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Wealth and subjective well-being in Germany

Antje Jantsch
(Leibniz Institute of Agricultural Development in Transition Economies (IAMO))

Julia Le Blanc
(Deutsche Bundesbank and European Commission - Joint Research Centre)

Tobias Schmidt
(Deutsche Bundesbank)

Deutsche Bundesbank, Wilhelm-Epstein-Straße 14, 60431 Frankfurt am Main,
Postfach 10 06 02, 60006 Frankfurt am Main

Tel +49 69 9566-0

Please address all orders in writing to: Deutsche Bundesbank,
Press and Public Relations Division, at the above address or via fax +49 69 9566-3077

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Non-technical summary

Research Question

The main research question of the paper is how a household's wealth and its components, in addition to income, affect an individual's life satisfaction. We analyse whether the absolute level of wealth matters for life satisfaction and look at the role of own wealth relative to that of other households.

Contribution

We contribute to the scarce literature on wealth and subjective well-being by empirically investigating the relationship between life satisfaction and (relative) wealth holdings using panel micro-data from the German wealth survey, Panel on household finances – PHF, for 2010 and 2014. The survey allows us to separate wealth into different components and to construct measures of relative wealth.

Results

We find that (i) individuals' life satisfaction is significantly positively associated with a household's wealth holdings, (ii) different components of wealth, such as real and financial assets, as well as debt, have differential effects on life satisfaction, and (iii) both the absolute value of assets and debt as such and assets and debt relative to other households matter for life satisfaction. Our study shows that it is important to consider wealth, in addition to income, when analysing the impact of households' finances on individuals' life satisfaction.

Nichttechnische Zusammenfassung

Fragestellung

Im Zentrum der Analysen steht die Frage wie sich das Vermögen eines Haushalts und dessen Komponenten, zusätzlich zum Einkommen, auf die Lebenszufriedenheit eines Individuums auswirken. Dabei wird nicht nur der Zusammenhang der Vermögenshöhe mit der Lebenszufriedenheit untersucht, sondern auch, welche Rolle die eigene Vermögensposition relativ zu der anderer Haushalte spielt.

Beitrag

Unsere Arbeit ergänzt die wenigen Studien zum Zusammenhang zwischen Vermögen und dem subjektiven Wohlergehen von Individuen. Mit den Mikrodaten der Vermögensstudie der Deutschen Bundesbank, Private Haushalte und ihre Finanzen – PHF, für die Jahre 2010 und 2014 untersuchen wir empirisch den Zusammenhang zwischen Lebenszufriedenheit und Vermögen auf Haushaltsebene. Die Daten erlauben es uns das Nettovermögen der Haushalte in unterschiedliche Vermögenstypen zu zerlegen und Maße für die relative Vermögensposition eines Haushalts zu bestimmen.

Ergebnisse

Wir finden, dass (i) die Lebenszufriedenheit von Individuen positiv vom Bruttovermögen des Haushalts beeinflusst wird, dem sie angehören, (ii) einzelne Vermögenskomponenten, wie Sachvermögen und Finanzvermögen oder auch Schulden, sich unterschiedlich auf die Lebenszufriedenheit auswirken und (iii) die relative Vermögensposition für die Lebenszufriedenheit von Bedeutung sein kann. Unsere Analysen zeigen, dass es wichtig ist, bei Studien zum Einfluss der finanziellen Situation auf die Lebenszufriedenheit einer Person, neben dem Einkommen auch das Vermögen zu berücksichtigen.

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Antje Jantsch
Leibniz Institute of Agricultural Development in Transition Economies (IAMO)

Julia Le Blanc
Deutsche Bundesbank and European Commission - Joint Research Centre

Tobias Schmidt[1]
Deutsche Bundesbank

Abstract

Wealth in addition to income determines to a large degree an individual's consumption opportunities and economic situation, which should in turn affect their subjective well-being. We analyse empirically the relationship between life satisfaction as an indicator of subjective well being and households' wealth. We contribute to the scarce literature on wealth and well-being using micro-data from the German wealth survey, Panel on Household Finances – PHF, for 2010 and 2014. Using panel regression models, we find that (i) individuals' life satisfaction is statistically significant and positively associated with their households' wealth holdings, (ii) different components of wealth, such as real and financial assets, as well as debt, have differential effects on life satisfaction, (iii) both wealth levels and wealth holdings relative to other households matter for life satisfaction. Our study shows that it is important to consider wealth, in addition to income, when analysing individuals' life satisfaction.

Keywords: wealth, debt, assets, life satisfaction, relative wealth, subjective well-being

JEL-Classification: I31, D19, D31

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[1] Corresponding author: Tobias Schmidt, Wilhelm-Epstein-Straße 14, 60431 Frankfurt am Main, Germany, Tobias.Schmidt@bundesbank.de. Phone: +49 69 9566. E-Mail: Tobias.Schmidt@bundesbank.de.

1 Introduction

Whether money can buy happiness is a question addressed by several authors in the empirical literature on life satisfaction and subjective well-being (see e.g. Diener and Biswas-Diener (2001) and Kahneman and Deaton (2010)). A common finding of most of these studies is that an individual's financial situation has a positive impact on their subjective well-being (SWB). To assess subjective well-being, one approach requires individuals to record their perceived life satisfaction on a numerical scale. Since this method is regarded by many economists as an appropriate proxy for utility (see, for example Frey and Stutzer, 2002), classic micro-economic theory can be used to explain this finding: an individual derives utility from consuming goods, which can be purchased using current income, saved or accumulated income (wealth), or new debt. Thus, higher levels of income and wealth should - through increased consumption opportunities - lead to higher utility levels.

Apart from providing consumption opportunities, wealth has some additional features making it prone to positively influencing SWB: it can be used to smooth consumption over an individual's life cycle, it provides security against income shocks, it serves as collateral for debt, and it generates income itself. Given these functions of wealth it is not surprising that several recent studies have found a positive relationship between SWB and wealth holdings (for example Hagerty and Veenhoven 2003; Headey and Wooden 2004; Brown and Gray 2016; Office for National Statistics 2015; Foye and Clapham 2016).

Most studies, however, have focused on only one aspect of an individual's financial situation, i.e. income (Weinzierl, 2005). Relying exclusively on income and ignoring wealth may lead to wrong conclusions regarding the relationship between SWB and an individual's financial situation (Clark *et al.,* 2008). Moreover, the link between subjective well-being and various wealth components has mostly been neglected in the existing literature, not least because of a lack of suitable data on individuals' and households' wealth. Most of the studies, which do include wealth, were limited either to one measure of total net wealth or to a single wealth component such as homeownership or savings. [1] We contribute to this literature by explicitly analysing the link between SWB and (components) wealth as well as debt of households.

Going beyond the classic absolute utility theory that focuses on the *levels* of income, wealth or consumption, the levels of these measures relative to others also seem to affect

[1] See Jantsch and Veenhoven (2019) for a comprehensive review.

SWB according to relative utility theory (Kuhn et al, 2011; Pollak, 1976). Here again, the empirical studies have mainly focused on income relative to others. Only recently, research in economics and finance has pointed to effects of relative wealth on SWB, where some studies confirmed the relevance of interpersonal comparisons based on wealth for SWB (Bertram-Hümmer and Baliki (2015); Brown and Gray (2016); however, the direction of the effect is unclear. On the one hand, wealthy people may cause negative externalities (Layard, 1980; Frank, 1989) because they make their peers feel relatively deprived (Runciman, 1966). On the other hand, wealthy people may cause positive externalities because their wealth and income levels serve as information for their peers' potential income and wealth in the future. The prospect of reaching these income and wealth levels in the future may have a positive effect on SWB now. This information effect is also called *tunnel effect* (Hirschman and Rothschild 1973).

Against this background we investigate two important aspects mentioned above of the link between SWB and wealth: first, we consider wealth and its different components such as real assets, financial assets, secured and unsecured debt, and investigate how these are associated with our measure of SWB, i.e. life satisfaction. Furthermore, we discuss whether the consideration of wealth alters the relationship between SWB and income. Second, we investigate the importance of one's own wealth relative to the wealth of other households for SWB. Specifically, we analyze whether and how the wealth of an individual's peer group matters for SWB.

For our analysis, we use panel micro-data from the German Wealth Survey, the Panel on Household Finances, PHF, for 2010 and 2014. The unique data of the PHF survey allows us to answer our research questions empirically using panel regression methods. The PHF is one of the few surveys available that is dedicated to measuring wealth at a very detailed level. It contains a self-reported measure of life satisfaction as an indicator of SWB and has a substantial panel component.

This paper is structured as follows. In the next section we review the literature on life satisfaction, income and wealth. The data set and some descriptive statistics are presented in section three. Our methodology is described in section four, and section five contains the results. Conclusions are drawn in section six.

2 Related literature

2.1 SWB and wealth

The empirical literature on wealth and SWB is relatively scarce. Several contributions using Australian survey data have been made. Headey and Wooden (2004), for example,

estimated the combined effects of disposable income and net wealth on subjective well-being and ill-being using cross-sectional data from the Household, Income and Labour Dynamics Survey in Australia (HILDA). The results indicate that income and net wealth promote subjective well-being and relieve ill-being almost in the same way. In another study, Headey *et al.* (2004) empirically investigated the combined effects of net wealth, disposable income and consumption on overall life satisfaction. Using data from five national household panels (Australia, Britain, Germany, Hungary and the Netherlands), he found a stronger correlation between life satisfaction and net wealth compared to the correlation between life satisfaction and income. Furthermore, it has been found that the relationship between subjective well-being and net wealth is rather weak in wealthy Western societies compared to their non-Western counterparts (Diener *et al.,* 1999; Schyns, 2002; Howell *et al.,* 2006).

Headey *et al.* (2004) considered net wealth as such and do not distinguish between assets and debts. They thus took two different dimensions, the effect of assets and the effect of indebtedness on individuals' SWB simultaneously into consideration; however, there is evidence that the different components of wealth affect SWB differently. Two studies have shown that assets and debts can have opposite effects on SWB (Office for National Statistics, 2015; Brown and Gray, 2016). In addition to splitting wealth into assets and debts, different types of assets in households' portfolios can have differential effects. Empirical evidence, for example from the housing literature, suggests that homeowners are, on average, more satisfied with their lives (Zumbro, 2014) and have a better mental health status (Manturuk, 2012) than renters. In contrast, a study published by the British Office for National Statistics (2015) showed that property ownership (and private pension wealth) is not statistically significantly related to life satisfaction. Instead, they find a positive relationship between net financial wealth and life satisfaction.

Moreover, different types of assets in a household's portfolio differ in both their risk properties and their liquidity. While liquid financial assets are immediately available to buy consumption goods, illiquid assets are more difficult to utilise for consumption purposes. These illiquid forms of wealth, however, are in many cases highly conspicuous goods, such as houses and cars. In his treatise, Veblen (1899) argued that highly conspicuous goods can be used to achieve greater social status. As greater social status can lead to greater levels of subjective well-being (Pinquart and Sörensen, 2000), assets which are more easily observed by others, such as real estate assets, may be correlated more closely with subjective well-being than other `hidden assets', such as financial assets.

Regarding different types of debt, Brown *et al.* (2005) explore the role of unsecured and secured debt for psychological well-being. Using the British Household Panel Survey (BHPS) they find that unsecured – opposed to secured debt – has a detrimental effect on psychological well-being. One possible reason for this negative effect could be that the additional "pleasure" of goods paid for by credit card, for example, is weaker and of shorter duration than the "pain" experienced when in debt (Jantsch and Veenhoven, 2019). According to Tay *et al.* (2017) secured debt, such as mortgage debt, does not necessarily lower SWB.

2.2 SWB and social comparisons

Richard Easterlin – one of the first economists to link happiness data to income – used data from repeated surveys carried out in the United States to compare self-reported happiness of U.S. citizens over time (Easterlin, 1974). He found no associated rise in reported happiness even though the average levels of U.S. incomes had risen remarkably over time – the Easterlin-Paradox. In 1995, he confirmed his finding "with somewhat greater assurance than twenty years ago" (Easterlin, 1995, p. 35)[2]. Easterlin's findings give rise to the question whether the assumption that greater *levels* of income lead to greater utility is adequate. Indeed, the Easterlin-Paradox has been mainly explained by social comparison; i.e. people compare their current income with their own income situation in the past and to the incomes of their peer or reference groups (Clark *et al.,* 2008).[3] Easterlin (1995, p. 35) argues that the positive effect of an increase in income on SWB is offset by the negative effect of a respective increase of the income of others. This negative effect is also known as the relative deprivation effect (Runciman 1966). This literature indicates that individuals take their own objective status and that of their peers into account when assessing their level of SWB (Easterlin, 1995, p. 36). [4] Thus, for a given income, a higher average income of others implies a lower position in the income distribution. This means that an individual may end up relatively worse-off compared to the rest of the society even if the level of their own disposable income has not changed.

To date, there is a large body of evidence that at the micro-level points to the importance of relative income rather than absolute income for SWB (see, for example, Clark and

[2] Clark *et al.* (2008) echo this finding for the United States using data from the General Social Survey (GSS) over the period 1973-2004. A similar pattern has been observed for Japan where incomes of Japanese citizens rose substantially between 1958 and 1987 (by a factor of five) – the average level of happiness remained constant (Di Tella and MacCulloch 2006, p. 26).

[3] An additional explanation is adaption to an income increase, a long-run and a short-run benefit of higher income (Clark et al. 2008). Adaption in this context means that a positive change in peoples' economic circumstances has an ephemeral effect as they get used to it.

[4] Some recent literature (for example Hagerty and Veenhoven , 2003) contests Easterlin's view on the basis of new and longer time series data on SWB and claims that absolute levels of income and wealth increase SWB and find little evidence for social comparisons in the U.S. and across nations.

Oswald, 1996; Senik, 2004; Ferrer-i-Carbonell, 2005; Luttmer, 2005; Wunder, 2009; Layard *et al.,* 2010). An increase in reference group income, however, is not necessarily associated with lower levels of SWB. Instead, empirical evidence suggests that comparisons with the respective reference group that is relatively better off could also have a positive effect on SWB (Senik, 2004, 2008; Knies, 2012; FitzRoy *et al.,* 2014). This finding is known as an information or *tunnel effect.* The phenomenon was first studied by Hirschman and Rothschild (1973), who assumed that people perceive their comparatively low income as only temporary and at the same time use others' higher incomes as information regarding their own (potential) future income. The assumption behind this is that people use information regarding their relevant reference group's income to predict their own future income and thereby derive utility from others' higher incomes. In some cases, this positive effect of an increase in peers' income my dominate the negative effect on SWB from a relatively worse position in the income distribution (Senik, 2004, p. 2101).[5] FitzRoy *et al.* (2014) study the relative importance of both effects over an individual's life cycle for individuals in West Germany and Great Britain. Their results reveal that the negative effect dominates later in life, while the positive effect appears to be more important in early life. Brown et al. (2016) confirm these results by analysing the relationship between SWB and relative wealth using HILDA data.

Some recent studies analyse the relationship between relative wealth and life satisfaction as an indicator of SWB for some selected types of wealth. Foye *et al.* (2018) argue that home-ownership is a positional good and show empirically for the UK that life satisfaction of homeowners decreases if the home-ownership rate of the reference group increases. Brown *et al.* (2017) use data for the US to examine the importance of the relative rank within a social comparison group for life satisfaction. Among other indicators, they look at mortgage debt and financial assets. They show that the relative position in the distribution and not the absolute level of mortgage debt and financial asset holdings affect life satisfaction.

Another strand in the literature analyses how the importance of income for life satisfaction changes along the income distribution. Kahneman and Deaton (2010) find that there is overall a relatively weak relationship between income and life satisfaction, and that this relationship decreases as income increases. The psychology literature claims that whether money can increase well-being depends not just on the level of resources but on how they are spent, e.g. experiences versus material goods, goods and services for others than oneself, small purchases instead of few big ones (Dunn *et al.,* 2011). In this line, Matz *et al.* (2016) argue that the right type of spending increases life satisfaction and conclude

[5] We will use the terms „information effect" and „tunnel effect" interchangeably throughout the paper.

that when spending matches the consumer' personality, money can indeed buy happiness. Unfortunately, our data do not allow disentangling consumption items.

3 Data and Descriptive Statistics

3.1 Data – The Panel on Household Finances

For our analysis we use data from the 2010 and 2014 waves of the German Wealth Survey ("Panel on household finances" - PHF). The survey is based on a random stratified sample of private households in Germany, with oversampling of wealthy areas.[6] The PHF net samples comprise 3,565 households in 2010 and 4,661 households in 2014. To account for attrition and to ensure cross-sectional representativeness, a refresher sample was drawn for the 2014 survey. Attrition was low for a survey with a three-year frequency. The survey thus has a large panel component, which we use in our analysis. More than two thousand households (2,191 incl. 40 split off households) participated in both 2010 and 2014.

The survey is well suited for our analysis as it contains detailed information on monthly household income and, in particular, on household wealth. It provides information on real assets (properties, self-employed businesses, vehicles and valuables) and financial assets (current accounts, savings account, stocks, bonds and other securities, pension contracts, managed accounts, non-self-employed business wealth) as well as liabilities (mortgages, consumer loans, private loans, overdue bills). To deal with missing values, the wealth and income variables of the PHF are multiply imputed using Rubin's (1987) method. Except for gross income and pension assets, all the financial information is collected at the household level. In our analysis, we use total assets calculated as the sum of all real and financial assets as well as total debt, the amount of outstanding mortgage debt and unsecured debt. Net income is taken from a one-shot question on total monthly net household income. We do not transform income or wealth using an equivalence scale, but include the logarithm of the household size in our model.

