Exploring the Effects of Social and Economic Factors on Well-being

Author: Opeyemi Ayanwale

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1 Introduction

Subjective well-being (SWB) is defined as how people perceive and evaluate their lives, as well as specific domains and activities within them (Stone and Mackie, 2013). Research has shown that well-being has been widely studied in the social sciences and is influenced by a combination of economic, social, and health factors. GDP per capita is frequently used as an indicator of a country's economic performance, but it does not tell us if life in general is improving. The OECD well-being framework helps us in assessing the well-being of individuals, communities, and societies and provides valuable insights into their quality of life, relationships, material, and economic conditions (OECD, 2024b).

The OECD Better Life Index highlights key determinants of well-being, including income, housing, employment opportunities, health, education, community, safety, work-life balance, social connections, and life satisfaction (OECD, 2024c). Life satisfaction, a key indicator of well-being, can be used to assess how people perceive their lives as a whole rather than their current emotions. Germany, known for its strong financial stability, comprehensive healthcare system, and high levels of social security, consistently reports above-average life satisfaction scores. According to the OECD, Germany's life satisfaction rating of 7.3 surpasses the OECD average of 6.7, making it a compelling case for understanding the drivers of well-being (OECD, 2024d).

This study aims to examine the factors contributing to life satisfaction in Germany and compare these findings with international contexts, specifically the United States and China. These countries were selected due to their distinct social, healthcare, and economic structures (GDP ranking, PPP-based), with Germany ranking 6th, the USA ranking 2nd, and China ranking 1st, allowing for a comparative analysis of well-being drivers across different national systems. Using the data from the most recently completed wave, World Values Survey Wave 7 (2017-2022), and the time-series data of the World Value Survey (WVS), this study employs descriptive analysis and Bayesian modelling to examine individual and country-level influences on well-being. The survey data is freely available and includes responses from approximately 100 different countries for research purposes (Haerpfer et al., 2022). Supplementary sources, the World Bank GDP ranking data, were used to provide country-level GDP per capita data, providing a more comprehensive economic context for our study (World Bank, 2024).

The second section of this report provides a more detailed overview of the dataset and information on data quality. The statistical analysis methods are explained in the third

section, and in the fourth section, the interpretation of the results is presented. Finally, in the fifth section, the main findings are summarised.

2 Problem Statement

2.1 Dataset and Data Quality

This case study utilizes data from the World Values Survey (WVS) Wave 7 (2017–2022), a globally recognized dataset that captures individuals' values, beliefs, and well-being across multiple countries. Additional trend and time-series datasets of the World Value Survey (WVS) were also utilised. The dataset was provided by the instructors of the Case Studies course at TU Dortmund during the Winter Semester of 2024. The WVS survey encompasses a wide range of topics, including political attitudes, social values, economic values, personal well-being, etc. For this study, we focus on the Happiness and Well-being section (Q46–Q56) and the Demographic and Socioeconomic section, selecting key variables that directly relate to subjective well-being and economic security.

The selected variables for our case study include:

- State of health (subjective) (Q47): 5 = Very good, 4 = Good, 3 = Fair, 2 = Poor and 1 = Very poor.
- Satisfaction with life (Q49): 10 = Completely satisfied and 9-1 = Gradual scale down to 1 (Completely dissatisfied)
- Satisfaction with financial situation of household (Q50): 10 = Completely satisfied and 9-1 = Gradual scale down to 1 (Completely dissatisfied)
- Access to medicine and treatment (Q53): 1 = Often, 2 = Sometimes, 3 = Rarely and 4 = Never
- Income level (Q288R): 1 = Low, 2 = Medium and 3 = High

All selected variables in this study are measured on an ordinal scale and they are used as in their original scale. The dependent variable is satisfaction with life (SWL), while the independent variables include state of health (SOH), satisfaction with financial situation (SFS), income level (INL), and access to medicine and treatment (AMT). The WVS dataset is widely used in social science research and is collected using rigorous sampling

methodologies to ensure representativeness. However, as with any survey-based dataset, some considerations regarding data quality include: Some responses may be incomplete or missing, requiring appropriate handling techniques such as listwise deletion, which was done in our analysis by deleting responses with -1.- Don´t know, -2. No answer, -4. Not asked, -5.- Missing; Not available / Unknown. The dataset and documentation files are available for educational/research purposes on the WVS website (Haerpfer et al., 2022). To provide additional context for cross-national comparisons, GDP per capita from the World Bank was also incorporated (World Bank, 2024).

2.2 Project Objectives

The primary objective of this study is to explore the key determinants of subjective well-being in Germany and analyse their evolution over time. Specifically, this study aims to answer the following research questions:

1. What is the relationship between economic and social factors and well-being in Germany?
2. How do perceptions of well-being in Germany compare to other countries with varying economic and social structures? (Germany vs. USA vs. China)
3. How has well-being in Germany evolved over time, particularly in relation to its key determinants?

To address these research questions, we employ:

Bayesian Ordinal Regression Analysis using the cumulative model within an ordinal regression framework to examine well-being determinants and Bayesian Multilevel Modelling to account for individual- and country-level variations in well-being, enabling robust cross-country comparisons. The statistical method session will go over the detailed methods used to meet the objectives of this report in detail.

3 Statistical Methods

This section outlines the statistical methods used to analyse the dataset based on the objectives of this report. All analyses were performed in the R statistical programming environment (R Development Core Team, 2022) that allows modelling ordinal responses where we use the brms package (Bürkner, 2017).

3.1 Bayesian Ordinal Regression Analysis

Bayesian ordinal regression extends traditional ordinal regression by incorporating prior distributions to estimate parameters within a probabilistic framework. This approach is particularly useful for modelling ordinal outcomes, such as life satisfaction, where response categories have a natural order but unknown distances between them. To investigate the relationship between socioeconomic factors and well-being in Germany (Research Question 1), we employ a Bayesian ordinal regression framework using the cumulative probit model. The **cumulative probit model** assumes that the effect of each predictor is the same across all thresholds (Bürkner and Vuorre, 2019).

3.1.1 Model Structure

The **cumulative probit model** is defined as:

$$\Phi^{-1}(P(Y \leq k)) = \theta_k - \beta_1 X_1 - \beta_2 X_2 - ... - \beta_p X_p \tag{1}$$

where:

- Y represents the ordinal response variable (life satisfaction),
- $P(Y \leq k)$ is the cumulative probability of observing a response in category k,
- $\Phi^{-1}(\cdot)$ is the inverse cumulative distribution function (CDF) of the standard normal distribution (i.e., the **probit link function**),
- θ_k are threshold parameters for each category k,
- X_p are the independent variables: *State of Health*, *Satisfaction with Financial Situation*, *Income Level*, and *Access to Medicine and Treatment*,
- β_p are regression coefficients associated with each predictor.

