emotions. 95% confidence intervals are given with the vertical blue lines.

Figure A.8: Nonparametric Relationships Between Patience and Emotions



Note: The black dots are coefficient estimates, depicted with their 90% (thick line) and 95% (thin line) confidence intervals. The coefficient estimates result from regression of patience on all emotion realization dummies, fixed effects and controls. The reference category for each emotion is "Sometimes". The depicted confidence intervals for the reference category is calculated as the average of the two adjacent categories.

Tables

Table A.19: Alternative Economic Explanations — Income and Wealth (Patience)

Dependent Variable	Patience [0,100]										
	Risk Attitudes	Financ. Assets		Real Estate	Owns Real Estate		Wealth Change		Asset Inc.	Househ. Inc. Change	
	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	Small	Large
Avg.	62	62	62	62	62	62	62	62	62	62	62
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Happiness	0.81***	1.50***	0.51	0.84***	0.56	1.15***	0.76	0.81**	0.84***	-0.27	0.84
	(0.30)	(0.58)	(0.36)	(0.31)	(0.43)	(0.43)	(0.63)	(0.35)	(0.31)	(0.56)	(0.64)
Anger	-1.64***	-0.78*	-2.03***	-1.64***	-1.65***	-1.62***	-0.65	-2.02***	-1.65***	-2.00***	-1.14**
	(0.23)	(0.46)	(0.27)	(0.23)	(0.34)	(0.32)	(0.49)	(0.26)	(0.23)	(0.41)	(0.48)
Fear	-0.34	0.05	-0.54*	-0.36	-0.50	-0.16	-0.36	-0.35	-0.35	-0.61	-0.17
	(0.24)	(0.44)	(0.29)	(0.24)	(0.34)	(0.33)	(0.48)	(0.28)	(0.24)	(0.42)	(0.50)
Willingness to Take Risks	0.05***										
	(0.01)										
House Owner x Real Est. Prices				0.04							
				(0.04)							
Real Estate Prices				-0.12							
				(0.20)							
Ln Capital Inv. Loss									0.25		
									(0.16)		
Ln Dividend Income									0.02		
									(0.11)		
Rent Income Indicator									-0.77		
									(0.87)		
Individual FE	X	X	X	X	X	X	X	X	X	X	X
Age FE	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X
Month FE	X	X	X	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X	X	X	X	X
Observations	21,894	6,332	15,522	21,856	10,392	11,464	5,050	16,844	21,882	11,137	9,875
Individuals	10,947	3,166	7,761	10,928	5,196	5,732	2,525	8,422	10,945	7,962	7,342
R-squared	0.75	0.74	0.76	0.75	0.74	0.76	0.74	0.76	0.75	0.87	0.87

Note: The table shows the estimated relationships between the frequency of emotions felt on a scale from 1 to 5 and patience using OLS. Standard errors (in parentheses) are based on clustering at the individual level. Financ. Assets is an indicator based on individuals stating that they held financial assets in 2012. Real estate ownership is based on whether individuals indicated that they owned parts of their apartments or houses in 2007 or, if the information is missing, in 2002 (even after substituting for older values, there are still some missing values). Real estate prices for apartments and houses stem from the vdp-Immobilienpreisindex. House Owner x Real Estate Prices is an interaction of real estate prices with real estate ownership in 2007. I classify individuals with small wealth change as those individuals who never lost in capital investment and earned less than a dividend income of 500 euros in any year. Asset Inc. refers to the inclusion of controls for asset income. Ln Capital Inv. refers to the ln of capital investment losses. The rent income indicator is 1 if the individual indicated income from renting out apartments or houses. I also include a dummy variable indicating whether rent income is missing (not shown in regression output). There are some missing values for returns from assets (Ln Capital Inv. Loss and Ln Dividend Income). I classify individuals as experiencing small income changes, Househ. Inc. Change–Small, if the income changed less than 9% (the median change in income) from the last survey wave to the current survey wave. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.20: Alternative Economic Explanations — General Economic Environment, the Business Cycle, and Health (Patience)