The scientific use file contains para data from the sampling stage, i.e. the stratification of the sample by wealth. Municipalities with less than 100,000 inhabitants were assigned to two strata, labelled "wealthy small municipality" and "other small municipality", based

[6] The PHF survey was conducted in 2010 (September 2010 to June 2011) and 2014 (April to November 2014). Detailed data on households' assets and liabilities are collected by interviewers in face-to-face CAPI interviews, which last, on average, about one hour. The German surveys are part of a larger effort to collect harmonized wealth data in the euro area, the "Household Finance and Consumption Survey" (HFCS). Unfortunately, information on life satisfaction is not part of the "core questionnaire" for all countries. For more information on the survey, see Kalckreuth *et al.* (2012), and Altmann *et al.* (2020) or visit the website of the Deutsche Bundesbank/PHF.

on the share of taxpayers with high income. In large cities, wealthy street sections were identified based on micro-geographic characteristics, such as housing structure. This information allows us to investigate whether the relationship between life satisfaction and income or wealth is affected by the "wealth" in the area the person lives in.[7]

We use *life satisfaction* as an indicator of SWB. It is taken from a question using a classic 11-point Likert scale: "In general, how satisfied are you currently with your life as a whole?" which respondents answer by ticking one option on a list running from 0 "completely dissatisfied with life" to 10 "completely satisfied with life". This question, like all the other questions on beliefs, expectations and evaluations, was only answered by one person in the household, the "financially knowledgeable person (FKP)" which is the person who knows best about the household's finances.[8,9]

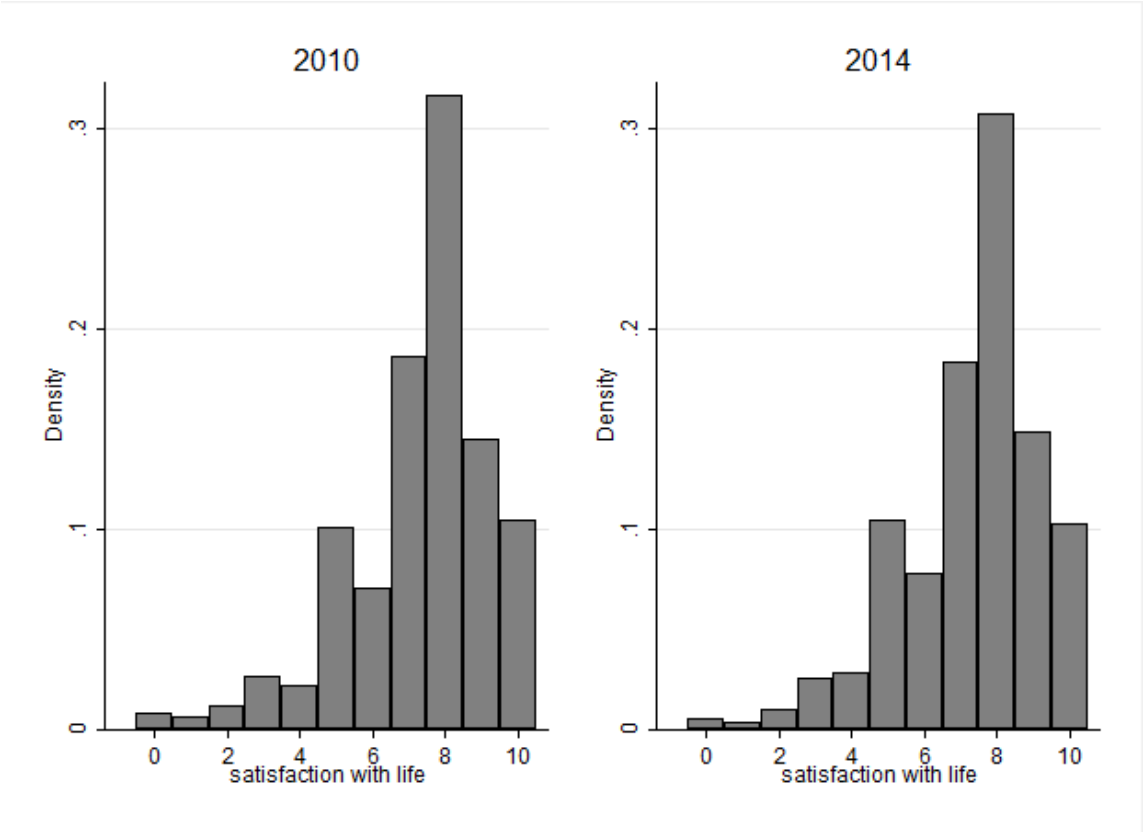
We concentrate our analysis on the balanced panel. Of the 2,139 panel households that could potentially be linked across the two waves we use 2,114 for our analysis. We delete four observations with missing information on life satisfaction in either one of the two survey waves. We also exclude 61 households in which the financially knowledgeable person has changed across waves to avoid comparing life satisfaction measures of different people across time, and 52 households are excluded because there are no households to link them to in wave 1. The 52 households include 40 split-off households and 12 households where the structure changed so substantially between waves 1 and 2 that they could no longer be considered the same households. Finally, we had to drop 19 individuals because we could not assign them an ISCED education status.[10]

3.2 Descriptive Statistics

We found that the respondents in the balanced panel have, on average, a fairly high level of life satisfaction. Average life satisfaction was almost identical in both waves: 7.32 in 2010 and 7.33 in 2014, with a standard deviation of 1.9 in each of the two years. Both the mean and the distribution were very similar across the two years, as Figure **1** shows. The mode in both years was at eight (8) and the mid-point of the scale (value 5) had a higher frequency than the next highest increment (value 6).

[7] See Altmann *et al.* (2020) for more details.
[8] Since wealth and income are measured at the household level and life satisfaction is measured at the individual level, we have to assume that all persons in a household participate equally in the resources of the household.
[9] See, for example, Cherchye *et al.* (2017).
[10] Those individuals had only provided "other education" as an answer to the questions on their educational background.

Figure 1: Histogram of life satisfaction measures 2010 and 2014



Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, panel households only.

While the overall distribution of life satisfaction was very stable across time, there were many transitions at the individual level (see Table 1).[11] Even though the values on the diagonal are, as expected, higher than the off-diagonal numbers, none of the diagonal elements exceed 50%; this indicates that more than half of our sample population reported changes in their life satisfaction, with no clear tendency towards more or less life satisfaction. About 34% of the respondents in our sample reported a reduction in life satisfaction, 34% an increase and 32% no change. Of those households with positive changes, 56% reported an increase of one-point on the 11-point scale and an additional 21% reported an increase of two points. For households reporting a decrease the respective numbers were 53% and 25% across the respective increments. Thus, it is clear the average life satisfaction remained nearly unchanged, despite the frequency of change in the life satisfaction of individuals, because the aggregate of negative and positive changes in the full sample were balanced almost exactly.

[11] Since we only have a small fraction of households in each of the 5 lowest categories (0-4), we combined those four items into one category for the sake of clarity. Detailed results are available upon request.

Table 1: Life satisfaction in 2010 and 2014 – transitions, (row percentages)

2014 \ 2010	0-4	5	6	7	8	9	10	*Total*
0-4	37	23	9	11	14	1	5	100
5	15	28	13	19	18	3	5	100
6	9	20	12	18	29	7	4	100
7	5	9	11	27	36	8	3	100
8	4	6	4	21	43	15	7	100
9	2	3	2	12	34	32	17	100
10	1	3	4	10	17	25	40	100
Total	7	10	7	19	32	14	11	100

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only.

With respect to wealth and income, the mean (median) annual net household income is €38,491 (32,400) in 2010 and €40,594 (35,316) in 2014. Mean (median) total gross wealth was at €432,003 (227,000) in 2010 and at €475,533 (256,888) in 2014 (Tables A1 and A4 in the appendix).[12] There were also substantial changes at the micro-level in our two main explanatory variables of interest[13], total gross wealth (total assets) and total debt (see Table A2 and Table A3 in the appendix). We find that about half of the panel households change the decile of their total assets between 2010 and 2014: 30 % move to a higher decile and 22 % to a lower decile, approximately 48% stay in the same decile. For total debt only about one third of households (34 %) stay in the same decile, 27 % move up one or more decile and 38 % down by at least one decile.

4 Empirical strategy

There is some discussion in the literature about what is the most appropriate estimation technique to use when analysing responses from Likert scale questions, such as our subjective well-being question. The answers can be interpreted as an ordinal or a cardinal variable. Depending on what is assumed, either ordered logit/probit models or regular

[12] Median and mean values for wealth components are presented in Table A1 in the appendix. Descriptive statistics for control variables included in the regression analysis are presented in Table A4. Both total net household income and total household wealth are substantially higher than the weighted averages for the total population, reflecting the oversampling of the wealthy.

[13] Please note that we do show the transitions within the wealth and debt distributions without considering where the households are in the life satisfaction distribution. It is not possible to infer from these tables how changes in wealth and debt are linked to changes in life satisfaction. This is the main topic of our multivariate analysis presented below.

OLS should be used. A widely cited paper by Ferrer-i-Carbonell and Frijters (2004) suggests "… that assuming ordinality or cardinality of happiness scores makes little difference, …" (p. 641). They also show that one should use fixed effects specifications in panel settings to account for individual unobserved heterogeneity. We follow their suggestion and perform panel OLS regressions using individual fixed effects on the balanced panel.[14] The regression equation is:

$$LS_{it} = \beta_1 \ln Y_{it} + \beta_2 \ln A_{it} + \beta_3 \ln D_{it} + \mathbf{x}'_{it}\,\delta + \alpha_i + \varepsilon_{it}, \qquad \textbf{(1)}$$

where *LS* is self-reported life satisfaction of individual *i* at time *t* measured on an 11-point scale ranging from 0 to 10. *Y*, *A* and *D* denote annual net household income, total household assets and total household debt, respectively. The literature on the relationship between life satisfaction and income typically makes use of a logarithmic transformation[15] of income to account for the diminishing marginal utility of income (Layard *et al.,* 2008) and to deal with extreme outliers. For our analysis, we also transform yearly net household income, assets and debts and the individual components of total assets using the logarithmic transformation. [16,17] Moreover, we use equivalence scales for income as well as for assets and debt to account for economies of scale of living together (Buhmann *et al.,* 1988). In doing so, we include the logarithm of household size in the equation, which allows us to estimate the additional income and wealth needed to compensate for the decline in subjective well-being if the household size increases. [18]

The vector x contains control variables for socio-demographic and socio-economic characteristics, including the respondent's age in years (also squared and cubed) at the time of the interview, the number of children below 16 that life in the respondent's household, their marital status (single-never married, married, divorced, widowed), their citizenship (German vs Non-German), their place of residence (East/West Germany),

[14] We also perform an OLS and ordered probit regression on the pooled dataset as a robustness check (see Table A7 – columns 3 to 6 in the Appendix).
[15] The inverse-hyperbolic is a very similar transformation since the transformation explicitly allows for zero and negative values.
[16] Alternatively, researchers could use wealth quintiles as explanatory variables. Using quintiles allows for non-linear effects of wealth on life satisfaction. It also avoids having to assume a diminishing marginal utility of wealth. We estimate the baseline specification using quintiles as a robustness check (Table A7 – column 2 in the appendix.
[17] In the case where the household owns zero assets or debts or has no income, we assigned the value zero to the log transformed variable. The share of observations "imputed" with a zero can be inferred from Table A1, by calculating the difference between 100% and the participation rate
[18] One reason to do so is that most equivalence scale elasticities regarding income suggested by expert scales, such as OECD equivalence scale, are higher than the estimated scales based on subjective data. This, in turn, could lead to an underestimation of economies of scale within a household Schwarze (2003). Results are very similar to those obtained for different equivalence scales (see appendix table Table A88).

their education level, according to the ISCED standard,[19] and their employment status (manual worker, employee, civil servant, self-employed, apprenticeship, student, unemployed, other not working).[20] The parameter designated by α denotes fixed effects for the household, and ε is the remaining error, which is assumed to be independently and identically distributed (IID); finally, β and δ are the parameters to be estimated. According to the literature review by Jantsch and Veenhoven (2019) we assume that the amount of total assets is positively related to life satisfaction, while the amount of total debt is negatively related.

In order to investigate the relationship between subjective well-being and wealth components, we include real assets, A^{REAL}, financial assets, A^{FIN}, mortgage debt, D^{SEC}, and non-mortgage debt, D^{UNSEC} separately in the baseline equation:

$$LS_{it} = \beta_1 \ln Y_{it} + \gamma_1 \ln A_{it}^{REAL} + \gamma_2 \ln A_{it}^{FIN} + \gamma_3 \ln D_{it}^{SEC} + \gamma_4 \ln D_{it}^{UNSEC} + \mathbf{x}'_{it}\,\delta + \alpha_i + \varepsilon_{it}. \quad \textbf{(2)}$$

The parameter designated by γ gives us an indication of how the individual components of wealth are associated with life satisfaction.

In the next step, the aim is to explain subjective well-being by an absolute and a relative component.

In doing so, we rely on specifications used in a similar way by Ferrer-i-Carbonell (2005) and Vendrik and Woltjer (2007), and start with the following equation which extends the baseline specification (1):

$$LS_{irt} = \beta_1 \ln Y_{it} + \beta_2 \ln A_{it} + \beta_3 \ln D_{it} + \kappa_1 \ln Y_{rt} + \kappa_2 \ln A_{rt} + \kappa_3 \ln D_{rt} + \mathbf{x}'_{it}\,\delta + \alpha_i + \varepsilon_{irt}, \quad \textbf{(3)}$$

where the current financial situation is not only captured by current annual net household income, Y, but also by total household assets, A, and total household debt, D. The relative components are Y_r, A_r and D_r, which represent measures of income, total assets, and total

[19] ISCED stands for International Standard Classification of Education, a system developed by the OECD for international comparison reasons.
[20] See the appendix (Table A5) for a detailed description of the variables used in our analysis.

debt for the respective reference group r.[21] The parameters designated by κ give us an indication of how the reference wealth is associated with life satisfaction.

Assuming that people have 'a unidirectional drive upward' due to a desire for social advancement (Festinger, 1954, p. 124, Hypothesis IV), a rise in the consumption opportunities of the respective reference group, r, is negatively associated with life satisfaction LS – even if their own consumption opportunities is already above that of the reference group. Therefore, the parameter κ is supposed to be negative.[22]

In equation (3) we don't consider whether an individual is above or below the income or wealth level of her reference group.

According to that and to Clark *et al.* (2008), equation (3) can be rewritten using an expression of interpersonal difference of consumption opportunities ($\ln Y_{it} - \ln Y_{rt}$), ($\ln A_{it} - \ln A_{rt}$), and ($\ln D_{it} - \ln D_{rt}$):

$$\begin{aligned} LS_{irt} = {} & (\beta_1 + \kappa_1)\ln Y_{it} + (\beta_2 + \kappa_2)\ln A_{it} + (\beta_3 + \kappa_3)\ln D_{it} \\ & - \kappa_1(\ln Y_{it} - \ln Y_{rt}) - \kappa_2(\ln A_{it} - \ln A_{rt}) - \kappa_3(\ln D_{it} - \ln D_{rt}) \\ & + \mathbf{x}'_{it}\,\delta + \alpha_i + \varepsilon_{irt}, \end{aligned} \qquad \textbf{(4)}$$

where ($\ln Y_{it} - \ln Y_{rt}$), ($\ln A_{it} - \ln A_{rt}$), and ($\ln D_{it} - \ln D_{rt}$) correspond to the relative consumption opportunities and can also be written as $\ln(Y_{it}/Y_{rt})$, $\ln(A_{it}/A_{rt})$, and $\ln(D_{it}/D_{rt})$. Moreover, equation (4) makes it possible to separate the effect on LS of the individual consumption opportunities relative to the reference consumption opportunities from the effect of the absolute individual consumption opportunities (Ferrer-i-Carbonell, 2005; Vendrik and Woltjer, 2007).

The expressions ($\ln Y_{it} - \ln Y_{rt}$), ($\ln A_{it} - \ln A_{rt}$), and ($\ln D_{it} - \ln D_{rt}$) also indicate the distance between one's own consumption opportunities and that of the corresponding reference group. We call this difference *Diff*. However, the specification (4) does not allow for asymmetries in comparisons. To find out which effect dominates – fear of social decline, tunnel effect, relative deprivation or relative gratification – we have to consider whether the individual's consumption opportunities are above or below that of the respective reference group's consumption opportunities. Therefore, we define a positive difference, $Diff^+$, if the level of one's own income and wealth is above that of the reference group,

[21] The definition of our reference group is based on individual characteristics and place of residence resulting in 30 different individual reference groups (see below for details).

[22] The vector **x** contains the same controls for socio-demographic and socio-economic characteristics introduced earlier. The parameter α denotes a fixed effect for the household, ε is the error term assumed to be independent and identically distributed (IID), and β, δ, and κ are the parameters to be estimated.

and a negative difference, $Diff^-$, if the level of one's own income and wealth is below that of the reference group (see equation (5) below). In the example of income, as soon as the difference between an individual's and the reference income is positive, i.e. $Y_{it} > Y_{rt}$, then $Diff_Y^+$ equals $Diff_Y$ and $Diff_Y^-$ equals zero. If the difference between an individual's and the reference income is negative, i.e. $Y_{it} < Y_{rt}$ then $Diff_Y^-$ equals $Diff_Y$ and $Diff_Y^+$ equals zero (cf. Ferrer-i-Carbonell, 2005). The term (β-κ) is represented by the coefficient θ.

$$\begin{aligned} LS_{irt} = {} & \theta_1 \ln Y_{it} + \theta_2 \ln A_{it} + \theta_3 \ln D_{it} \\ & - \kappa_1^+ Diff_Y^+ - \kappa_2^+ Diff_A^+ - \kappa_3^+ Diff_D^+ \\ & - \kappa_1^- Diff_Y^- - \kappa_2^- Diff_A^- - \kappa_3^- Diff_D^- \\ & + \mathbf{x}'_{it}\,\delta + \alpha_i + \varepsilon_{irt}. \end{aligned} \qquad \textbf{(5)}$$

The parameters κ^+ and κ^- give us an indication of the association between life satisfaction and the reference wealth and reference income, taking into account whether an individual is above or below reference income and reference wealth, respectively.

The negative difference, *Diff-*, represents an upward comparison, wherein one's own income and total assets are below that of the reference group. According to equation (5), a negative sign of the estimated coefficient of $Diff_Y$- and $Diff_A$- correspond to the tunnel effect, whereas a positive sign of the estimated coefficient of $Diff_Y$- and $Diff_A$- correspond to the relative deprivation effect. However, this interpretation of the signs does not hold for the coefficients of relative debt; it is the other way around. Here, $Diff_D$- corresponds to downward comparison as the reference group is worse off due to holding more debt. Hence, a negative sign of the estimated coefficient of $Diff_D$-corresponds to the relative gratification effect because as the total debt of the reference group decreases, so too does the distance between one's own and the reference debt decrease. This also reduces the relative gratification effect. A positive sign of the estimated coefficient of $Diff_D$-corresponds to a fear and worry of social decline. The logic here is that as the debt of the reference group decreases, life satisfaction is expected to decrease also as fear and worry of future social decline set in.

The positive difference, *Diff +*, represents a downward comparison, wherein one's own income and total assets are above that of the reference group. Looking at $Diff_y$+ and $Diff_A$+, a negative sign corresponds to a sense of fear and worry about one's own social decline, whilst a positive sign of the estimated coefficient is associated with the effect of relative gratification. Here, too, these interpretations do not hold for the relative debt indicators. The term $Diff_D$+ represents an upward comparison, as it implies that one's own

total debt is larger than the median in the reference group. A negative sign of the estimated coefficient of $Diff_D+$ corresponds to the relative deprivation effect because with decreasing reference total debt, and therefore an increasing $Diff_D+$, a lower level of life satisfaction would be expected. It follows that if the sign of the coefficient for $Diff_D+$ is positive, a higher life satisfaction is expected when reference total debt decreases and $Diff_D+$ gets larger. In this case, therefore, (positively assessed) information is derived so that the household can also achieve the low debt level of the reference group in the future. Hence, a positive sign of the estimated coefficient of $Diff_D+$ corresponds to the tunnel effect.

