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Uncertainty, financial crises, and subjective well-being

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Uncertainty, Financial Crises, and Subjective Well-being

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Uncertainty, Financial Crises, and Subjective Well-being*

Abstract

This paper focuses on the effect of uncertainty as reflected by financial market variables on subjective well-being. The analysis is based on Eurobarometer surveys, covering 20 countries over the period from 2000 to 2013. Individuals report lower levels of life satisfaction in times of higher uncertainty approximated by stock market volatility. This effect is heterogeneous across respondents: The probability of being unsatisfied is higher for respondents who are older, less educated, and live in one of the GIIPS countries of the euro area. Furthermore, higher uncertainty in combination with a financial crisis increases the probability of reporting low values of life satisfaction.

Keywords: subjective well-being, uncertainty, financial crises

JEL Classification: D60, G01, I31

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1 Motivation

Does uncertainty as reflected by financial market variables and the experience of financial crises affect individuals' subjective life evaluation? Recent research has revealed huge costs of uncertainty and financial crises to the real economy (Bloom 2014). Reinhart and Rogoff (2014) analyse the pattern of GDP per capita around systemic banking crises and show that, on average, pre-crisis levels are reached only after eight years. A large fraction of these costs can be assigned to halted recovery. Although there is ample evidence on the negative effects of uncertainty and financial crises on macroeconomic variables, we know relatively little about the micro foundations behind these relationships. The objective of this paper is thus to establish a link between increased levels of uncertainty, arising in particular during financial crisis episodes, and individual responses. The focus is thereby on personal judgments of subjective well-being (henceforth: *SWB*).

The importance of this relationship is revealed by the OECD (2013), which shows that *SWB* has declined in the Euro area since the start of the recent financial crisis. For example, between 2007 and 2012, life satisfaction declined by more than 20% in Greece, 12% in Spain and 10% in Italy. Commonly found determinants of *SWB* are income and employment status. However, income and employment react with a delay to the start of financial crises. Recent research for the United States shows that *SWB* follows stock market movements (Deaton 2012). Atkinson et al. (2013) calculate that the costs of the 2007-09 crisis amounted to \$50,000 for each American but \$120,000 if broader effects on well-being are included. Additionally, the OECD (2013) states, "The global economic crisis has had a profound impact on people's well-being, reaching far beyond the loss of jobs and income." This raises the question of whether *SWB* reflects the psychological costs of uncertainty arising due to fears about the future, which are strengthened during crisis periods.

To answer these questions, we analyse empirically whether individuals adjust their subjective reporting of *SWB* in response to a higher degree of uncertainty and whether responses differ between non-crisis and crisis times. For this analysis, we focus on life satisfaction using data from Eurobarometer surveys for the period 2000-13 and 20 European countries. Life satisfaction is measured as the response to the question “On the whole, are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the life you lead?” which can be answered on a scale from one to four. We exploit the fact that all countries can be classified as developed countries. However, some countries were hit by the recent financial crisis harder than others, which generates a sufficient degree of heterogeneity in identifying effects.

The paper has two main aims: First, we test whether individuals’ assessment of their life depends on the country’s level of uncertainty in which they live. To do so, we relate individual responses on *SWB* to uncertainty as reflected by financial market variables and approximated by stock market volatility. This is motivated by the fact that during the sample period, fluctuations in financial markets were the primary source of uncertainty about future economic developments. Higher stock market volatility and thus less predictability of stock market returns, as well as the realization of financial losses during crisis times, might at first sight affect stock market participants. However, increased uncertainty in financial markets can also reflect uncertainty about future economic developments like output growth or unemployment, thus having far-reaching consequences for the whole population. Second, we test whether the relationship between life satisfaction and uncertainty is amplified during financial crises.

If uncertainty has an effect on individuals’ life satisfaction, this has to be by no means homogeneous across respondents. In contrast, individuals can be differently affected by uncertainty depending on their personal characteristics. For example, one might assume that unemployed people are more affected by uncertainty because job market prospects become

even more uncertain. Age can also matter: Younger individuals at the beginning of a professional career might adjust their life evaluation because they face a larger uncertainty about finding a job and future income paths. Older individuals, in contrast, might be more responsive to the uncertainty surrounding bad news and suffer from larger losses of accumulated financial wealth when a crisis occurs.

The macroeconomic environment and the political response to higher levels of uncertainty can also affect the response in *SWB*. For example, countries in the Euro area that belong to the GIIPS countries (Greece, Italy, Ireland, Portugal, and Spain) with stringent austerity programs established to reduce unsustainable debt levels are more likely to tighten conditions for individuals in the short run. Also, the effect of uncertainty might depend on social security systems and we test whether individuals react less to uncertainty in countries with a higher gross replacement rate or welfare expenditures. Furthermore, countries that have lower public or private debt levels might have buffers and fiscal space to mitigate the negative effects of economic downturns during periods of higher uncertainty.

Our findings suggest that periods characterized by a higher degree of uncertainty increase the probability that individuals report a lower life satisfaction. Looking at heterogeneous responses of individuals to uncertainty, we find that negative effects of uncertainty on life satisfaction are stronger for older and low-educated respondents. Respondents' life satisfaction in the GIIPS countries are particularly affected by higher uncertainty compared to respondents living in other European countries. In contrast, the existence of a social security system in the respondents' country plays a minor role in mitigating adverse consequences of uncertainty. The effect of uncertainty is enforced during crisis periods. The probability of being "not at all satisfied" with one's life is increasing with a higher degree of uncertainty, while larger in absolute terms during a crisis period compared to a non-crisis period.

The paper is structured as follows. The following part presents the literature review. Part 3 explains the data set and provides descriptive statistics. Part 4 analyses, in a first step, the (heterogeneous) effect of uncertainty on life satisfaction. In a second step, the analysis is extended to test whether the response of life satisfaction to uncertainty differs during crisis periods. The final part concludes the paper.

2 Literature Review

The first and most prominent strand of related literature looks at the effect of income on *SWB*. Whereas Easterlin (1974) finds no significant relationship between income and *SWB* in a time-series analysis for the US, Stevenson and Wolfers (2008) detect a positive effect of income on *SWB* in a cross-country study. Di Tella et al. (2001, 2003) look at the effect of macroeconomic variables such as inflation and unemployment on *SWB*. Based on Eurobarometer and US General Social Survey data, they find that higher unemployment and higher inflation decrease life satisfaction.¹ Their estimations suggest that individuals would need an additional annual payment of \$200 to compensate for losses other than unemployment and income decline during US recessions. This finding indicates the importance of psychological costs of recessions, which go beyond economic costs. In line with this finding, De Neve et al. (2015) find that economic downturns affect life satisfaction twice as much as periods of positive economic growth. However, research on heterogeneous responses in life satisfaction across individuals and during recessions is scarce. In this paper, we analyse whether individuals are affected differently by uncertainty depending on personal characteristics such as age, financial situation, and education status.

¹ The negative effect of unemployment on *SWB* is also found by Clark and Oswald (1994) using British survey data. Wolfers (2003) shows a negative link between higher unemployment volatility and *SWB* using data from the Eurobarometer survey. In a recent book, Weimann et al. (2015) discuss the Easterlin paradox, the usefulness of happiness scales, and the importance of economic growth.

A second and more recent strand of literature analyses the effects of financial crises on *SWB*. Montagnoli and Moro (2014) show that banking crises, measured as a dummy variable, lowered *SWB* in European countries between 1980 and 2011. This finding holds particularly if a country has a financial centre or experienced a pre-crisis credit boom. Deaton (2012) uses daily data on *SWB* for the US over the period 2008-2010 and shows that *SWB* correlates with stock market developments. One reason behind this fact might be that households suffered large losses in financial wealth due to declining asset and housing prices (Hurd and Rohwedder 2010, Graham et al. 2010). This would be consistent with the finding of Frijters et al. (2015) that, given increases in stock prices, individuals active in stock market benefit in terms of well-being.