Dependent Variable	Patience [0,100]					
	Econ. Env.		Business Cycle			Health Yes
	(1)	(2)	(3)	(4)	(5)	(6)
Happiness	0.84***	0.95**	0.84***	0.86***	0.88***	0.64**
	(0.31)	(0.38)	(0.31)	(0.31)	(0.31)	(0.31)
Anger	-1.64***	-1.78***	-1.64***	-1.64***	-1.58***	-1.57***
	(0.23)	(0.29)	(0.23)	(0.23)	(0.23)	(0.23)
Fear	-0.35	-0.39	-0.35	-0.34	-0.32	-0.23
	(0.24)	(0.30)	(0.24)	(0.24)	(0.24)	(0.24)
Econ. Policy Uncertainty	-0.12					
	(0.88)					
ZEW Sentiment	0.14					
	(0.54)					
Prev. Week Avg. Trading Volume in 1,000,000		-0.01				
		(0.01)				
Prev. Day Trading Volume in 1,000,000		0.01				
		(0.01)				
Prev. Week Avg. Stock Market Return		-0.28				
		(0.63)				
Prev. Day Stock Market Return		0.05				
		(0.19)				
Subjective Health						1.34***
						(0.27)
Individual FE	X	X	X	X	X	X
Age FE	X	X	X	X	X	X
Year FE	X	X				X
Month FE	X	X				X
Year × Month FE			X			
Year × Week FE				X		
Year × Month × State FE					X	
Controls	X	X	X	X	X	X
Observations	21,894	17,259	21,894	21,894	21,894	21,876
Individual Clusters	10,947	10,273	10,947	10,947	10,947	10,947
R-squared	0.75	0.80	0.75	0.75	0.76	0.75

Note: The table shows the estimated relationships between the frequency of emotions felt and patience using OLS. Standard errors (in parentheses) are based on clustering at the individual level. Econ. Env. denotes the columns where I take into account variables capturing the economic environment, such as economic policy uncertainty. The monthly Economic Policy Uncertainty index for Germany is from (Baker, Bloom and Davis, 2016) and based on the frequency of mentions of economic policy uncertainty in newspaper articles. The ZEW Index for Economic Sentiment is based on interviews about the situation of the German economy with economists and analysts. Stock market and trade volume (in 1 mio.) stem from the DAX, the main german stock market index. Subjective health ranges from 1 ("Very Bad") to 5 ("Very Good"). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.21: Alternative Economic Explanations — Background Risk (Patience)

Dependent Variable	Patience [0,100]			
	Financ. Worries		Retirement Age	
	Yes	Yes	Yes	No
Avg.	62	61	63	60
	(1)	(2)	(3)	(4)
Happiness	0.87***	1.32***	-0.47	1.74***
	(0.31)	(0.46)	(0.61)	(0.59)
Anger	-1.63***	-1.55***	-1.92***	-1.78***
	(0.23)	(0.34)	(0.49)	(0.45)
Fear	-0.36	-0.39	-0.39	0.43
	(0.24)	(0.35)	(0.51)	(0.44)
Worried About Personal Financ. Sit.	0.11			
	(0.33)			
Worried About Job Security		-0.36		
		(0.48)		
Individual FE	X	X	X	X
Age FE	X	X	X	X
Year FE	X	X	X	X
Month FE	X	X	X	X
Controls	X	X	X	X
Observations	21,764	10,810	4,864	6,460
Individuals	10,882	5,405	2,432	3,230
R-squared	0.75	0.76	0.75	0.74

Note: The table shows the estimated relationships between the frequency of emotions felt and patience using OLS. Standard errors (in parentheses) are based on clustering at the individual level. Financ. Worries refers to either including worries about the personal financial situation (Worried About Personal Financ. Sit.) or worries about job security (Worried About Job Security). Only a subset of individuals was asked about whether they worry about their job security. Worries about the financial situation or job security range from "Not Concerned at All" to "Very Concerned" on a scale from 1 to 3. Retirement Age Yes indicates individuals older than 64, No indicates individuals younger than 46. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.22: Alternative Psychological Explanations (Patience)

Dependent Variable	Patience [0,100]					
	(1)	(2)	(3)	(4)	(5)	(6)
Happiness	0.16	0.19	0.86***	1.60***		
	(0.31)	(0.31)	(0.31)	(0.28)		
Anger	-1.48***	-1.47***	-1.65***		-1.92***	
	(0.23)	(0.23)	(0.24)		(0.22)	
Fear	-0.14	-0.14	-0.31			-1.01***
	(0.24)	(0.24)	(0.24)			(0.22)
Life Satisfaction	1.19***					
	(0.15)					
Individual FE	X	X	X	X	X	X
Age FE	X	X	X	X	X	X
Year FE	X	X		X	X	X
Month FE	X	X		X	X	X
L.-Sat. D.		X				
Date FE			X			
Controls	X	X	X	X	X	X
Observations	21,894	21,894	21,894	21,894	21,894	21,894
Individual Clusters	10,947	10,947	10,947	10,947	10,947	10,947
R-squared	0.75	0.75	0.76	0.75	0.75	0.75

