Money, Social Capital and Materialism. Evidence from Happiness Data

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Abstract

Are unhappiness, high concern for money and scarcity of social capital different faces of the same phenomenon? Economists tend to treat these variables as distinct correlates of well-being. On the contrary, positive psychologists argue that they all relate to materialism, a system of personal values ascribing great importance in life to extrinsic motivations and low priority to intrinsic motivations. Using data from two European cross-sectional surveys and the German Socio-Economic Panel, I test the hypothesis that material interests, proxied by the effects of individual and reference income on well-being, are associated with low levels of social capital. The results suggest that people with scarce social capital tend to have greater material interests, whereas the negative effect of income comparisons on well-being is eliminated for individuals exhibiting the highest levels of social capital. The implication of such finding is that promoting social capital reduces people's material concerns and has positive impact on their well-being. The results from a country-level analysis additionally show that, since social capital moderates the importance of income for well-being on individual level, the well-being gap between income groups is significantly smaller in countries with higher social capital.

Keywords: subjective well-being · life satisfaction · social capital · materialism · relative income · social comparisons · happiness inequality

JEL Classifications: D31 · I31 · Z13

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1 Introduction

Happiness economics has identified various correlates and determinants of subjective well-being[1] (see Dolan et al., 2008; MacKerron, 2012, for reviews). Some of them, for example, inflation rate and unemployment rate, being basically untrended, do not influence the long-run movements in subjective well-being (SWB). Others instead, such as absolute and relative income or social capital, play an important role in explaining the happiness-income paradox defined by Easterlin (1974, 1995). A vast number of empirical tests show that income comparisons are crucial for undermining the possibility of increasing the average happiness by economic growth (Clark et al., 2008). Furthermore, the most relevant examples of the Easterlin paradox can be additionally explained by the decline of social capital. That is to say, in the most spectacular cases of growing economies throughout the last decades, both, in developed countries such as the USA (Bartolini et al., 2013a) and in developing ones, for instance in China (Bartolini and Sarracino, 2015), the negative changes in happiness are associated with the decreasing indicators of trust and civicness. What those countries have in common is the fact that the SWB trend is predicted by two social factors: the erosion of social capital and the strong role of social comparisons. Moreover, Bartolini and Sarracino (2014) show that, in a representative international sample, average well-being in the long run is more likely to grow in countries where social capital grows than in countries where the economy grows.

All these factors – individual income, income comparisons and social capital – are usually analysed separately in happiness economics; however, according to positive psychologists, they are all related to the same phenomenon called "materialism". Positive psychologists define it as a system of personal values ascribing higher importance in life to extrinsic motivations and lower to intrinsic motivations. The distinction between these two types of motivation refers to the instrumentality, or lack thereof, of the reason for doing something. The term "extrinsic" stands for motivations that are external to an activity (for example, money or other material rewards). Conversely, "one is said to be intrinsically motivated to perform an activity when one receives no apparent reward except the activity itself" (Deci, 1971, p. 105). For instance, an individual can decide to work because he or she finds a given job interesting (intrinsic motivation) or because it will bring him or her a certain remuneration (extrinsic motivation). In short, materialistic persons tend to attribute an elevated priority to life goals such as money, luxury consumer's goods, success or high economic position, and a lower priority to human relationships, affection, solidarity, civic engagement or – more generally – to pro-social behaviours.

The literature analysed materialism in many quantitative studies using distinct population samples. Using various methods these works quantify the levels of materialism in individuals in order to relate it to different psychological outcomes. The main finding of these studies is that materialism is associated with a poorer quality of relationships with others. This negative relation is a consequence of relational attitudes developed by individuals with materialistic inclinations. Especially unfavourable for having decent social relationships is the tendency

[1] Diener (2006, p. 399) defines 'subjective well-being' as "all of the various types of evaluations, both positive and negative, that people make of their lives". Following many benchmark studies (e.g., Easterlin, 2003; Frey and Stutzer, 2000), I will use terms 'life satisfaction' and 'happiness' interchangeably as two most common indicators of subjective well-being.

to consider people as objects. An individual who tends to "objectify" others not only lacks generosity, empathy, and cooperative capacity, but also exhibits higher level of cynicism and mistrust, which then becomes an obstacle for building genuine relationships. (Belk, 1985; Cohen and Cohen, 1996; Kasser, 2002; Kasser and Sheldon, 2000; Kasser et al., 1995; McHoskey, 1999; Sheldon et al., 2000). In this view materialism is a cause of relational poverty, however, the opposite direction of causality is plausible as well. The scarcity of emotional relationship with one's parents during infancy leads to greater importance of material concerns in adult life. It is, in fact, lack of affection that causes an individual to feel insecure, while materialism is an answer to insecurity (Cohen and Cohen, 1996; Kasser and Sheldon, 2000; Kasser et al., 1995; Williams et al., 2000). The message coming from positive psychologists is that materialism and relational poverty affect each other resulting in a vicious circle.

The research question posed in this paper is then the following: is it true that high interest for money and scarcity of social capital are associated with each other? If yes, social capital should be a factor which decreases the importance of money in one's life, whereas a lower importance of individual income should also mean a lower importance of income comparisons. I respond the question using the strength of the relationship between subjective well-being and (i) individual income as a proxy of interest for own money; (ii) income of the reference group as a proxy of interest for others' money. As measures of social capital I employ survey questions focused on the quality of social relationships (e.g., frequency of meeting friends, trust in others). To test whether the two phenomena are related to each other, I integrate them within interaction terms introduced into the standard happiness equation. The conclusion is that psychologist are right: attachment to money and low social capital are two faces of the same phenomenon. Individuals with better social relationships attach lower importance to their own income and are less affected by income comparisons, whereas at the highest levels of social capital the negative effect of income comparisons is eliminated and the positive effect of individual income is maintained. An implication of this result is the following: if higher social capital moderates the negative impact of income comparisons on subjective well-being, it should be perceived as a condition for economic growth being followed by happiness growth.

The remainder of the paper is organised as follows. Section 2 provides background for the study reviewing the literature. Section 3 presents the evidence from cross-section; it firsts describes the data and methodology (section 3.1), next it presents the results from the primary sample of individuals (main result in section 3.2.1, causality analysis in section 3.2.2), from an alternative sample of individuals (section 3.3), and from a country-level analysis (section 3.4). Section 4 applies panel data in order to control for individual fixed effects (section 4.1) and to analyse the impact of social capital changes on the importance of income for well-being (section 4.2). Section 5 concludes providing discussion and potential policy implications.

2 Background

The investigation of the relationship between utility and money is as old as the economic science, however, the importance of relative income and relative consumption for well-being has been underlined gradually. Two early contribution were made by Veblen (1899) with his

conspicuous consumption and the so-called "Veblen effects", and by Duesenberry (1949) who proposed the relative income hypothesis explaining that individual's consumption and saving behaviour is determined more by his income in relation to others than by its absolute values. In sociology, the same intuition behind the relativity of well-being components was defined by Festinger (1954) as the "social comparison process", and by Runciman (1966) who introduced the notion of "relative deprivation".

Social comparisons were proposed by Easterlin (1974) as an explanation to his happiness-income paradox: even though income is positively correlated with happiness in a cross section, increasing GDP per capita does not lead to an increase in average level of subjective well-being. It is because what matters for happiness is income in relative terms, that is to say, people compare their income to what others earn whereas increasing the income of all will improve the relative position of no one. More generally, "as a person's income (consumption) increases relative to his income standard, so does his SWB. The higher the person's income is relative to the standard (or norm), the greater his happiness. As the economy grows, so do income standards, and this rise in standards acts to deflate the effect of the increased income." (McBride, 2001, p. 254)

More recent empirical studies tend to confirm the relevance of income comparisons for individual well-being. Clark and Oswald (1996) document that, in a representative sample from the BHPS, reported satisfaction levels of British workers are inversely related to their comparison wage rates. Ferrer-i Carbonell (2005) uses the data from the German SOEP to show that individual happiness is affected by the income of the reference group about as importantly as by the own income, and that people are the more satisfied with their lives the higher their income is compared to the income of the reference group. Additional evidence supporting the hypothesis that relative income significantly affects individual assessments of SWB comes from cross-sectional studies on the American GSS data (McBride, 2001) and international samples from the European Social Survey (Caporale et al., 2009).

Furthermore, position on the income ladder turns out to be as important for SWB as income expressed in absolute terms. Using a representative sample of British workers, Brown et al. (2008) show that the level of well-being (measured with different components of job satisfaction, including satisfaction with pay) depends on the ordinal rank of an individual's wage within a comparison group rather than on absolute wage or average wage in the workplace. Boyce et al. (2010) find evidence within the BHPS data that income rank explains significantly more of the overall variation in life satisfaction than absolute income, whereas their result holds after introducing various reference groups. Finally, Carlsson et al. (2007) provide an experimental proof confirming the importance of relative income and relative consumption for people's utility, while Fliessbach et al. (2007) show that social comparisons affect reward-related brain activity, which constitutes a neurophysiological proof of the existence of relative income concerns.

More evidence comes from studies analysing the direct link between the importance of income comparisons and individual well-being. Clark and Senik (2010), using a sample of workers from the European Social Survey 2006, find out that there is a negative and significant correlation between the "declared comparison intensity"[2] and various measures of SWB: overall

[2]As a measure of income comparison intensity Clark and Senik (2010) use a direct question "How important

life satisfaction, happiness, job satisfaction, and satisfaction with pay. What is particularly important for the present analysis, the authors note that individuals reporting to meet socially more often attach less importance to income comparisons; however, the link between social capital and importance of relative income is not further investigated as it lies beyond the scope of their study. Recently, Goerke and Pannenberg (2015) apply novel German data on self-reported income comparison intensity to show that positional concerns are negatively related to individual life satisfaction. Additonally, Clark et al. (2015) provide evidence from Japan using hypothetical discrete choice experiments in which respondents choose between alternative combinations of income amounts, both for themselves and certain reference group. They observe that individuals with strong positional concerns (i.e., those who prefer to earn less in absolute terms but more than the reference group) report lower income satisfaction.