3.1.2 Priors

Following the standard recommendations for the Bayesian framework, prior distributions are assigned to model parameters(Gelman et al., 2013). We specified weakly informative priors to regularise estimates while allowing flexibility:

$$\boldsymbol{\beta} \sim \mathcal{N}(0, 10) \qquad \theta_k \sim \mathcal{N}(0, 10) \tag{2}$$

3.2 Bayesian Multilevel Modeling

To address Research Question 2 (cross-country differences in well-being), we extend ordinal regression to a multilevel model, allowing for country-level variations (Gelman and Hill, 2006). The model introduces a hierarchical structure:

$$y_{ij}^* = \mathbf{x}_{ij}^T \boldsymbol{\beta} + u_j + \epsilon_{ij} \tag{3}$$

where:

- y_{ij}^* is the latent well-being score for individual i in country j,
- $\mathbf{x}_{ij}$ are individual-level predictors,
- $u_j \sim \mathcal{N}(0, \sigma_u^2)$ represents country-level random effects,
- $\epsilon_{ij} \sim \mathcal{N}(0, \sigma^2)$ is individual-level residual error.

A Bayesian approach allows for uncertainty quantification, yielding posterior distributions for both individual-level and country-level effects.

3.3 Bayesian Time-Trend Analysis

To examine the evolution of well-being in Germany over time (Research Question 3), we fit a Bayesian ordinal regression model where *year* is treated as a categorical predictor:

$$\Phi^{-1}(P(Y \leq k)) = \theta_k - \beta_{year}\text{Year} \tag{4}$$

Posterior estimates are used to visualize changes in life satisfaction across World Values Survey waves. For comparison, we also estimate a frequentist ordinal probit regression:

$$P(Y = k) = \Phi(\theta_k - X\beta) - \Phi(\theta_{k-1} - X\beta) \tag{5}$$

3.4 Model Diagnostics and Validation

To ensure robustness, we conduct thorough model diagnostics by assessing model convergence using R-hat values and trace plots. Model fit is evaluated using posterior predictive distributions. These diagnostics ensure that our Bayesian models provide reliable inferences for the research questions posed in this study.

4 Results

4.1 Socioeconomic Factors Influencing Well-Being in Germany

4.1.1 Descriptive Analysis

Figure 1(a) presents the heatmap illustrating the relationship between satisfaction with life (SWL) and income level. Most respondents in Germany fall into the medium-income category (2), with a general trend showing that as income increases, so does life satisfaction (see Figure 1(a)). The Spearman rank correlation between income level and life satisfaction is 0.253, indicating a weak but positive relationship (see Table 1). This suggests that individuals with above a moderate level of income tend to report slightly higher life satisfaction, aligning with previous findings that economic stability contributes to well-being (Diener and Seligman, 2004). Figure 1(b) illustrates the relationship between access to healthcare and life satisfaction. The results indicate that most respondents report high access to healthcare (*rarely* or *never* gone without access). Interestingly, those who frequently lack access to healthcare (*often* or *sometime*) exhibit similar life satisfaction levels, suggesting that other factors may moderate the effect of access to medicine and treatment on well-being (see Figure 1(b)). The Spearman correlation coefficient is 0.173, indicating a weak positive relationship (see Table 1). Figure 1(c) presents the distribution of respondents' self-reported state of health in relation to their life satisfaction. The results indicate a clear positive relationship: individuals with better health (*Good* or *Very Good*) report higher life satisfaction. Most respondents report a state of health of level 4 (*Good*) and a satisfaction with life level of 8 (see Figure 1(c)). The Spearman correlation between these two variables is 0.348, suggesting a weak to moderate positive association (see Table 1). Figure 1(d) highlights the relationship between satisfaction with financial situation and life satisfaction. A clear positive trend is observed, where individuals who report higher satisfaction with their financial situation also report higher life satisfaction (see Figure 1(d)). The Spearman correlation between these variables is 0.522, making it the strongest observed relationship in this analysis (see Table 1). From this analysis, financial security has a higher impact on life satisfaction than health/healthcare access, which is consistent with literature emphasising the role of financial stability in overall well-being (OECD, 2024a).

4.1.2 Bayesian Ordinal Regression Model Analysis

The Bayesian ordinal regression model examines the relationship between life satisfaction and key predictors: income level, access to health, state of health, and satisfaction with financial status. The prior distributions for the regression coefficient and intercept were specified as:

$$\boldsymbol{\beta} \sim \mathcal{N}(0, 2) \qquad \theta_k \sim \mathcal{N}(0, 1) \tag{6}$$

State of Health ($\beta = 0.29$, 95% CI: [0.23, 0.36]) has the strongest positive effect on life satisfaction. A higher self-reported state of health significantly increases satisfaction with life. The credible interval does not contain zero, indicating a robust positive effect. Similarly, satisfaction with financial status ($\beta = 0.26$, 95% CI: [0.23, 0.29]) is a strong and statistically significant predictor. Individuals who are more satisfied with their financial status are more likely to report higher life satisfaction. The narrow credible interval indicates high precision. Access to Health ($\beta = 0.07$, 95% CI: [-0.04, 0.17]) has a weak positive effect. The credible interval includes zero, suggesting limited evidence of impact. Income Level ($\beta = 0.06$, 95% CI: [-0.07, 0.18]) is the weakest predictor in the model. The credible interval spans zero, suggesting income alone does not strongly influence life satisfaction when controlling for other factors (see Table 3).

4.1.3 Model Diagnostics & Convergence

The posterior distributions for intercepts reveal increasing mean values, indicating that higher thresholds correspond to higher levels of life satisfaction. All intercepts exhibit good convergence with Rhat values equal to 1 and effective sample sizes in the thousands, indicating reliable estimates. The trace plots in Figure 3 demonstrate effective mixing across four chains for each intercept. There are no signs of systematic trends or divergence, confirming that the model parameters have converged appropriately.

4.1.4 Conditional Effects of Predictors on Life Satisfaction

Each plot on Figure 4 shows the predicted probability of different satisfaction levels as a function of a specific predictor. As state of health or financial satisfaction increases, the probability of higher life satisfaction levels increases, while lower satisfaction categories become less likely (see Figure 4(d) and Figure 4(c)). This reinforces the regression

results, where these predictors had the strongest effects. While the probabilities of different satisfaction categories for access to healthcare and income level remain relatively flat, meaning their influence on life satisfaction is less pronounced (see Figure 4(a) and Figure 4(b)). This aligns with the regression results, where their credible intervals included zero, suggesting weak evidence for an effect.

4.1.5 Cumulative Distributions of Posterior Estimates

The cumulative distribution plot shows how different predictors influence life satisfaction. State of Health shows the steepest curve, indicating a strong positive effect on life satisfaction. Satisfaction with financial status also demonstrates a strong positive association. Access to Healthcare and Income Level show flatter curves centered around zero, suggesting weaker associations with life satisfaction. This indicates that state of health and financial satisfaction are strong determinants of well-being in Germany, while access to healthcare and income level may have less impact according to this model (see Figure 5).