However, people who held stocks were not the only ones to suffer during the crisis (Shapiro 2010); individuals with little financial wealth also faced declines in well-being, measured by a drop in consumption, which might be traced back to an increase in unemployment and tightened credit conditions. Stock market developments can, in this context, be interpreted as an indicator of the state of the economy, incorporating fears about future economic conditions (Deaton 2012). This can explain why they affect individuals who hold stocks but also reflect expectations about income and employment for those outside of stock markets (Frijters et al. 2015). Also, Ratcliffe and Taylor (2015) find that higher stock market volatility results into lower mental well-being. Given these findings, we also focus on stock market developments to measure uncertainty in this paper.

We extend these analyses by asking which personal and country-specific characteristics interact with the negative effect of higher stock market volatility on *SWB*. For example, one might suspect that during periods of increased uncertainty reflected by higher stock market volatility, the economic environment and future prospects become more uncertain. Such uncertainty, in turn, can affect individuals' life evaluation. The change in individual reactions

is likely to depend on personal characteristics such as age, experience or employment status. Malmendier and Nagel (2011) show, for example, that individual experiences of macroeconomic shocks affect current risk-taking behaviour. Additionally, the institutional setting might matter (Di Tella et al. 2003). Countries with better social security systems can mitigate the effect of increased economic uncertainty on individuals.

The amplifying effect of uncertainty during economic downturns is studied from a macroeconomic perspective by, for example, Bloom (2009), Bloom et al. (2012), and Gilchrist et al. (2014). A common finding in this literature is that uncertainty has negative effects on investment, consumption and output growth (Bloom 2014). Due to the feedback effect of a reduction in economic activity on uncertainty, uncertainty rises endogenously during recessions. Papers studying the effects of uncertainty at the micro level focus primarily on firms' decision-making under uncertainty (Bloom et al. 2007, Guiso and Parigi 1999, Leahy and Whited 1996), whereas firms tend to reduce their investment as a response to higher uncertainty.² Aaberge et al. (2016) use micro data to show that political uncertainty increases household savings.

Our objective is to assess the effect of aggregate uncertainty not on economic variables but on subjective responses of “common” individuals. If uncertainty affects economic conditions and if individuals adjust their life assessment in uncertain times, these relationships might be interdependent and have the potential to reinforce each other. Our evidence that uncertainty affects *SWB* at the micro level suggests that changes in individuals' life evaluation could, in turn, affect future decisions about consumption and investment and thus feed back to the macroeconomy.

² Buch et al. (2015) study the effect of increased uncertainty in the banking sector on banks' loan supply and find that banks grant fewer loans if uncertainty is higher; however, the effect depends on bank-level characteristics.

3 Data and Descriptive Statistics

The main variable of interest is a measure of subjective life evaluation based on micro data of survey respondents. Uncertainty is captured by a country's stock market volatility. The data set is complemented by micro- and macro-level control variables. The following subsections give a brief overview of data sources and patterns.

3.1 Data Description

The micro data on *SWB* are obtained from Eurobarometer surveys. The sample covers 20 European countries over the period 2000-13. The Eurobarometer surveys provide cross-sectional observations on subjective life satisfaction and the personal characteristics of respondents. Each survey contains data for approximately 1,000 individuals per country and is conducted twice a year.³ Personal characteristics include gender, age, marital status, and unemployment status. Summary statistics can be found in Table 1a), and more details on the data are provided in the appendix.

[Insert Table 1 here]

The Eurobarometer survey has two nice features compared to related data sources such as the World or European Values Survey. First, it is based on a relatively homogeneous sample of countries such that confounding factors due to different stages of economic development, as observed for advanced and emerging market economies, play a minor role. At the same time, countries were differently affected by the recent financial crisis. This discrepancy generates a sufficient degree of heterogeneity in identifying effects. Second, the survey is conducted bi-annually, allowing it to assess shorter-term movements in *SWB*. The sample period extends

³ The surveys for Germany and the UK include more observations due to a separation between West and East Germany and Great Britain and Northern Ireland. For the years 2003-2004, the question on life satisfaction was asked only once a year.

over a non-crisis period and a crisis period, including the global financial crisis and the Euro area sovereign debt crisis. This sample period allows for analysing not only the effect of uncertainty on *SWB* but also interacting effects with the occurrence of a crisis.

In our analysis, the main variable of interest, *SWB*, is captured by the response to the following question on life satisfaction: “On the whole, are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the life you lead?” which can be answered on a scale from one (very satisfied) to four (not at all satisfied). For a more intuitive interpretation, we invert the scale such that higher values correspond to a higher life satisfaction, and we code the answer as an ordinal variable with integer values from one to four. It should be noted that the variable cannot be interpreted in a cardinal way, and there is no natural scaling of answers such as “very satisfied” and “satisfied”. The reason is that respondents can differ in their quantitative assessment of the four categories such that it is hard to compare responses across individuals. However, such concerns are reduced given that the sample size is large enough.

In contrast to many (objective) measures in economics, survey questions on *SWB* assign every individual the right to assess one’s own life in a subjective way (Diener 2000). Hence, these measures related to *SWB* reflect feelings rather than economic actions, which explains their frequent use by psychologists and social scientists. However, they can also contain useful information for economists. For example, they might shed light on questions related to welfare analysis or help predict future behaviour (Wolfers 2003). Despite concerns about the reliability of subjective responses, Di Tella et al. (2003) show that results from life satisfaction regressions are similar across countries, which validates the information consistency of the data. Furthermore, they find that higher levels of *SWB* correlate with lower suicide rates. Oswald (1997) shows that those people that are likely to report lower values for life satisfaction, e.g. men or unemployed people, show also higher suicide rates. More

validation tests confirming the information content of these data can be found in the psychology literature.

Following the related literature on *SWB*, we control for GDP growth, the inflation rate, and the unemployment rate (Di Tella et al. 2001, 2003).⁴ All variables at the macro level are included as quarterly averages, and summary statistics can be found in Table 1b). Many papers analyse the link between life satisfaction and economic development or growth. Thus, for comparison, Figure A1a) in the [supplementary appendix](#) shows a scatterplot for life satisfaction and GDP per capita. Consistent with earlier findings, there is a positive relationship, but it holds up only to a certain level of GDP per capita (Blanchflower and Oswald 2004, Kahnemann and Deaton 2010, Proto and Rustichini 2013).

The development of life satisfaction and GDP growth over time, averaged across all sample countries, can be seen in Figure A1b). Average GDP growth shows a large decrease during the crisis, which is accompanied by a decline in average life satisfaction. However, in general, no clear relationship can be detected. On the one hand, this might be due to the aggregation of data across countries and a large degree of heterogeneity. On the other hand, there might be other relevant factors that determine the pattern of individual respondents' life satisfaction. Thus, the following regression analysis controls for a broader set of micro- and macro-level variables.