The second line of happiness studies proposes an alternative explanation to the happiness-income paradox. The "negative endogenous growth" approach suggests that the economy tends to grow faster when individuals become relatively poorer in social relationships. In other words, the erosion of social ties can actually "feed" the economic growth as firms, facing a decline in honesty, trust, and work ethics, have to invest more in defensive expenditures, control mechanisms, and guard labour (Bartolini and Bonatti, 2002, 2003, 2008). Furthermore, recent empirical findings demonstrate that the positive effect of income on happiness may be offset by lower consumption of the so-called relational goods (Becchetti et al., 2011; Bruni and Stanca, 2008). Becchetti et al. (2008, 2012) show that relational goods, defined as "affective and expressive, non instrumental, side of interpersonal relationships" (measured, e.g., with the frequency of attendance at social gatherings) have a positive effect on life satisfaction, controlling for unobserved individual characteristics and reverse causality.

The link between SWB and the quality of social ties has been also analysed in a broader sense showing that happiness depends on the level of "social capital". According to the definition provided by OECD (2001, p. 41), the term should be associated with "networks together with shared norms, values and understandings that facilitate co-operation within or among groups". Putnam (2000) proposes various measures of social capital: intensity of involvement in community and organizational life; public engagement (e.g. voting) and volunteering; informal sociability (e.g. visiting friends); and reported levels of interpersonal trust. Empirical evidence shows that, no matter which measure is applied, the level of social capital is positively related to subjective well-being (Bartolini et al., 2013b; Helliwell, 2006; Helliwell and Putnam, 2004; Ram, 2010; Sarracino, 2010, 2012). Additionally, Sarracino (2013) documents that social capital enters positively the happiness equation indifferently in low income and high income countries. The analysis of social capital in a dynamic perspective indicates that social capital trends predict the long-run changes in subjective well-being much better than economic growth (Bartolini and Sarracino, 2014).

As the above review of studies shows, income comparisons and interpersonal relationships constitute two significant social dimensions of SWB. What is missing in the existing literature, however, is an investigation linking the two phenomena of interest. An intuition behind a

is to you compare your income with other people's income?", with answers on a 0-6 scale ranging from "Not important at all" to "Very important".

possible association between the importance of income for well-being and the quality of social ties is given by positive psychologist: high concern for money and poor social relationships are both related to materialism, a system of personal values ascribing greater importance to activities motivated extrinsically (Kasser, 2002).

The contribution of the present paper consists of an empirical link between two fundamental aspects of well-being: social comparisons and social capital. Assuming that attachment to money and scarcity of social relations are both related to materialistic system of values, I show that more sociable and trustful people exhibit lower concern for individual and reference income. An eventual implication of such result is that a reduction of materialism may rise the level of social capital, and, vice-versa, an increase in social capital can decrease people's interest for money. Therefore, policies that reduce materialism or policies that increase social capital may possibly trigger a self-feeding mechanism that lowers interest for money and simultaneously increases social capital, having a positive impact on people's well-being.

3 Evidence from cross section

3.1 Data and methodology

The primary data source used in the study is the European Union Statistics on Income and Living Conditions (EU-SILC). In 2013 the questionnaire included an ad-hoc module for measuring subjective well-being with a set of questions on overall experience of life, satisfaction with material living conditions, health, as well as leisure and social interactions. In the empirical analysis the well-being of an individual will be measured with the answer to a standard self-evaluative question: "Overall, how satisfied are you with your life these days? Please answer on a scale of 0 to 10, where 0 means 'Not at all satisfied' and 10 means 'Completely satisfied'."[3]

As far as social capital is concerned, I focus on its relational aspects looking at two commonly used measures of interpersonal relationships quality: trust in others (expressing individual *attitude*) and frequency of meeting friends (expressing individual *behaviour*) (OECD, 2001; Onyx and Bullen, 2000). The trust question asks respondents to indicate how trustful they are on a 11-step scale: "Would you say that most people can be trusted? Please answer on a scale from 0 to 10, where 0 means that in general 'You do not trust any other person' and 10 that you feel 'Most people can be trusted'." I construct a dummy variable equal to 1 for trust ranging from 6 to 10. The frequency of socializing is captured by the question: "Do you meet up with friends/family for a drink/meal (at home or outside) at least once a month?". The second social capital dummy variable is therefore equal to 1 if an individual meets his friends or family at least once per month. In order to capture both aspects of interpersonal relationships (behaviour and attitude) in one variable, I introduce an "index" of social capital which simply

[3]Several studies showed that direct questioning people about their recent affective experience as well as about global evaluation of their lives are reliable measures of subjective well-being. Answers to well-being questions correlate well with physical measures of affect such as frequency of smiling, heart rate measures, and electrical activity in the brain (Blanchflower and Oswald, 2004; Van Reekum et al., 2007) as well as with non-self-report measures based on evaluations of other people such friends and family (Sandvik et al., 1993). Moreover, single item scales provide similar correlates of SWB as the multi-item scales (Krueger and Schkade, 2008).

adds up the two dummies. The index will be a categorical variable assuming values {0, 1, 2}, whereas its highest level means that a person is both, trustful and sociable.[4]

The remaining variables of interest are individual and reference income. The individual income is defined as monthly disposable equivalised income adjusted to PPP.[5] I assume that individuals compare their incomes with others of similar socio-demographic characteristics who live in the same geographical area (Bartolini et al., 2013b; Boyce et al., 2010; Ferrer-i Carbonell, 2005). The reference income is thus calculated as the average individual income in the reference group defined as people of the same sex and age group living in the same region.[6]

The EU-SILC regression sample includes more than 320,000 observations coming from 29 European countries.[7] The average life satisfaction is 6.92, whereas 73% of the respondents meets friends at least monthly and around 58% is trustful (scoring between 6-10). Looking at the descriptive statistics for the social capital index, one can see that 14% of the sample scores 0, meaning that approximately 1 out of 7 individuals is neither sociable nor trustful, while 45% is both, trustful and sociable (for detailed descriptive statistics see table A12).

In order to test the hypothesis that social capital moderates the importance of income and income comparisons for well-being, I adapt a standard "happiness equation" introducing interaction terms between the social capital index and the income variables:

$$\begin{aligned} LS_i = \alpha &+ \beta_1 * log(Ind\ inc_i) + \beta_2 * log(Ref\ inc_i) + \beta_3 * SC\ index_i \\ &+ \beta_{13} * SC\ index_i * log(Ind\ inc_i) \\ &+ \beta_{23} * SC\ index_i * log(Ref\ inc_i) \\ &+ \boldsymbol{\gamma}' \boldsymbol{X}_i + \varepsilon_i \end{aligned} \tag{1}$$

where LS is the reported life satisfaction, *Ind inc* and *Ref inc* are individual and reference income, *SC index* is a categorical variable capturing the level of social capital, $\boldsymbol{X}$ is a vector of control variables (including: sex, age group, marital status, education level, labour market status, house owner, and country dummies)[8], and ε is the error term of standard properties.

[4]The EU-SILC well-being module includes as well two variables measuring social support: "receiving help from others" and "having anyone to discuss with personal matters". I do not include them since the focus is placed on individual *behaviour* towards others (meeting socially) and individual *attitude* towards others (trust), while receiving help and having support describe rather the behaviour and attitudes of others towards the individual, accounting for the social environment around him.

[5]The equivalised disposable income is the total income of a household, after tax and other deductions, that is available for spending or saving, divided by the number of household members converted into equalised adults; household members are equalised or made equivalent by weighting each according to their age, using the so-called modified OECD equivalence scale (1.0 to the first adult; 0.5 to the second and each subsequent person aged 14 and over; 0.3 to each child aged under 14); see http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Equivalised_disposable_income. In the PPP adjustment I use price level indices for the actual individual consumption (EU28=100); see http://ec.europa.eu/eurostat/en/web/products-datasets/-/PRC_PPP_IND (last update 17.12.15, extracted 18.01.16).

[6]Five age groups (under 26, 26-35, 36-45, 46-55, 55+) * two genders * 104 regions = 1040 reference groups. The average number of individuals in a reference groups is around 312. For the list of regions see table A13.

[7]AT, BE, BG, CH, CY, DE, EE, EL, ES, FI, FR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, RO, RS, SE, SK and UK. Countries in which the question on meeting friends was not asked are dropped from the sample (CZ, DK and SI).

[8]I use age groups instead of age and age squared since the age variable in EU-SILC is not perfectly continuous; it groups all individuals aged 80+ in one category. Household size is not included in the regression as it is directly

The interactions are introduced to check weather the impact of individual and reference income on life satisfaction varies with the level of social capital.[9] For the correct interpretation of interaction coefficient, the estimated model will include the main effects of the interacted variables (see Brambor, 2005; Braumoeller, 2004). I assume that self-reported life satisfaction scores can be treated as a cardinal variable employing an OLS regression, which allows to interpret the coefficients of interactions more easily. In fact, it has been shown that models assuming cardinality and those assuming ordinality of life satisfaction scores provide similar results (Ferrer-i Carbonell and Frijters, 2004; Stutzer and Frey, 2006).