4.2 Cross-Country Comparison of Well-being

4.2.1 Descriptive Analysis

Figure 2(a) displays the heatmap of satisfaction with life across Germany, the USA, and China. Across all three countries, responses are concentrated around levels 7 and 8 of life satisfaction. Germany has a lower proportion of respondents reporting low life satisfaction compared to the USA and China. Despite some distributional differences, the three countries share the same median life satisfaction score of 8 (see Figure 2(a) and Table 2). Figure 2(b) presents the heatmap of the state of health across Germany, the USA, and China. Across all three countries, responses are concentrated around levels 4 and 5. Germany and the USA have a larger proportion of respondents reporting level 4 as their state of health. Despite variations in distribution, the median state of health score remains consistent at 4 across all three countries (see Figure 2(b) and Table 2). Figure 2(c) illustrates the distribution of satisfaction with financial situation by country. Higher satisfaction levels (7 to 8) are predominant across all three countries, suggesting a general trend toward moderate to high financial satisfaction. The median satisfaction with financial situation is highest in Germany (8), followed by China (7), and the USA

(6), indicating slight variation in perceptions of financial stability (see Figure 2(c) and Table 2).

4.2.2 Bayesian Multilevel Model Analysis

A Bayesian multilevel ordinal regression model was used to examine the relationship between life satisfaction and individual-level factors while accounting for country-level variation. The model predicts *satisfaction with life* using *state of health* and *satisfaction with financial status* as predictors, with a varying intercept by country. The prior distributions were specified as:

$$\beta \sim \mathcal{N}(0, 2), \quad \text{(Fixed effects)} \tag{7}$$

$$\alpha \sim \mathcal{N}(0, 2), \quad \text{(Intercept)} \tag{8}$$

$$\sigma_{\text{random}} \sim \mathcal{N}(0, 1), \quad \text{(Random effects)} \tag{9}$$

Table 4 presents the estimated regression coefficients. The results indicate that both *state of health* and *satisfaction with financial status* are significant predictors of life satisfaction. A one-unit increase in *state of health* is associated with a $\beta = 0.27$ increase in life satisfaction, with a 95% CI of [0.24, 0.30]. This suggests a strong positive effect, as the credible interval does not include zero. A one-unit increase in *satisfaction with financial status* results in a $\beta = 0.30$ increase in life satisfaction, with a 95% CI of [0.29, 0.31], indicating an even stronger effect than health. The random effects structure reveals that country-level variation is relatively small ($\sigma = 0.17$), suggesting that most variation is at the individual level rather than across countries (see Table 4).

4.2.3 Model Diagnostic & Convergence

The model demonstrated strong convergence properties, with all potential scale reduction factors ($\hat{R}$) equal to 1.00. Effective sample sizes (ESS) for key parameters exceeded 1000, indicating reliable posterior estimates. The trace plots in Figure 7 demonstrate effective mixing across four chains for each intercept. There are no signs of systematic trends or divergence, confirming that the model parameters have converged appropriately (see Figure 7).

4.2.4 Conditional Effects of Predictors on Life Satisfaction

Each plot on Figure 8 shows how various factors influence life satisfaction across different countries. As financial satisfaction increases, individuals are more likely to report being satisfied with their lives at levels 8 to 10, and individuals who perceive their health as good (levels 4 to 5) show significantly higher chances of reporting elevated life satisfaction compared to those with lower health ratings (see Figure 8(a) and Figure 8(b)). The conditional effects for countries demonstrate distinct patterns in life satisfaction among respondents from China, Germany, and the USA. All three countries exhibit low probabilities for lower levels of life satisfaction (1 and 2) while there are slight variations in reported probabilities for higher satisfaction levels (8 to 10), and no single country consistently demonstrates significantly higher probabilities across all high satisfaction levels (see Figure 8(c)).

4.3 Evolution of Well-being in Germany Over Time

4.3.1 Descriptive Analysis

Figure 6 shows the satisfaction with life over the years (1997, 2006, 2013, and 2018) in Germany. The most common satisfaction levels fall between 7 and 9, with level 8 consistently being the most reported across all years. Over time, the proportion of people reporting higher satisfaction levels (8, 9, and 10) appears to have increased in Germany, while lower satisfaction levels remain relatively less frequent (see Figure 6).

4.3.2 Bayesian Trend Analysis

The Bayesian ordinal regression model, which accounts for satisfaction levels over time, provides further insights into the trend. The prior distributions for the effect of year and intercept were specified as:

$$\boldsymbol{\beta} \sim \mathcal{N}(0, 5) \qquad \boldsymbol{\beta} \sim \mathcal{N}(0, 5) \tag{10}$$

The trend plot in Figure 9 shows the predicted probability of each satisfaction level across different WVS waves. Satisfaction levels 8, 9, and 10 have increased over time, while lower satisfaction levels (1–4) remain consistently low. The 2018 wave exhibits the highest predicted probability of reporting high satisfaction, reinforcing the pattern

observed in the descriptive analysis (see Figure 9). In Table 6 the year effects indicate how satisfaction has evolved. In the year 2006, the estimate (0.01, 95% CI: -0.05 to 0.07) suggests no significant change compared to the baseline (1997). In 2013, the estimate (0.27, 95% CI: 0.20 to 0.33) shows a small but meaningful increase in life satisfaction. In 2018, the estimate (0.45, 95% CI: 0.38 to 0.51) suggests a moderate increase in satisfaction over time. The credible intervals for 2013 and 2018 exclude zero, indicating strong evidence that life satisfaction increased in these years. However, the 2006 estimate has a CI spanning zero, suggesting no clear difference from the baseline.

4.3.3 Model Diagnostic & Convergence

The posterior distributions of the year effects are well-defined, showing a shift toward higher satisfaction in 2013 and 2018. The trace plots confirm proper mixing and convergence of the Markov Chain Monte Carlo (MCMC) samples, as indicated by the Rhat values ≈ 1 across all parameters (see Figures 10).

4.4 Comparison of Bayesian and Frequentist Approaches on Socioeconomic Factors Influencing Well-Being in Germany

The results from our frequentist approach show that the state of health coefficient is 0.2984 ($p < 0.001$), indicating a significant positive association with life satisfaction. Satisfaction with the financial status coefficient of 0.2647 ($p < 0.001$) is also significantly associated with higher life satisfaction. Income level coefficient of 0.0599 ($p = 0.359$) shows no significant effect (see Table 5). Both approaches identified state of health and financial satisfaction as strong predictors of life satisfaction, reinforcing the importance of these factors across different statistical frameworks. The Bayesian model offered insights into uncertainty through credible intervals, while the frequentist approach relied on p-values to determine significance. In the frequentist framework, P-values indicated that only state of health and financial status were statistically significant predictors at conventional alpha levels (e.g., $p < 0.05$). The Bayesian approach allowed for a direct interpretation of credible intervals around parameters; for example, if a credible interval does not include zero, it suggests a high degree of belief in the effect's existence based on prior information combined with observed data. The posterior means (Bayesian) align closely with MLE estimates (Frequentist). The consistency between both methods highlights robust relationships between well-being factors and life satisfaction.