From the technical side of the estimation process: Information about wealth and income in the PHF is multiply imputed. [23] In our sample, almost 40 % of the values for total assets, 12 % for total debt, and 4 % for net income are imputed.[24] For the estimation of equations (1) to (5), we take into account the uncertainty introduced by the multiple imputation (five implicates) of our independent variables by running the regression on each of the imputed datasets; thus we obtain five coefficient estimates and the variance-covariance matrices corresponding to the parameter estimates. According to the combination rules by Rubin (1987), the coefficients and standard errors (SE) are then adjusted for the variability between imputations.[25]

5 Definition of an individual's reference group

In order to account for the fact that an individual's life satisfaction might be affected by income or wealth in relative rather than in absolute terms, we first need to define the respective reference group of each individual under consideration. The difficulty is to accurately conceptualise which people an individual will include in their reference group. Several authors have made use of a geographical interpretation of reference group in the context of income:

Persky and Tam (1990) assumed that subjective well-being of people is only affected by the people living in the same region. As Becchetti *et al.* (2013) showed in their paper, 'region' is a vague term and leaves room for interpretation. They argued that whole countries may serve as reference groups and not just the people living nearby. Knight *et*

[23] The life satisfaction question is not imputed. This has no consequences for our analysis. However, only four persons in the balanced panel did not provide information on life satisfaction in either wave and were consequently dropped.

[24] The high share of imputed values for total assets is induced by the fact that the PHF surveys collect very detailed information on wealth ie. each component of wealth is collected separately with its own question. If only one of the items is imputed, the total assets measure is also labelled "imputed". The item-non-response rates for individual items range between 5% and 15%

[25] The estimation was done in Stata MP 16 using the command `mi estimate`.

al. (2009) asked people in rural China directly about whom they compare themselves and found that most of the surveyed people were comparing themselves to neighbours or fellow villagers. Some studies have used a narrower interpretation of a geographical reference group and define only people living in an immediate vicinity as a relevant reference group (Luttmer, 2005; Knies *et al.,* 2008).

It is also well known from the literature that people select their comparison target on the basis of similar attributes. McBride (2001) picked up this idea by defining an individual's reference group based on age, where the reference interval includes all people who are five years younger or older. In addition, Layard *et al.* (2010) explored the inclusion of education and gender in the construction of the reference group.

Ferrer-i-Carbonell (2005) combined both the individual characteristics and 'geography'; i.e. she considers only those people living in the same region as the reference group, in addition to the socio-demographic characteristics (in her paper, East and West Germany). Particularly in the German context, the distinction between East and West Germany could give an indication about expected income for individuals; according to the Federal Employment Agency the incomes in West Germany even almost 30 years after the reunification are, on average, still higher than those in East Germany (Statistik der Arbeit Bundesagentur für Arbeit, 2019).

Clark and Oswald (1996) and Senik (2004) chose a different approach. They predicted the reference income individually for each person as a result of an estimation based on a "conventional earnings equation" (Clark and Oswald, 1996, p. 368). Senik (2004) predicted "the logarithm of the typical real income of an individual, based on his education, years of working experience, region, branch, age, sex, and primary occupation" (p. 2105) for each wave in their panel. In doing so, she assumed that people have the income equivalent to the 'typical real income' of people with given characteristics in mind. She further assumes that this prediction for individual income serves as a good indicator of what individuals might expect for their own income and thus serves as reference group income.

All approaches of defining the reference group and calculating the reference income based on survey data have advantages and disadvantages. The geographical approach is based on what people really 'see', namely those who live in the same region, although the term 'region' leaves room for interpretation. This approach, however, ignores that people might compare themselves with people who have similar 'attributes' such as gender, age or education. Therefore, it is reasonable to extend this estimation to consider these other attributes in addition to the region, as Ferrer-i-Carbonell (2005) did. Still, the problem with this approach, in general, is that the number of observations in each

reference group can strongly influence the results. A too fine-grained definition of the reference group, may lead to a small number of observations for each group and as a result, the calculation of reference income will depend on only a few individuals. This induces problems with outliers, heightens measurement error issues and in general may lead to an imprecise estimate of reference income. Compared to the approach of assessing reference income based on sample means for a predefined reference group, the post-estimation approach has the advantage of predicting reference income, even if there are only one or two observations in the sample that cover all the attributes included. However, this approach only reflects the social comparison to a limited extent because a comparison could also take place with persons with other characteristics. For example, a woman could compare herself with a man. Or individuals could compare themselves with people of a different age, such as if an individual assesses whether they have achieved what an older reference individual had when they were at the age of the individual making the comparison.

In this paper, we therefore follow Ferrer-i-Carbonell (2005) and calculate reference income, reference wealth, and reference debt of people belonging to the same education level, the same age group, and living in the same region. With this approach we assume that people compare themselves with similar people. In order to define our reference groups, we divide the education level into three categories, namely, 'low' (primary and lower secondary education), 'medium' (upper secondary and post-secondary non-tertiary education), and 'high' (first and second stage tertiary education). Moreover, we draw five age groups, namely, <35 years, 35-44 years, 45-54 years, 55-64 years and 65 years and older. Finally, we also differentiate between households living in East and West Germany. In doing so we assume that individuals have a good knowledge of the socio-economic situation of people living in East and West Germany because they are able to observe and assess their living conditions.[26] For each of the 30 resulting groups we calculated the group median for net income, total assets and total debt. Finally, though Ferrer-i-Carbonell (2005) used the mean, we decided to use the median on its own because it is a robust measure of income and wealth within the respective reference group and less sensitive to outliers (than the mean).[27]

[26] It is preferable to choose smaller educational groups and age brackets, and define the region using a higher level of spatial specificity, such as federal state or district level; however, this is not possible due to the limited number of observations in our dataset.

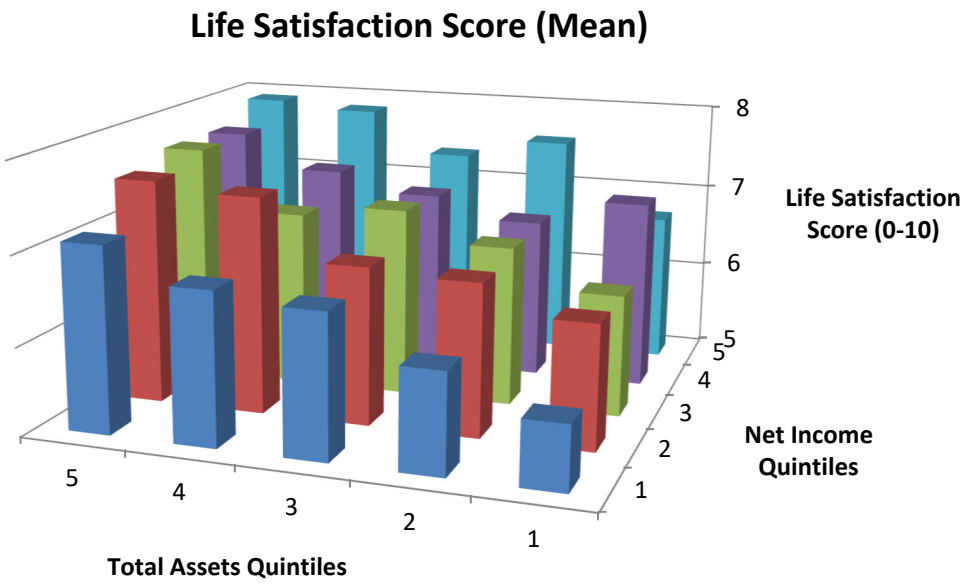
[27] Descriptive statistics for comparison group income, total assets and total debt are shown in Table A6 in the appendix.

6 Results

Before presenting the main results of our multiple regression analysis, we examine the bivariate relationship between life satisfaction and net income and wealth in Germany, respectively (see Figure A1, Figure A2 and Figure A3 in the appendix). We find average life satisfaction to increase with annual net household income, which reflects the well-known positive relationship documented by Frijters *et al.,* 2004). The same picture emerged with life satisfaction and total household assets. This indicates that the higher the asset quintile in which a household is located, the higher the average life satisfaction. Interestingly, Figure A3 also shows increasing average life satisfaction the higher the debt quintile in which a household is located. This is contrary to the expectation we formed based on the results of the literature review carried out by Jantsch and Veenhoven (2019). It is conceivable that the relationship between life satisfaction and total debt shown in Figure A3 is explained by a third factor not considered, such as income. We conducted multiple regression analysis in order to control for variables that correlate with life satisfaction in addition to income, assets and debt.

As income and wealth are assumed to jointly determine an individual's resources and hence potential life satisfaction, the joint distribution of income, wealth and median life satisfaction for the pooled sample is shown in Figure 2. Life satisfaction is lowest for respondents in the lowest quintile of income and wealth. As soon as income is higher, life satisfaction increases regardless of the position in the wealth distribution of the household. Life satisfaction also increases with wealth, but for low levels of income, wealth needs to be at least in the third quintile for an increase of life satisfaction. Respondents of households in the highest wealth or income quintile achieve a life satisfaction score of 8 regardless of the respective other measure of economic well-being.

Figure 2: Average Life satisfaction by Net Income and Total Assets



Source/Notes: PHF 2010/11 and PHF 2014 pooled – SUF Files, unweighted, panel households only.

We now turn to the panel regression results and will first discuss the role of wealth components for life satisfaction, distinguishing between total assets and total debt, and real assets, financial assets, mortgage debt and non-mortgage debt. We will then discuss the importance of a household's wealth holdings relative to others by investigating whether there is a satiation point for wealth, whether there are regional differences with respect to wealth effects and finally whether a peer-group's wealth in relation to a household's own wealth matters for life satisfaction.

6.1 Relationship between SWB, income and wealth components

The results from regression equation (1) are shown in Table 2. The first column displays the correlation of life satisfaction and household income, the second column adds total household assets, and in the third column we show results for also adding household indebtedness.

As expected, we found net income to be positively associated with individual life satisfaction. Interestingly, the association between life satisfaction and net income changed minimally once wealth was factored in, pointing to an additional effect of wealth in addition to that of income. Even though income and net wealth are correlated at the household level, they seem to have separately identifiable effects on life satisfaction.

While total assets were positively associated with life satisfaction, total debt had a negative association with life satisfaction; each of these results were found when we

controlled for household income and other socio-demographic characteristics of the individual.[28]

In a direct comparison, the relationships between life satisfaction and total assets and, in particular, total debt, seem to be much weaker compared to that between life satisfaction and net income. The doubling the household income was associated with, on average, 0.346 points higher life satisfaction on the 11-point scale, other things held constant. In contrast, the doubling of total assets was associated, *c.p.*, on average with approximately 0.101 points life satisfaction. In connection to this, the absolute value of the negative effect of total debt (β_2 = -0.016) turned out to be smaller than the positive effect of total assets (β_1 = 0.101) on life satisfaction. This could be an indication that the positive effect of having assets has more of an impact on life satisfaction than the negative effect of indebtedness. We will return to this issue below when we analyse different components of debt and assets. As a robustness check we also estimate a model where we allow for non-linear effects of income and wealth on life-satisfaction by including income and wealth quintiles as explanatory variables rather than income and wealth levels. The results did not change substantially (see Table A7 in the appendix).[29]

Table 2: Life satisfaction, net income, total assets, and total debt in Germany - Coefficients from Fixed Effects Panel- Regressions

VARIABLES	**(1)**	**(2)**	**(3)**
ln(total assets)		0.096***	0.101***
		[0.035]	[0.036]
ln(total debt)			-0.016*
			[0.009]
ln(hh-income)	0.382***	0.341***	0.346***
	[0.115]	[0.113]	[0.113]
Controls	yes	yes	yes
Constant	9.565***	9.500***	9.509***
	[2.954]	[2.956]	[2.961]
Model test F statistic	3.82	3.14	3.14
MI model test p-value	<0.001	<0.001	<0.001
Observations	4,108	4,108	4,108
Number of individuals	2,054	2,054	2,054

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs.

[28] Pooled OLS and pooled ordered probit regressions yield qualitatively similar results (Table A7)

[29] Additionally, results in column (2) show that individuals in higher quintiles of total assets reported, *c.p.*, obtain on average higher levels of life satisfaction than those in lower asset quintiles. At the same time, the increase in life satisfaction systematically diminishes from one quintile to the next. This, in turn, may indicate diminishing marginal utility of total assets to life satisfaction, which justifies the use of the natural logarithm of total assets as we have done in the specification, for which results are shown in column (1).

6.2 The importance of income and wealth for SWB

To judge the relative importance of net income, total assets, and total debt in explaining life satisfaction, we predicted how life satisfaction would change if the individual lives in a household with mean ln(net income), ln(total assets) and ln(total debt), and if this household would additionally receive, *c.p.*, the value of a standard deviation (SD) of the logarithm of each of these. The values for the average change in life satisfaction in the last column of

Table **3** are calculated on the basis of the estimated coefficients in column (3) of Table 2. The results presented in

Table **3** show that we found an average increase in life satisfaction of 0.251 points on the 11-point scale after one SD of ln(total assets) was added to the mean of ln(total assets). This was 0.025 points more than the average change in life satisfaction when an SD of ln(net income) was added to the mean of ln(net income). Moreover, on average life satisfaction decreased by 0.082 points on the scale after an SD of ln(debt) was added to its mean. These results suggest that total assets may be slightly more important for life satisfaction than income. Moreover, for a one SD increase in income or total assets, the increase in life satisfaction was larger than the decrease in life satisfaction caused by the same change in total debt (+0.251 compared to -0.082).

Table 3: Change in life satisfaction for a one SD increase of ln(net income), ln(total assets) and ln(total debt) over the respective mean[30]

	Mean of logarithm (€)	Mean of logarithm + SD of logarithm (€)	Δ Life satisfaction
Net income	31,743 €	61,017 €	0.226
Total assets	112,621 €	1,344,618 €	0.251
Total debt	139 €	25,872 €	-0.082

Source: PHF 2010/11, PHF 2014 SUF Files, unweighted, panel households only.

However, with this calculation we cannot make a clear statement as to whether total assets are more important for life satisfaction than net income. The distribution of total assets and net income is very different, i.e. one standard deviation of income is about the same as the mean, while it was about ten times the mean of total assets. Instead of adding one standard deviation to the respective mean, we gave a household with median ln(net income) - which corresponds to €33,600 - an additional amount of €1,000 annual net

[30] Please note that the euro values shown are calculated based on the mean of the ln of the variable plus one standard deviation of the ln of the variable. In the case of income, for example, the mean is calculated as exp(11.63) and the mean +sd is exp(11.63+2.48).

income. We calculated then that life satisfaction for that household should increase by 0.01 points on the 11-point scale.[31] We then calculated the value of total assets needed by a household with median ln(total assets), which corresponded to € 243,200, to increase life satisfaction of an individual living in this household by 0.01 points. To achieve an equivalent increase in life satisfaction for an individual living in a household with median ln(total assets), we found that an additional €26,700 would need to be added to the value of their median total assets, everything else being equal.

As income is a flow variable, while assets are a stock variable, comparing an increase of €1,000 to annual net income with a one-off asset increase of €26,700 to total assets does not allow us to make any meaningful conclusions as to whether income or total assets is of greater importance for life satisfaction. That would require us to make further assumptions. Assuming that the household with medium total assets could draw a constant amount from the additional total assets of €26,700 for 20 years, the household with medium net income would also have to receive an increase of €1,000 to their annual net income for 20 years. Assuming further an interest rate of 2%, an increase in income of €1,000 over the next 20 years corresponds to a present value of €16,351. The value of €16,351 can now be compared with the previously calculated monetary value of assets (€26,700) that the other household has to receive in order to obtain the same increase in life satisfaction; thus, implicitly assuming that the structure of total assets is increased in equal shares for all asset components. Comparing those two values shows that the present value of €16,351 is worth as much to the household as an increase in total assets of €26,700, indicating a slightly greater importance of income for life satisfaction than total assets. The reason for this finding could be due to the fact that total assets are composed of liquid and illiquid components, some of which are not immediately available for use in consumption opportunities; whereas income can be immediately used for consumption, total assets is often not directly accessible. However, a slight change in the assumptions of this thought experiment changes the statement on the relative importance of net income and total assets for life satisfaction. In summary, the question of what is ultimately more important for life satisfaction cannot be answered clearly at this point as the outcome of the analysis is highly sensitive to the assumptions made in order to do it.

6.3 Relationship between SWB and wealth components

To further investigate the importance of wealth for life satisfaction, we now turn to an analysis of different types of assets and debt. With respect to various wealth components, real assets are very illiquid, and since the evaluation of satisfaction with life could also

[31] Again, in order to calculate the change in life satisfaction we used the estimated coefficients in column (3) of Table 2. For income, we calculated ln(33,600+1,000) * 0.346 - ln(33,600) * 0.346 = 0.0102.

capture an individual's perceived ability to smooth consumption, liquid assets may be more important as they can be easily accessed for consumption. If the different components of total assets are to be associated differently with life satisfaction, it is also interesting to look at how different components of total debt relate to life satisfaction. Mortgages ("secured debt") are typically used to purchase real estate, an illiquid asset usually held for a substantial amount of time, which is both a consumption and an investment good. Non-mortgage debts, in contrast, are used to purchase goods for consumption and are typically not linked to investments and are also called an unsecured debt. We therefore investigate whether the different components of total assets and total debt relate differently to an individual's satisfaction with life.

The results for different wealth and debt components from regression equation (2) are shown in Table 4. Considering both indicators and levels of assets and debt, financial assets drove the positive effect of total assets, and it was, in particular, non-mortgage debt that reduced life satisfaction the most. Non-mortgage debt was in most cases linked to (non-durable) consumption expenditure. For which, our results indicate that the 'burden' of being indebted and having to service non-mortgage debt may be higher (or more long-lasting) than the average increase in life satisfaction derived from consumption financed by such debt. Moreover, the results revealed that owning real assets – while not considering the actual monetary value of those real assets – were negatively correlated to life satisfaction. When it comes to the actual level of these real assets, however, life satisfaction increased, *c.p.*, with higher levels of real assets.