3.2 Results: sample of individuals

3.2.1 Main result

The coefficients and statistical significance of the variables of interest confirm the common findings of the happiness literature (see table A1 for detailed results). Life satisfaction is positively related to individual income and negatively to reference income. The higher the income of an individual, the more satisfied he is, whereas his life satisfaction decreases with rising income of the reference group. The positive impact of social capital on well-being rises with the level of the SC index, showing that people being both, trustful and sociable are the happiest (holding other variables constant).

The main interest is focused, however, on the sign and statistical significance of the interaction terms. In fact, the signs are opposite to those of income variables, which indicates that the impact of own and reference income on well-being is smaller for individuals with higher social capital (table A1). Compared to people exhibiting the lowest value of social capital (index = 0), the life satisfaction of those who are either trustful or sociable (index = 1) is less affected by individual income (the coefficient is 9% smaller) and by reference income (the coefficient smaller by 8%, however, this difference is not significant).

In case of people being trustful and sociable (index = 2), the moderation effect for individual income amounts to -42%, while for reference income it is equal to -101%, both differences being statistically significant (table 1).[10] This means that at the highest level of social capital own income is less, but still important for life satisfaction, while the negative effect of reference income is entirely eliminated (figure 1). One can therefore conclude that social capital has a double positive effect on well-being: the direct effect, as life satisfaction rises with the level of social capital; and the indirect effect, as the reference income is no longer harmful for life satisfaction at the highest value of the SC index (figure 2).[11]

correlated with the equivalent income; still, including household size (or number of children) among the controls does not change the results.

[9] When rearranging equation 1, it may be shown that the marginal effect of *Ind inc* on *LS* is equal to the expression $\beta_1 + \beta_{13} * SC\ index$; the same applies for *Ref inc* and $\beta_2 + \beta_{23} * SC\ index$ (see appendix B.1 for details). For a broader discussion on the interpretation of interaction terms see Balli and Sørensen (2013).

[10] The percentage moderation effect is calculated as the ratio of interaction coefficient to income coefficient. For example, the coefficient of "Social capital index = 2 * Log of individual income" is equal to -0.201, while for "Log of individual income" alone it is 0.479, meaning that for the category "SC index = 2" the income coefficient is $-0.201 + 0.479 = 0.278$; the original coefficient 0.479 is therefore decreased by 0.201, which in percentage terms gives $0.201/0.479 \simeq 42\%$ (see estimates of specification 3 in table A1).

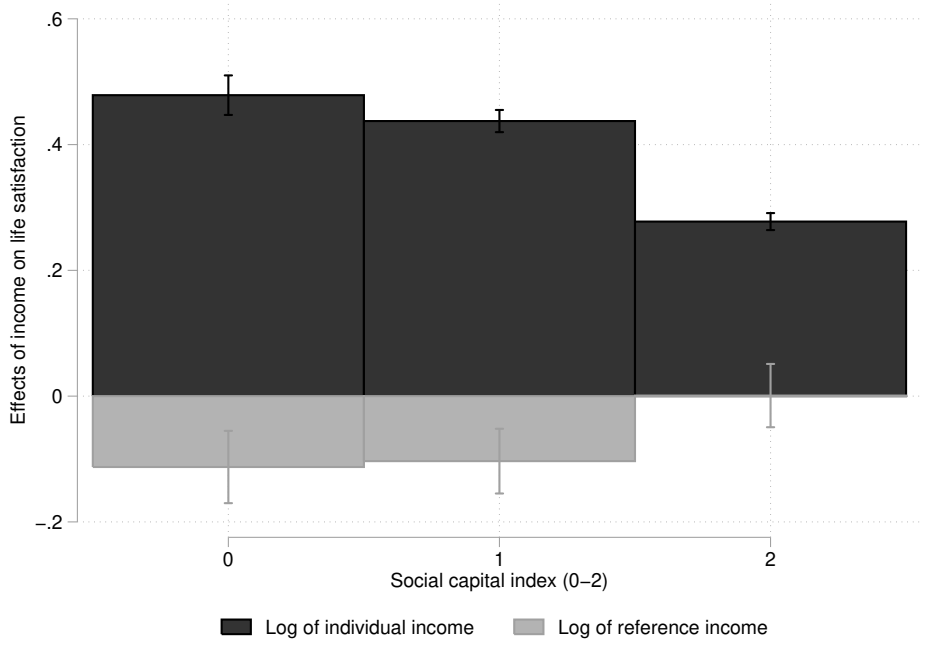
[11] Figure 2 shows that the slope of reference income does not significantly differ between *SC index* = 0 and

Table 1: Main results: moderation effects (EU-SILC 2013).

	Social capital index = 1	Social capital index = 2
Log of individual income	**-9%**	**-42%**
Log of reference income	**-8%** (n/s)	**-101%**

Note: Moderation effects express by how much the income coefficient is moderated at a given level of social capital index (compared to index = 0); the effects are calculated for specification 3 from table A1. n/s = not significant.

Figure 1: Income effects moderated by increasing social capital (EU-SILC 2013).



Note: Average marginal effects on the linear prediction of life satisfaction with 90% confidence intervals; calculated for specification 3 from table A1.

An important robustness check of the obtained results consists of splitting the sample into two groups of countries characterized by different economic and cultural background: Western Europe (developed countries) and Eastern Europe (economies characterized by the transition experience).[12] It has been shown in the literature that the impact of reference income on well-being in transition countries may actually be positive due to the so-called "tunnel effect".[13]

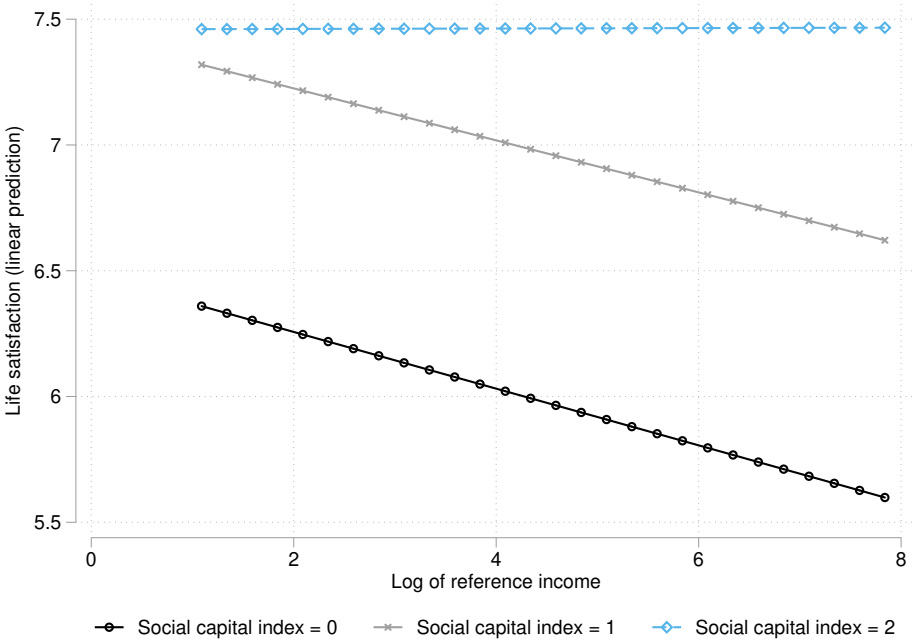
SC index = 1 (as the interaction term *SC index* = $1 * log(Ref\ inc)$ is insignificant), whereas the slope for *SC index* = 2 becomes flat showing that the negative impact of reference income is eliminated.

[12]Western Europe: AT, BE, CH, CY, DE, EL, ES, FI, FR, IE, IS, IT, LU, MT, NL, NO, PT, SE and UK; Eastern Europe: BG, EE, HR, HU, LT, LV, PL, RO, SK and RS.

[13]During a transition from socialism to capitalism, when the social mobility is high, individual well-being may be positively affected by higher incomes of others as it is not necessary a source of envy and financial dissatisfaction, but may become a source of information creating positive expectations about own future income (Hirschman and Rothschild, 1973). Senik (2004) follows this reasoning and shows with Russian panel data from period 1994-2000 that reference income is positively correlated with life satisfaction on personal level, which contradicts the standard intuition behind utility and relative income. Additionally, Senik (2008) documents that higher reference income negatively affects individual happiness in Western Europe, but increases happiness in the transition countries of Eastern Europe (using data from 1989-2000). In the analysis with the 2013 data I find out the the impact of reference income is negative and significant in both groups of countries, which may suggests the the so-called "tunnel effect" was present exclusively during the most dynamic period of transition, that is, in the early 90-ties.

However, after the sample split I actually find out that the impact of reference income on life satisfaction is negative and significant in both groups of countries. Importantly, the main result holds showing that for the highest level of social capital, the effects of individual and reference income on well-being are significantly moderated in both subsamples (table A1).[14]

Figure 2: Reference income effects eliminated for the highest social capital (EU-SILC 2013).



Note: Predictive margins calculated for specification 3 from table A1.

3.2.2 Instrumenting social capital

In the estimated happiness regression the coefficient of the social capital index is significant and strongly positive, however, the direction of causality is unclear: being sociable and trustful may make an individual happier, or, vice versa, happiness may positively affect his sociability and trust in others. Moreover, there may be some unobserved factors, e.g. personality traits, which affect both, social capital and happiness. This means that the social capital index is an endogenous variable and, in consequence, so are the interaction terms. In order to tackle the endogeneity problem, I employ the instrumental variable approach, assuming that in a regression including the main effect and the interaction effect it is necessary to instrument one and the other (Balli and Sørensen, 2013).