5 Summary

The primary goal of this analysis is to examine the key drivers of subjective well-being in Germany, compare them to the United States and China, and track the evolution of well-being in Germany over time. According to the findings of the Bayesian ordinal regression model, the most influential factors affecting life satisfaction in Germany are state of health and financial status satisfaction. Income level and access to health have no significant effects, indicating that subjective financial satisfaction is more important than absolute income. The conditional effects plots also show that "state of health" and "financial satisfaction" significantly increase life satisfaction, while "income level" and "access to health" have weaker effects. The ECDF plot reinforces these findings, showing that the posterior distributions for "state of health" and "financial satisfaction" are more certain and shifted toward positive values. Cross-country comparisons show that Germany reports higher financial satisfaction, while life satisfaction and state of health remain similar across the three countries.

A hierarchical Bayesian model was fitted to account for regional variations in life satisfaction. Results show that individuals from all three countries reported high levels of life satisfaction, particularly at higher levels (8-10). While there were slight variations in probabilities among countries, no single country consistently outperformed others in terms of high life satisfaction probabilities. The third objective, which examines the evolution of well-being over time, revealed consistent trends in life satisfaction levels over the years. Both the descriptive and Bayesian analyses confirm a positive trend in life satisfaction in Germany over time, particularly from 2013 onward. This suggests that societal factors, policy changes, or broader well-being improvements may have contributed to this rise in subjective well-being among German citizens.

In our final analysis, we employed frequentist methods to examine the socioeconomic factors influencing life satisfaction in Germany and compared them to the Bayesian approach. The frequentist model identified state of health and financial satisfaction as significant predictors aligning with Bayesian results. However, income level and access to health remained statistically insignificant. By combining both methodologies in this analysis, we gain comprehensive insights into how various factors contribute to life satisfaction while recognising the strengths of each statistical approach. This dual perspective enhances our ability to inform policy or interventions aimed at improving well-being across populations.

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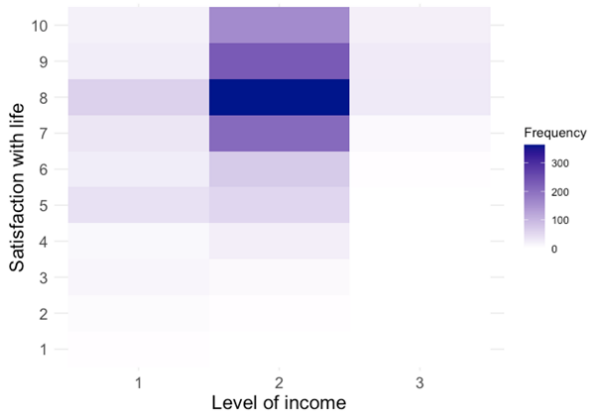
Appendix

Table 1: Spearman Rank Correlation

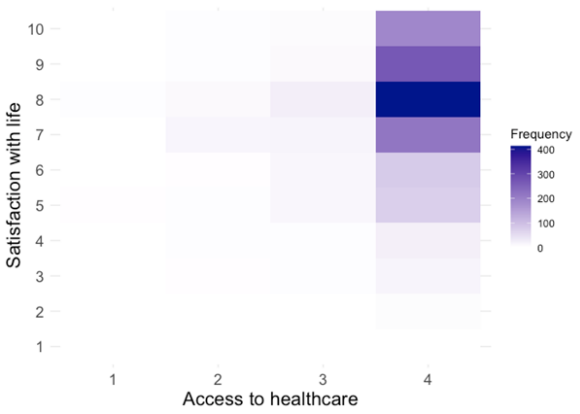
Variable	**Spearman Correlation**
Income Level	0.253
Access to Healthcare	0.173
State of Health	0.348
Satisfaction with Financial Situation	0.522

Table 2: Median Satisfaction Scores by Country

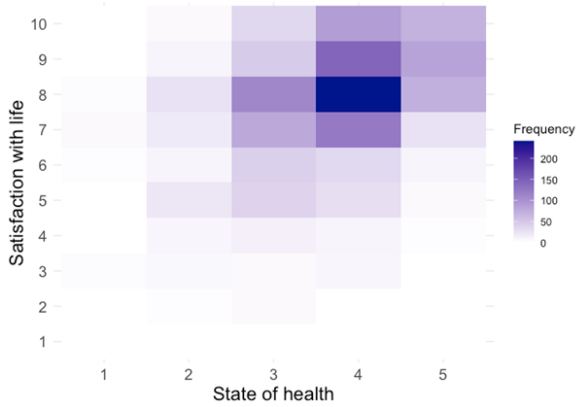
Variable	**China**	**Germany**	**USA**
Satisfaction with Life	8	8	8
State of Health	4	4	4
Satisfaction with Financial Status	7	8	6