Table 4: Life satisfaction and net wealth components - Coefficients from Fixed Effects Panel- Regressions[32]

	Indicators	**Values**
VARIABLES	(1)	(2)
Has real assets	-0.100	—
	[0.218]	
Has financial assets	0.681***	—
	[0.242]	
Has mortgage debt	0.017	—
	[0.096]	
Has non-mortgage debt	-0.258***	—
	[0.085]	

[32] A table with coefficient estimates for all variables including control variables is included in the Appendix (Table A9).

ln(real assets)	—	0.012
		[0.021]
ln(fin. assets)	—	0.071***
		[0.025]
ln(mortgage debt)	—	0.001
		[0.009]
ln(non-mortgage debt)	—	-0.031***
		[0.010]
ln(hh-income)	0.383***	0.341***
	[0.114]	[0.114]
Controls	yes	yes
Constant	9.281***	9.758***
	[2.941]	[2.948]
Model test F statistic	3.150	3.256
MI model test p-value	<0.001	<0.001
Observations	4,108	4,108
Number of individuals	2,054	2,054

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs.

6.4 Additional insights

Splitting the sample by region: East vs. West

To start investigating the role of relative wealth we look at two sample splits by region. An obvious choice to split any German sample is by East and West (Table 5). It is well known that there are still systematic differences between the two parts of Germany in average life satisfaction and economic performance, but there are also cultural causes due to the different life histories of people in the East and West (Frijters *et al.,* 2004; Pfaff and Hirata, 2013). Any split of the data most likely captures not only differences in wealth levels, but also other systematic differences between the two regions. In doing so, we simply estimate equation (1) for the individuals who live in East and West Germany and compare the effects of wealth on life satisfaction in each of these distinct parts of Germany. This regional split produced some interesting results. While debt levels seem to have a statistically significantly negative impact on life satisfaction in East Germany, their effect is statistically insignificant in the West. The opposite is true for net income and assets; these show a statistically significant effect in West Germany only, although the estimated coefficients for these two indicators are positive in both regions. These results indicate that the East and West German samples differ by more than just wealth and income levels. In particular, there is evidence of strong debt aversion of households in East Germany.

Table 5: Life satisfaction and total assets, total debt and net income in East and West Germany - Coefficients from Fixed Effects Panel- Regressions[33]

VARIABLES	**West**	**East**
ln(total assets)	0.109**	0.066
	[0.043]	[0.059]
ln(total debt)	-0.010	-0.045**
	[0.010]	[0.022]
ln(hh-income)	0.270**	0.641**
	[0.124]	[0.311]
Controls	yes	yes
Constant	9.640***	11.549
	[3.285]	[7.381]
Model test F statistic	1.889	$4.7*10^5$
MI model test p-value	<0.001	<0.001
Observations	3,349	759
Number of individuals	1,679	384

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs.

Splitting the sample by region: Wealthy vs Non-wealthy regions

We now utilise the data collected in the PHF survey to identify possible regional heterogeneities across non-wealthy and wealthy regions regarding the relationship between life satisfaction and wealth. The sample design of the PHF survey allowed us to group individuals by regional wealth levels (see Section 3.1 for details), and so we were able to directly identify households that live in wealthy areas across different geographical regions.

[33] A table with coefficient estimates for all variables including control variables is included in the Appendix (Table A11).

As can be seen from Table 6 mean total assets, debt and net income are statistically significant different between these sampling areas.

Table 6: Median Wealth and Life Satisfaction by Sampling Strata 2014

	Life satisfaction	Total assets	Total debt	Household net annual income
Non-wealthy Regions	7.03 (2.04)	278,722 (508,845)	62,011 (94,443)	32,243 (18,819)
Wealthy Regions	7.62 (1.68)	670,173 (1,048,944)	129,395 (251,775)	48,954 (64,670)
t-test for mean difference	***	***	***	***

Source/Notes: PHF, 2014, unweighted, standard deviations in parentheses, *** 99% significance level.

We proceed by estimating equation (1) for the individuals who live in wealthy and non-wealthy areas and compare the effects of wealth on life satisfaction in each of these distinct areas (see Table 7).

The marginal effect of wealth on SWB is much greater in non-wealthy areas than in wealthy areas. Assuming that individuals who live in non-wealthy areas are in a lower part of the wealth distribution, these results may be an indication of diminishing marginal utility of wealth. We observe the same pattern for the relationship between SWB and income: the marginal effect of income on SWB is almost twice as high in non-wealthy areas than in wealthy areas. Moreover, this analysis reveals that the relationships observed for the overall sample are mainly driven by the non-wealthy regions (Table 7). Similarly for debt, the effect is negative in non-wealthy regions, while it is positive in wealthy regions, although statistically insignificant. These results suggest that it might be even for debt appropriate to assume a diminishing marginal "disutility". The results are confirmed by a model with interaction terms.

This analysis also serves as a starting point for the analysis of the importance of relative wealth below, as we analyse neighbourhood effects of (non-)wealthy households. As we were able to determine which individuals were living in an area with a high proportion of wealthy individuals around them, the idea behind this approach was to investigate whether there were spillover effects of the presence of other individuals or not. This means that in regions with many affluent (/less wealthy) people the positive effect of wealth on life satisfaction may be less (/more) pronounced. Thus, from the viewpoint of the individuals who live in wealthy regions, the higher proportion of wealthy people in

their immediate surroundings may have characteristics of a public bad (/good) as it could cause negative (/positive) externalities. This rationale also applies to income.

Table 7: Life satisfaction and wealth in wealthy and less-wealthy regions - Coefficients from Fixed Effects Panel- Regressions[34]

	Baseline		
	Wealthy regions	**Non-wealthy regions**	**Interaction**
VARIABLES	(1)	(2)	(3)
ln(total assets)	0.003	0.147***	0.138***
	[0.059]	[0.043]	[0.043]
ln(total debt)	0.005	-0.036**	-0.035**
	[0.010]	[0.015]	[0.015]
ln(hh-income)	0.260*	0.450**	0.373**
	[0.143]	[0.175]	[0.168]
ln_total assets*wealthy	—	—	-0.112
			[0.070]
ln_total debt*wealthy	—	—	0.039**
			[0.018]
ln_hh-income*wealthy	—	—	-0.048
			[0.210]
Controls	yes	yes	yes
Constant	3.773	10.766***	9.632***
	[5.985]	[4.475]	[2.944]
Model test F statistic	711.890	2.886	2.997
MI model test p-value	<0.001	<0.001	<0.001
Observations	2,032	2,076	4,108
Number of individuals	1,016	1,038	2,054

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs.

6.5 Relative wealth

In the following Section we investigate the relationship between life satisfaction and the consumption opportunities of the respective reference group. We therefore consider how life satisfaction is, on average, predicted to change if the consumption opportunities of the respective reference group change. According to our research questions, we estimate in a first step the association between life satisfaction and reference consumption opportunities represented by reference income and reference wealth. In doing so, we also

[34] A table with coefficient estimates for all variables including control variables is included in the Appendix (Table A10).

consider whether the individual is above or below the reference consumption opportunities. Motivated by previous findings by FitzRoy *et al.* (2014) and Brown and Gray (2016) regarding different effects of relative income and relative wealth for different age groups, we then discuss the results of our regression analysis for two groups of people: those younger than 45 years of age and those 45 years or older. Further, we split our sample by reference to the East and West German regions to account for the systematic differences between the two parts of Germany discussed above. Finally, we discuss the results of running the regression separately for wealthy and non-wealthy areas in order to investigate whether the comparison effects also differ depending on regional wealth, building on our findings above.

As we are interested in exploring how the relevant reference group influences life satisfaction, we first successively included the reference income, reference total assets and reference total debt to our baseline regression according to equation (1). The respective results are shown in Table 8. This also enables us to observe potential changes regarding the relationship between life satisfaction and the absolute values of income, assets and debt.

Interestingly, the successive addition of reference income, reference total assets and reference total debt to the regression equation does not alter any of the results regarding the positive relationship between life satisfaction and the level of the household's own income and total assets, as well as the negative relationship between life satisfaction and total debt.[35]

Looking further at the coefficients of the reference measures, it appears that reference income was positively associated with life satisfaction. This indicates that the average life satisfaction is predicted to increase when the income of the reference group increased. This result is not in accordance with what the literature would suggest (Ferrer-i-Carbonell, 2005; Clark *et al.,* 2008).

When we added reference debt, as presented in column (4), the estimated coefficient for reference income decreased ($\kappa_1 = 0.020$). The effect became economically very small, however, a 10% increase in reference income is predicted to increase life satisfaction on average by only 0.002 scale points. This finding can be interpreted as the tunnel effect. This result also suggests that the neglect of reference assets and reference debt may lead to incorrect conclusions being drawn regarding the comparison effect of income.

[35] Please note that we cluster the standard errors for reference groups as the reference variables' effects is the main interest in this section. For the baseline estimations presented in 5.1 we clustered at the level of individuals. The significance levels reported here are thus different from the baseline estimates reported in 5.1.

In contrast and in accordance with our expectations, an increase in the level of reference total assets was on average accompanied by a decrease in individual life satisfaction. This negative correlation can also be interpreted as a deprivation effect. Regarding the observed association between life satisfaction and total debt, life satisfaction was positively related to the respective reference group's total debt. This positive correlation can also be interpreted as a deprivation effect.

Reference income, debt and wealth are not statistically significant.

This analysis only takes into account the level of wealth, debt and income of the reference group, but not the position of an individual relative to their reference group. We next take a closer look at how net income, total assets and total debt of the respective reference group were associated with life satisfaction, taking into account whether individuals were below or above the reference group's income, total assets and total debt.

Table 8: Life satisfaction and reference group median wealth, debt and net income - Coefficients from Fixed Effects Panel- Regressions[36]

	Baseline	+ ref income	+ ref assets	+ ref debt
VARIABLES	(1)	(2)	(3)	(4)
Total assets: ln(A)	0.101***	0.104***	0.103***	0.103***
	[0.032]	[0.032]	[0.031]	[0.031]
Total debt: ln(D)	-0.016	-0.017	-0.017	-0.017
	[0.012]	[0.011]	[0.011]	[0.011]
Net income: ln(Y)	0.346**	0.329***	0.328***	0.330***
	[0.130]	[0.109]	[0.109]	[0.110]
Reference income: ln(Y_r)	—	0.305	0.202	-0.000
		[0.224]	[0.257]	[0.293]
Reference assets: ln(A_r)	—	—	0.039	-0.031
			[0.069]	[0.096]
Reference debt: ln(D_r)	—	—	—	0.124
				[0.082]
Controls	yes	yes	yes	yes
Constant	9.509***	8.597***	8.552***	9.086***
	[2.961]	[2.359]	[2.792]	[2.771]
Model test F statistic	3.145	41.985	41.720	30.500
MI model test p-value	< 0.001	<0.001	<0.001	<0.001
Observations	4108	4108	4108	4108
Number of individuals	2,054	2,054	2,054	2,054

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. Reference income ln(Y_r), assets ln(A_r) and debt ln(D_r) refer to the median income, assets and debt of the previously defined reference group r of each household.

To investigate further the 'construction' of κ, we allowed for asymmetries in comparisons. Following the logic behind equation (5), we included both the relative position of the individual with respect to their reference group's income and wealth in the regression as well as the distance. In doing so, it also allowed us to distinguish between positive and negative differences between household's own wealth and reference wealth, and individual's own income and reference income, respectively.

[36] A table with coefficient estimates for all variables including control variables is included in the Appendix (Table A12).

It also allows us to investigate further whether the tunnel or the deprivation effect is at play for wealth and how important these effects are. The tunnel effect is at play when being below the median wealth of the respective reference group is positively correlated with life satisfaction, i.e. individuals are optimistic about their own prospects. In contrast, the deprivation effect dominates if individuals are more satisfied with their lives because their wealth is higher than their reference group's wealth.

According to the size of the point estimates in column (2) of Table 9, the comparison effect of income is not asymmetric as the coefficients are of similar size. With this finding of the upward comparison not dominating the downward comparison, we do not corroborate previous empirical evidence that points to upward comparisons being more relevant to people with respect to income (Duesenberry, 1949; Holländer, 2001; Ferrer-i-Carbonell, 2005; Vendrik and Woltjer, 2007). Here, the relative deprivation effect with one's own income being below and fear and worry of social decline with one's own income being above that of the respective reference group's income is at play.

Results regarding social comparisons with respect to total assets indicate that there is, in accordance with expectations, dominance of the upward comparison over the downward comparison when comparing the size of the estimated coefficients. In the case of the upward comparison life satisfaction is expected to increase the smaller the difference becomes between the total assets of one's own and those of the respective reference group. This is an indication for the relative deprivation effect being at play. If the household's total assets are above the level of the reference assets, life satisfaction is expected to slightly decrease the smaller the difference becomes between the total assets of one's own and those of the respective reference group with the point estimate being close to zero though.

Results regarding social comparisons with respect to total debt indicate that life satisfaction is expected to increase the larger the difference becomes between the total debt of one's own and those of the respective reference group. This is regardless of whether the household's total debt is above or below the level for the reference assets. Our results also indicate that there is dominance of the upward comparison and therefore the relative deprivation effect over the downward comparison when comparing the size of the estimated coefficients.

Table 9: Life satisfaction and reference group wealth measures - Coefficients from Fixed Effects Panel- Regressions[37]

VARIABLES	(1)	(2)
Total assets: ln(A)	0.103***	0.099
	[0.031]	[0.117]
Total debt: ln(D)	-0.017	0.121
	[0.011]	[0.083]
Net income: ln(Y)	0.330***	0.350
	[0.110]	[0.299]
Reference income: ln(Y_r)	-0.000	—
	[0.293]	
Reference assets: ln(A_r)	-0.031	—
	[0.096]	
Reference debt: ln(D_r)	0.124	—
	[0.082]	
$Diff_Y^-$: ln(Y/Y_r)	—	0.136
		[0.347]
$Diff_Y^+$: ln(Y/Y_r)	—	-0.156
		[0.267]
$Diff_A^-$: ln(A/A_r)	—	0.059
		[0.092]
$Diff_A^+$: ln(A/A_r)	—	-0.006
		[0.121]
$Diff_D^-$: ln(D/D_r)	—	-0.043
		[0.105]
$Diff_D^+$: ln(D/D_r)	—	-0.144*
		[0.084]
Controls	yes	yes
Constant	9.086***	8.119***
	[2.771]	[2.873]
Model test F statistic	30.500	45.785
MI model test p-value	<0.001	<0.001
Observations	4108	4,108
Number of individuals	2,054	2,054

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. Reference income ln(Y_r), assets ln(A_r) and debt ln(D_r) refer to the median income, assets and debt of the previously defined reference group r of each household. For the case of income and total assets, the negative difference *Diff*$^-$ represents an upward comparison with the own consumption opportunities being below that of the reference group. The positive difference *Diff*$^+$ represents a downward comparison with the own consumption opportunities being above that of the reference group. For the case of debt, the opposite applies.

[37] A table with coefficient estimates for all variables including control variables is included in the Appendix (Table A13).

Table 10: Separate fixed-effects panel regressions of individuals' life satisfaction on absolute wealth and relative wealth for Younger and Older people[38]

	Younger (aged < 45)		Older (aged ≥ 45)	
VARIABLES	(1)	(2)	(3)	(4)
Total assets: ln(A)	0.064	-0.213	0.084**	0.212
	[0.063]	[0.206]	[0.031]	[0.152]
Total debt: ln(D)	0.007	0.306**	0.352**	0.065
	[0.022]	[0.132]	[0.011]	[0.095]
Net income: ln(Y)	0.048	0.053	0.352**	0.486
	[0.299]	[0.799]	[0.128]	[0.395]
Reference income: ln(Y_r)	-0.142	—	0.098	—
	[1.075]		[0.347]	
Reference assets: ln(A_r)	-0.143	—	0.076	—
	[0.260]		[0.126]	
Reference debt: ln(D_r)	0.210*	—	0.076	—
	[0.115]		[0.098]	
$Diff_Y^-$: ln(Y/Y_r)	—	0.405	—	-0.039
		[1.152]		[0.399]
$Diff_Y^+$: ln(Y/Y_r)	—	-0.300	—	-0.222
		[0.858]	—	[0.318]
$Diff_A^-$: ln(A/A_r)	—	0.089		0.025
		[0.267]	—	[0.112]
$Diff_A^+$: ln(A/A_r)	—	0.296		-0.147
		[0.235]	—	[0.157]
$Diff_D^-$: ln(D/D_r)	—	-0.091		0.027
		[0.190]	—	[0.115]
$Diff_D^+$: ln(D/D_r)	—	-0.315**		-0.093
		[0.125]	—	[0.097]
Controls	yes	yes	yes	yes
Constant	12.177	13.394	-1.453	-1.593
	[9.397]	[9.014]	[12.604]	[11.647]
Model test F statistic	47.394	120.367	417.410	449,820
MI model test p-value	< 0.05	0.128	<0.001	<0.001
Observations	814	814	3,294	3,294
Number of individuals	407	407	1,647	1,647

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. Reference income ln(Y_r), assets ln(A_r) and debt ln(D_r) refer to the median income, assets and debt of the previously defined reference group r of each household. For the case of income and total assets, the negative difference *Diff*$^-$ represents an upward comparison with the own consumption opportunities being below that of the reference group. The positive difference *Diff*$^+$ represents a downward comparison with the own consumption opportunities being above that of the reference group. For the case of debt, the opposite applies.

[38] A table with coefficient estimates for all variables including control variables is included in the Appendix (Table A14).

The results presented above raise at least two questions: (1) who are the individuals whose own life satisfaction decreased due to the greater income and assets of others? And (2), are there individuals who used the higher level of income or total assets of others as information for their own potential level of income or total assets in the future? FitzRoy *et al.* (2014) have postulated that relative deprivation effect with respect to income dominates in later life, while the positive tunnel effect is more important early in life. We thus split the sample by age in a subsequent step and repeated the analysis, including relative income as well as relative wealth indicators for individuals younger than 45 years and individuals 45 years and older. The results for this split sample are shown in Table 10.

Interestingly, income, total assets and total debt did not seem to influence the life satisfaction of younger individuals, as is indicated by the size of the estimated coefficients shown in column (1). Household income appears to have been more important for life satisfaction among the older population, which is indicated by the larger point estimate which is further statistically significant; the same applies to both total assets and total debt.

Reference income and reference assets have the opposite effect on life satisfaction for younger and older individuals. Whereas higher incomes and assets are associated with, on average, lower levels of life satisfaction for the young, they slightly increase life satisfaction for the older individuals. With this finding we do not confirm FitzRoy *et al.* (2014) results with the tunnel effect being more important in early life.

Looking at the association between life satisfaction and reference debt, the results in columns (1) and (3) show that for both younger and older people the reference debt was positively associated with life satisfaction. This means that life satisfaction is predicted to increase on average with an increase in reference group's debt. Looking at the size of the estimated coefficients, this association was even stronger for the younger population.