Finding a proper instrument for social capital is not a trivial task, as most of the factors affecting social life of an individual affect his happiness as well. I overcome this issue by using a method proposed by Lewbel (2012), which generates the so-called heteroskedasticity-based instruments. The Lewbel's approach allows to identify structural parameters in models with endogenous or mismeasured regressors; it may be used in "applications where other sources of identification, such as instrumental variables, repeated measurements, or validation studies, are not available. The identification comes from having regressors uncorrelated with the product of

[14]I additionally run separate regressions interacting the income variables with a given social capital dummy instead of the index, which also gives significant interaction terms of the same signs (results presented in appendix A.1.2).

heteroscedastic errors, which is shown to be a feature of many models in which error correlations are due to an unobserved common factor, such as unobserved ability in returns to schooling models, or the measurement error in mismeasured regressor models."[15] This relatively new method has been recently applied in various fields: finance (Boschi et al., 2014; Schlueter et al., 2015), international trade (Lin, 2015), agricultural economics (Emran and Shilpi, 2012), education economics (Denny and Oppedisano, 2013; Gao and Smyth, 2015; Mishra and Smyth, 2015), health economics (Schroeter et al., 2013; Brown, 2014), and, most importantly, happiness economics (Tiefenbach and Holdgrün, 2015; Tiefenbach and Kohlbacher, 2015).

I use the Lewbel's method to instrument the endogenous variables from equation 1: the main effect of social capital index, the interaction with individual income, and the interaction with reference income.[16] I first regress each of the endogenous variables on the vector of controls from equation 1:

$$\textit{Endogenous variable}_i = a + \boldsymbol{B}'\boldsymbol{X}_i + \epsilon_i. \tag{2}$$

A crucial assumption of the Lewbel's approach is that there is heteroskedasticity in the error term of the "first stage equation" (ϵ). In order to test it I run a Breusch-Pagan test indicating that the null of constant variance is rejected, which means that the the assumption is fulfilled and the Lewbel's generated instruments method may be applied. Next, I generate the instruments by multiplying the residuals from the "first stage equation" (equation 2) with each of the control variables in mean-centred form:

$$Z_j = (X_j - \overline{X}_j) * \hat{\boldsymbol{\epsilon}} \tag{3}$$

where j corresponds to a given control variable from vector $\boldsymbol{X}$, and $\hat{\boldsymbol{\epsilon}}$ is the vector of residuals from the "first-stage regression" of each endogenous variable on all controls from $\boldsymbol{X}$ (including a constant vector; equation 2). For each endogenous variable the number of generated instruments Z is therefore equal to the number of controls in vector $\boldsymbol{X}$.[17]

Finally, I estimate the "second stage equation" using the 2SLS method, instrumenting the endogenous variables with the generated instruments Z (results in table A2). The first important observation coming from the obtained results is that the positive impact of social capital on life satisfaction is causal in the specification with and without the interactions terms. Secondly, the estimates show that the OLS results hold after controlling for endogeneity of social capital: the effects of individual and reference income on well-being are significantly moderated. Again, I observe that the moderation effects for reference income are much stronger than for the individual income, and that at the highest level of social capital the negative impact of reference income on well-being is eliminated (table 2).

[15] Lewbel, 2012, p. 67. For a detailed description of the Lewbel's method see appendix B.3.

[16] Social capital index is a categorical variable, it is therefore necessary to instrument each category (dummy) and the interactions with each category; the list of the instrumented variables is thus the following: *SC index =1*, *SC index =2*, $(SC\ index\ =1) * log(Ind\ inc)$, $(SC\ index\ =2) * log(Ind\ inc)$, $(SC\ index\ =1) * log(Ref\ inc)$ and $(SC\ index\ =2) * log(Ref\ inc)$.

[17] For a detailed description of the procedure see appendix B.2.

Table 2: Instrumenting social capital: moderation effects (EU-SILC 2013).

	Social capital index = 1 (instrumented)	Social capital index = 2 (instrumented)
Log of individual income	**-55%**	**-81%**
Log of reference income	**-87%**	**-122%**

Note: Moderation effects express by how much the income coefficient is moderated at a given level of social capital index (compared to index = 0); the effects are calculated for specification 3 from table A2.

It is important to interpret the moderation effect for *SC index = 2* and reference income: it is higher than 100%, meaning that if an individual is sociable and trustful, the impact of reference income becomes positive, in other words, the "envy effect" turns into the "tunnel effect". Last but not least, the 2SLS results hold also after splitting the sample into Western and Eastern Europe (table A2).

3.3 Robustness check: alternative dataset

A further robustness check consists of implementing an alternative dataset: I employ the last available wave (round 6) of the European Social Survey (ESS, 2012).[18] As already described, the three key concepts of the research question are: well-being, social capital, and income. The first is again proxied by reported life satisfaction, measured with the answers to a standard 11-step self-evaluation question: "All things considered, how satisfied are you with your life as a whole nowadays? Please answer using this card, where 0 means 'extremely dissatisfied' and 10 means 'extremely satisfied'."[19] I employ the same proxies of social capital as in the main analysis, focusing on its relational aspects: frequency of meeting friends and interpersonal trust. The question "How often do you meet socially with friends, relatives or work colleagues?" will be used in order to create a dummy variable equal to 1 if a respondent meets socially at least once per week.[20]

The ESS questionnaire asks three questions that are considered as proxies of interpersonal trust in a broader sense (compared to the previously used single-item question): "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?"; "Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?"; and "Would you say that most of the time people try to be helpful or that they are mostly looking out for themselves?". Each question can be replied on a scale ranging from 0 to 10, corresponding to the lowest and the highest degree of perceived trustworthiness, fairness, and helpfulness of others. I calculate the arithmetic mean of the three scores in order to create a dummy variable equal to 1 if the mean ranges between 6 and 10 (the dummy will be called "social trust" to distinguish it form the previously used

[18]Round 7 from 2014 has been recently released, however it is still incomplete missing the data from 7 participating countries; see http://www.europeansocialsurvey.org/data/country_index.html, accessed on February 29, 2016.

[19]ESS (2014).

[20]The ESS questionnaire explains that 'Meet socially' implies meeting by choice rather than for reasons of either work or pure duty. Originally there are seven possible answers (from 'Never' to 'Every day'), I choose 'Once a week' to create the dummy since it divides the sample into two groups of almost the same size (see table A15).

single-item proxy of trust in others). Finally, following the approach from the previous section, I define an index of social capital as a sum of the two dummies; it will therefore assume values from the set {0, 1, 2}.

Contrarily to the EU-SILC database, among the ESS variables there is no information about the exact amount of individual's income. Instead, the ESS questionnaire asks the respondent to choose the interval corresponding to his or her household's total income.[21] There are ten intervals which are adjusted to the income distribution in each country so that they constitute the income deciles. This implies that I will now use income in relative terms (measured with income rank) as a proxy of social comparisons.[22] I create a categorical variable "income rank" which will express the individual's position on the national income ladder. For the sake of simplicity, it will have three levels: income rank 1-3 (for the bottom three deciles), income rank 4-7 (for the middle four deciles), and income rank 8-10 (for the top three deciles).[23]

Additional transformations were needed in order to obtain the measure of income in absolute terms (disposable household monthly income from all sources). I first calculate the average from lower and upper bounds for each income decile, next, in case of the non-Euro countries I convert it into Euro, and then adjust for PPP.[24] I am aware of the imprecision of the absolute income proxy, still it is essential to introduce it into the analysis. To avoid further transformation of the absolute income variable, it is calculated as logarithm of household income (instead of equivalised income, as previously), however, I will now control for the presence of children in household.

Since there is a high correlation between the absolute and relative income variables, I introduce two separate regressions, one for interaction with household income (controlling for income rank, equation 4) and one for interaction with income rank (controlling for household income, equation 5):

$$\begin{aligned} LS_i = \alpha &+ \beta_1 * log(Hh\ inc_i) + \beta_2 * Inc\ rank_i + \beta_3 * SC\ index_i \\ &+ \beta_{13} * SC\ index_i * log(Hh\ inc_i) \\ &+ \boldsymbol{\gamma}' \boldsymbol{X}_i + \varepsilon_i \end{aligned} \tag{4}$$

$$\begin{aligned} LS_i = \alpha &+ \beta_1 * log(Hh\ inc_i) + \beta_2 * Inc\ rank_i + \beta_3 * SC\ index_i \\ &+ \beta_{23} * SC\ index_i * Inc\ rank_i \\ &+ \boldsymbol{\gamma}' \boldsymbol{X}_i + \varepsilon_i \end{aligned} \tag{5}$$

where LS is the reported life satisfaction, *Hh inc* is the household income, *Inc rank* is the

[21] Defined as "after tax and compulsory deductions, from all sources"; with the possibility to indicate weekly, monthly or annual income.

[22] Theoretical (Rablen, 2008) and empirical (Boyce et al., 2010) studies demonstrate that relative income can be modelled as the relative rank of an income in the income distribution. I adopt this approach expecting that when a proxy of purchasing power (absolute income) is included in the regression equation, income rank reflects solely the relative importance of wealth being rather related to individual's economic position in the society.

[23] The reference category is defined as the middle deciles, so that, after introducing the interactions term, I can test weather the effect of being relatively poor/rich is moderated by social capital.

[24] Exchange rates come from the ESS documentation (ESS, 2014). PPP figures are taken from Eurostat, they express price level indices for the actual individual consumption (EU28=100); see footnote 5.

income rank variable with three categories (bottom deciles, middle deciles - base level, and top deciles), *SC index* is a categorical variable measuring the level of social capital, and $\boldsymbol{X}$ includes the control variables (sex, age, age squared, living with partner, living with children, years of education, labour market status, country dummies).

The regression sample includes around 35,000 observations coming from 25 European countries.[25] The average life satisfaction is equal to around 6.89, while as the social capital index is concerned, 26% of the sample scores 0, 47% scores 1, and 27% scores 2 (which means being trustful and meeting socially at least weekly; see table A15 for detailed descriptive statistics).