Note: The table shows the estimated relationships between the frequency of emotions felt and patience using OLS. Standard errors (in parentheses) are based on clustering at the individual level. L.-Sat. D. indicate that I account for dummies of all realizations of life satisfaction. Date FE are fixed effects for each date a survey was taken. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.23: Heterogeneity in the Population (Patience)

Dependent Variable	Patience [0,100]							
Avg.	High Inc. 61	Low Inc. 63	Uni. 61	Nonuni. 62	Employed 62	Unempl. 62	Male 62	Female 62
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Happiness	1.11**	0.84	0.80	0.92**	1.23***	-0.14	0.41	1.13***
	(0.44)	(0.55)	(0.49)	(0.40)	(0.45)	(0.51)	(0.47)	(0.40)
Anger	-2.00***	-1.71***	-1.25***	-1.88***	-1.60***	-1.78***	-1.85***	-1.43***
	(0.31)	(0.46)	(0.35)	(0.31)	(0.33)	(0.40)	(0.33)	(0.32)
Fear	-0.37	-0.11	-0.33	-0.33	-0.41	-0.44	-0.39	-0.30
	(0.33)	(0.46)	(0.37)	(0.32)	(0.34)	(0.41)	(0.37)	(0.31)
Individual FE	X	X	X	X	X	X	X	X
Age FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
Month FE	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X	X
Observations	14,101	7,793	8,504	13,032	12,977	8,917	10,330	11,564
Individuals	8,010	4,856	4,426	6,701	7,357	5,327	5,165	5,782
R-squared	0.80	0.80	0.79	0.74	0.79	0.80	0.75	0.75

Note: The table shows the estimated relationships between the frequency of emotions felt and patience using OLS. Standard errors (in parentheses) are based on clustering at the individual level. High Inc. refers to above median income of €2,100 of the full SOEP sample. Uni. refers to more than vocational education. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.4 Mechanisms

Tables

Table A.24: Expectations, Impulsiveness, and Perceived Control

Dependent Variable	Riskt.	Patience	Riskt.		Patience		High Control	
			Impulsive		Impulsive			
			No	Yes	No	Yes		
Avg.	43	62	37	47	65	60	4.3	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Happiness	0.53***	0.64**	1.05***	0.77***	1.17**	0.69*	0.22***	0.22***
	(0.16)	(0.32)	(0.18)	(0.13)	(0.47)	(0.40)	(0.02)	(0.02)
Anger	0.35***	-1.67***	0.03	0.30***	-1.15***	-1.93***	-0.03**	-0.03**
	(0.11)	(0.24)	(0.13)	(0.09)	(0.39)	(0.29)	(0.02)	(0.02)
Fear	-0.20	-0.22	-0.51***	-0.45***	-0.44	-0.33	-0.14***	-0.14***
	(0.12)	(0.25)	(0.14)	(0.10)	(0.40)	(0.30)	(0.02)	(0.02)
Expected Life Satisfaction in 5 Years	0.57***	0.87***						
	(0.07)	(0.13)						
Individual FE	X	X	X	X	X	X	X	X
Age FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
Month FE	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X		X
Observations	68,033	21,385	40,194	71,045	7,940	13,948	18,994	18,994
Individuals	25,513	10,884	6,010	10,686	3,970	6,974	9,497	9,497
R-squared	0.70	0.76	0.59	0.60	0.76	0.75	0.70	0.70

Note: All specifications shown use OLS. Standard errors (in parentheses) are based on clustering at the individual level. Riskt. denotes risk attitudes / willingness to take risks. Impulsive–No refers to below median self-assessed general impulsiveness (scale from 0, "Not at All Impulsive" to 10 "Very Impulsive" – the median is 5). The data on impulsiveness is available for 2008 and 2013, the sample split is done based on answers to the 2008 question. High control refers to the individuals feeling in control over their lives. The corresponding question on whether individuals feel in control of their lives was asked in 2010 and 2015. The responses were recorded on a scale from 1 "Does Not Apply" to 7 "Fully Applies". I inverted the scale, meaning that 7 is highest perceived control and 1 lowest perceived control. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.5 Data Sources

- German Socio-Economic Panel:
  https://www.diw.de/de/soep
- vdp-Immobilienpreisindex:
  https://www.pfandbrief.de/site/de/vdp/statistik/statistik/statistik_uebersicht.html
- Economic Policy Uncertainty:
  http://www.policyuncertainty.com/europe_monthly.html
- ZEW Sentiment:
  https://www.zew.de/en/publikationen/zew-gutachten-und-forschungsberichte/forschungsberichte/konjunktur/zew-finanzmarktreport/
- Dax Trading Volume and Returns:
  https://finance.yahoo.com/quote/%5EGDAXI/history/?guccounter=1