Data on *SWB* are matched to the uncertainty measure. Although research on uncertainty has gained in interest in recent years, there is no unique and well-established measure for uncertainty (Bloom 2014). Commonly used measures that proxy uncertainty are, on the one hand, time-series measures such as stock market volatility or output growth volatility. A

⁴ In robustness tests, also GDP per capita is controlled for. See the appendix for more information on variable sources and definitions.

higher volatility reflects higher uncertainty because forecasting the future becomes more difficult. On the other hand, uncertainty is approximated by cross-sectional dispersion measures. Examples are forecaster disagreement, the dispersion across firm variables such as sales growth and firm-specific forecast errors or the cross-sectional dispersion of bank-level shocks (Bachmann et al. 2013, Bloom et al. 2012, Buch et al. 2015). The intuition behind these cross-sectional measures is that a higher dispersion reflects a higher range of outcome possibilities and thus less predictability and higher uncertainty.⁵

The main interest of this paper is in a timely indicator of uncertainty. Having in mind that output only reacts with a delay to the start of financial crises and following the arguments by Deaton (2012) that stock market developments are likely to reflect the state of the economy and incorporate fears about future outcomes, we approximate uncertainty in the economy by stock market volatility. Stock market volatility is frequently used in related studies, for example, Bloom (2014) shows that stock market volatility is counter-cyclical to the business cycle and increases during recessions.⁶

To control for expectations about future developments in contrast to second moment shocks as captured by uncertainty measures, economic and consumer sentiment indicators are added. A higher economic sentiment indicator captures more optimistic assessments of the economy and a certain degree of confidence in positive economic development. A higher consumer confidence reflects consumers' positive expectations about the future economic situation. To reduce simultaneity issues, stock market volatility as well as the sentiment indicators are lagged by one quarter, this means that survey data from May 2013 (November 2013) are

⁵ The European Commission (2013) provides a discussion of uncertainty measures such as stock market volatility and forecaster dispersion in the context of recent developments in the Euro area.

⁶ Stock market volatility has also the advantage of good data coverage. For example, Baker et al. (2016) compute a measure for policy uncertainty, though it is not available for all sample countries.

matched to values of the aforementioned explanatory variables corresponding to the first (third) quarter of 2013.⁷

3.2 Descriptive Statistics: Subjective Well-Being

Table A1 in the [supplementary appendix](#) shows summary statistics for the survey responses to the question on life satisfaction. The upper panel is based on the whole sample, and the lower panel focuses on the surveys conducted during the financial and sovereign debt crisis (2007 November-2012 November). For the full sample, it can be observed that unemployed respondents show, on average, the lowest value for life satisfaction. In contrast, students report, on average, the highest values for the question on life satisfaction. During the crisis period, average life satisfaction decreases, whereas the decrease is highest for the unemployed. Students' life satisfaction stays at elevated levels during the crisis. This pattern might suggest that worries about finding a job are not yet reflected in their answer.

Correlations among life satisfaction and the explanatory variables are shown in Table A2 in the [supplementary appendix](#). Table A2a) correlates individuals' answers on life satisfaction with the corresponding respondent characteristics. As to be expected, employed individuals seem to have a higher life satisfaction. The other correlations are rather weak, which might be due to the ordinal scaling of the dependent variable. Table A2b) shows correlations for life satisfaction, averaged per country and survey, and the macro variables. Life satisfaction correlates positively with GDP growth and negatively with the unemployment rate. Regarding stock market volatility, the correlation coefficient points in a reasonable direction. Higher uncertainty reflected by a higher stock market volatility shows a negative correlation with life

⁷ The fact that the survey is conducted twice a year implies that recent economic developments can be closely related to the survey date at which the life satisfaction has been asked. Given that it is plausible to assume that recent developments obtain stronger weights in answering the question on life satisfaction, relevant relationships among the variables of interest are captured by this approach.

satisfaction. As to be expected, a higher economic or consumer sentiment correlates positively with life satisfaction.

3.3 Graphical Analysis: Heterogeneity across Countries and Time

How does uncertainty drive life satisfaction? Are there differences across countries and time periods? To shed light on these questions, Figure 1 shows the average development of life satisfaction and the uncertainty measure. In line with the correlations (Table A2), periods of higher stock market volatility seem to be related to lower life satisfaction.

[Insert Figure 1 here]

Heterogeneity across countries becomes visible in Figure A2 in the [supplementary appendix](#). Figure A2a) provides a scatterplot of life satisfaction against stock market volatility for different country groups. The relationship between uncertainty measured by stock market volatility and life satisfaction seems to be stronger for GIIPS countries of the EU than for “core” European countries.⁸ For the latter, Figure A2a) reveals that life satisfaction seems to be higher and much less disperse. This heterogeneity across countries is confirmed in Figure A2b), which shows the development of stock market volatility and life satisfaction over time for selected countries. Stock market volatility fluctuates more in all countries during the financial and sovereign debt crises. However, increases in stock market volatility are accompanied by larger declines in life satisfaction in Greece and Spain compared to Germany and France. This finding suggests that countries react differently to higher degrees of uncertainty, which might be due to different underlying fundamentals or a varying composition of the population.

⁸ The core European countries include all European countries in the sample excluding the GIIPS countries, Eastern European countries, and outlier countries like Finland, Luxembourg, and Malta: Austria, Belgium, Denmark, France, Germany, Netherlands, Sweden, and the United Kingdom.

Finally, Figure A3 focuses on the relationship between life satisfaction and stock market volatility, comparing a non-crisis period with a crisis period. The scatterplots provide evidence that during crisis periods (right panel), the effect of higher uncertainty measured by higher stock market volatility becomes stronger. The empirical model in the following section will analyse this finding more carefully.

4 Empirical Model: Subjective Well-Being and Uncertainty

In this paper, we are interested in whether *SWB* is driven by more than income and unemployment. For example, during crisis periods, economic conditions worsen, and future prospects become less bright and more uncertain. These conditions might affect how people assess their *SWB*. Hence, we ask the following research questions: First, is *SWB* affected by the degree of uncertainty in the economy? Second, is this relationship strengthened during periods of financial crises?

4.1 The Benchmark Model

To evaluate the costs of an uncertain economic environment, we analyse the effect of stock market volatility on individuals' reported life satisfaction. Due to the ordinal nature of the variable of interest, we choose an ordered probit model. The regression equation looks as follows:⁹

$$Life\ satisfaction_{ijt} = \alpha_j + \delta_t + \gamma_1 Personal_{ijt} + \gamma_2 Macro_{jt} + \gamma_3 Unc_{jt-1} + \varepsilon_{ijt} \quad (1)$$

where $Life\ satisfaction_{ijt}$ is the response of individual i in country j at time t to the question on life satisfaction, which has four distinct categories, i.e., $Life\ satisfaction_{ijt} \in$

⁹ This corresponds to the latent model of the estimated ordered probit regressions.

{1,2,3,4}. One indicates “not at all satisfied”, and four corresponds to the answer “very satisfied”.

Country- and time-fixed effects are given by α_j and δ_t . Country-fixed effects reduce omitted variable bias by controlling for heterogeneity in countries’ culture, location, or constant institutional setting. E.g., Frey and Stutzer (2000) show that institutional factors like direct democracy affect well-being. Time-fixed effects capture time trends that affect all individuals simultaneously. The vector $Personal_{ijt}$ controls for individual characteristics such as gender, age, marital status, and employment status. Individual-fixed effects cannot be included because individuals are not tracked over time in the survey. Similar to Di Tella et al. (2003), we control for the macroeconomic environment $Macro_{jt}$ by including GDP growth, the inflation rate, and the unemployment rate. The coefficient of interest is γ_3 , which reflects the effect of aggregate uncertainty Unc_{jt-1} on individuals’ life satisfaction. Standard errors are clustered by each country-survey combination.