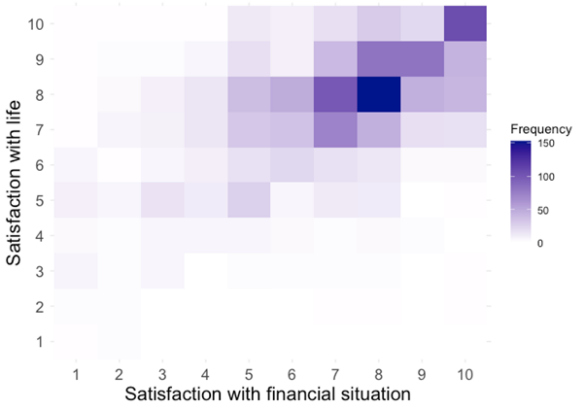
(a) Life Satisfaction vs. Income Level



(b) Life Satisfaction vs. Access to healthcare

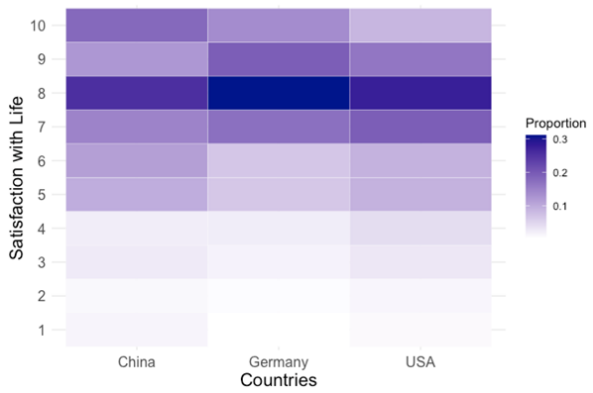


(c) Life Satisfaction vs. State of Health

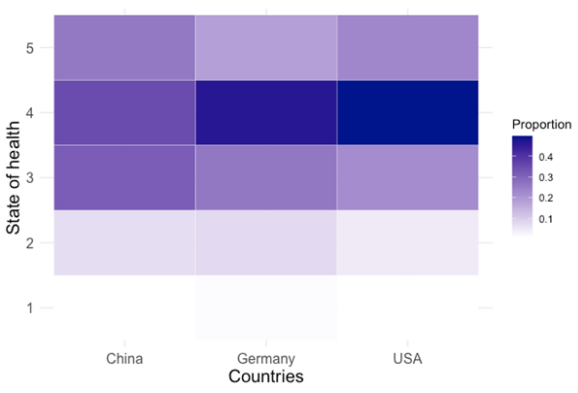


(d) Life Satisfaction vs. Satisfaction with Financial Situation

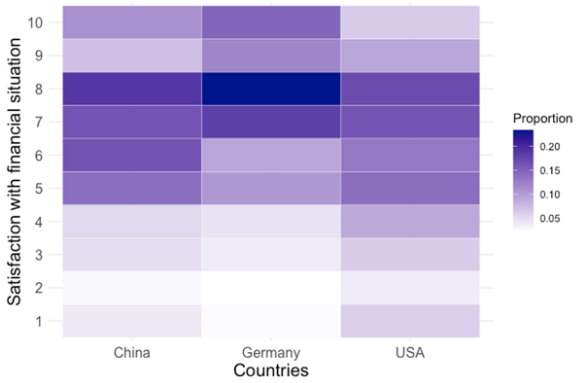
Figure 1: Descriptive Analysis Plots of Factors.



(a) Life Satisfaction by Countries



(b) State of Health by Countries



(c) Satisfaction with Financial Situation by Countries

Figure 2: Descriptive Analysis Plots for Cross-Country.

Table 3: Bayesian Ordinal Regression Results for Socioeconomic Well-being

Predictor	**Estimate**	**95% CI**	**ESS**
Intercept[1]	-0.25	[-0.84, 0.33]	4849
Intercept[2]	0.32	[-0.17, 0.83]	5962
Intercept[3]	0.87	[0.40, 1.33]	5717
Intercept[4]	1.25	[0.78, 1.72]	5827
Intercept[5]	1.84	[1.39, 2.30]	5742
Intercept[6]	2.23	[1.78, 2.70]	5761
Intercept[7]	2.90	[2.44, 3.37]	5714
Intercept[8]	3.88	[3.40, 4.35]	5700
Intercept[9]	4.65	[4.16, 5.14]	5811
Income Level	0.06	[-0.08, 0.19]	4177
Access to Health	0.07	[-0.04, 0.18]	5020
State of Health	0.29	[0.23, 0.36]	4897
Satisfaction with Financial Status	0.26	[0.23, 0.29]	4150

Table 4: Bayesian Multilevel Regression Results for Cross-Country Well-being

Predictor	**Estimate**	**95% CI**	**ESS**
Intercept[1]	-0.06	[-0.30, 0.43]	1312
Intercept[2]	0.32	[0.08, 0.81]	1275
Intercept[3]	0.80	[0.57, 1.30]	1258
Intercept[4]	1.15	[0.92, 1.65]	1265
Intercept[5]	1.77	[1.54, 2.27]	1274
Intercept[6]	2.22	[1.99, 2.72]	1286
Intercept[7]	2.84	[2.60, 3.33]	1280
Intercept[8]	3.75	[3.50, 4.24]	1283
Intercept[9]	4.40	[4.16, 4.89]	1298
State of Health	0.27	[0.24, 0.30]	4435
Satisfaction with Financial Status	0.30	[0.29, 0.31]	5061
Random Effect (Country)			
σ (Intercept)	0.17	[0.02, 0.87]	694

Table 5: Frequentist Estimates for Socioeconomic Factors on Well-Being

	Value	Std. Error	t value	p-value	l-95% CI	u-95% CI
income_level	0.06	0.07	0.92	0.36	-0.07	0.19
access_to_health	0.07	0.05	1.27	0.21	-0.04	0.17
state_of_health	0.30	0.03	9.09	0.00	0.23	0.36
financial_satisfaction	0.26	0.02	17.37	0.00	0.23	0.29
1|2	-0.35	0.31	-1.12	0.26		
2|3	0.28	0.25	1.12	0.26		
3|4	0.87	0.23	3.72	0.00		
4|5	1.26	0.23	5.46	0.00		
5|6	1.87	0.23	8.07	0.00		
6|7	2.27	0.23	9.72	0.00		
7|8	2.95	0.24	12.45	0.00		
8|9	3.93	0.24	16.23	0.00		
9|10	4.70	0.25	19.12	0.00		

Table 6: Bayesian Trend Analysis

	Estimate	Est.Error	l-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
Intercept[1]	-2.20	0.05	-2.30	-2.11	1.00	2300.10	2696.43
Intercept[2]	-1.92	0.04	-2.00	-1.85	1.00	3048.95	2985.30
Intercept[3]	-1.49	0.03	-1.55	-1.43	1.00	3179.58	3249.43
Intercept[4]	-1.18	0.03	-1.23	-1.12	1.00	3090.47	3118.69
Intercept[5]	-0.71	0.03	-0.76	-0.66	1.00	2761.48	2912.90
Intercept[6]	-0.40	0.02	-0.45	-0.36	1.00	2773.38	3197.94
Intercept[7]	0.07	0.02	0.03	0.12	1.00	2715.61	2944.68
Intercept[8]	0.87	0.03	0.82	0.92	1.00	2522.98	2774.40
Intercept[9]	1.49	0.03	1.43	1.54	1.00	2779.88	2957.46
year2006	0.01	0.03	-0.05	0.07	1.00	2837.35	3044.55
year2013	0.27	0.03	0.20	0.33	1.00	2665.28	2851.76
year2018	0.45	0.03	0.38	0.51	1.00	2997.42	2849.25