Since the upward comparisons dominated with respect to relative income in the younger sample, the negative effect of the reference income can be interpreted as a relative deprivation effect. With this analysis, we did not observe similar results to FitzRoy *et al.* (2014) for relative income, as we found that the relative deprivation effect plays a role in both younger and later life. Furthermore, our results do not suggest there is a tunnel effect with respect to income. In the sample containing older individuals, downward comparisons seem to be more pronounced. As the coefficient appears to be negative, we interpret this as fear and worries of social decline because an increase in reference income is associated with lower levels in life satisfaction.

In terms of total assets, downward comparisons dominated in both the younger and the older sample. In the case of the younger sample, the positive coefficient of the downward comparison is associated relative gratification whereas in the older sample the negative coefficient is associated with fear and worries of social decline.

Now we come to the relationship between life satisfaction and total reference debt. In both population groups, the upward comparison dominated, i.e. towards those with a lower level of total debt. Thus, the feeling of relative deprivation also dominated among both population groups since the point estimate appears to be negative.

For regional cuts of the data we have no clear expectations. We nonetheless explore the effect of wealth on subjective well-being by again separating our sample into regions in two different ways: firstly, geographically by separating it into the East and West German regions, and secondly, in a separate analysis we split the sample according to the wealth of different municipalities, similar to the analysis for absolute wealth, for which the results are shown in Table 7.

When splitting our sample into East and West Germany (Table 11), we considered a definition of reference groups based on education level and age within East and West Germany, respectively. In doing so, we observed a positive relationship between reference income and life satisfaction in both East and West Germany. Since downward comparisons dominated in both regions, a comparison with the incomes of the respective reference group was, on average, associated with the feeling of fear and worry of social decline. For total assets, we observe a negative association between life satisfaction and reference group's total assets for both East and West Germany with the coefficient for East Germany being zero though. Downward comparisons with regard to total assets dominate too, which correspond to the feeling of fear and worries of social decline in West Germany and the feeling of relative gratification in East Germany. Looking now at the signs of the coefficients of reference debt, these were determined to be positively linked to life satisfaction. This means that if the total debt of the comparison group increases, the average life satisfaction is also predicted to increase, everything else remaining constant. In both population groups, upward comparisons dominated, i.e. with those who have less debt and are therefore better off; this downward comparison triggered a feeling of relative deprivation.

Table 11: Separate fixed-effects panel regressions of individuals' life satisfaction on absolute wealth and relative wealth for West and East Germany [39]

	West Germany		East Germany	
VARIABLES	(1)	(2)	(3)	(4)
Total assets: ln(A)	0.111***	0.180	0.072	-0.088
	[0.037]	[0.134]	[0.059]	[0.247]
Total debt: ln(D)	-0.011	0.054	-0.044*	0.199
	[0.012]	[0.110]	[0.022]	[0.129]
Net income: ln(Y)	0.255**	0.321	0.676*	0.957*
	[0.116]	[0.450]	[0.363]	[0.497]
Reference income: ln(Y_r)	0.097	—	0.148	—
	[0.429]		[0.620]	
Reference assets: ln(A_r)	-0.000	—	-0.083	—
	[0.100]		[0.241]	
Reference debt: ln(D_r)	0.048	—	0.261*	—
	[0.107]		[0.137]	
$Diff_Y^-$: ln(Y/Y_r)	—	0.046	—	0.175
		[0.495]		[0.655]
$Diff_Y^+$: ln(Y/Y_r)	—	-0.190	—	-0.671
		[0.380]	—	[0.682]
$Diff_A^-$: ln(A/A_r)	—	0.072		-0.072
		[0.079]	—	[0.259]
$Diff_A^+$: ln(A/A_r)	—	-0.093		0.179
		[0.142]	—	[0.251]
$Diff_D^-$: ln(D/D_r)	—	0.052		-0.151
		[0.130]	—	[0.172]
$Diff_D^+$: ln(D/D_r)	—	-0.072		-0.250*
		[0.108]	—	[0.138]
Controls	yes	yes	yes	yes
Constant	12.177	13.394	-1.453	-1.593
	[9.397]	[9.014]	[12.604]	[11.647]
Model test F statistic	123.624	114.429	1150.371	585.523
MI model test p-value	<0.001	<0.001	<0.001	<0.001
Observations	3,349	3,349	759	759
Number of individuals	1,679	1,679	384	384

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. Reference income ln(Y_r), assets ln(A_r) and debt ln(D_r) refer to the median income, assets and debt of the previously defined reference group r of each household. For the case of income and total assets, the negative difference $Diff^-$ represents an upward comparison with the own consumption opportunities being below that of the reference group. The positive difference $Diff^+$ represents a downward comparison with the own consumption opportunities being above that of the reference group. For the case of debt, the opposite applies.

[39] A table with coefficient estimates for all variables including control variables is included in the Appendix (Table A14).

Finally, the results of the sample split by regional wealth are presented in Table 12. We again used a classification for wealthy regions that was based on the stratification scheme used to oversample wealthy households in the PHF survey. With this classification we tried to separate regions by wealth. Using the sampling information to assign households to wealthy and non-wealthy regions[40] we found the following: if one compares the relative income effect between wealthy and non-wealthy regions, the reference income appears to be positively linked to life satisfaction in wealthy regions whereas the association is negative in non-wealthy regions. In wealthy regions, downward comparisons tended to dominate, which corresponds to the feeling of fear and worries of social decline with the coefficient being negative. In less affluent regions it is the other way around, upward comparisons dominated and with them also the effect of relative deprivation since the coefficient is positive.

Interestingly, the coefficients of reference total assets have the opposite sign indicating a different association with life satisfaction. In wealthy areas, others' higher level of total assets negatively correlated with individual's life satisfaction. The opposite was true for people living in non-wealthy areas. Regarding asymmetric effects of the comparison, the results again suggest that upward and downward comparisons are asymmetric, whereby upward comparisons dominated. This allows the negative effect of the reference assets to be interpreted as more of a relative deprivation effect in wealthy regions. In non-wealthy regions, however, the tunnel effect tended to be more pronounced. This means that people in less affluent regions looked optimistically to the future with regard to their own total assets.

The association between life satisfaction and reference total debt is the same in the two regions: increases to total debt of the reference group were associated with rising life satisfaction. Since here the upward comparisons dominated slightly (i.e. comparisons with those who have less debt and are therefore better off), a feeling of relative deprivation arose.

[40] Although the label 'other regions' would be more precise, we chose the label 'non-wealthy regions' for the sake of simplicity.

Table 12: Separate fixed-effects panel regressions of individuals' life satisfaction on absolute wealth and relative wealth for people in wealthy and non-wealthy areas[41]

	Wealthy regions		Non-wealthy regions	
VARIABLES	(1)	(2)	(3)	(4)
Total assets: ln(A)	0.007	-0.101	0.149***	0.179
	[0.044]	[0.138]	[0.036]	[0.199]
Total debt: ln(D)	0.004	0.138	-0.039**	0.144
	[0.009]	[0.152]	[0.017]	[0.124]
Net income: ln(Y)	0.226**	0.294	0.444**	0.419
	[0.103]	[0.614]	[0.191]	[0.482]
Reference income: ln(Y_r)	0.083	—	-0.082	—
	[0.641]		[0.499]	
Reference assets: ln(A_r)	-0.212	—	0.048	—
	[0.145]		[0.169]	
Reference debt: ln(D_r)	0.132	—	0.161	—
	[0.155]		[0.123]	
$Diff_Y^-$: ln(Y/Y_r)	—	-0.038	—	0.371
		[0.655]		[0.574]
$Diff_Y^+$: ln(Y/Y_r)	—	-0.118	—	-0.190
		[0.630]	—	[0.463]
$Diff_A^-$: ln(A/A_r)	—	0.283*		-0.069
		[0.165]	—	[0.162]
$Diff_A^+$: ln(A/A_r)	—	0.066		-0.031
		[0.133]	—	[0.200]
$Diff_D^-$: ln(D/D_r)	—	-0.120		-0.030
		[0.168]	—	[0.163]
$Diff_D^+$: ln(D/D_r)	—	-0.138		-0.190
		[0.151]	—	[0.126]
Controls	yes	yes	yes	yes
Constant	2.743	1.903	11.355**	10.447**
	[8.390]	[8.277]	[4.233]	[4.439]
Model test F statistic	416.054	391.007	45.582	62.281
MI model test p-value	<0.001	<0.001	<0.001	<0.001
Observations	2,032	2,032	2,076	2,076
Number of individuals	1,016	1,016	1,038	1,038

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. Reference income ln(Y_r), assets ln(A_r) and debt ln(D_r) refer to the median income, assets and debt of the previously defined reference group r of each household. For the case of income and total assets, the negative difference *Diff*$^-$ represents an upward comparison with the own consumption opportunities being below that of the reference group. The positive difference *Diff*$^+$ represents a downward comparison with the own consumption opportunities being above that of the reference group. For the case of debt, the opposite applies.

[41] A table with coefficient estimates for all variables including control variables is included in the Appendix (Table A145).

7 Conclusion

The link between subjective well-being and various wealth components has mostly been neglected in the existing literature, not least because of a lack of suitable data on individuals' and households' wealth. Moreover, the literature did not reveal the relative importance of wealth to subjective well-being compared to income. We therefore investigated the role of wealth for subjective well-being in Germany using panel micro-data from the German Wealth Survey (Panel on Household Finances -PHF) for 2010 and 2014. The PHF survey is a unique dataset, since it is dedicated to measuring wealth at a very detailed level, it contains a self-reported measure of subjective well-being and has a substantial panel component. We employed a regression analysis considering wealth and its different components such as real assets, financial assets, mortgage and non-mortgage debt. Additionally, we used life satisfaction as an indicator for subjective well-being which was answered by respondents to the survey using an 11-point scale for the question: 'In general, how satisfied are you currently with your life as a whole?'.

The encouraging outcome from our research is that the association between life satisfaction and income changed only minimally when we took wealth into account. Our results indicate that wealth is still important for life satisfaction; if it was not taken into account, an important explanatory factor for life satisfaction might be neglected. However, our analysis does not allow conclusions to be drawn about the relative importance of income and wealth. The characteristics of income and wealth seem to be too different to compare. Not least because income is a flow and wealth a stock. In addition, statements about the importance of income in relation to wealth depend significantly on the assumptions that have to be made to compare these two measures.

Our analysis also shows that the associations between life satisfaction and individual asset components differ. We suppose that it is due to the fact that the different components of total assets have differing characteristics, such as varying degrees of liquidity. In addition, real assets are more visible to others than financial assets, which in turn could affect the evaluation of life satisfaction through status effects. Characteristics of various debt components differ too. Our results point to the different effects of various debt components for the satisfaction with life.

Moreover, our results suggest that wealth levels can have differing effects for different groups of households. We show, for example, that the relevance of income and wealth differ slightly between the East and West German populations. Apart from the fact that the average levels of income and wealth are different between these two regions, the variation in socialisation may be another reason the patterns observed in these regions

vary too. Distinguishing between people living in wealthy regions and those living in less wealthy regions, we find that the relationship between life satisfaction, income and wealth is mainly driven by people living in less prosperous regions; this means that in less wealthy regions an individual derives more happiness out of their total assets compared to individuals who live in wealthy regions.

In this paper we go beyond an analysis of wealth and income levels and also look at wealth and income relative to a reference group. Some results of the analysis concerning relative income do not corroborate findings of previous studies whereby the income of others was negatively related to life satisfaction. However, this does not mean that the tunnel effect is present. As our results revealed an asymmetrical effect of comparisons made by an individual to those wealthier and those that are worse off with the downward comparison dominating, the positive association between life satisfaction and reference income can be interpreted rather as fear and worries of social decline. This held for people older than 45, both East and West Germans as well as people living in affluent regions.

In contrast, the negative correlation that we found between life satisfaction and median total assets of the respective reference group can be understood as the relative deprivation effect. The finding of the dominance of the relative deprivation effect in the case of total assets means that negative externalities emanate as a result of those whose total assets increase – life satisfaction is predicted to decrease, on average, for those whose total assets do not change as a result of being in a worse position in the wealth distribution. This held for the whole population under investigation and, in particular, for people living affluent regions too. There is no evidence for the tunnel effect being present with an exception in less affluent regions. Hence, the population living in those regions looked into the future with confidence as they tend to compare themselves with people better-off and the higher total assets of others were not, on average, negatively linked to the evaluation of life satisfaction.

Future research is needed to fully understand the mechanisms behind a change in different wealth components, in order to fully understand the relationship between wealth and subjective well-being. In particular, it would be interesting to see how, in Bentham's (1789/2000, p. 31) words, intensity and duration of pleasure and pain look when someone consumes or acquires a good that is financed, for example, by non-mortgage debt. Questions that would be worth exploring in this context refer to the psychological burden of consumer debt relative to the benefits of consuming the debt-financed goods orreasons when the possession of real assets is associated with lower life satisfaction.

Finally, this paper contributes to a better understanding of social comparisons not only with regard to income but also in relation to wealth.

8 References

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9 APPENDIX

Table A1: Descriptive statistics for wealth variables included in the analysis

	2010			
	Participation Rate	Conditional Mean	Conditional Median	Conditional sd
Total gross wealth	100.0%	432,003	227,000	923,634
Total net wealth	100.0%	382,787	184,000	888,129
Total real assets	90.5%	359,150	202,000	805,480
Total financial assets	99.6%	101,247	37,000	306,659
Total outstanding balance of mortgage debt	30.4%	128,673	88,000	164,889
Total outstanding balance of non-mortgage debt	31.9%	12,430	4,000	33,178

	2014			
	Participation Rate	Conditional Mean	Conditional Median	Conditional sd
Total gross wealth	100.0%	475,533	256,888	841,092
Total net wealth	100.0%	434,306	213,150	826,801
Total real assets	90.7%	402,880	220,400	684,916
Total financial assets	99.8%	114,310	39,200	351,505
Total outstanding balance of mortgage debt	29.2%	143,289	90,000	226,249
Total outstanding balance of non-mortgage debt	29.0%	11,876	4,500	35,590

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, panel households only.

Table A2: Total assets quintiles in 2010 and 2014 – transitions, (row percentages)

2014 \ 2010	< 20	20-39	40-59	60-79	80-100	*Total*
< 20	63	27	8	1	1	100
20-39	17	50	25	5	3	100
40-59	5	16	49	22	8	100
60-79	2	2	14	52	30	100
80-100	0	0	2	10	88	100
Total	10	12	15	20	43	100

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, weighted, panel households only.

Table A3: Total debt quintiles in 2010 and 2014 – transitions, (row percentages)

2014 \ 2010	< 20	20-39	40-59	60-79	80-100	*Total*
< 20	39	24	21	9	6	100
20-39	26	22	35	10	7	100
40-59	12	28	36	15	9	100
60-79	3	6	25	50	16	100
80-100	1	1	4	17	77	100
Total	10	12	21	23	34	100

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, weighted, panel households only.

Table A4: Descriptive statistics for life satisfaction and control variables included in the analysis

	2010		2014		
	mean	sd	mean	sd	z-score
Life Satisfaction	7.323	1.940	7.333	1.887	-0.004
Household net income in euro	38,479	38,466	40,594	48,758	-0.034
Age in years	54.935	15.234	58.261	15.187	-0.155
Gender (female=1)	0.425	0.494	0.425	0.494	0.000
Family Status					
Single	0.152	0.359	0.135	0.342	0.034
Divorced, widowed, separate	0.198	0.399	0.186	0.389	0.021
Married	0.650	0.477	0.678	0.467	-0.043
German national	0.922	0.269	0.921	0.270	0.003
Living in East Germany	0.186	0.389	0.184	0.387	0.004
Household size	2.277	1.065	0.720	0.475	1.335
Number of children below 16	0.306	0.718	0.299	0.717	0.007
Education					
Low education (ISCED 1,2)	0.068	0.251	0.065	0.247	0.007
Medium-low education (ISCED 3)	0.428	0.495	0.406	0.491	0.032
Medium-high education (ISCED 4)	0.069	0.253	0.074	0.261	-0.014
High education (ISCED 5, 6)	0.436	0.496	0.455	0.498	-0.028
Employment Status					
Worker	0.068	0.251	0.054	0.227	0.039
Employee	0.314	0.464	0.308	0.462	0.010
Civil servant	0.059	0.236	0.049	0.216	0.032
Self-employed	0.085	0.278	0.076	0.266	0.022
Student/vocational training	0.004	0.066	0.003	0.050	0.022
Unemployed	0.046	0.209	0.034	0.181	0.042
Not in the labour force	0.424	0.494	0.476	0.499	-0.073

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, panel households only.

Table A5: Construction of Variables

Variable	Scale	Measure
Income variables		
Net annual household income	logarithm	"What do you estimate the monthly net disposable income is in your household, that is, the amount of money which is available to the entire household after the deduction of taxes and social security contributions to cover the expenditure?"
Wealth variables		
Total Assets	logarithm	Total value of total real assets and total financial assets (sum).
Total Real Assets	logarithm	Total value of properties (household main residence, other properties), net self-employment businesses wealth, vehicles and valuables at time of interview.
Total Financial Assets	logarithm	Total value of current accounts, savings account, stocks, bonds and other securities, pension contracts, managed accounts, non-self-employed business wealth at the time of interview.
Total Debt	logarithm	Total value of total outstanding balance of mortgage debt and total outstanding balance of non-mortgage debt (sum).
Total outstanding balance of mortgage debt	logarithm	Total outstanding balance on mortgages on household main residence or other properties at the time of interview.
Total outstanding balance of non-mortgage debt	logarithm	Total outstanding balance on mortgages, consumer loans, private loans, loans from an employer, student loans, overdue bills and other unsecured loans at the time of interview.
Has real assets	dummy	Household owns household main residence, other properties, self-employment business, vehicles or valuables at time of interview.
Has financial assets	dummy	Household owns current accounts, savings account, stocks, bonds and other securities, pension contracts, managed accounts or non-self-employed business at the time of interview.
Has mortgage debt	dummy	Household has outstanding balance on mortgages on household main residence or other properties at the time of interview.
Has non mortgage debt	dummy	Household has outstanding balance on mortgages, consumer loans, private loans, loans from an employer, student loans, overdue bills and other unsecured loans at the time of interview.
Socio-demographics		
Respondent's age	continuous	Respondent's age at time of interview in years, also included squared and cubed
Female	dummy	One, if person is female, zero otherwise
Marital status	dummy variables	Marital status at time of interview. Categories from which dummies are generated: 0 "single (reference category)", 1 "divorced, widowed, separated", 2 "married"

German national	dummy	One, if person is a German national at time of interview, zero otherwise
East Germany	dummy	One, if person resides in East Germany (including Berlin) at time of interview, zero otherwise
Education	dummy variables	ISCED classification of education categories, low education (ISCED 0,1,2 -reference category), medium-low education (ISCED 3), medium-high education (ISCED 4), high education (ISCED 5,6)
Employment Status	dummy variables	Categories from which dummies are generated: 0 “worker”, 1 „employee“, 2 „civil servant, 3 „self-employed“, 4 “student/vocational training”, 5 ”unemployed”, 6 “not in the labour force, e.g. retired, homemaker,…”
Household size (log)	Log	number of household members
Number of children below 16	continuous	number of household members age 16 or less
Classification of Regions		
Wealthy sampling region	dummy	One if household resided in a wealthy small municipality or wealthy street section at the time of drawing the sample.
Non-wealthy sampling region	dummy	One if household DID NOT reside in a wealthy small municipality or wealthy street section at the time of drawing the sample.