An important issue in this estimation strategy is reverse causality. One might, for example, suppose that individuals who are more satisfied with their life are more motivated and productive. This might result in a positive macroeconomic outlook and give less scope for a pessimistic and uncertain economic environment. However, it should be noted that the dependent variable is measured at the individual level, whereas uncertainty is measured at the country level. The difference in aggregation levels should reduce concerns about reverse causality because it seems hard to imagine that single individuals affect macroeconomic outcomes. In addition, the measure for uncertainty is included with a lag, which reduces simultaneity issues. Finally, the inclusion of time- and country-fixed effects helps absorb omitted factors that affect both life satisfaction and uncertainty.

Table 2a) presents the regression results of the ordered probit model estimated for 20 European countries and the period 2000-13. Column (1) shows the model without the proxy for uncertainty, that is stock market volatility. Regarding the micro variables, and as in related work, we find that married people are more likely to report a higher life satisfaction; the same holds for female survey participants (Oswald 1997). The effect of age is negative but reverses with increasing age.¹⁰ Employment has a positive effect on life satisfaction. Regarding the macro variables, GDP growth has, as expected, a positive sign but remains insignificant. A higher inflation rate tends to increase life satisfaction, which could indicate that in boom times, prices usually rise when living standards increase. In line with the micro data, a higher level of aggregated unemployment reduces life satisfaction.

[Insert Table 2 here]

To interpret the quantitative effect of the estimates, marginal effects are shown in Table A3 of the [supplementary appendix](#). Table A3 shows the average marginal effects for the benchmark model (column (1) of Table 2), i.e., the marginal effect of an explanatory variable on the probability of having a higher or lower life satisfaction record while keeping the other variables at their actual values. To give an example: It becomes obvious that the probability of reporting “very satisfied” increases significantly for married respondents (0.092). However, the probability that married respondents are “not at all satisfied” decreases significantly compared to unmarried individuals (-0.022).

In column (2) of Table 2, the model is augmented with stock market volatility to approximate the degree of uncertainty in the economy. Higher uncertainty reflected by a higher stock market volatility has a negative and significant effect on life satisfaction. This is in line with

¹⁰ The U-shaped relationship between age and life satisfaction is, for example, analyzed by Schwandt (2016) and Van Landeghem (2012).

findings by Ratcliffe and Taylor (2015) who conduct a study based on British household survey data focusing on the effects of stock market activity on mental health. The marginal effect of stock market volatility by outcome category of the life satisfaction variable are depicted in Table 2b). As to be expected, also in quantitative terms, higher stock market volatility significantly increases the probability to be “not at all satisfied” and strongly decreases the probability to be “very satisfied”. To verify that stock market volatility indeed captures uncertainty (second moments) and not expectations (first moments), in columns (3) and (4) of Table 2a), sentiment indicators are additionally controlled for. Higher aggregate sentiment indicators go hand in hand with higher life satisfaction reported at the micro level. Nevertheless, the coefficient of stock market volatility remains significantly negative.

4.2 How Does Uncertainty Transmit?

The previous results have shown that uncertainty has a negative effect on life satisfaction. However, is this effect homogeneous across survey respondents living in Europe? To test whether uncertainty affects individuals differently, we interact the uncertainty measure with individual and country characteristics. The benchmark model is based on the model that includes the standard set of micro variables and macro variables (Table 2a), column (2)).

Individual characteristics that are interacted with the uncertainty measure comprise the respondents’ age, employment status, financial situation, and education status.¹¹ This setup accounts for the fact that individuals might be differently affected by uncertainty. For example, individuals with a better financial situation might care less about uncertainty because they have a financial buffer. Additionally, the prevalence of a safety net at the country level can mitigate negative effects of increased uncertainty. For example, uncertainty

¹¹ For ease of interpretation, the variable for a respondent’s financial situation and education status are defined as a binary variable. For the exact definition of the variables, see the appendix.

might be perceived as less threatening if there is access to social security benefits. To control for determinants at the macro level, we interact stock market volatility with a dummy that indicates whether the respondents' country is one of the GIIPS countries, a country's welfare expenditures in Euros per inhabitant, the gross replacement rate, the level of public debt in percentage of GDP, and private credit relative to GDP (in %).

The results are presented in Table 3 for the interactions with the micro-level variables and Table 4 for the macro-level interactions, and described below for each variable that is interacted with stock market volatility following the ordering in the tables. It is important to note that, due to the choice of an ordered probit model, a non-linear (interaction) model is estimated. Thus, unlike it is the case in ordinary least squares regressions, the information content of the coefficients belonging to interaction terms is limited. To interpret the effect of uncertainty conditional on one of the interacted variables, we compute the marginal effect of stock market volatility for the outcome category one ("not at all satisfied").¹² If stock market volatility is interacted with a dummy variable, we calculate the marginal effect of stock market volatility conditional on the dummy variable taking a value of zero or one. If stock market volatility is interacted with a continuous variable, the marginal effect of stock market volatility is conditional on the value at the first and third quartiles of the distribution of this continuous variable.

Micro-level variables (Table 3)

(1) **Age:** The coefficient of the interaction term of stock market volatility and age is negative and significant. This suggests that the effect of uncertainty is enforced with increasing age.

The marginal effects for uncertainty conditional on age being at the first versus third

¹² The focus is on the first outcome category only to reduce dimensionality and to ensure clearness. Marginal effects for the three remaining outcome categories can be obtained upon request.

quartile support this finding. The quantitative effect of uncertainty, and thus the probability of reporting a low value of life satisfaction with an increasing degree of uncertainty, is lower for younger people compared to older respondents (0.248 versus 0.705). Figure A4 (see [supplementary appendix](#)) plots the marginal effects of uncertainty conditional on different values of age for all four outcome categories of life satisfaction. The upper-left panel is in line with the result described above. With increasing age, higher uncertainty, increases the probability of being unsatisfied to a larger extent. The negative effect is particularly high for middle-aged people and again declining for people above sixty. The lower-right panel shows marginal effects for outcome category four, “very satisfied”. Now, the negative effect of uncertainty on life satisfaction decreases with a higher age, i.e., the probability of reporting a high level of life satisfaction decreases.

- (2) **Employed:** The marginal effect of stock market volatility on life satisfaction is given conditional on being unemployed as well as conditional on having a job. It can be seen that the quantitative effect regarding the probability to be unsatisfied with one’s life is higher for individuals who are unemployed compared to employed respondents (0.611 versus 0.399). This points into the direction that the negative effect of uncertainty on life satisfactions is weakened for employed compared to unemployed individuals. However, the marginal effect when conditioning on unemployment is not significant limiting the explanatory power of the result.
- (3) **Financial situation:** Furthermore, stock market volatility is interacted with the financial situation of a respondent, which is a dummy with a value of one if the financial situation is evaluated as “rather good” or “very good” and zero if the financial situation is judged as “rather bad” or “very bad”. Although a better financial situation improves life satisfaction significantly, stock market volatility, the interaction term, and the marginal effects are not significant. One reason may be that information on the financial situation is consistently

available only from November 2008 onward. Another reason can be that a key driver behind the effect of increased uncertainty on reduced life satisfaction relates to respondents' financial situation.

- (4) **Education:** Finally, respondents' education is interacted with stock market volatility. Better educated people might be more flexible to adjust to an environment of increased uncertainty. Additionally, a higher level of education can capture a higher income or financial resources. Education is defined as a dummy variable with a value of one if respondents finished education at an age older than 22 years and zero otherwise. This value should, for most respondents, reflect that they have been enrolled in a university and finished education at a higher age than respondents who started working directly after school. Education seems to have a positive effect on life satisfaction and lowers the effect of uncertainty following the positive sign of the interaction term. The marginal effect of uncertainty conditional on the education dummy being zero is positive and significant. This finding indicates that the likelihood of being unsatisfied increases with uncertainty, particularly for respondents who are unlikely to have a university degree.