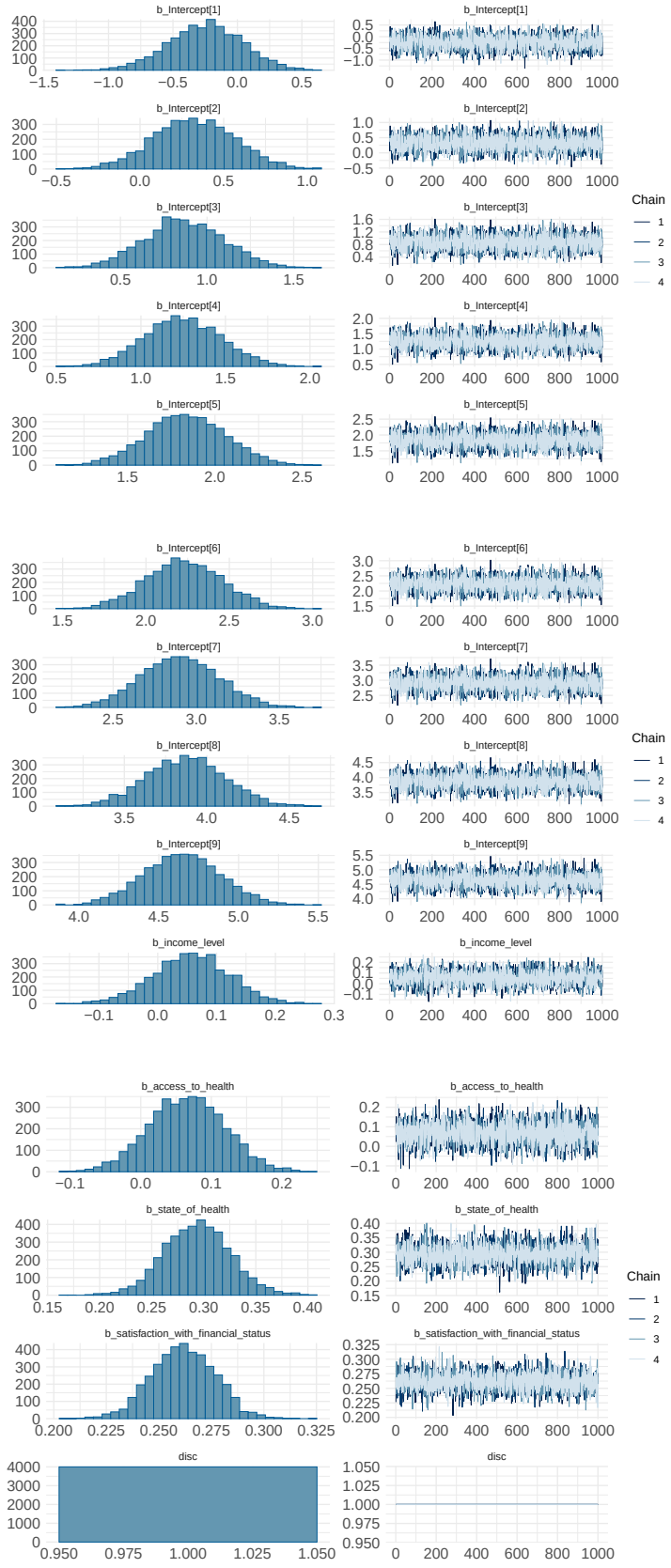
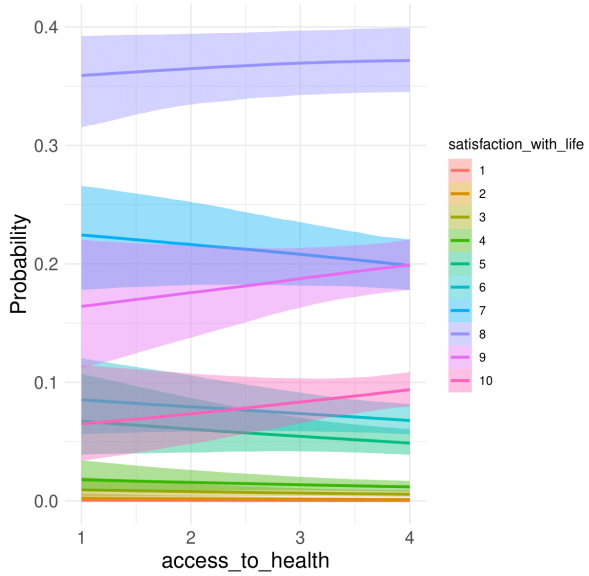
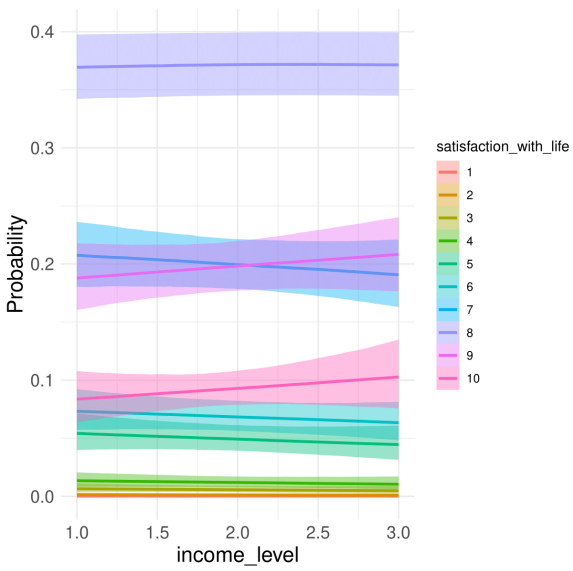


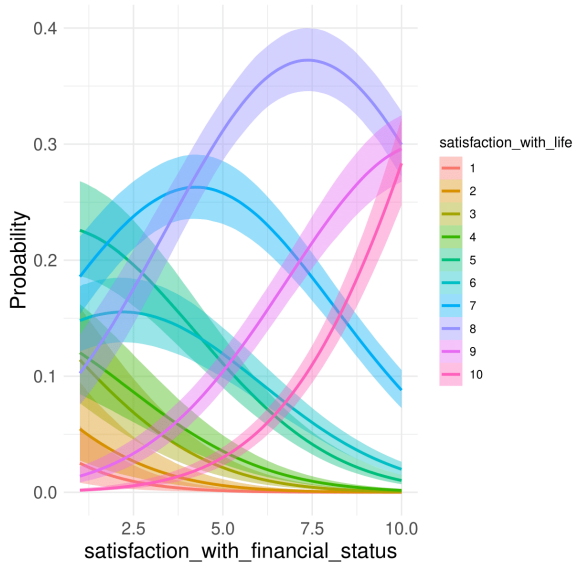
Figure 3: Posterior Distributions and Trace Plots.



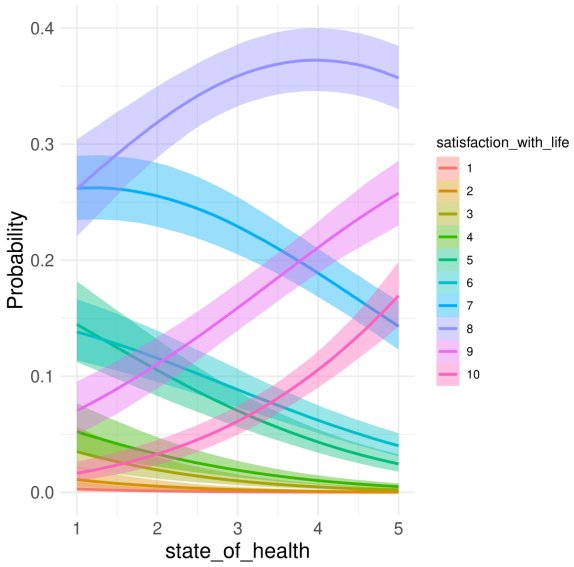
(a) Effect of Access to Health



(b) Effect of Income Level



(c) Effect of Financial Satisfication



(d) Effect of State of Health

Figure 4: Effects of each parameter on satisfaction with life.