Table A6: Descriptive Staticstics for comparison group life satisfaction, income, total assets and total debt

				life satisfaction		annual net income			total assets			total debt		
age group	education group	region	n	mean	sd	median	mean	sd	median	mean	sd	median	mean	sd
< 35 years	low	West	32	5.88	2.14	16,200	20,985	17,055	3,580	47,433	107,757	65	6,773	18,794
		East	12	6.17	2.44	11,700	13,770	6,267	485	2,162	3,469	1,580	4,490	6,313
	medium	West	182	7.27	1.60	24,000	26,130	15,569	19,115	120,843	252,344	500	17,683	50,223
		East	53	6.75	1.94	22,800	23,269	10,558	13,000	42,943	76,677	1,500	17,972	39,799
	high	West	98	7.65	1.71	33,600	37,615	20,319	64,950	189,746	278,774	1,050	51,228	102,423
		East	16	7.13	1.02	32,400	29,250	9,718	35,350	65,681	74,347	6,250	26,534	47,996
35 to 44 years	low	West	24	5.79	2.40	26,400	25,480	9,595	42,475	73,386	86,798	9,550	30,899	47,762
		East	4	6.25	3.77	22,200	22,800	5,628	46,000	51,538	27,829	100	1,050	1,969
	medium	West	221	7.47	1.79	36,000	37,388	18,790	175,900	335,683	1,120,216	6,000	61,054	89,206
		East	59	6.78	2.46	28,800	28,609	11,545	70,750	105,946	135,232	6,860	43,191	80,001
	high	West	199	7.74	1.64	49,200	54,872	29,980	325,400	407,757	396,307	53,000	110,460	144,356
		East	37	7.43	1.66	40,800	39,120	15,230	129,450	358,009	984,528	5,000	67,292	106,484
45 to 54 years	low	West	38	6.16	2.49	28,800	28,607	17,079	121,650	145,846	157,162	1,750	33,907	56,379
		East	5	6.00	2.92	20,400	21,744	15,746	3,500	186,450	412,195	2,200	6,996	9,099
	medium	West	370	7.02	1.99	34,800	38,796	26,169	227,950	391,752	731,847	2,000	52,349	99,302
		East	81	5.57	2.22	27,600	27,791	14,919	53,400	100,890	129,147	7,500	31,557	50,911
	high	West	316	7.67	1.58	49,800	60,008	74,530	391,501	643,249	993,162	34,450	104,391	242,842
		East	45	7.07	1.90	33,600	45,293	32,574	251,900	347,223	302,812	16,100	66,133	112,876
55 to 64 years	low	West	39	6.56	1.82	24,000	32,751	46,125	113,600	281,120	601,427	4,000	27,833	48,617
		East	4	6.25	0.96	22,200	22,050	11,607	3,120	46,373	88,454	1,000	2,500	3,786
	medium	West	348	7.05	2.03	30,000	33,477	20,628	230,800	468,327	1,168,929	600	33,653	95,095
		East	97	5.94	2.31	19,200	23,785	15,659	40,100	143,035	271,898	250	22,990	80,224
	high	West	341	7.66	1.63	44,400	56,411	99,261	505,000	813,544	1,270,639	620	65,476	163,904
		East	68	7.01	2.06	34,800	38,349	23,990	246,550	357,836	409,217	50	46,760	102,417
>= 65 years	low	West	100	7.22	2.03	16,200	22,888	29,247	83,175	174,395	267,852	0	4,596	17,615
		East	16	6.06	3.11	13,200	13,845	3,775	5,000	102,614	256,820	0	963	3,014
	medium	West	501	7.60	1.82	27,600	32,962	28,689	301,500	446,943	599,841	0	13,592	47,298
		East	94	6.76	2.04	19,200	22,845	12,534	42,000	165,281	322,958	0	1,267	8,252
	high	West	542	8.01	1.59	40,800	47,026	36,360	468,800	791,561	1,145,554	0	36,260	164,157
		East	166	7.28	1.67	30,000	33,753	18,932	209,300	434,421	1,063,632	0	15,293	56,268

Source: PHF 2010/11, PHF 2014 - SUF Files, panel households only.

Table A7: Panel regressions of individuals' life satisfaction on net household income and net wealth

	Fixed-Effects OLS Regression		Pooled OLS Regression		Pooled Ordered Probit Regression	
	(1)	(2)	(3)	(4)	(5)	(6)
ln(hh-income)	0.346***		0.583***		0.354***	
	[0.113]		[0.064]		[0.038]	
ln (total assets)	0.101***		0.159***		0.086***	
	[0.036]		[0.018]		[0.009]	
ln (total debt)	-0.016*		-0.025***		-0.014***	
	[0.009]		[0.006]		[0.003]	
Net annual household income						
2nd quintile		-0.033		0.442***		0.116
		[0.200]		[0.159]		[0.079]
3rd quintile		0.214		0.820***		0.236***
		[0.221]		[0.152]		[0.079]
4th quintile		0.353		0.996***		0.378***
		[0.221]		[0.150]		[0.083]
5th quintile		0.464*		1.221***		0.597***
		[0.237]		[0.151]		[0.087]
Household total assets						
2nd quintile		0.209		-0.212		0.224***
		[0.218]		[0.136]		[0.082]
3rd quintile		0.330		-0.123		0.425***
		[0.244]		[0.097]		[0.081]
4th quintile		0.626**		-0.188**		0.545***
		[0.276]		[0.091]		[0.081]
5th quintile		0.768***		-0.313***		0.684***
		[0.291]		[0.082]		[0.082]
Household total debt						
2nd quintile		-0.236		0.268*		-0.092
		[0.150]		[0.148]		[0.074]
3rd quintile		0.047		0.527***		-0.083
		[0.125]		[0.144]		[0.056]
4th quintile		-0.080		0.756***		-0.107*
		[0.131]		[0.148]		[0.056]
5th quintile		-0.193		1.087***		-0.195***
		[0.146]		[0.152]		[0.051]
Respondents age	-0.273	-0.258	-0.214***	-0.213***	-0.100***	-0.097***
	[0.168]	[0.167]	[0.057]	[0.058]	[0.034]	[0.035]
Respondents age, squared	0.004	0.004	0.003***	0.003***	0.001**	0.001**
	[0.003]	[0.003]	[0.001]	[0.001]	[0.001]	[0.001]
Respondents age, cubed	-0.000	-0.000	-0.000**	-0.000**	-0.000*	-0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

Female			0.006	0.017	0.032	0.040
			[0.060]	[0.060]	[0.036]	[0.036]
Marital status: divorced,widowed, separated	-0.177	-0.161	-0.023	-0.038	-0.027	-0.035
	[0.405]	[0.398]	[0.125]	[0.124]	[0.069]	[0.069]
Marital status: married	0.265	0.284	0.213*	0.200*	0.131**	0.128*
	[0.344]	[0.339]	[0.115]	[0.115]	[0.065]	[0.065]
German national	-0.059	-0.010	0.127	0.107	0.068	0.054
	[0.830]	[0.833]	[0.115]	[0.115]	[0.066]	[0.066]
East Germany	-3.068***	-3.194***	-0.394***	-0.385***	-0.248***	-0.239***
	[0.810]	[0.856]	[0.076]	[0.078]	[0.043]	[0.044]
EDU: ISCED 3	-0.157	-0.161	0.052	0.104	0.020	0.059
	[0.273]	[0.269]	[0.142]	[0.144]	[0.079]	[0.079]
EDU: ISCED 4	-0.442	-0.414	0.150	0.192	0.046	0.078
	[0.311]	[0.308]	[0.169]	[0.171]	[0.095]	[0.095]
EDU: ISCED 5-6	-0.307	-0.323	0.204	0.260*	0.107	0.148*
	[0.299]	[0.295]	[0.148]	[0.149]	[0.083]	[0.083]
Employment stat.						
Employee	0.267	0.289	0.327**	0.319**	0.149*	0.143*
	[0.220]	[0.221]	[0.140]	[0.142]	[0.078]	[0.079]
civil servant	0.242	0.275	0.234	0.170	0.129	0.089
	[0.338]	[0.346]	[0.177]	[0.180]	[0.102]	[0.102]
self-employed	0.427	0.438	0.165	0.241	0.089	0.124
	[0.338]	[0.337]	[0.163]	[0.166]	[0.092]	[0.094]
Vocational training, student	0.849	0.891	-0.124	-0.063	-0.063	-0.057
	[0.596]	[0.605]	[0.576]	[0.581]	[0.321]	[0.322]
Unemployed	-0.113	-0.146	-0.613***	-0.764***	-0.223*	-0.337***
	[0.294]	[0.296]	[0.226]	[0.228]	[0.114]	[0.115]
not in the labour force	0.453*	0.457*	0.312**	0.277*	0.198**	0.170**
	[0.237]	[0.238]	[0.152]	[0.155]	[0.085]	[0.086]
Household size (log)	0.065	0.096	-0.325***	-0.341***	-0.208***	-0.208***
	[0.205]	[0.204]	[0.102]	[0.104]	[0.060]	[0.061]
Number of children below 16	-0.178**	-0.196**	0.134**	0.136**	0.070**	0.070**
	[0.090]	[0.090]	[0.055]	[0.056]	[0.033]	[0.033]
2014 Survey (dummy)	0.102	0.101	-0.073	-0.039	-0.049	-0.029
	[0.094]	[0.093]	[0.054]	[0.055]	[0.032]	[0.033]
Constant	9.509***	12.942***	3.445***	9.678***		
	[2.961]	[2.900]	[1.055]	[0.961]		
Observations	4,108	4,108	4,108	4,108	4,108	4,108
Number of individuals	2,054	2,054	2,054	2,054	2,054	2,054
F-Statistic	2.98	2.73	18.33	15.53	20.16	15.43

Source/Notes: Robust standard errors in brackets, multiple imputation (5 implicates) taken into account;
*** p<0.01, ** p<0.05, * p<0.1

Table A8: Life satisfaction and equalized income/ wealth - Coefficients from Fixed Effects Panel- Regressions

	Equivalence scale						
	Per capita income/ wealth	"Oxford" scale ("Old OECD scale")	"OECD - modified" scale	Square root scale	Schwarze	Household Income/ wealth	Estimated for income (+wealth)[1]
Equalized income only							
Elasticity e	*1*	*0.73*	*0.53*	*0.50*	*0.35*	*0*	*-0.19*[1]
ln(total assets)	0.113***	0.110***	0.108***	0.107***	0.106***	0.102***	0.101***
ln(total debt)	-0.015*	-0.015*	-0.015*	-0.015*	-0.015*	-0.016*	-0.016*
ln(eqinc)	0.268**	0.311***	0.336***	0.339***	0.351***	0.355***	0.346***
ln(hhsize)							0.065
Equalized income and assets							
Elasticity e	*1*	*0.73*	*0.53*	*0.50*	*0.35*	*0*	*-0.15*[2]
ln(eqassets)	0.115**	0.118**	0.119**	0.119**	0.119**	0.102***	0.101***
ln(total debt)	-0.014	-0.014	-0.015	-0.015	-0.015	-0.016*	-0.016*
ln(eqinc)	0.263**	0.321***	0.354***	0.358***	0.374***	0.355***	0.346***
ln(hhsize)							0.065
Observations	4,108	4,108	4,108	4,108	4,108	4,108	4,108
Number of individuals	2,054	2,054	2,054	2,054	2,054	2,054	2,054

Source/Notes: Robust standard errors in brackets, multiple imputation (5 implicates) taken into account; *** p<0.01, ** p<0.05, * p<0.1

Table A9: Life satisfaction and net wealth components - Coefficients from Fixed Effects Panel- Regressions

	Indic: real/fin	Values: real/fin
VARIABLES	(1)	(2)
Has real assets	-0.100	—
	[0.218]	
Has financial assets	0.681***	—
	[0.242]	
Has mortgage debt	0.017	—
	[0.096]	
Has non mortgage debt	-0.258***	—
	[0.085]	
ln(real assets)	—	0.012
		[0.021]
ln(fin. assets)	—	0.071***
		[0.025]
ln(mortgage debt)	—	0.001
		[0.009]
ln(non-mortgage debt)	—	-0.031***
		[0.010]
ln(hh-income)	0.383***	0.341***
	[0.114]	[0.114]
Age	-0.257	-0.264
	[0.168]	[0.168]
Age, squared	0.004	0.004
	[0.003]	[0.003]
Age, cubed	-0.000	-0.000
	[0.000]	[0.000]
Marital status = 2, Divorced, widowed, separated	-0.164	-0.185
	[0.406]	[0.403]
Marital status = 3, Married	0.268	0.286
	[0.344]	[0.343]
German national [0/1]	-0.052	-0.075
	[0.815]	[0.837]
East [0/1]	-3.219***	-3.143***
	[0.800]	[0.772]
Education [ISCED] = 3	-0.159	-0.145
	[0.276]	[0.277]
Education [ISCED] = 4	-0.427	-0.430
	[0.314]	[0.315]
Education [ISCED] = 5	-0.303	-0.297
	[0.300]	[0.303]
Employment status = 2, Employee	0.278	0.277
	[0.218]	[0.219]

Employment status = 3, Civil servant	0.268	0.240
	[0.339]	[0.336]
Employment status = 4, Self-employed	0.473	0.445
	[0.332]	[0.337]
Employment status = 5, Vocational training, student	0.821	0.876
	[0.597]	[0.597]
Employment status = 6, Unemployed	-0.110	-0.101
	[0.295]	[0.292]
Employment status = 7, Not in the labour force	0.504**	0.494**
	[0.238]	[0.237]
ln(hh-size)	0.157	0.078
	[0.201]	[0.205]
No. of kids (<16)	-0.182**	-0.171*
	[0.091]	[0.091]
Wave = 2	0.114	0.106
	[0.095]	[0.094]
Constant	9.281***	9.758***
	[2.941]	[2.948]
Model test F statistic	3.150	3.256
MI model test p-value	<0.001	<0.001
Observations	4,108	4,108
Number of individuals	2,054	2,054

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs.

Table A10: Life satisfaction and wealth in wealthy and less-wealthy regions - Coefficients from Fixed Effects Panel- Regressions

	Baseline		
	Wealthy regions	**Non-wealthy regions**	**Interaction**
VARIABLES	(1)	(2)	(3)
ln(total assets)	0.003	0.147***	0.138***
	[0.059]	[0.043]	[0.043]
ln(total debt)	0.005	-0.036**	-0.035**
	[0.010]	[0.015]	[0.015]
ln(hh-income)	0.260*	0.450**	0.373**
	[0.143]	[0.175]	[0.168]
ln_total assets*wealthy	—	—	-0.112
			[0.070]
ln_total debt*wealthy	—	—	0.039**
			[0.018]
ln_ hh-income*wealthy	—	—	-0.048
			[0.210]
wealthy			
Respondents age	-0.002	-0.432*	-0.269
	[0.246]	[0.258]	[0.168]
Respondents age, squared	0.001	0.007	0.004
	[0.004]	[0.005]	[0.003]
Respondents age, cubed	-0.000	-0.000	-0.000
	[0.000]	[0.000]	[0.000]
Female			
Marital status: divorced, widowed, separated	0.072	-0.422	-0.161
	[0.487]	[0.717]	[0.410]
Marital status: married	0.087	0.512	0.279
	[0.400]	[0.561]	[0.348]
German national	-0.295	0.686	-0.032
	[0.477]	[1.866]	[0.796]
East Germany	-1.030***	-3.349***	-3.075***
	[0.209]	[0.885]	[0.800]
EDU: ISCED 3	0.043	-0.273	-0.144
	[0.457]	[0.342]	[0.273]
EDU: ISCED 4	-0.377	-0.404	-0.438
	[0.487]	[0.425]	[0.311]
EDU: ISCED 5-6	-0.209	-0.332	-0.304
	[0.472]	[0.402]	[0.298]
Employment stat. Employee	0.344	0.255	0.265

	[0.378]	[0.268]	[0.220]
civil servant	0.467	0.020	0.219
	[0.473]	[0.489]	[0.336]
self-employed	0.578	0.318	0.419
	[0.464]	[0.505]	[0.341]
Vocational training, student	1.357	0.550	0.808
	[0.992]	[0.725]	[0.603]
Unemployed	-0.067	-0.095	-0.116
	[0.504]	[0.349]	[0.293]
not in the labour force	0.613	0.325	0.441*
	[0.402]	[0.290]	[0.236]
Household size (log)	0.380	-0.244	0.079
	[0.283]	[0.302]	[0.207]
Number of children below 16	-0.231*	-0.095	-0.180**
	[0.120]	[0.133]	[0.090]
2014 Survey (dummy)	-0.015	0.064	0.106
	[0.254]	[0.125]	[0.095]
Constant	3.773	10.766**	9.632***
	[5.985]	[4.475]	[2.944]
Model test F statistic	711.890	2.886	2.997
MI model test p-value	<0.001	<0.001	<0.001
Observations	2,032	2,076	4,108
Number of individuals	1,016	1,038	2,054

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs.