[Insert Table 3 here]

Macro-level variables (Table 4)

- (1) **GIIPS country:** Stock market volatility is interacted with a dummy being one if the respondent lives in one of the GIIPS countries of the Euro area (Greece, Ireland, Italy, Portugal, and Spain) and zero otherwise. These countries were hit more seriously by the financial and sovereign debt crisis and are subject to speculations about their future in the Euro area. Their status generates uncertainty about future economic but also political and social development, which seems to be reflected in a negative and significant interaction

term of stock market volatility and the GIIPS dummy.¹³ The marginal effect of uncertainty conditional on living in a GIIPS country is significantly positive and considerably higher than conditional on living in non-GIIPS countries. This finding implies that uncertainty increases the probability of reporting “not at all satisfied”, particularly for respondents living in GIIPS countries.

(2) **Welfare expenditures:** In column (2), stock market volatility is interacted with welfare state expenditures in Euro per inhabitant. Looking at the marginal effects shows that stock market volatility exerts a negative and significant effect. However, no heterogeneities arise across different level of welfare expenditures. That is, the marginal effects of stock market volatility do not differ much conditional on lower and higher levels of welfare expenditures.

(3) **Gross replacement rate:** Similar results as for welfare expenditures are obtained for the gross replacement rate for the average worker. This finding suggests that rather individual characteristics affect the way uncertainty affects individuals’ life satisfaction. Macro-economic variables reflecting the state of the welfare system play a minor role and do not cause heterogeneous effects of uncertainty across countries.

(4) **Public debt:** When looking at the indebtedness of the government, the marginal effects of stock market volatility suggest that the effect of uncertainty is enforced for higher levels of public debt (in % of GDP). Hence, more unsustainable public finances seem to enforce the negative effect of increased uncertainty (0.191 versus 0.590). In addition, the marginal effect of stock market volatility is not significant for countries with lower levels of public debt suggesting that uncertainty plays a minor role in countries with more sustainable public finances.

¹³ Note that the GIIPS dummy cannot be included separately due to multicollinearity. More specifically, the time-invariant information of whether a country is a GIIPS country is captured by the country fixed effects.

(5) **Private credit:** The ratio of private credit (in % of GDP) reflects credit granted by banks to the non-financial, private sector. The marginal effects of stock market volatility are positive and significant; however, stock market volatility does not seem to affect life satisfaction in a different way conditional on different levels of the private credit ratio because the values of the marginal effects do not differ much (0.716 versus 0.698).

[Insert Table 4 here]

4.3 Robustness Tests – Income Control

Previous results have shown a negative effect of uncertainty on life satisfaction. One shortcoming of the Eurobarometer Surveys is that no income variable is included across all survey periods. Because income can be a key driver of life satisfaction, we conduct a set of robustness tests. To do so, we focus on the benchmark regression including micro and macro variables and stock market volatility to capture uncertainty (Table A4, column (1)).

Although the survey contains no question on income, it does include alternative questions that are likely to capture the financial situation of a respondent. As indicated in Table 3, the inclusion of the variable that indicates whether a respondent has a solid financial situation renders the uncertainty measure insignificant (Table A4, column (2)). The shortcoming of this variable is that it is available only from November 2008 onward, and it might capture the fact that respondents with a good financial situation during the crisis period had buffers to survive the crisis relatively well. Thus, the fact that stock market volatility is insignificant during this sample period might suggest that the effect of uncertainty is channelled through financial conditions.

Including a variable that captures whether a person has a low-, medium-, or high-skilled occupation in column (3) does not change the sign or significance of the uncertainty measure.

The variable itself has a positive and significant coefficient, indicating that individuals with a high-skilled job are more likely to report a higher life satisfaction. This might be because jobs requiring better skilled people usually offer higher payment and better working conditions, and tend to be permanent positions, factors that leave the respondent in a better and more secure situation. Furthermore, we include GDP per capita to control for the level of income in the respondent's country (column (4)). The inclusion of this variable does not change the results. Additionally, we exclude groups that are likely to have a special income situation, such as students or retired respondents.¹⁴ This exclusion reduces the sample size, but again, the results remain robust (column (5)).

4.4 The Effect of Financial Crises

To answer the second research question, we extend equation (1) by introducing an interaction term of the uncertainty measure with a financial crisis indicator:

$$\begin{aligned}
& \text{Life satisfaction}_{ijt} \\
&= \alpha_j + \delta_t + \gamma_1 \text{Personal}_{ijt} + \gamma_2 \text{Macro}_{jt} + \gamma_3 \text{Crisis}_{jt}(0/1) + \gamma_4 \text{Unc}_{jt-1} \\
&+ \gamma_5 \text{Unc}_{jt-1} * \text{Crisis}_{jt}(0/1) + \varepsilon_{ijt}
\end{aligned} \tag{2}$$

where $\text{Unc}_{jt-1} * \text{Crisis}_{jt}(0/1)$ reflects the additional effect of uncertainty conditional on experiencing a financial crisis. The occurrence of a financial crisis is captured by the dummy variable $\text{Crisis}_{jt}(0/1)$, which is equal to one if a country experienced a crisis according to the database by Laeven and Valencia (2012) and zero otherwise.

The results are presented in Table 5 (column (1)) and stay robust for the control variables. The crisis dummy has a positive coefficient but remains insignificant. To evaluate the effect

¹⁴ E.g., Nikolova and Sanfey (2015) show that responses to life satisfaction questions can differ across income groups and education status.

of the uncertainty measure, i.e. stock market volatility, the marginal effects for the outcome category “not at all satisfied” conditional on experiencing a crisis or not are shown at the end of the table.¹⁵ Comparing the size of the marginal effects of stock market volatility conditional on the crisis dummy being zero and conditional on the crisis dummy being one, it can be seen that the probability to be “not at all satisfied” significantly increases for higher levels of stock market volatility. Yet, the quantitative effect is much stronger conditional on the country experiencing a crisis (0.373 versus 0.688).¹⁶

[Insert Table 5 here]

One key issue is how to define a crisis. Thus, to verify our results, we use alternative crisis definitions. In column (2), the crisis dummy does not vary across countries but is set to one for the period from Q4/2007 to Q4/2009, covering the financial crisis, and zero otherwise. Note that in this case the crisis dummy is the same for all countries and absorbed by time fixed effects. In column (3), we consider the period of the financial and sovereign debt crisis from Q4/2007 to Q4/2012. The crisis dummy is set to one for the respective quarter if a country experienced negative GDP growth and zero otherwise. The results remain robust; however, the quantitative effect of uncertainty varies. For example, in column (2), the probability to report “not at all satisfied” is even higher than in the benchmark model for increasing values of uncertainty conditional on being in a crisis period.

¹⁵ Note that with respect to the latent model of the ordered probit regressions, the marginal effect of stock market volatility is now composed of γ_4 and $\gamma_5 * Crisis_{jt}(0/1)$. Due to the non-linear model, the marginal effect by outcome category of the dependent variable has to be calculated to draw inference about the significance of the uncertainty measure conditional on being in a non-crisis or crisis period, i.e. no conclusions can be drawn by only looking at the coefficient of the interaction term.

¹⁶ Marginal effects for the remaining outcome categories can be found in the [supplementary appendix](#).

5 Conclusions

The results of our analysis show that life satisfaction is negatively affected by uncertainty approximated by stock market volatility. This finding suggests that uncertainty comes with psychological costs that go beyond economic losses due to declines in output. The effect is reinforced during financial crisis periods, which might be one reason why recovery from recessions following financial crises tends to be stagnated. The analysis is based on individual responses of Europeans from 20 countries over the period 2000-13 to Eurobarometer survey questions on life satisfaction. Most of the existing literature in economics has focused on the effect of unemployment and income on life satisfaction. This paper is, in contrast, interested in the effect of uncertainty. While uncertainty is found to have negative effects on the macroeconomy, less evidence exists on the micro foundations.