The results confirm the finding from the previous paragraph: higher social capital moderates the impact of income and income comparisons on well-being. Again, the moderation effect obtained for the proxy of income comparisons (income rank) is stronger than the one obtained for own income (table 3).[26] Moreover, at the highest value of social capital index, the impact of absolute income is significantly weaker but still positive (figure 3), while the impact of relative income is eliminated as it becomes insignificant (figure 4).

Table 3: Main results: moderation effects (ESS 2012).

	Social capital index = 1	Social capital index = 2
Log of household income	**-25%**	**-69%**
Income rank 1-3	**-33%** (n/s)	**-129%**
Income rank 8-10	**-59%**	**-100%**

Note: Moderation effects express by how much the income coefficient is moderated at a given level of social capital index (compared to index = 0); the effects are calculated for specifications 2 (first row) and 3 (second and third row) from table A5. n/s = not significant.

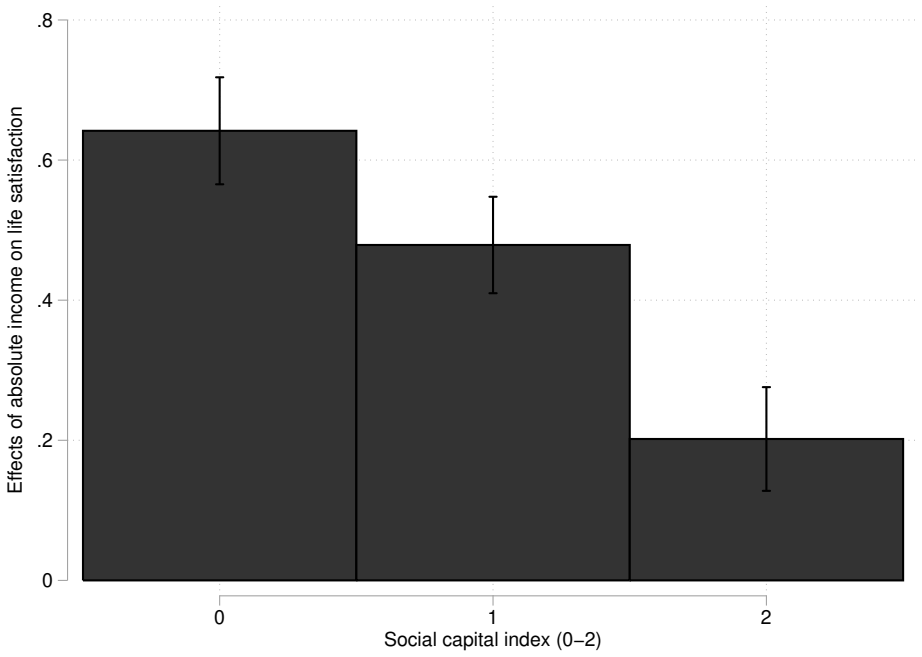
The analysis performed with the ESS data constitutes an important robustness check of the EU-SILC results not only because it leads to the same conclusions with the use of an alternative dataset, but also because the approach to the concept of income comparisons is different. In the methodology applied in the previous section I used reference income as the proxy variable for income comparisons, assuming that an individual compares his incomes with others of the same sex, age and living in the same region, which additionally implies that he makes an evaluation of how much the others earn.[27] In the ESS questionnaire the respondent is asked to choose the income decile corresponding to his earnings, therefore he can immediately assess his position in the national income ladder. In this approach the "reference group assumption" is not required, while the information about the income of others comes directly from the questionnaire (since the lower and upper bounds of each decile are precisely specified).

[25] AL, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, HU, IE, IS, IT, LT, NL, NO, PL, PT, SE, SI and SK. I had to exclude IL, RU, UA and XK since the Eurostat PPP data was missing for these 4 countries.

[26] The same result is obtained when interacting the income variables with social capital dummies instead of the index (see appendix A.1.4).

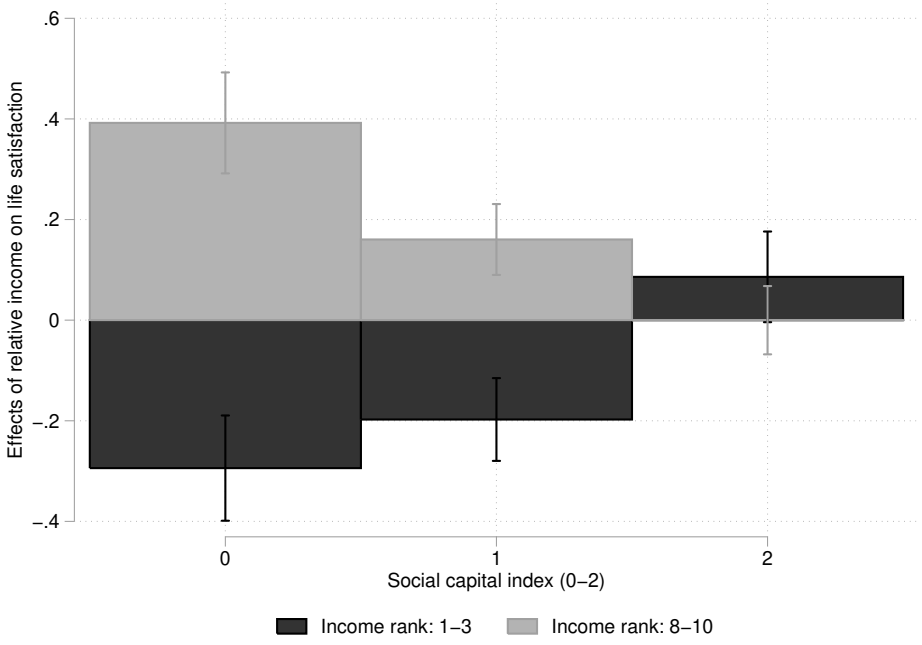
[27] In fact, the psychological literature shows that an individual may choose his reference group instrumentally; in a motivational strategy, he will compare his outcomes to those of the people above him (self-improvement), while in order to feel more appreciated he will adapt a self-validation strategy comparing with others below him (self-enhancement) (Diener and Fujita, 1995; Falk and Knell, 2004). Other studies demonstrate that optimistic individuals are more likely to compare downward, whereas pessimistic individuals tend to compare with more successful ones (Lyubomirsky and Ross, 1997).

Figure 3: Absolute income effects moderated by increasing social capital (ESS 2012).



Note: Average marginal effects on the linear prediction of life satisfaction with 90% confidence intervals; calculated for specification 2 from table A5.

Figure 4: Relative income effects eliminated for the highest social capital (ESS 2012).



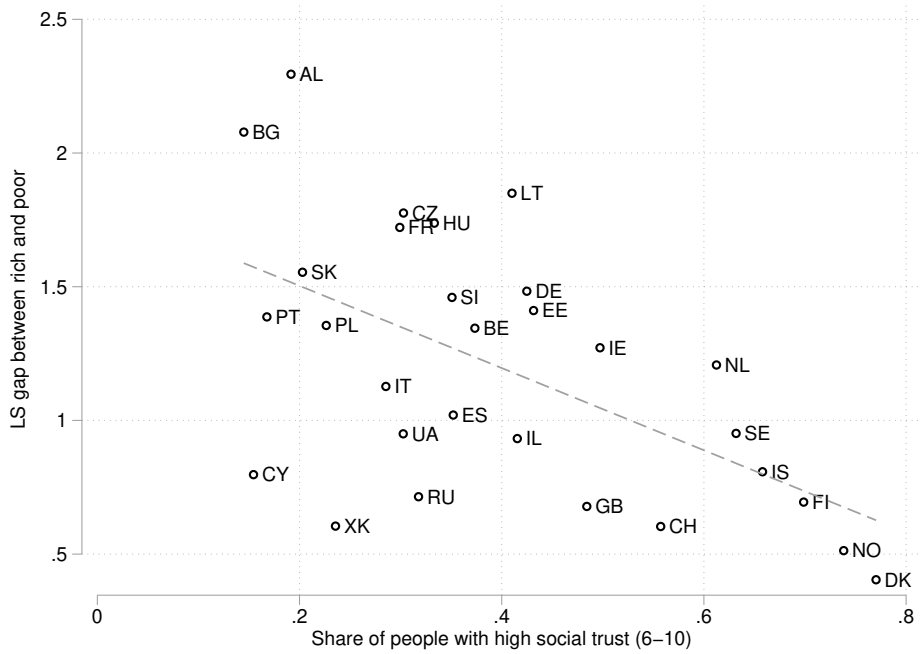
Note: Average marginal effects on the linear prediction of life satisfaction with 90% confidence intervals; calculated for specification 3 from table A5.

3.4 Results: sample of countries

For further cross-sectional investigation I introduce macro-level variables created by aggregating the micro data at country level. I assume that if social capital moderates the importance of income for well-being on individual level, one can expect that the well-being gap between income groups should be smaller in countries with higher social capital.

First, I calculate the average life satisfaction of the individuals defined as "poor" (in the ESS sample those with household income rank between 1-3, in the EU-SILC those in the bottom quintile of equivalised income) and for individuals defined as "rich" (income rank 8-10 in the ESS, top quintile in the EU-SILC). The difference between the two averages will be called "life satisfaction gap between rich and poor" and will be calculated for each country. Intuitively, the gap is positive in all countries as the average life satisfaction in the high income group is always greater than the average life satisfaction in the low income groups. Next, I aggregate the trust dummy obtaining a macro variable expressing the share of people with high trust (scores between 6-10): social trust in case of the ESS and trust in others in the EU-SILC.[28]

Figure 5: Well-being gap between rich and poor decreases with social trust (ESS 2012).