Table A11: Life satisfaction and wealth, total debt and net income in East and West Germany - Coefficients from Fixed Effects Panel- Regressions

	Baseline		
	Germany	**West**	**East**
VARIABLES	(1)	(2)	(3)
ln(total assets)	0.101***	0.109**	0.066
	[0.036]	[0.043]	[0.059]
ln(total debt)	-0.016*	-0.010	-0.045**
	[0.009]	[0.010]	[0.022]
ln(hh-income)	0.346***	0.270**	0.641**
	[0.113]	[0.124]	[0.311]
Respondents age	-0.273	-0.270	-0.500
	[0.168]	[0.180]	[0.475]
Respondents age, squared	0.004	0.004	0.008
	[0.003]	[0.003]	[0.009]
Respondents age, cubed	-0.000	-0.000	-0.000
	[0.000]	[0.000]	[0.000]
Female			
Marital status: divorced, widowed, separated	-0.177	0.047	-1.016*
	[0.405]	[0.481]	[0.588]
Marital status: married	0.265	0.379	0.016
	[0.344]	[0.426]	[0.459]
German national	-0.059	0.056	-0.981***
	[0.830]	[0.935]	[0.191]
East Germany	-3.068***		
	[0.810]		
EDU: ISCED 3	-0.157	-0.069	-0.622
	[0.273]	[0.292]	[0.742]
EDU: ISCED 4	-0.442	-0.497	-0.084
	[0.311]	[0.336]	[0.820]
EDU: ISCED 5-6	-0.307	-0.297	-0.333
	[0.299]	[0.319]	[0.819]
Employment stat.			
Employee	0.267	0.307	0.174
	[0.220]	[0.232]	[0.537]
civil servant	0.242	0.314	0.032
	[0.338]	[0.374]	[0.688]
self-employed	0.427	0.369	0.780
	[0.338]	[0.336]	[0.997]
Vocational training, student	0.849	0.846	-1.612
	[0.596]	[0.639]	[1.117]
Unemployed	-0.113	-0.075	0.084
	[0.294]	[0.350]	[0.592]

not in the labour force	0.453*	0.427*	0.663
	[0.237]	[0.245]	[0.628]
Household size (log)	0.065	-0.042	0.662
	[0.205]	[0.225]	[0.499]
Number of children below 16	-0.178**	-0.205**	-0.026
	[0.090]	[0.096]	[0.269]
2014 Survey (dummy)	0.102	0.116	0.174
	[0.094]	[0.113]	[0.193]
Constant	9.509***	9.640***	11.549
	[2.961]	[3.285]	[7.381]
Model test F statistic	3.145	1.889	$4.7*10^5$
MI model test p-value	<0.001	<0.001	<0.001
Observations	4,108	3,349	759
Number of individuals	2,054	1,679	384

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs.

Table A12: Life satisfaction and reference group median wealth, debt and net income - Coefficients from Fixed Effects Panel- Regressions

	Baseline	**+ ref income**	**+ ref assets**	**+ ref debts**
VARIABLES	(1)	(2)	(3)	(4)
ln(total assets)	0.101***	0.101***	0.101***	0.102***
	[0.032]	[0.032]	[0.033]	[0.033]
ln(total debt)	-0.016	-0.016	-0.016	-0.016
	[0.012]	[0.012]	[0.012]	[0.012]
ln(hh-income)	0.346**	0.344**	0.344**	0.348**
	[0.130]	[0.130]	[0.130]	[0.132]
RG median: ln(hh-income)	—	0.094	0.101	0.020
		[0.177]	[0.242]	[0.252]
RG median: ln(tot.assets)	—	—	-0.003	-0.039
			[0.059]	[0.060]
RG median: ln(tot.debt)	—	—	—	0.073
				[0.051]
Respondents age	-0.273**	-0.275**	-0.275**	-0.281**
	[0.132]	[0.132]	[0.132]	[0.130]
Respondents age, squared	0.004*	0.004*	0.004*	0.004*
	[0.002]	[0.002]	[0.002]	[0.002]
Respondents age, cubed	-0.000	-0.000	-0.000*	-0.000*
	[0.000]	[0.000]	[0.000]	[0.000]
Female				
Marital status: divorced, widowed, separated	-0.177	-0.175	-0.175	-0.170
	[0.306]	[0.307]	[0.308]	[0.308]
Marital status: married	0.265	0.265	0.265	0.275
	[0.323]	[0.322]	[0.322]	[0.324]
German national	-0.059	-0.056	-0.056	-0.059
	[0.659]	[0.660]	[0.660]	[0.663]
East Germany	-3.068***	-3.055***	-3.056***	-3.005***
	[0.616]	[0.622]	[0.631]	[0.662]
EDU: ISCED 3	-0.157	-0.181	-0.178	-0.109
	[0.155]	[0.162]	[0.154]	[0.145]
EDU: ISCED 4	-0.442**	-0.464**	-0.461***	-0.408**
	[0.160]	[0.166]	[0.164]	[0.162]
EDU: ISCED 5-6	-0.307**	-0.363*	-0.360*	-0.321*
	[0.140]	[0.177]	[0.177]	[0.180]
Employment stat. Employee	0.267	0.270	0.271	0.261

	[0.184]	[0.183]	[0.182]	[0.182]
civil servant	0.242	0.241	0.242	0.231
	[0.278]	[0.277]	[0.276]	[0.277]
self-employed	0.427	0.431	0.430	0.425
	[0.286]	[0.283]	[0.284]	[0.282]
Vocational training, student	0.849	0.855	0.856	0.855
	[0.610]	[0.613]	[0.611]	[0.609]
Unemployed	-0.113	-0.111	-0.110	-0.118
	[0.212]	[0.211]	[0.210]	[0.209]
not in the labour force	0.453**	0.461**	0.461**	0.460**
	[0.174]	[0.171]	[0.168]	[0.169]
Household size (log)	0.065	0.063	0.063	0.060
	[0.160]	[0.161]	[0.161]	[0.161]
Number of children below 16	-0.178***	-0.179***	-0.179***	-0.176***
	[0.062]	[0.062]	[0.062]	[0.062]
2014 Survey (dummy)	0.102*	0.102*	0.102*	0.091*
	[0.050]	[0.051]	[0.051]	[0.048]
Constant	9.509***	8.597***	8.552***	9.086***
	[2.961]	[2.359]	[2.792]	[2.771]
Model test F statistic	3.145	41.985	41.720	30.500
MI model test p-value	< 0.001	<0.001	<0.001	<0.001
Observations	4108	4108	4108	4108
Number of individuals	2,054	2,054	2,054	2,054

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. Reference income, assets and debts refer to the median income, assets and debts of the previously defined reference groups of each household. RG: reference group.

Table A13: Life satisfaction and reference group wealth measures - Coefficients from Fixed Effects Panel- Regressions

VARIABLES	(1)	(2)	(3)
ln(total assets)	0102***	0.096**	0.126*
	[0.032]	[0.031]	[0.068]
ln(total debt)	-0.016	-0.022*	0.070
	[0.011]	[0.011]	[0.055]
ln(hh-income)	0.348**	0.340**	0.337**
	[0.132]	[0.130]	[0.129]
RG median: ln(hh-income)	0.020	0.116	0.012
	[0.252]	[0.188]	[0.232]
RG median: ln(tot.assets)	-0.039	—	—
	[0.060]		
ln (total assets) > RG median ln (total assets) – [0/1]	—	0.046	—
		[0.132]	
Pos diff btw. ln(total assets) and RG median ln(total assets)	—	—	0.106
			[0.072]
Neg diff btw. ln(total assets) and RG median ln(total assets)	—	—	0.048
			[0.068]
Reference group: median - ln(tot.debt)	0.073	—	—
	[0.051]		
ln (total debt) > RG median ln (total debt) – [0/1]	—	0.111	—
		[0.086]	
Pos diff btw. ln(total debt) and RG median ln(total debt)	—	—	-0.065
			[0.061]
Neg diff btw. ln(total debt) and RG median ln(total debt)	—	—	0.089
			[0.053]
Respondents age	-0.281**	-0.282**	-0.275**
	[0.130]	[0.133]	[0.126]
Respondents age, squared	0.004*	0.004*	0.004*
	[0.002]	[0.002]	[0.002]
Respondents age, cubed	-0.000*	-0.000*	-0.000*
	[0.000]	[0.000]	[0.000]
Female			
Marital status: divorced, widowed, separated	-0.170	-0.177	-0.172
	[0.308]	[0.308]	[0.304]

Marital status: married	0.275	0.263	0.250
	[0.324]	[0.321]	[0.314]
German national	-0.059	-0.068	-0.058
	[0.663]	[0.660]	[0.652]
East Germany	-3.005***	-3.057***	-2.961***
	[0.662]	[0.622]	[0.673]
EDU: ISCED 3	-0.109	-0.169	-0.090
	[0.145]	[0.159]	[0.140]
EDU: ISCED 4	-0.408**	-0.451**	-0.395**
	[0.162]	[0.164]	[0.156]
EDU: ISCED 5-6	-0.321*	-0.334*	-0.323*
	[0.180]	[0.179]	[0.171]
Employment stat.			
Employee	0.261	0.269	0.273
	[0.182]	[0.185]	[0.180]
civil servant	0.231	0.255	0.263
	[0.277]	[0.277]	[0.266]
self-employed	0.425	0.423	0.414
	[0.282]	[0.284]	[0.291]
Vocational training, student	0.855	0.868	0.847
	[0.609]	[0.613]	[0.607]
Unemployed	-0.118	-0.108	-0.112
	[0.209]	[0.211]	[0.213]
not in the labour force	0.460**	0.462**	0.475***
	[0.169]	[0.172]	[0.169]
Household size (log)	0.060	0.069	0.043
	[0.161]	[0.167]	[0.165]
Number of children below 16	-0.176***	-0.181***	-0.185***
	[0.062]	[0.062]	[0.064]
2014 Survey (dummy)	0.091*	0.103*	0.069
	[0.048]	[0.052]	[0.045]
Constant	9.086***	8.569***	8.119***
	[2.771]	[2.423]	[2.873]
Model test F statistic	30.500	45.785	45.785
MI model test p-value	< 0.001	<0.001	<0.001
Observations	4,108	4,108	4,108
Number of individuals	2,054	2,054	2,054

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. RG: reference group.

Table A14: Separate fixed-effects panel regressions of individuals' life satisfaction on absolute wealth and relative wealth for Younger and Older people

a) Young

	Younger (aged < 45)		
VARIABLES	(1)	(2)	(3)
ln(total assets)	0.058	0.077	0.115
	[0.061]	[0.053]	[0.106]
ln(total debt)	0.008	-0.013	0.119
	[0.021]	[0.023]	[0.095]
ln(hh-income)	0.047	0.094	0.039
	[0.300]	[0.295]	[0.305]
RG median: ln(hh-income)	-0.479	-0.294	-0.458
	[0.573]	[0.442]	[0.544]
RG median: ln(tot.assets)	0.098		
	[0.103]		
ln (total assets) > RG median ln (total assets) – [0/1]		-0.469**	
		[0.198]	
Pos diff btw. ln(total assets) and RG median ln(total assets)			-0.097
			[0.157]
Neg diff btw. ln(total assets) and RG median ln(total assets)			0.061
			[0.102]
Reference group: median - ln(tot.debt)	0.066		
	[0.080]		
ln (total debt) > RG median ln (total debt) – [0/1]		0.462*	
		[0.226]	
Pos diff btw. ln(total debt) and RG median ln(total debt)			0.023
			[0.141]
Neg diff btw. ln(total debt) and RG median ln(total debt)			0.123
			[0.087]
Respondents age	0.057	-0.124	0.155
	[0.567]	[0.540]	[0.612]
Respondents age, squared	-0.009	-0.004	-0.012
	[0.016]	[0.015]	[0.018]
Respondents age, cubed	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]
Female			

Marital status: divorced, widowed, separated	0.529	0.605	0.535
	[0.874]	[0.888]	[0.866]
Marital status: married	0.372	0.405	0.371
	[0.318]	[0.323]	[0.303]
German national	0.552	0.616	0.646
	[1.120]	[1.092]	[1.112]
East Germany	-1.992	-2.074*	-1.944
	[1.181]	[1.006]	[1.185]
EDU: ISCED 3	-0.223*	-0.267*	-0.231
	[0.123]	[0.131]	[0.136]
EDU: ISCED 4	-0.905***	-0.924***	-0.923***
	[0.258]	[0.223]	[0.261]
EDU: ISCED 5-6	-0.594**	-0.531**	-0.611**
	[0.213]	[0.206]	[0.222]
Employment stat.			
Employee	0.265	0.269	0.279
	[0.307]	[0.309]	[0.300]
civil servant	0.213	0.225	0.256
	[0.400]	[0.444]	[0.405]
self-employed	0.402	0.511	0.358
	[1.013]	[1.030]	[1.016]
Vocational training, student	0.897	0.797	0.880
	[0.977]	[1.059]	[0.962]
Unemployed	-0.613	-0.541	-0.606
	[0.358]	[0.355]	[0.358]
not in the labour force	0.239	0.275	0.249
	[0.387]	[0.384]	[0.367]
Household size (log)	0.586*	0.630**	0.613*
	[0.288]	[0.266]	[0.302]
Number of children below 16	-0.277*	-0.303**	-0.285*
	[0.144]	[0.130]	[0.143]
2014 Survey (dummy)	0.189	0.221	0.182
	[0.397]	[0.421]	[0.387]
Constant	12.177	13.394	10.881
	[9.397]	[9.014]	[9.706]
Model test F statistic	47.394	120.367	27.957
MI model test p-value	< 0.05	0.128	0.172
Observations	814	814	814
Number of individuals	407	407	407

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. RG: reference group.

b) Old

	Older (aged ≥ 45)		
VARIABLES	(4)	(5)	(6)
ln(total assets)	0.084**	0.066*	0.093
	[0.034]	[0.030]	[0.108]
ln(total debt)	-0.021*	-0.025*	0.006
	[0.012]	[0.012]	[0.078]
ln(hh-income)	0.369**	0.366**	0.361**
	[0.165]	[0.161]	[0.155]
RG median: ln(hh-income)	0.414*	0.293	0.423*
	[0.201]	[0.166]	[0.200]
RG median: ln(tot.assets)	-0.106		
	[0.091]		
ln (total assets) > RG median ln (total assets) – [0/1]		0.214	
		[0.170]	
Pos diff btw. ln(total assets) and RG median ln(total assets)			0.204*
			[0.106]
Neg diff btw. ln(total assets) and RG median ln(total assets)			0.045
			[0.110]
Reference group: median - ln(tot.debt)	0.010		
	[0.078]		
ln (total debt) > RG median ln (total debt) – [0/1]		0.060	
		[0.086]	
Pos diff btw. ln(total debt) and RG median ln(total debt)			0.008
			[0.089]
Neg diff btw. ln(total debt) and RG median ln(total debt)			0.032
			[0.082]
Respondents age	0.191	0.223	0.183
	[0.588]	[0.553]	[0.592]
Respondents age, squared	-0.003	-0.004	-0.003
	[0.009]	[0.009]	[0.009]
Respondents age, cubed	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]
Female			
Marital status: divorced, widowed, separated	-0.988**	-0.953**	-0.955**
	[0.414]	[0.404]	[0.409]
Marital status: married	-0.219	-0.190	-0.219

	[0.614]	[0.616]	[0.619]
German national	-0.917***	-0.998***	-1.017***
	[0.155]	[0.216]	[0.186]
East Germany	-3.634***	-3.611***	-3.567***
	[0.503]	[0.481]	[0.513]
EDU: ISCED 3	-0.106	-0.204	-0.097
	[0.156]	[0.181]	[0.154]
EDU: ISCED 4	-0.308*	-0.390**	-0.307*
	[0.166]	[0.160]	[0.163]
EDU: ISCED 5-6	-0.233	-0.303*	-0.264
	[0.160]	[0.150]	[0.158]
Employment stat.			
Employee	-0.061	-0.085	-0.046
	[0.304]	[0.318]	[0.298]
civil servant	-0.150	-0.158	-0.095
	[0.336]	[0.349]	[0.313]
self-employed	0.267	0.242	0.248
	[0.268]	[0.276]	[0.277]
Vocational training, student	0.843	0.852*	0.787
	[0.481]	[0.465]	[0.519]
Unemployed	-0.296*	-0.306*	-0.301*
	[0.158]	[0.151]	[0.153]
not in the labour force	0.221	0.194	0.239
	[0.225]	[0.240]	[0.228]
Household size (log)	-0.277	-0.291	-0.295
	[0.186]	[0.187]	[0.187]
Number of children below 16	-0.161	-0.159	-0.161
	[0.110]	[0.110]	[0.111]
2014 Survey (dummy)	0.026	0.044	0.029
	[0.190]	[0.188]	[0.181]
Constant	-1.453	-1.593	-1.593
	[12.604]	[11.647]	[11.647]
Model test F statistic	417.410	449.820	255.933
MI model test p-value	<0.001	<0.001	0.970
Observations	3,294	3,294	3,294
Number of individuals	1,647	1,647	1,647

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. RG: reference group.