This paper documents a negative effect of uncertainty on life satisfaction. This holds the more so for older individuals and respondents with a lower level of education. Heterogeneities also arise between respondents living in different countries. Respondents from one of the GIIPS countries of the Euro area are more likely to report a lower value of life satisfaction if uncertainty increases compared with those from the remaining European countries. This might reflect the fact that these countries have been hit substantially by the recent crisis. Macro-level variables capturing a country's social security system play a minor role. Importantly, higher uncertainty in combination with a financial crisis worsens the situation, whereas the results remain robust for different crisis definitions. This finding indicates that the probability to report a low level of life satisfaction in an increasingly uncertain environment is higher conditional on a crisis period than on a non-crisis period.

The results of the paper offer relevant implications. First, individuals react to increased levels of uncertainty by adjusting their subjective life evaluation. This adjustment might generate

more pessimistic attitudes toward the future. Analysing spillovers to economic decisions such as consumption seem to be an interesting avenue for future research. Second, the evaluation of losses of financial crises is most often limited to the analysis of economic costs. Accounting for declines in life satisfaction, as documented in this paper, would most likely raise these costs. Third, policy measures that target macroeconomic fluctuations and reduce the probability of crises have positive implications for life satisfaction.

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Data Appendix

The empirical results in this paper are based on various data sources. We use data from the Eurobarometer Surveys to obtain a measure for subjective well-being. Stock market volatility to capture uncertainty associated to financial markets is obtained from Bloom (2014). Data on financial crises come from Laeven and Valencia (2012). Macroeconomic variables are taken from Eurostat, the OECD, and the Bank for International Settlements.

List of countries

Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Spain, Sweden, United Kingdom

Country groups

GIIPS: Greece, Ireland, Italy, Portugal, Spain

Core: Austria, Belgium, Denmark, France, Germany, Netherlands, Sweden, the United Kingdom

Eastern Europe: Czech Republic, Hungary, Poland, Romania

Other: Finland, Luxembourg, Malta

Dependent variables

Subjective well-being: For data on subjective well-being, we resort to the Eurobarometer surveys. Data are available for the years 2000-13 and 20 countries. Surveys are conducted twice a year but only once a year for the years 2003 and 2004. To assess respondents' life satisfaction the following question is asked: "On the whole, are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the life you lead?" Answers are ranked on a scale from one to four: very satisfied, fairly satisfied, not very satisfied, not at all satisfied (very satisfied = 1, not at all satisfied = 4). To make the interpretation more intuitive, the scale is inverted. Respondents who do not provide answers or answered "don't know" are dropped from the analysis.

Life satisfaction (country-level): To obtain country-level data for life satisfaction, we take simple averages by survey and country across respondents' answers to the life satisfaction question.

Life satisfaction (individual-level): The ordered probit regressions are based on the answers of the respondents: very satisfied=4, fairly satisfied=3, not very satisfied=2, not at all satisfied=1.

Uncertainty and financial crises

Stock market volatility: Stock market volatility comes from Bloom (2014) and is measured as the average of the quarterly standard deviation of stock daily returns over the last four quarters.

Financial crises: First, data on financial crises are taken from Laeven and Valencia (2012). The database provides information on time and depth of financial crises across the world. We construct a crisis dummy which equals one if a country experienced a financial crisis, and zero otherwise. The database stops in 2012 and we set the dummy in 2013 to zero. Second, we create a dummy which equals one for the surveys Q4/2007-Q4/2009 covering the financial crisis, and zero otherwise. Third, we consider the period of the financial and sovereign debt crisis Q4/2007-Q4/2012, and the crisis dummy is set to one for the respective quarter if a country experienced negative GDP growth, and zero otherwise.

Macroeconomic control variables

GDP growth: Quarterly GDP growth at market prices (Eurostat).

GDP per capita: Quarterly data on GDP per capita at market prices (Eurostat).

Inflation: Monthly data for annual percentage change in inflation rate (Eurostat).

Unemployment: Quarterly data on the number of people employed as percentage of the labor force (Eurostat).

Economic sentiment: To capture economic sentiment, we use data from Eurostat. The index for economic sentiment is a composite indicator covering five sectoral confidence indicators: Industrial confidence indicator, services confidence indicator, consumer confidence indicator, construction confidence indicator and retail trade confidence indicator. Quarterly values are obtained by taking the average of the three respective months.

Consumer sentiment: Monthly consumer confidence indicator measured in arithmetic average of balances is obtained from Eurostat.

GIIPS: Dummy which equals one if the respondent is living in Greece, Italy, Ireland, Portugal, or Spain, and zero otherwise.

Welfare expenditures: Annual data on welfare state expenditures in Euro per inhabitant (Eurostat).

Gross replacement rate: Annual data on gross replacement rate for average worker as a percentage of previous income (OECD).

Public debt: Quarterly data on public debt as percentage of GDP (Eurostat).

Private credit: Credit to private non-financial sector from domestic banks as a percentage of GDP (Bank for International Settlements, Datastream).

Microeconomic control variables from Eurobarometer surveys

Married: The marital status is indicated by the dummy variable married which is equal to one if the respondent is married, and zero otherwise.

Male: Gender is given by the dummy variable male which is equal to one if the respondent is male, and zero otherwise.

Age: The regression model controls for a respondent's age and age squared.

Employed: The employment status is given by the dummy variable employed which is equal to one if the respondent is employed, and zero otherwise.

Financial situation: Data on the situation of the financial household are available for the period 2008, November – 2013, November and coded as one if the financial situation was evaluated as very good or rather good, and zero if rather bad and very bad.

Education: Age when finishing education, available from the year 2002 onwards whereas the variable is transformed to equal one when the age of finishing education exceeds 22, and zero otherwise. Individuals still studying are excluded and the dummy contains a missing value.

Occupation: Respondents' occupation is defined as zero if the person is low skilled, one if skilled, and two if high skilled. Low skilled includes the categories: Responsible for ordinary shopping etc., Unskilled manual worker, etc., Farmer, Fisherman,; Skilled includes: Skilled manual worker, Employed position, service job, Employed position, at desk, Employed position, travelling, Owner of a shop, craftsman etc.; High skilled includes: Professional (lawyer, etc.), Supervisor, Employed professional (employed doctor, etc.), General management etc., Middle management etc., Business proprietors etc.