Note: Weighted averages.

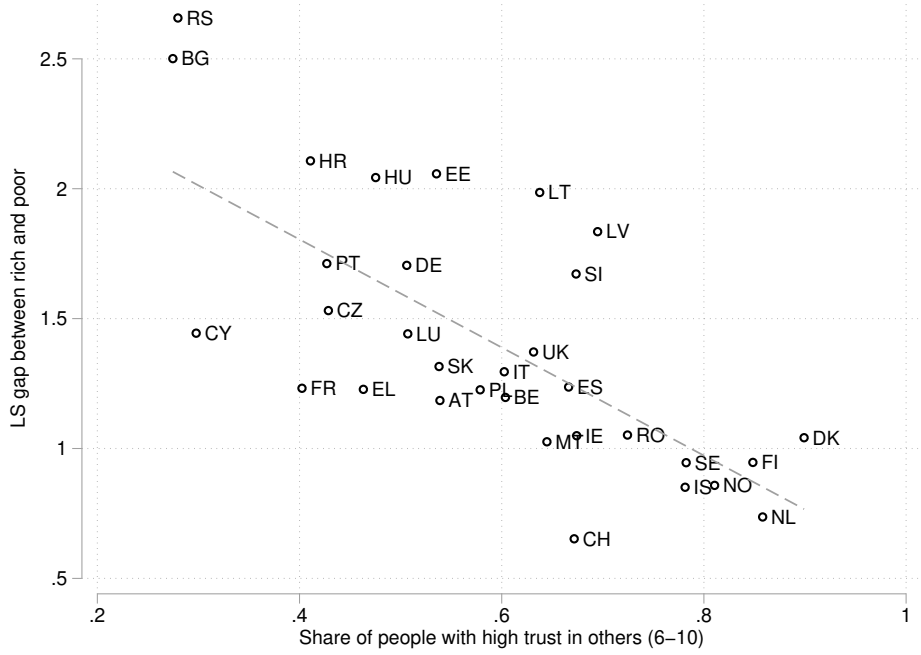
Figures 5 and 6 present the results graphically.[29] In both analysed samples the average score of trust is negatively correlated with the life satisfaction gap between the rich and poor. This finding goes in line with the results coming from the micro analysis: as social capital moderates the individual effects of income on well-being, the life satisfaction discrepancies between the rich and the poor are smaller in societies more endowed with social capital.

It is plausible to assume, however, that the well-being differences between income classes are mainly driven by income inequalities: if there are high disparities in income between the rich and the poor, most likely the life satisfaction gap between the two groups will also be elevated. What is more, the degree of interpersonal trust is typically higher in developed countries (see figures 5 and 6). In order to account for this, I perform a regression controlling for the Gini index and for the level of GDP per capita. The estimated model will have the following form:

[28]All the calculated averages are weighted: in the ESS with the design weight (*dweight*), in the EU-SILC with the personal cross-sectional weight (*RB050*), as recommended by the data providers in the user's manuals.

[29]In the macro analysis I include the countries previously dropped due to missing data: the ESS sample will now have 29 countries (including IL, RU, UA and XK), while the EU-SILC sample will consist of 32 countries (including CZ, DK and SI).

Figure 6: Well-being gap between rich and poor decreases with trust in others (EU-SILC 2013).



Note: Weighted averages.

Table 4: Well-being gap between rich and poor: regression results (EU-SILC 2013).

	(1) LS gap	(2) LS gap	(3) LS gap	(4) LS gap	(5) LS gap	(6) LS gap
Trust in others	-2.080***			-1.607***	-1.713***	-1.454***
	(-4.98)			(-3.72)	(-3.97)	(-3.38)
Gini index		7.589***		3.880**		2.672
		(3.74)		(2.18)		(1.53)
GDP per capita			-0.0227***		-0.0137*	-0.0112
			(-3.57)		(-1.90)	(-1.69)
Number of observations	32	32	32	32	32	32
Adjusted R^2	0.474	0.323	0.275	0.525	0.556	0.571

Note: OLS regressions with robust standard errors. Observations = countries. Dependent variable: the difference in average life satisfaction between the first and fifth income quintile in a given country. "Trust in others" is the share of people declaring trust in others between 6-10. Gini index is calculated for equivalised income. GDP per capita is expressed in purchasing power standards (in thousands). All macro variables are derived using weights. * p< 0.1, ** p< 0.05, *** p< 0.01, t statistics in parentheses.

$$LSgap_k = \alpha + \beta * Trust_k + \gamma * Gini_k + \delta * GDPpc_k + \varepsilon_k \tag{6}$$

where *LSgap* stands for the life satisfaction gap between the rich and the poor, *Trust* is the share of people with high trust in others (scores 6-10), *Gini* is the Gini index calculated for equivalised income, *GDPpc* is the GDP per capita adjusted to purchasing power parity[30], k indicates the country ($k = 32$), and ε is an error term with standard properties.[31]

[30] I use data from Eurostat for "Gross domestic product at market prices" in "Current prices, PPS per capita"; see http://ec.europa.eu/eurostat/en/web/products-datasets/-/NAMA_10_PC (last update 15.03.16, extracted 15.03.16). PPS stands for "purchasing power standard"; see http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Purchasing_power_standard_(PPS)

[31] See table A14 for descriptive statistics of the EU-SILC macro variables.

The results show that the negative relationship between social capital and the well-being gap between income groups is significant also after controlling for income inequalities and the level of economic development (table 4). Interestingly, the effects of Gini index and GDP per capita on the life satisfaction gap become insignificant when trust in others is included in the regression. This suggests that social capital should be considered as one of the main drivers of happiness inequality.

4 Evidence from panel

In the second part of the empirical analysis I employ panel data in order to: (i) control for individual unobserved heterogeneity; (ii) investigate a possible causal relationship between changes in social capital in time and the impact of income on well-being. The sample comes from the last available version of the German Socio-Economic Panel (GSOEP) released in 2015 (covering period 1984-2013).[32] GSOEP is a household based study which reinterviews adult household members on an annual basis generating a representative sample for the German population of the last three decades.

4.1 Controlling for fixed effects

In order to control for time invariant unobserved characteristics, e.g. personality traits, I introduce the individual fixed effects (f_i) within the same methodological framework as in the EU-SILC analysis.[33] The model will now take the following form:

$$\begin{aligned} LS_{i,t} = \alpha &+ \beta_1 * log(Ind\ inc_{i,t}) + \beta_2 * log(Ref\ inc_{i,t}) + \beta_3 * SC\ index_{i,t} \\ &+ \beta_{13} * SC\ index_{i,t} * log(Ind\ inc_{i,t}) \\ &+ \beta_{23} * SC\ index_{i,t} * log(Ref\ inc_{i,t}) \\ &+ \boldsymbol{\gamma}' \boldsymbol{X}_{i,t} + f_i + \varepsilon_{i,t}. \end{aligned} \tag{7}$$

Life satisfaction (LS) is measured on a 0-10 scale[34], individual income ($Ind\ inc$) is defined as monthly equivalised disposable income and is adjusted to price level in a given year, while the vector of controls ($\boldsymbol{X}$) includes socio-demographic characteristics as well as year and regional dummies.[35] The definition of the reference income does not change: I assume that people compare their incomes with others of the same sex, age group and living in the same geographical area.[36]

[32] I use the data from version 30 in long format; see https://www.diw.de/en/diw_01.c.504352.en/soep_v30.html.

[33] In order to decide between fixed or random effects I run the Hausman test; the null hypothesis that the individual effects are uncorrelated with the other regressors in the model is rejected. Between the two alternatives, the fixed effects model is therefore the better choice (see Greene, 2008, pp. 301-303).

[34] The GSOEP questionnaire uses the following question: "Please answer on a scale from 0 to 10, where 0 means 'completely dissatisfied' and 10 means 'completely satisfied: How satisfied are you with your life, all things considered?".

[35] Controls include: sex (omitted due to fixed effects), age, age squared, martial status, years of education, labour market status, house owner, living in East Germany, regional dummies, year dummies.

[36] Following the existing studies on income comparisons in Germany (Bartolini et al., 2013b; Ferrer-i Carbonell, 2005), for "geographical area" I distinguish between West and East. The variables used to construct

The availability of social capital proxies in the GSOEP questionnaire will influence the composition of the social capital index. Trust variable is no longer available, however, I will involve two new proxies of social capital: helping and volunteering.[37] The index will be now defined as a sum of three dummy variables (capturing individual behaviour towards others): attending social gatherings, helping friends, and performing volunteering work (each is equal to 1 if the respondent carries out a given activity at least once per month)[38]. This implies that the new social capital index will have 4 categories: ranging from 0 (for individuals not performing any of the activities) to 3 (for those who perform all three activities).

The regression sample is limited to the 12 waves in which all the required variables are present; it includes around 41,000 individuals interviewed at least two times between 1985-2011, giving more than 158,000 observations.[39] The average life satisfaction in the sample is equal to 6.97; I observe the following shares of individuals scoring 0, 1, 2 or 3 in the social capital index: 16%, 36%, 35% and 13%, respectively (for detailed descriptive statistics see table A16).

Controlling for fixed effects and using different proxies of social capital does not change the main results: (i) with rising social capital the impact of income and income comparisons on well-being is significantly moderated (as all the interaction terms are significant, see table A8); (ii) for the highest level of social capital the effect of individual income is still positive, while the negative effect of reference income becomes insignificant (figure 7); (iii) the moderation effects are much stronger in case of reference income (table 5). Additionally, I run separate regressions for West and East Germany, characterized by different socio-economic background, showing that the interactions terms are significant also in smaller, more homogeneous samples (table A8).[40]

Table 5: Main results: moderation effects (GSOEP 1985-2011).