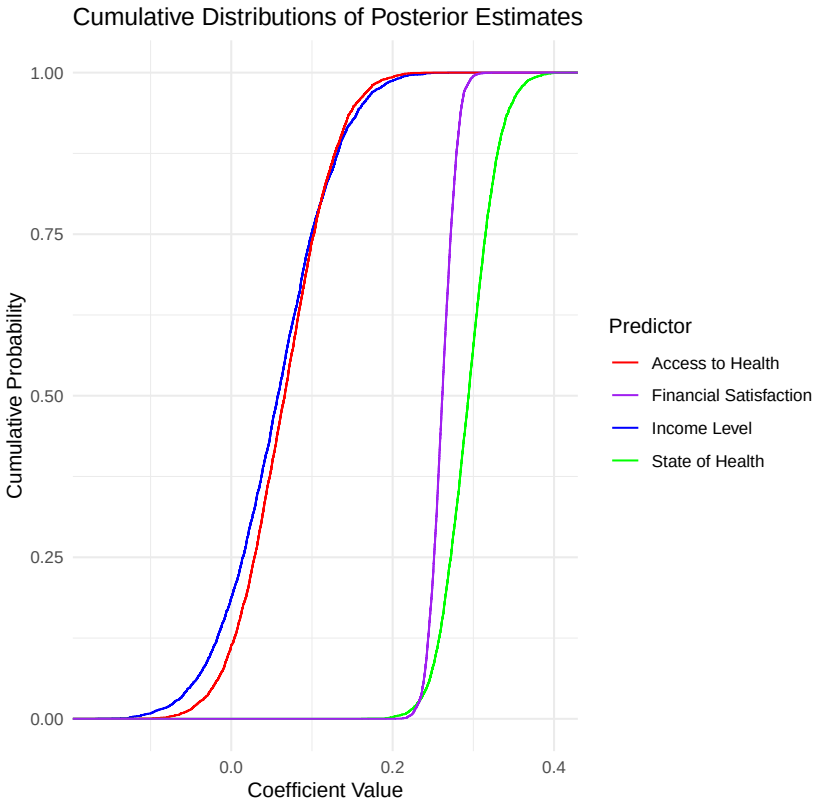


Figure 5: Cumulative Distribution Function (ECDF) Plot

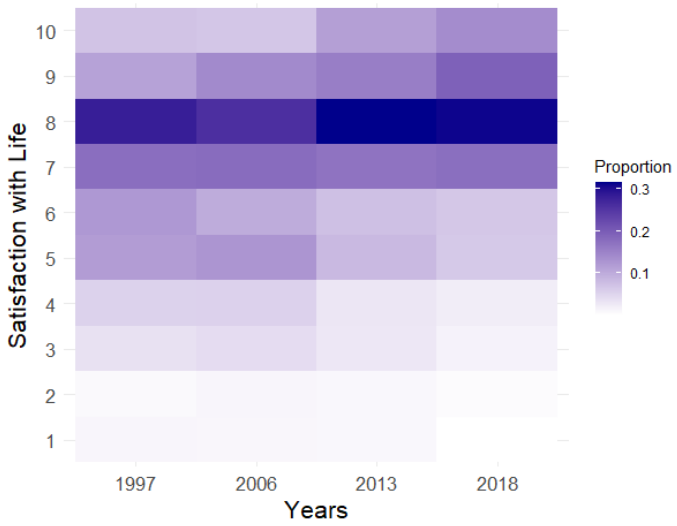


Figure 6: Satisfaction Levels Over Time in Germany

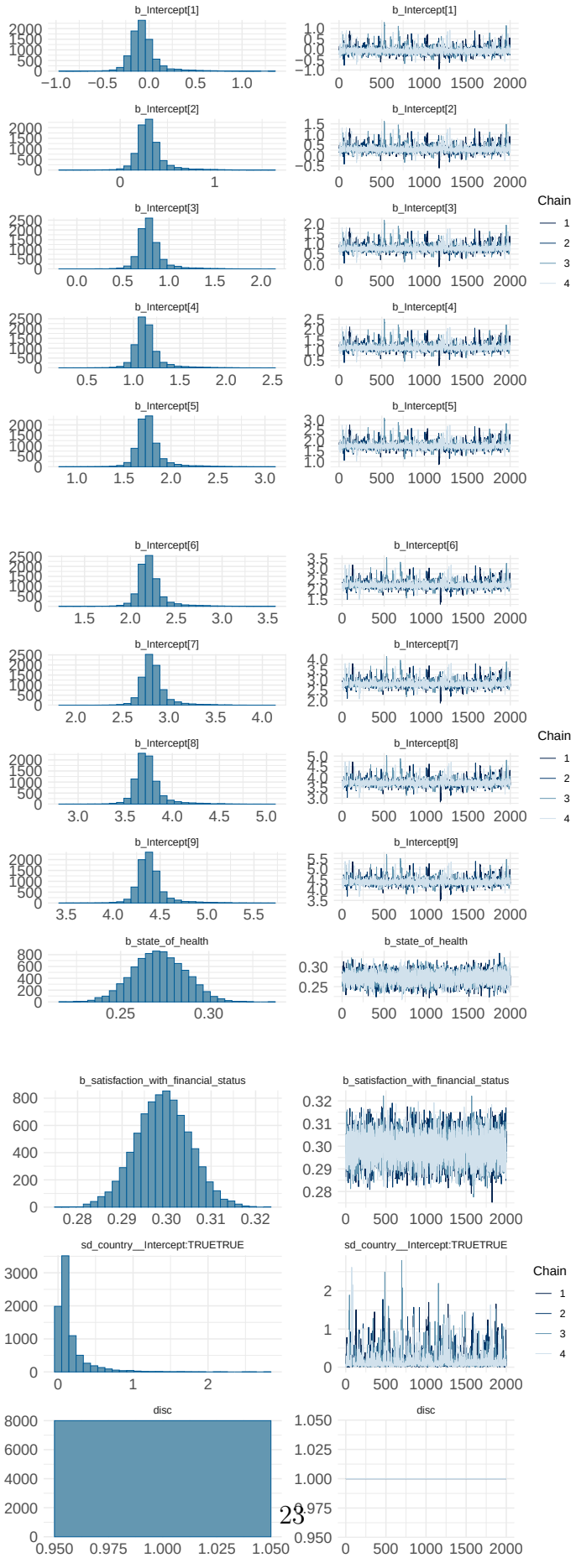
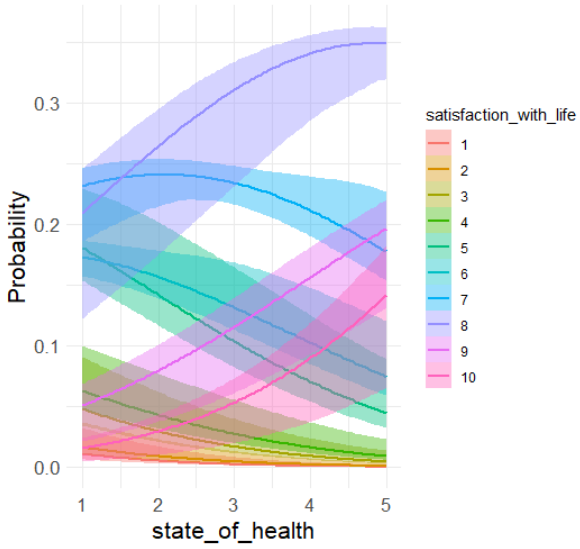
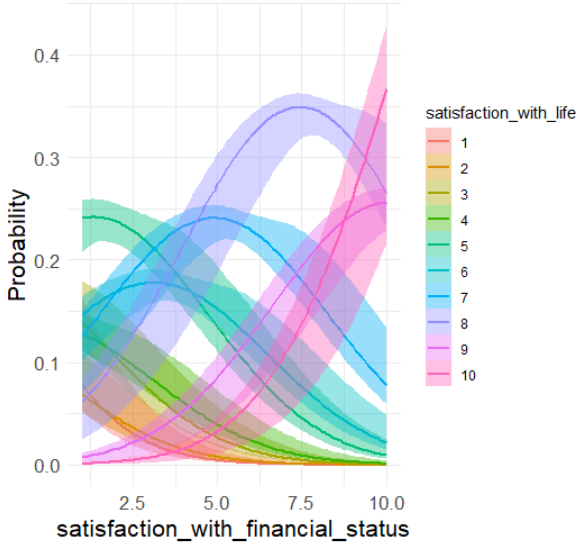