Table 1: Summary Statistics, Explanatory Variables

Table 1a) Micro variables

	Obs.	Mean	Std. dev.	Min	Max
Life satisfaction	523,529	3.01	0.76	1	4
Married	523,529	0.52	0.50	0	1
Male	523,529	0.46	0.50	0	1
Age	523,520	47.35	18.24	15	99
Employed	523,529	0.93	0.25	0	1
Financial situation	216,775	0.66	0.47	0	1
Education	388,989	0.17	0.37	0	1
Occupation	306,480	1.98	0.70	1	3

Table 1b) Macro variables

	Obs.	Mean	Std. dev.	Min	Max
GDP growth	442,574	0.37	0.93	-5.50	3.90
Inflation rate	523,529	2.45	1.55	-2.73	10.00
Unemployment rate	491,844	8.06	3.84	2.00	27.60
Stock market volatility	475,035	0.01	0.01	0.00	0.06
Economic sentiment	495,876	99.46	9.84	66.87	119.63
Consumer confidence	519,548	-11.84	18.73	-82.67	25.77
GIIPS	523,529	0.27	0.44	0.00	1.00
Welfare expenditures	523,529	7,139.18	3,531.13	364.98	18,862.11
Gross replacement rate	523,529	30.77	12.16	6.00	59.00
GDP per capita	492,909	6,843.92	2,892.07	1,500.00	21,000.00
Government debt	523,529	64.18	29.46	5.70	175.10
Private credit	488,619	373.72	139.59	90.57	828.99

Note: The table shows summary statistics for the explanatory variables. The sample comprises 20 European countries and the period 2000-13. The upper panel relates to the variables at the micro level and includes information on whether a respondent is *Married* (married = 1), *Male* (male = 1), the respondent's *Age*, and employment status *Employed* (employed = 1), the *Financial situation* (good = 1), the level of *Education* (high = 1), and the skill-level of *Occupation* (low skilled = 0, skilled = 1, and high skilled = 2). The lower panel relates to the variables at the macro level including *GDP growth*, the *Inflation rate*, the *Unemployment rate*, the quarterly *Stock market volatility*, data on *Economic sentiment*, computed as a composite indicator including Industrial, Services, Consumer, Construction, and Retail trade confidence indicators, and quarterly data on *Consumer sentiment*. Further controls include: a dummy variable being one for *GIIPS* countries, *Welfare expenditures*, *Gross replacement rate*, *GDP per capita*, *Government debt*, and *Private credit*. Data source: Eurobarometer, Eurostat and Bloom (2014).

Table 2: Ordered Probit Regressions, Subjective Well-Being and Uncertainty

Table 2a) Regression results

<i>Model:</i>	(1)	(2)	(3)	(4)
Married	0.322*** (0.006)	0.314*** (0.006)	0.314*** (0.006)	0.314*** (0.006)
Male	-0.009* (0.005)	-0.006 (0.005)	-0.006 (0.005)	-0.007 (0.005)
Age	-0.042*** (0.001)	-0.042*** (0.001)	-0.042*** (0.001)	-0.042*** (0.001)
Age ²	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Employed	0.639*** (0.013)	0.637*** (0.014)	0.636*** (0.014)	0.637*** (0.014)
GDP growth	0.019 (0.014)	0.017 (0.014)	0.007 (0.014)	0.003 (0.015)
Inflation rate	0.023** (0.009)	0.031*** (0.011)	0.032*** (0.010)	0.038*** (0.010)
Unemployment rate	-0.016*** (0.003)	-0.012*** (0.003)	-0.008** (0.003)	-0.008** (0.003)
Stock market volatility (t-1)		-6.063*** (1.975)	-5.597*** (1.911)	-5.411*** (1.974)
Economic sentiment (t-1)			0.006*** (0.002)	
Consumer sentiment (t-1)				0.005*** (0.001)
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	414,837	372,456	372,456	370,659
Pseudo R-squared	0.104	0.100	0.100	0.101

Table 2b) Marginal effects of stock market volatility

<i>Category:</i>	not at all satisfied	not very satisfied	fairly satisfied	very satisfied
Column 2: Stock market volatility	0.427*** (0.140)	0.956*** (0.311)	0.306*** (0.101)	-1.689*** (0.550)
Observations	372,456	372,456	372,456	372,456

Note: Table 2a) shows coefficient estimates of ordered probit regressions. Table 2b) shows average marginal effects of the *Stock market volatility* based on the estimated model in Column (2) of Table 2a). The dependent variable is derived from survey respondents' life satisfaction ranging from not at all satisfied = 1 to very satisfied = 4. The sample covers 20 countries over the period 2000-13. The measure of uncertainty is captured by *Stock market volatility*, lagged by a quarter. All regressions include country and time fixed effects. Standard errors clustered by country and survey are in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% level. For more information on the variables, see the appendix.

Table 3: Ordered Probit Regressions, Subjective Well-Being and Uncertainty - *Micro-Level Interaction Terms*

<i>Model:</i>	(1)	(2)	(3)	(4)
	<i>Micro variables interacted with stock market volatility</i>			
	Age	Employed	Financial sit.	Education
Married	0.314*** (0.006)	0.314*** (0.006)	0.232*** (0.007)	0.325*** (0.006)
Male	-0.006 (0.005)	-0.006 (0.005)	-0.048*** (0.009)	-0.015*** (0.006)
Age	-0.040*** (0.001)	-0.042*** (0.001)	-0.036*** (0.001)	-0.039*** (0.001)
Age ²	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Employed	0.637*** (0.014)	0.669*** (0.039)	0.395*** (0.013)	0.614*** (0.014)
GDP growth	0.017 (0.014)	0.017 (0.014)	0.006 (0.022)	0.012 (0.014)
Inflation rate	0.031*** (0.011)	0.031*** (0.011)	0.034** (0.016)	0.026** (0.011)
Unemployment rate	-0.012*** (0.003)	-0.012*** (0.003)	-0.018*** (0.006)	-0.016*** (0.003)
Stock market vol. (t-1)	-0.012 (2.931)	-3.898 (2.871)	0.193 (3.226)	-4.812** (2.435)
Variable (<i>see column head</i>)			1.012*** (0.041)	0.140*** (0.029)
Stock market vol. (t-1)	-0.128*** (0.050)	-2.336 (2.472)	2.980 (2.501)	8.375*** (2.068)
Marginal effect of stock market volatility for outcome category 1: "not at all satisfied"				
Dummy var.=0/Cont. var.=p25	0.248* (0.127)	0.611 (0.448)	-0.026 (0.439)	0.373** (0.189)
Dummy var.=1/Cont. var.=p75	0.705*** (0.200)	0.399*** (0.130)	-0.070 (0.046)	-0.180 (0.137)
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	372,456	372,456	151,361	291,290
Pseudo R-squared	0.100	0.100	0.182	0.109

Note: This table shows results from ordered probit regressions. The dependent variable is derived from survey respondents' life satisfaction ranging from not at all satisfied = 1 to very satisfied = 4. The sample covers 20 countries over the period 2000-13. The measure for uncertainty *Stock market volatility*, lagged by a quarter, is included separately and interacted with micro-level variables. Marginal effects for stock market volatility conditional on the interacted variable are shown for the outcome category one, "not at all satisfied". All regressions include country and time fixed effects. Standard errors clustered by country and survey are in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% level. For more information on the variables, see the appendix.

Table 4: Ordered Probit Regressions, Subjective Well-Being and Uncertainty - *Macro-Level Interaction Terms*