	Social capital index = 1	Social capital index = 2	Social capital index = 3
Log of individual income	**-18%**	**-28%**	**-47%**
Log of reference income	**-40%**	**-64%**	**-73%**

Note: Moderation effects express by how much the income coefficient is moderated at a given level of social capital index (compared to index = 0); the effects are calculated for specification 3 from table A8.

reference groups are the following: sex, age group (below 26, 26-35, 36-45, 46-55, 55+), living in East/West, and year. This will give 2*5=10 reference groups per year for the 3 years before unification (which do not include East Germany), and 2*2*5=20 reference groups per year for the 9 years after unification. Altogether it gives 10x3+20x9=210 reference groups for the whole sample. The average size of a reference groups is around 755, the smallest one contains 140 individuals, the biggest 2852.

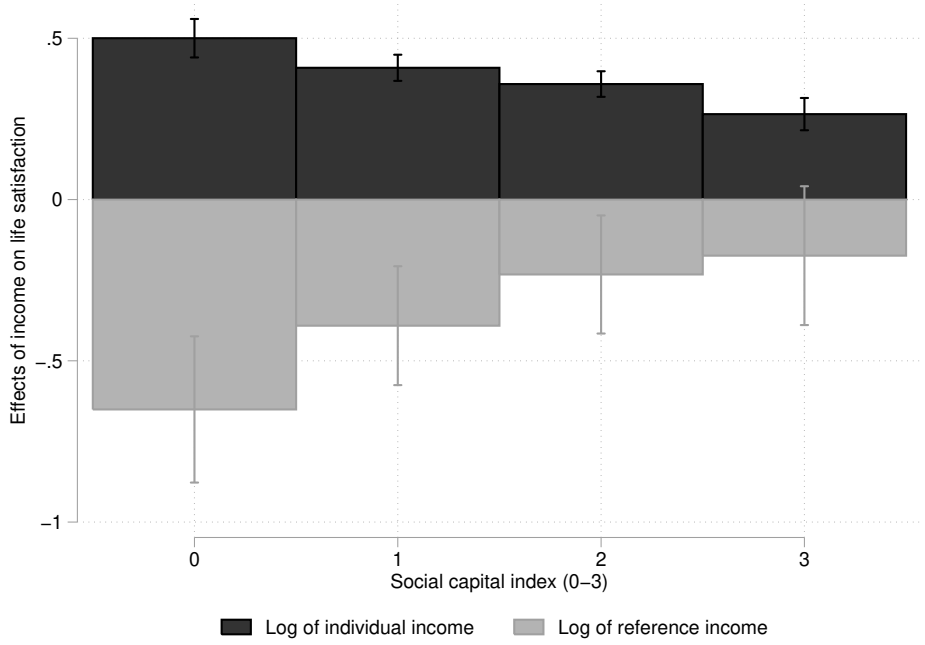
[37]In fact, the trust question is present in years 2003, 2008 and 2013, however, in these years other proxies of social capital are not included in the questionnaire.

[38]Source variables: Attend Social Gathering (*pli0094*), Helping Relatives, Friends (*pli0095*), Perform Volunteer Work (*pli0096*). The battery of questions on social participation in GSOEP includes also Participate In Local Politics; I exclude this variable assuming that the motivation behind being involved in political activities is not necessarily intrinsic.

[39]Included years: 1985, 1986, 1988, 1992, 1994, 1996, 1997, 1999, 2005, 2007, 2009 and 2011. The social participation questions were also asked in 1984, 1990 and 2001, but in 1984 the information on region (NUTS 1, Federal State) is missing, while in 1990 the questions were asked only in the East Germany, whereas for 2001 the volunteering variable is not present.

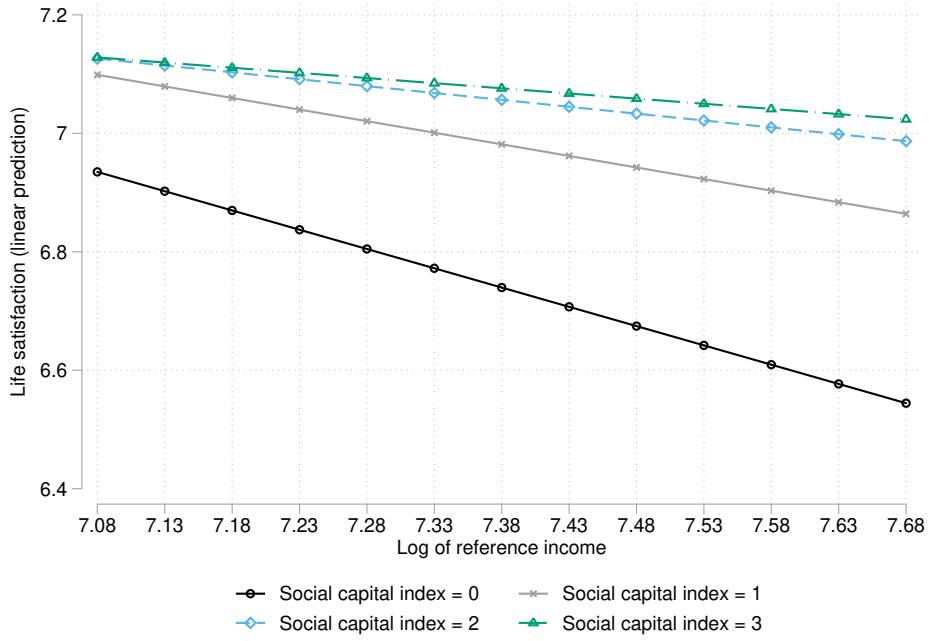
[40]The income variables are also interacted with a given social capital dummy instead of the index, which gives significant interaction terms of the same signs (results presented in appendix A.1.6).

Figure 7: Income effects moderated by increasing social capital (GSOEP 1985-2011).



Note: Average marginal effects on the linear prediction of life satisfaction with 90% confidence intervals; calculated for specification 3 from table A8.

Figure 8: Reference income less harmful for well-being with higher social capital (GSOEP 1985-2011).



Note: Predictive margins calculated for specification 3 from table A8.

Again, one can conclude that social capital positively affects well-being in two manners: it is associated with higher well-being (direct effect), and it moderates the detrimental effects of income comparisons on well-being (indirect effect). Figure 8 illustrates both effects; with increasing social capital index: the predicted life satisfaction rises and the negative slope of reference income becomes flatter.

Compared to the results obtained in the cross-sectional analysis, the only difference here is that at the highest level of social capital the income comparison effects are moderated but not entirely eliminated (the slope for *SC index = 3* is not perfectly flat, as the moderation effect amounts to -73%). This may suggest that a necessary condition for eliminating the negative effect of reference income (the "envy effect") is the high degree of interpersonal trust (a variable included in the SC index in the EU-SILC and ESS, but not present in the GSOEP analysis due to data limitations).

4.2 Changes of social capital

In the final step of the empirical analysis I employ the GSOEP data in order to test the following hypothesis: positive (negative) changes in social capital from yesterday to today are associated with lower (higher) importance of income and income comparisons for well-being today. I create a categorical variable capturing positive and negative changes in the social capital index:

$$\Delta SC\ index_{\ t} = \begin{cases} negative\ change, & \text{if } SC\ index_{\ t} < SC\ index_{\ t-1} \\ no\ change, & \text{if } SC\ index_{\ t} = SC\ index_{\ t-1} \\ positive\ change, & \text{if } SC\ index_{\ t} > SC\ index_{\ t-1}. \end{cases} \tag{8}$$

$\Delta SC\ index_{\ t}$ will be implemented into the happiness regression being interacted with individual and reference income in time t (setting *no change* as the reference category):

$$\begin{aligned} LS_{i,t} = \alpha &+ \beta_1 * log(Ind\ inc_{i,t}) + \beta_2 * log(Ref\ inc_{i,t}) + \beta_3 * \Delta SC\ index_{i,t} \\ &+ \beta_{13} * \Delta SC\ index_{i,t} * log(Ind\ inc_{i,t}) \\ &+ \beta_{23} * \Delta SC\ index_{i,t} * log(Ref\ inc_{i,t}) \\ &+ \boldsymbol{\gamma}' \boldsymbol{X}_{i,t} + f_i + \varepsilon_{i,t}. \end{aligned} \tag{9}$$

This means that each of the two income variables is going to be interacted with a dummy for negative change and a dummy for positive change.

I run three separate regressions in order to check weather the impact of social capital change on the importance of income for well-being may be lagged in time: first, I use $SC\ index_{\ t}$ as defined in equation 8, then I create analogical variables for $t-2$ and for $t-3$.[41] There results can be summarized as follows (see table A9 for estimates):

- a negative change in social capital from yesterday to today is associated with higher importance of individual income for well-being today (the interaction is significant in the specifications for $t-2$ and $t-3$);
- a positive change in SC is associated with lower importance of individual income (significant for all three lags);

[41] The sample is now limited to individuals present in two subsequent waves ($t-1$ and t). I end up with around 119,000 observations, of which ∼30,000 (25%) exhibit a negative change in social capital index, ∼61,000 (51%) exhibit no change, while ∼28,000 (24%) exhibit a positive change. For $t-2$ the numbers are, respectively, ∼92,000 (sample size), ∼25,000 (27%), ∼43,000 (47%), and ∼24,000 (26%). Finally, for $t-3$ I have ∼68,000 (sample size), ∼19,000 (28%), ∼30,000 (44%), and ∼19,000 (28%).

- a negative change in SC reinforces the negative impact of reference income on well-being (significant for all three lags);
- a positive change in SC moderates the negative impact of reference income (significant for $t-1$).