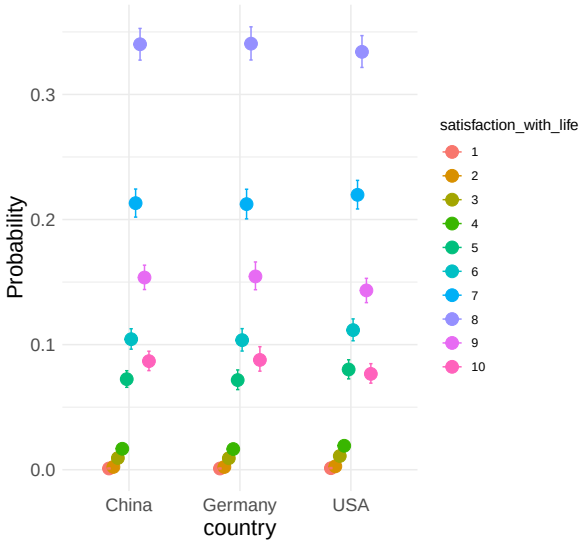
Figure 7: Posterior Distributions and Trace Plots for Multilevel Model.



(a) Effect of State of Health



(b) Effect of Financial Satisfication



(c) Conditional Effects for Countries

Figure 8: Conditional effects of each parameter on satisfaction with life.

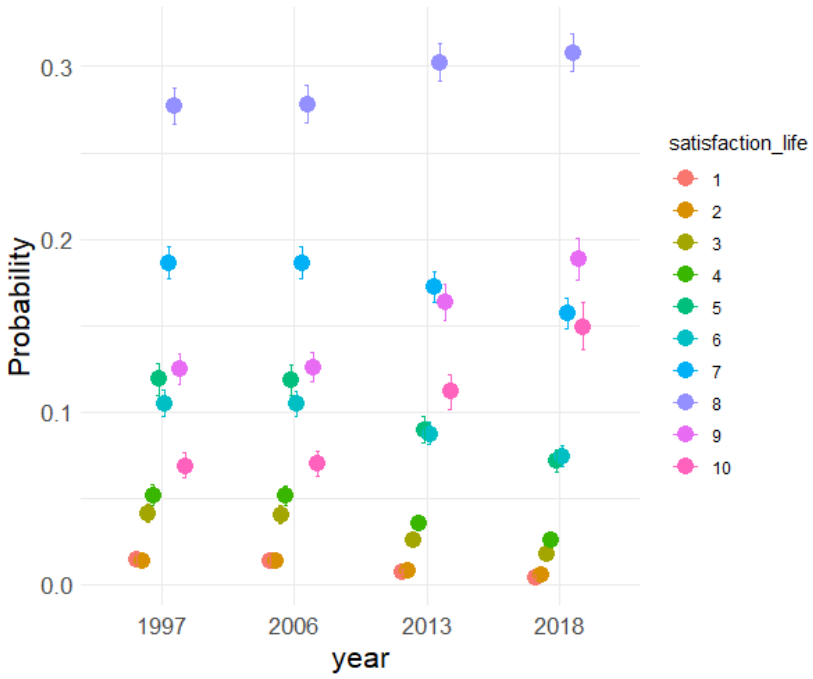


Figure 9: Trend Analysis of Life Satisfaction in Germany Across WVS Waves

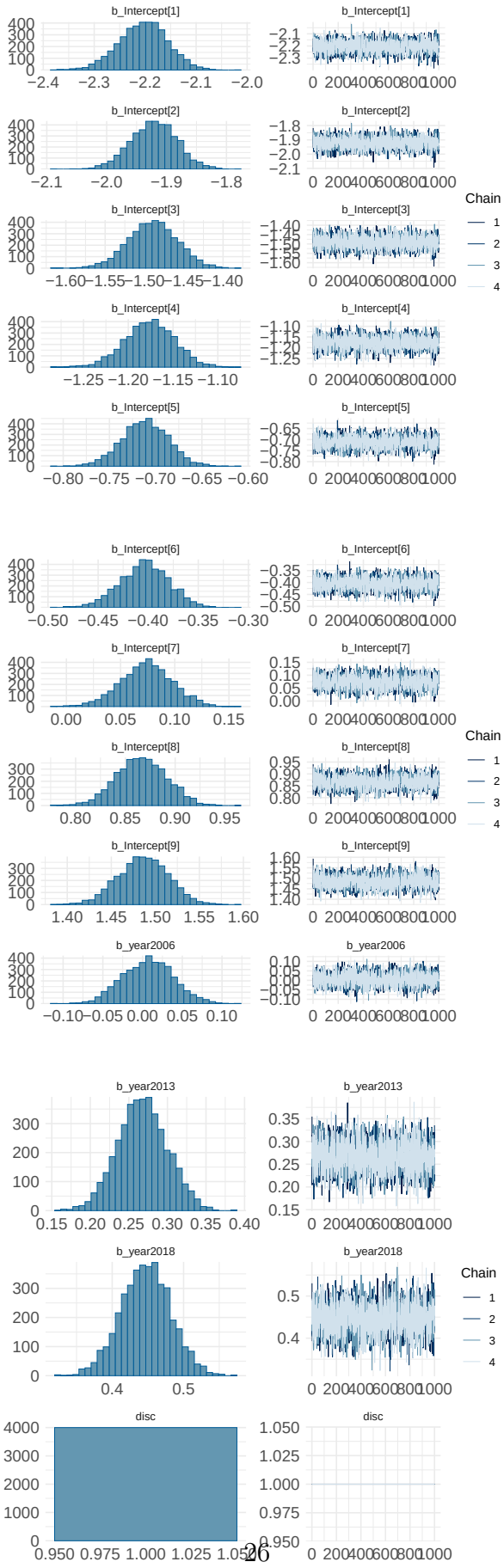


Figure 10: Posterior Distributions and Trace Plots for Years.