Table A15: Separate fixed-effects panel regressions of individuals' life satisfaction on absolute wealth and relative wealth for people in wealthy and non-wealthy areas

a) Wealthy

	Wealthy areas		
VARIABLES	(1)	(2)	(3)
ln(total assets)	0.007	0.005	-0.103
	[0.045]	[0.041]	[0.124]
ln(total debt)	0.004	0.017*	0.101
	[0.008]	[0.008]	[0.130]
ln(hh-income)	0.273**	0.265**	0.260**
	[0.118]	[0.116]	[0.119]
RG median: ln(hh-income)	0.193	-0.160	0.141
	[0.605]	[0.489]	[0.623]
RG median: ln(tot.assets)	-0.219*		
	[0.126]		
ln (total assets) > RG median ln (total assets) – [0/1]		0.022	
		[0.161]	
Pos diff btw. ln(total assets) and RG median ln(total assets)			0.286*
			[0.142]
Neg diff btw. ln(total assets) and RG median ln(total assets)			-0.057
			[0.131]
Reference group: median - ln(tot.debt)	0.093		
	[0.124]		
ln (total debt) > RG median ln (total debt) – [0/1]		-0.204*	
		[0.099]	
Pos diff btw. ln(total debt) and RG median ln(total debt)			-0.126
			[0.130]
Neg diff btw. ln(total debt) and RG median ln(total debt)			0.096
			[0.130]
Respondents age	0.001	0.009	0.014
	[0.207]	[0.194]	[0.202]
Respondents age, squared	0.001	0.000	0.000
	[0.004]	[0.003]	[0.004]
Respondents age, cubed	-0.000	-0.000	-0.000
	[0.000]	[0.000]	[0.000]
Female			

Marital status: divorced, widowed, separated	0.529	0.605	0.535
	[0.874]	[0.888]	[0.866]
Marital status: married	0.038	0.068	0.038
	[0.390]	[0.418]	[0.368]
German national	0.085	0.089	0.059
	[0.365]	[0.372]	[0.357]
East Germany	-0.324	-0.281	-0.306
	[0.343]	[0.305]	[0.331]
EDU: ISCED 3	-1.095***	-1.019***	-0.973***
	[0.301]	[0.180]	[0.306]
EDU: ISCED 4	0.343	0.076	0.347
	[0.370]	[0.288]	[0.385]
EDU: ISCED 5-6	-0.111	-0.344	-0.106
	[0.364]	[0.285]	[0.374]
Employment stat.			
Employee	0.335**	0.338**	0.301**
	[0.129]	[0.130]	[0.125]
civil servant	0.486	0.447	0.496
	[0.418]	[0.415]	[0.402]
self-employed	0.588***	0.575***	0.530**
	[0.184]	[0.198]	[0.187]
Vocational training, student	1.387	1.348	1.375
	[0.962]	[0.972]	[0.952]
Unemployed	-0.099	-0.080	-0.106
	[0.290]	[0.304]	[0.301]
not in the labour force	0.625***	0.594***	0.607***
	[0.186]	[0.192]	[0.186]
Household size (log)	0.369	0.370	0.346
	[0.276]	[0.278]	[0.273]
Number of children below 16	-0.236**	-0.221**	-0.233**
	[0.086]	[0.092]	[0.090]
2014 Survey (dummy)	-0.021	-0.005	-0.033
	[0.230]	[0.227]	[0.208]
Constant	12.177	13.394	10.881
	[9.397]	[9.014]	[9.706]
Model test F statistic	416.054	14151.468	391.007
MI model test p-value	<0.001	<0.001	<0.001
Observations	2,032	2,032	2,032
Number of individuals	1,016	1,016	1,016

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. RG: reference group.

b) Non-wealthy

	Non-wealthy areas		
VARIABLES	(4)	(5)	(6)
ln(total assets)	0.148***	0.137***	0.292*
	[0.039]	[0.035]	[0.142]
ln(total debt)	-0.037*	-0.052**	0.034
	[0.018]	[0.019]	[0.076]
ln(hh-income)	0.449*	0.434**	0.437*
	[0.218]	[0.210]	[0.217]
RG median: ln(hh-income)	-0.180	0.202	-0.173
	[0.442]	[0.429]	[0.418]
RG median: ln(tot.assets)	0.093		
	[0.122]		
ln (total assets) > RG median ln (total assets) – [0/1]		0.080	
		[0.180]	
Pos diff btw. ln(total assets) and RG median ln(total assets)			-0.029
			[0.141]
Neg diff btw. ln(total assets) and RG median ln(total assets)			0.159
			[0.141]
Reference group: median - ln(tot.debt)	0.054		
	[0.075]		
ln (total debt) > RG median ln (total debt) – [0/1]		0.331**	
		[0.137]	
Pos diff btw. ln(total debt) and RG median ln(total debt)			-0.016
			[0.083]
Neg diff btw. ln(total debt) and RG median ln(total debt)			0.076
			[0.080]
Respondents age	-0.426*	-0.457*	-0.424*
	[0.238]	[0.245]	[0.236]
Respondents age, squared	0.006	0.007	0.006
	[0.005]	[0.005]	[0.005]
Respondents age, cubed	-0.000	-0.000	-0.000
	[0.000]	[0.000]	[0.000]
Female			
Wealthy			
Marital status: divorced, widowed, separated	-0.395	-0.445	-0.411

	[0.538]	[0.541]	[0.540]
Marital status: married	0.530	0.502	0.492
	[0.481]	[0.489]	[0.469]
German national	0.696	0.655	0.655
	[1.786]	[1.767]	[1.804]
East Germany	-3.227***	-3.309***	-3.187***
	[0.591]	[0.557]	[0.604]
EDU: ISCED 3	-0.414	-0.278	-0.396
	[0.244]	[0.213]	[0.244]
EDU: ISCED 4	-0.567*	-0.404	-0.557*
	[0.310]	[0.288]	[0.312]
EDU: ISCED 5-6	-0.547	-0.343	-0.561
	[0.352]	[0.335]	[0.345]
Employment stat.			
Employee	0.237	0.258	0.260
	[0.227]	[0.235]	[0.222]
civil servant	-0.004	0.059	0.028
	[0.283]	[0.287]	[0.282]
self-employed	0.329	0.311	0.325
	[0.437]	[0.457]	[0.442]
Vocational training, student	0.534	0.587	0.523
	[0.678]	[0.691]	[0.682]
Unemployed	-0.120	-0.075	-0.112
	[0.277]	[0.284]	[0.278]
not in the labour force	0.313	0.351	0.333
	[0.245]	[0.246]	[0.244]
Household size (log)	-0.264	-0.217	-0.271
	[0.246]	[0.249]	[0.244]
Number of children below 16	-0.093	-0.101	-0.109
	[0.084]	[0.085]	[0.083]
2014 Survey (dummy)	0.064	0.068	0.040
	[0.062]	[0.069]	[0.068]
Constant	-1.453	-1.593	-1.593
	[12.604]	[11.647]	[11.647]
Model test F statistic	45.582	36.622	62.281
MI model test p-value	<0.001	<0.001	<0.001
Observations	2,076	2,076	2,076
Number of individuals	1,038	1,038	1,038

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. RG: reference group.

Table A16: Separate fixed-effects panel regressions of individuals' life satisfaction on absolute wealth and relative wealth for West and East Germany

a) West Germany

	West Germany		
VARIABLES	(1)	(2)	(3)
ln(total assets)	0.058	0.077	0.115
	[0.061]	[0.053]	[0.106]
ln(total debt)	0.008	-0.013	0.119
	[0.021]	[0.023]	[0.095]
ln(hh-income)	0.047	0.094	0.039
	[0.300]	[0.295]	[0.305]
RG median: ln(hh-income)	-0.479	-0.294	-0.458
	[0.573]	[0.442]	[0.544]
RG median: ln(tot.assets)	0.098		
	[0.103]		
ln (total assets) > RG median ln (total assets) – [0/1]		-0.469**	
		[0.198]	
Pos diff btw. ln(total assets) and RG median ln(total assets)			-0.097
			[0.157]
Neg diff btw. ln(total assets) and RG median ln(total assets)			0.061
			[0.102]
Reference group: median - ln(tot.debt)	0.066		
	[0.080]		
ln (total debt) > RG median ln (total debt) – [0/1]		0.462*	
		[0.226]	
Pos diff btw. ln(total debt) and RG median ln(total debt)			0.023
			[0.141]
Neg diff btw. ln(total debt) and RG median ln(total debt)			0.123
			[0.087]
Respondents age	-0.268*	-0.278*	-0.252*
	[0.144]	[0.135]	[0.138]
Respondents age, squared	0.004	0.004	0.004
	[0.003]	[0.002]	[0.002]
Respondents age, cubed	-0.000	-0.000	-0.000
	[0.000]	[0.000]	[0.000]
Female			

Marital status: divorced, widowed, separated	0.050	0.045	0.037
	[0.367]	[0.366]	[0.353]
Marital status: married	0.373	0.365	0.328
	[0.417]	[0.410]	[0.400]
German national	0.063	0.064	0.076
	[0.769]	[0.761]	[0.746]
East Germany			
EDU: ISCED 3	-0.133	-0.128	-0.082
	[0.119]	[0.126]	[0.106]
EDU: ISCED 4	-0.554***	-0.548***	-0.498***
	[0.147]	[0.142]	[0.138]
EDU: ISCED 5-6	-0.465**	-0.434**	-0.420**
	[0.160]	[0.154]	[0.140]
Employment stat.			
Employee	0.312*	0.308*	0.316*
	[0.153]	[0.151]	[0.155]
civil servant	0.301	0.311	0.323
	[0.279]	[0.279]	[0.270]
self-employed	0.371	0.362	0.352
	[0.290]	[0.286]	[0.297]
Vocational training, student	0.852	0.883	0.846
	[0.729]	[0.723]	[0.727]
Unemployed	-0.068	-0.075	-0.065
	[0.257]	[0.255]	[0.266]
not in the labour force	0.447**	0.442**	0.466**
	[0.149]	[0.147]	[0.154]
Household size (log)	-0.050	-0.053	-0.074
	[0.168]	[0.176]	[0.172]
Number of children below 16	-0.206***	-0.206***	-0.218***
	[0.060]	[0.060]	[0.066]
2014 Survey (dummy)	0.116*	0.117*	0.072
	[0.057]	[0.058]	[0.053]
Constant	12.177	13.394	10.881
	[9.397]	[9.014]	[9.706]
Model test F statistic	123.624	206.294	114.429
MI model test p-value	<0.001	<0.001	<0.001
Observations	3,349	3,349	3,349
Number of individuals	1,679	1,679	1,679

Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. RG: reference group.

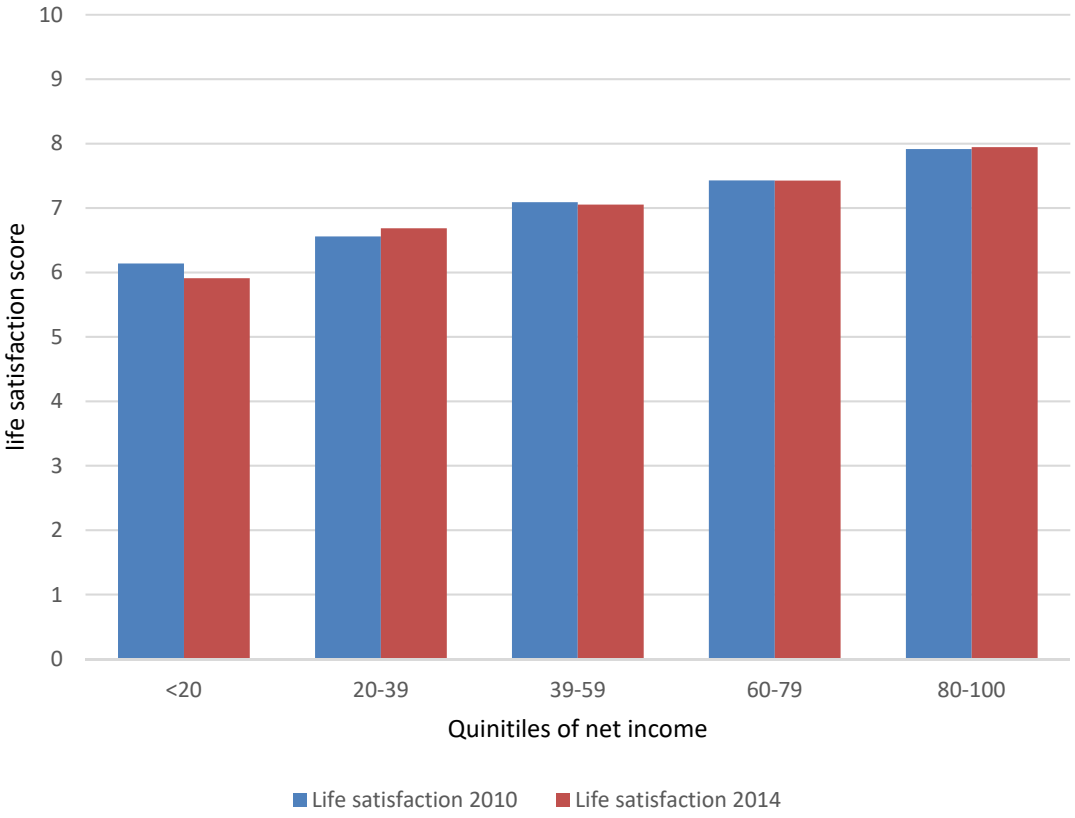
b) East Germany

	East Germany		
VARIABLES	(4)	(5)	(6)
ln(total assets)	0.084**	0.066*	0.093
	[0.034]	[0.030]	[0.108]
ln(total debt)	-0.021*	-0.025*	0.006
	[0.012]	[0.012]	[0.078]
ln(hh-income)	0.369**	0.366**	0.361**
	[0.165]	[0.161]	[0.155]
RG median: ln(hh-income)	0.414*	0.293	0.423*
	[0.201]	[0.166]	[0.200]
RG median: ln(tot.assets)	-0.106		
	[0.091]		
ln (total assets) > RG median ln (total assets) – [0/1]		0.214	
		[0.170]	
Pos diff btw. ln(total assets) and RG median ln(total assets)			0.204*
			[0.106]
Neg diff btw. ln(total assets) and RG median ln(total assets)			0.045
			[0.110]
Reference group: median - ln(tot.debt)	0.010		
	[0.078]		
ln (total debt) > RG median ln (total debt) – [0/1]		0.060	
		[0.086]	
Pos diff btw. ln(total debt) and RG median ln(total debt)			0.008
			[0.089]
Neg diff btw. ln(total debt) and RG median ln(total debt)			0.032
			[0.082]
Respondents age	-0.312	-0.372	-0.297
	[0.249]	[0.243]	[0.235]
Respondents age, squared	0.004	0.005	0.003
	[0.005]	[0.005]	[0.005]
Respondents age, cubed	-0.000	-0.000	-0.000
	[0.000]	[0.000]	[0.000]
Female			
Marital status: divorced, widowed, separated	-1.028**	-1.044**	-1.047**
	[0.396]	[0.429]	[0.382]
Marital status: married	-0.045	-0.059	-0.059

	[0.250]	[0.252]	[0.266]
German national	-1.046***	-0.747***	-0.997***
	[0.068]	[0.225]	[0.097]
East Germany			
EDU: ISCED 3	-0.330	-0.533	-0.297
	[0.586]	[0.614]	[0.560]
EDU: ISCED 4	0.096	-0.031	0.167
	[0.655]	[0.606]	[0.601]
EDU: ISCED 5-6	0.326	0.008	0.413
	[0.677]	[0.669]	[0.622]
Employment stat.			
Employee	0.079	0.172	0.048
	[0.503]	[0.533]	[0.472]
civil servant	-0.217	-0.033	-0.298
	[0.610]	[0.628]	[0.537]
self-employed	0.667	0.737	0.667
	[0.938]	[0.942]	[0.905]
Vocational training, student	-2.497***	-1.605*	-2.427***
	[0.722]	[0.882]	[0.748]
Unemployed	-0.017	0.062	-0.041
	[0.499]	[0.494]	[0.489]
not in the labour force	0.552	0.606	0.529
	[0.622]	[0.604]	[0.599]
Household size (log)	0.663	0.741	0.677
	[0.429]	[0.452]	[0.448]
Number of children below 16	0.021	0.011	0.030
	[0.303]	[0.314]	[0.299]
2014 Survey (dummy)	0.100	0.123	0.098
	[0.101]	[0.090]	[0.100]
Constant	-1.453	-1.593	-1.593
	[12.604]	[11.647]	[11.647]
Model test F statistic	1150.371	$2.4*10^5$	585.523
MI model test p-value	<0.001	<0.001	<0.001
Observations	759	759	759
Number of individuals	384	384	384

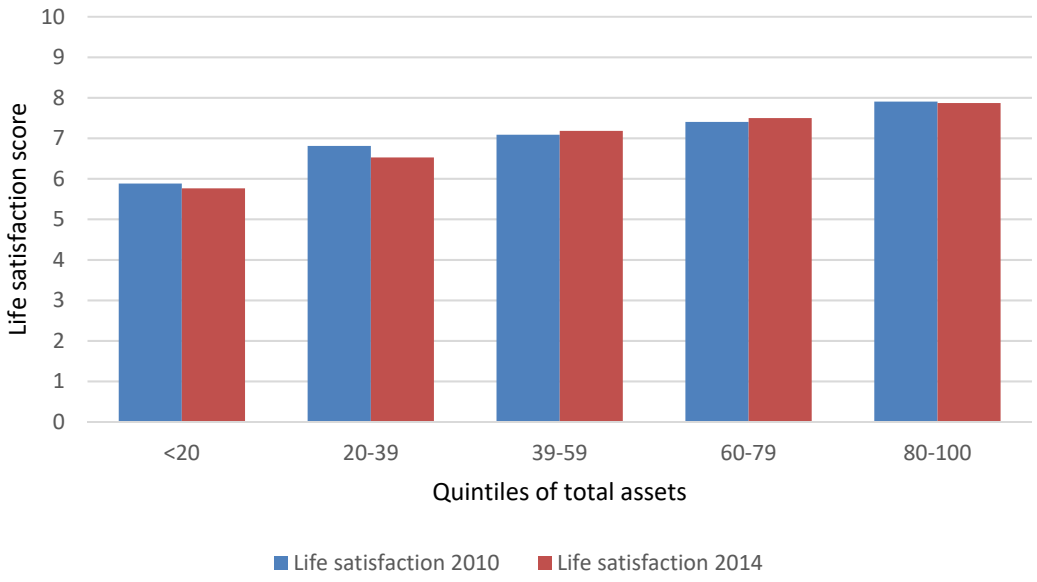
Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only, * 90%, ** 95, *** 99% significance level. Multiple imputation taken into account in the calculation of SEs. Standard errors clustered at reference group level. RG: reference group.

Figure A1: Life satisfaction measure by income quintiles 2010 and 2014



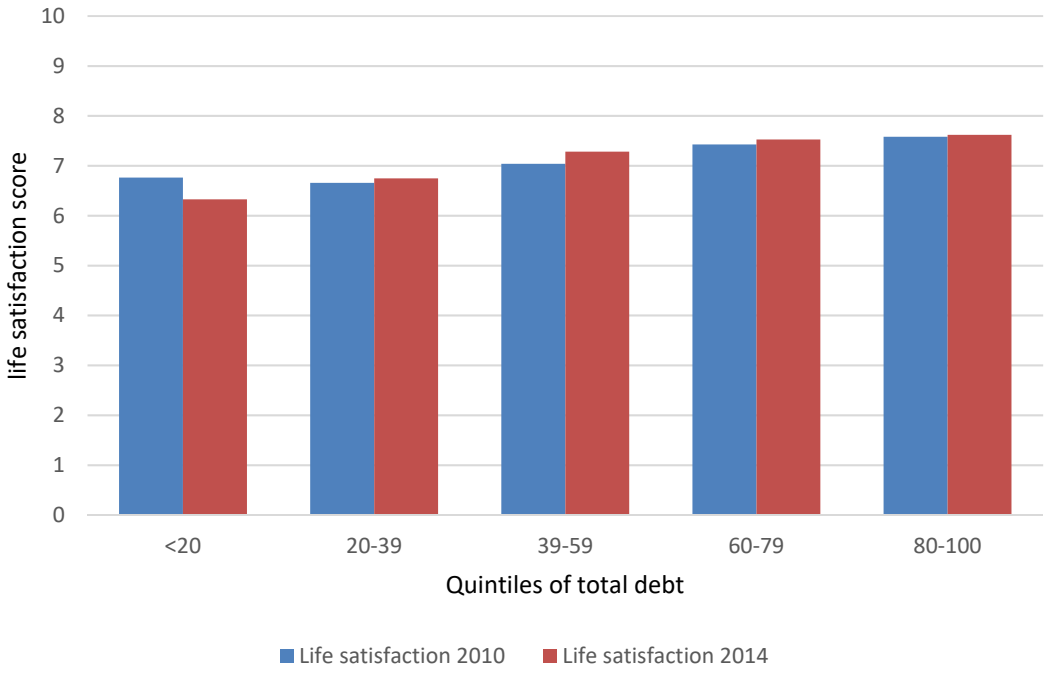
***Source/Notes*: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only**

Figure A2: Life satisfaction measure by total assets quintiles 2010 and 2014



Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only

Figure A3: Life satisfaction measure by total debt quintiles 2010 and 2014



Source/Notes: PHF 2010/11, PHF 2014 – SUF Files, unweighted, persons in panel households only