<i>Model:</i>	(1)	(2)	(3)	(4)	(5)
	<i>Macro variables interacted with stock market volatility</i>				
	GIIPS	Welfare exp	GRR	Public debt	Private credit
Married	0.315*** (0.006)	0.314*** (0.006)	0.314*** (0.006)	0.314*** (0.006)	0.317*** (0.006)
Male	-0.006 (0.005)	-0.006 (0.005)	-0.006 (0.005)	-0.006 (0.005)	-0.007 (0.005)
Age	-0.042*** (0.001)	-0.042*** (0.001)	-0.042*** (0.001)	-0.042*** (0.001)	-0.042*** (0.001)
Age ²	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Employed	0.636*** (0.014)	0.637*** (0.014)	0.637*** (0.014)	0.637*** (0.014)	0.638*** (0.014)
GDP growth	0.018 (0.014)	0.017 (0.014)	0.017 (0.014)	0.019 (0.014)	0.015 (0.014)
Inflation rate	0.029*** (0.010)	0.031*** (0.011)	0.031*** (0.011)	0.028*** (0.010)	0.032*** (0.011)
Unemployment rate	-0.010*** (0.003)	-0.012*** (0.003)	-0.012*** (0.003)	-0.012*** (0.003)	-0.009*** (0.003)
Stock market vol. (t-1)	-5.201*** (2.012)	-5.773 (3.654)	-6.192 (3.791)	4.187 (4.166)	-13.492*** (3.059)
Variable (<i>see column head</i>)		0.000 (0.000)	-0.004 (0.006)	0.002 (0.001)	-0.001*** (0.000)
Stock market vol. (t-1)	-8.771**	-0.000	0.006	-0.159***	0.011
* Variable (<i>see column head</i>)	(3.455)	(0.000)	(0.118)	(0.054)	(0.011)
Marginal effect of stock market volatility for outcome category 1: "not at all satisfied"					
Dummy var.=0/Cont. var.=p25	0.347** (0.137)	0.428*** (0.155)	0.424*** (0.143)	0.191 (0.175)	0.716*** (0.124)
Dummy var.=1/Cont. var.=p75	1.135*** (0.339)	0.434*** (0.167)	0.460** (0.190)	0.590*** (0.162)	0.698*** (0.209)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	372,456	372,456	372,456	372,456	358,467
Pseudo R-squared	0.100	0.100	0.100	0.100	0.103

Note: This table shows results from ordered probit regressions. The dependent variable is derived from survey respondents' life satisfaction ranging from not at all satisfied = 1 to very satisfied = 4. The sample covers 20 countries over the period 2000-13. The measure for uncertainty *Stock market volatility*, lagged by a quarter, is included separately and interacted with macro-level variables. Marginal effects for stock market volatility conditional on the interacted variable are shown for the outcome category one, "not at all satisfied". All regressions include country and time fixed effects. Standard errors clustered by country and survey are in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% level. For more information on the variables, see the appendix.

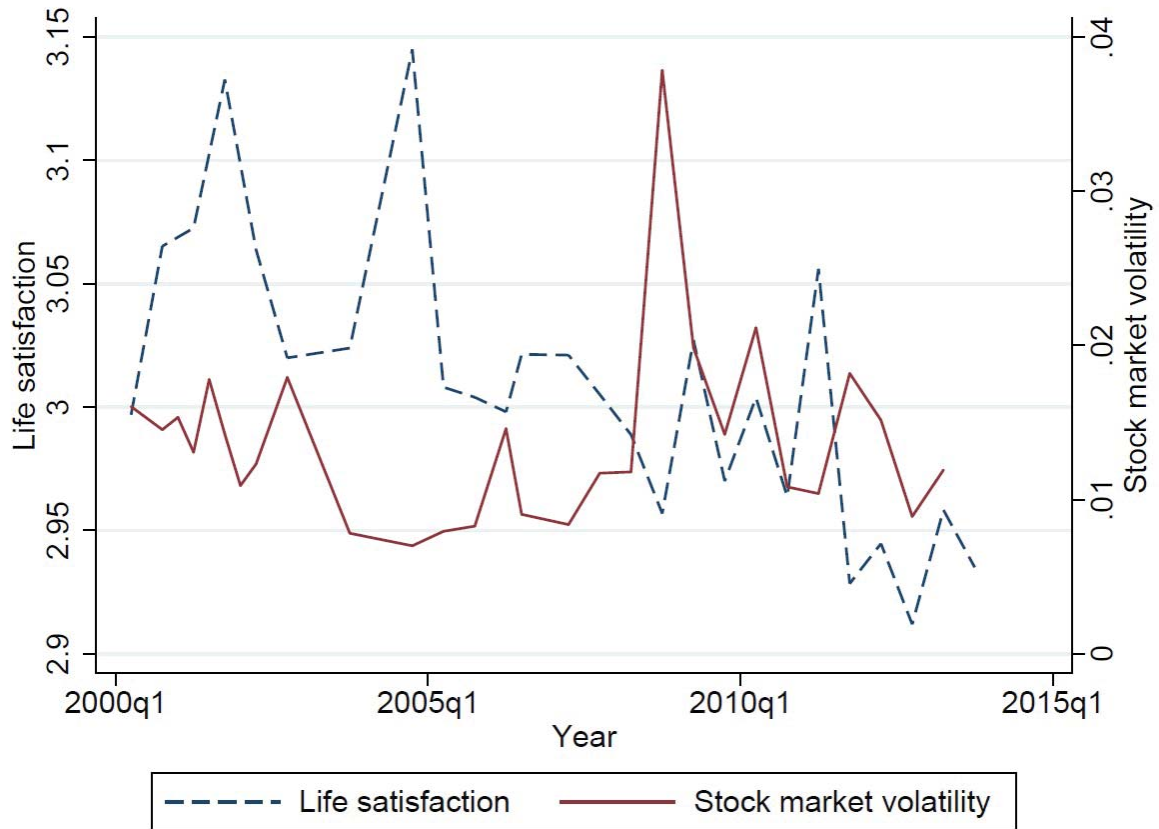
Table 5: Ordered Probit Regressions, The Effect of Financial Crises

<i>Model:</i>	(1)	(2)	(3)
	<i>Financial crisis definition</i>		
	Laeven & Valencia	2007-2009	$\Delta GDP < 0$
Married	0.314*** (0.006)	0.315*** (0.006)	0.315*** (0.006)
Male	-0.006 (0.005)	-0.006 (0.005)	-0.006 (0.005)
Age	-0.042*** (0.001)	-0.042*** (0.001)	-0.042*** (0.001)
Age ²	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Employed	0.636*** (0.014)	0.637*** (0.014)	0.636*** (0.014)
GDP growth	0.015 (0.014)	0.018 (0.014)	0.020 (0.013)
Inflation rate	0.030*** (0.011)	0.031*** (0.011)	0.031*** (0.011)
Unemployment rate	-0.012*** (0.003)	-0.013*** (0.003)	-0.013*** (0.003)
Crisis	0.077 (0.067)		0.086 (0.072)
Stock market volatility (t-1)	-5.314** (2.118)	-4.985** (2.223)	-5.167** (2.114)
Stock market volatility (t-1)*Crisis	-4.631 (3.363)	-7.496* (4.317)	-3.952 (4.524)
<u>Marginal effect of stock market volatility for outcome category 1: "not at all satisfied"</u>			
Dummy var.=0	0.373** (0.152)	0.335** (0.154)	0.366** (0.151)
Dummy var.=1	0.688*** (0.248)	0.990*** (0.355)	0.616* (0.316)
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	372,456	372,456	372,456
Pseudo R-squared	0.100	0.100	0.100

Note: This table shows results from ordered probit regressions. The dependent variable is derived from survey respondents' life satisfaction ranging from not at all satisfied = 1 to very satisfied = 4. The sample covers 20 countries over the period 2000-13. *Stock market volatility*, lagged by a quarter, is included as a measure of uncertainty and interacted with different types of crisis dummies. In column (1), the crisis dummy *Crisis* is equal to one if a crisis is reported for a country in the database of Laeven and Valencia (2012), and zero otherwise. In column (2), the crisis dummy equals one in the period Q4/2007-Q4/2009. In column (3), the crisis dummy equals one if a country's GDP growth has been negative in a respective quarter during the period Q4/2007-Q4/2012. All regressions include country and time fixed effects. Standard errors clustered by country and survey are in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% level. For more information on the variables, see the appendix.

Figure 1: Subjective Well-Being and Uncertainty

The figure shows the time series pattern for *Life satisfaction* (average across all respondents, left axis) and the measure for uncertainty, *Stock market volatility* (average across all countries, right axis). The sample comprises 20 European countries and the period 2000-13. Data source: Eurobarometer and Bloom (2014).



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