The above findings suggest that it is plausible to assume the existence of a causal relationship between the analysed variables: an increase in social capital is likely to cause lower importance of income and income comparisons for well-being. Importantly, also in the case of social capital changes, the moderation effects are higher in magnitude for reference income than for absolute income (table 6).

Table 6: Changes of social capital: moderation effects for *t-1* (GSOEP 1985-2011).

	Social capital index: negative change	Social capital index: positive change
Log of individual income	**+9%** (n/s)	**-18%**
Log of reference income	**+29%**	**-30%**

Note: Moderation effects express by how much the income coefficient is moderated for a given change in social capital index (compared to Social capital index: no change); the effects are calculated for specification 1 from table A9. n/s = not significant.

5 Conclusions and policy implications

Using data from two European cross-sectional surveys and from the German Socio-Economic Panel, I show that:

(i) individual income is positively correlated with life satisfaction and this relationship is significantly weaker for individuals with higher social capital, meaning that they have lower material interests;

(ii) reference income is negatively correlated with life satisfaction and this relationship is significantly weaker for individuals with higher social capital, meaning that they are less affected by income comparisons;

(iii) social capital moderates the importance of income for well-being, while the moderation effects for reference income are stronger than those for individual income.

Importantly, the above statements hold after accounting for the endogeneity of social capital and after controlling for the individual unobserved heterogeneity. Additionally, as the panel data analysis demonstrated, it is reasonable to expect that positive changes in social capital are likely to reduce the material interests of individuals.

These findings provide an empirical evidence that the two components of SWB usually analysed separately in happiness economics, the importance of income and the level of social capital, actually constitute two faces of the same phenomenon, that is, materialism. People who exhibit higher values of social capital, as they are less materialistic, tend to attach less importance to money expressed in absolute and relative terms. For individuals who are trustful and often meet socially, the effects of individual income on life satisfaction are significantly moderated, while the negative effects of reference income are practically eliminated and become insignificant. This outcome indicates that in the societies highly endowed with social capital, economic growth may be followed by happiness growth: if for high levels of trust and sociability

the concern for relative income is eliminated, while the absolute income still positively affects happiness, social capital becomes a necessary condition to make economic growth compatible with happiness growth. Similar result has been recently obtained by Mikucka and Sarracino (2014), who demonstrate that economic growth has a positive effect on subjective well-being in presence of increasing social trust and decreasing income inequality.

Therefore, social capital should be taken into consideration in future studies on the happiness-income paradox defined by Easterlin (1974, 1995). This additional social dimension of SWB is crucial for determining the long-run relationship between economic growth and society's well-being. Income comparisons play a significantly more important role in life satisfaction assessments in case of individuals with lower social capital. In consequence, such individuals are less likely to benefit from economic growth bringing higher standards of living to all. As the effects of relative income are virtually eliminated at high levels of trust and sociability, while the positive relationship between SWB and absolute income is maintained, it is plausible to assume that social capital is a necessary condition for making economic growth consistent with happiness growth.

The intuition behind the results on micro level is supported by the macro analysis. Social capital is significantly and negatively correlated with the life satisfaction gap between income groups. In countries characterized by high degree of interpersonal trust, the differences in average SWB between the rich and the poor is smaller. That is to say, societies highly endowed with social capital are more egalitarian in terms of happiness distribution among income groups. This finding constitutes an important contribution to the growing literature on happiness inequality, which, so far, has not considered the role of social capital (see, e.g., Becchetti et al., 2014; Delhey and Kohler, 2011; Dutta and Foster, 2013).

Clark et al. (2012) argues that in countries which have exhibited positive income growth, the happiness inequality has decreased, adding that "if raising the income of all does not raise the happiness of all, it will at least harmonize the happiness of all". The results obtained in the macro analysis suggest, instead, that SWB inequality may be reduced by increasing social capital. Raising social capital of all can raise the happiness of all and it can harmonize the happiness of the rich and poor. This conclusion, however, should be taken with care as it comes from cross-sectional data. Further investigation of international happiness times-series should therefore focus on the relationship between the trends of social capital and the trends of SWB inequality.

Finally, increases in the level of social capital, apart from having a direct positive impact on well-being, should be expected to build a society that is less dependent on material goods and more attached to commonly shared values such as solidarity, equality and civic engagement. Policies aimed to increase social capital or to reduce materialism could stimulate a mechanism that lowers people's interest for positional competition and, at the same time, increases trust and cooperation among individuals.

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A Appendix: regressions results and descriptive statistics

A.1 Regressions results

A.1.1 EU-SILC: social capital index

Table A1: Main results (EU-SILC 2013).

	(1) All	(2) All	(3) All	(4) West	(5) East
Log of individual income	0.375***	0.430***	0.479***	0.405***	0.585***
	(55.91)	(53.34)	(25.04)	(15.99)	(21.27)
Log of reference income	-0.0656**	-0.0600**	-0.113***	-0.342***	-0.427***
	(-2.18)	(-1.99)	(-3.22)	(-6.55)	(-6.06)
Social capital index = 1 * Log of individual income		-0.0311***	-0.0411*	-0.0201	-0.0627**
		(-6.06)	(-1.91)	(-0.71)	(-1.98)
Social capital index = 2 * Log of individual income		-0.0984***	-0.201***	-0.176***	-0.198***
		(-18.32)	(-9.79)	(-6.55)	(-6.39)
Social capital index = 1 * Log of reference income			0.00933	0.0520	0.0422
			(0.43)	(1.18)	(1.34)
Social capital index = 2 * Log of reference income			0.114***	0.177***	0.175***
			(5.46)	(4.20)	(5.64)
Social capital index = 1	1.060***	1.209***	1.203***	0.746***	1.123***
	(88.77)	(40.20)	(37.66)	(3.12)	(31.95)
Social capital index = 2	1.724***	2.307***	2.215***	1.549***	1.914***
	(143.80)	(71.14)	(64.30)	(6.71)	(49.34)
Controls (socio-demographic, country)	Yes	Yes	Yes	Yes	Yes
Number of observations	324059	324059	324059	207614	116445
Adjusted R^2	0.302	0.303	0.303	0.238	0.349

Note: OLS with robust standard errors. Dependent variable: Life satisfaction. Omitted categories: "Social capital index = 0", "Social capital index = 0 * Log of individual income" and "Social capital index = 0 * Log reference income". Controls: sex, age group, marital status, education level, labour market status, house owner, country dummies. * p< 0.1, ** p< 0.05, *** p< 0.01, t statistics in parentheses.

Table A2: Instrumenting social capital: 2SLS (EU-SILC 2013).

	(1) All	(2) All	(3) All	(4) West	(5) East
Log of individual income	0.416***	0.421***	0.878***	0.874***	0.898***
	(64.87)	(60.10)	(30.63)	(20.88)	(22.46)
Log of reference income	-0.0531*	-0.0612**	-0.502***	-0.842***	-0.727***
	(-1.77)	(-2.06)	(-12.39)	(-14.33)	(-9.46)
Social capital index = 1 (inst.) * Log of individual income		-0.0289***	-0.480***	-0.513***	-0.453***
		(-6.17)	(-13.80)	(-10.59)	(-8.86)
Social capital index = 2 (inst.) * Log of individual income		-0.0812***	-0.709***	-0.761***	-0.588***
		(-15.34)	(-20.68)	(-15.16)	(-12.00)
Social capital index = 1 (inst.) * Log of reference income			0.436***	0.578***	0.422***
			(12.80)	(10.45)	(8.48)
Social capital index = 2 (inst.) * Log of reference income			0.610***	0.784***	0.558***
			(18.14)	(13.89)	(11.64)
Social capital index = 1 (inst.)	1.244***	1.178***	1.105***	0.269	1.051***
	(65.41)	(43.53)	(38.55)	(1.48)	(31.96)
Social capital index = 2 (inst.)	1.302***	2.208***	2.117***	1.133***	1.848***
	(42.66)	(69.11)	(64.16)	(6.46)	(47.64)
Controls (socio-demographic, country)	Yes	Yes	Yes	Yes	Yes
Number of observations	324059	324059	324059	207614	116445
Adjusted R^2	0.286	0.303	0.301	0.234	0.348

Note: 2SLS regression with heteroskedasticity-based instruments (instrumented variables: "Log of individual income (inst.)", "Log of reference income (inst.)", "Social capital index (inst.) = 1", "Social capital index (inst.) = 2", "Social capital index (inst.) = 1 * Log of individual income", "Social capital index (inst.) = 1 * Log of reference income", "Social capital index (inst.) = 2 * Log of individual income", "Social capital index (inst.) = 2 * Log of reference income"). Dependent variable: Life satisfaction. Omitted categories: "Social capital index (inst.) = 0", "Social capital index (inst.) = 0 * Log of individual income" and "Social capital index (inst.) = 0 * Log reference income". Controls: sex, age group, marital status, education level, labour market status, house owner, country dummies. * p< 0.1, ** p< 0.05, *** p< 0.01, t statistics in parentheses.

A.1.2 EU-SILC: social capital dummies

Table A3: Interacting social capital dummies (EU-SILC 2013).

	(1) SC = Getting together with friends	(2) SC = Trust in others
Log of individual income	0.477*** (33.92)	0.619*** (53.17)
Log of reference income	-0.0749** (-2.25)	-0.143*** (-4.48)
SC * Log of individual income	-0.0940*** (-6.05)	-0.270*** (-20.14)
SC * Log of reference income	0.0301* (1.89)	0.208*** (14.88)
SC (main effect)	Yes	Yes
Controls (socio-demographic, country)	Yes	Yes
Observations	324059	324059
Adjusted R^2	0.270	0.279

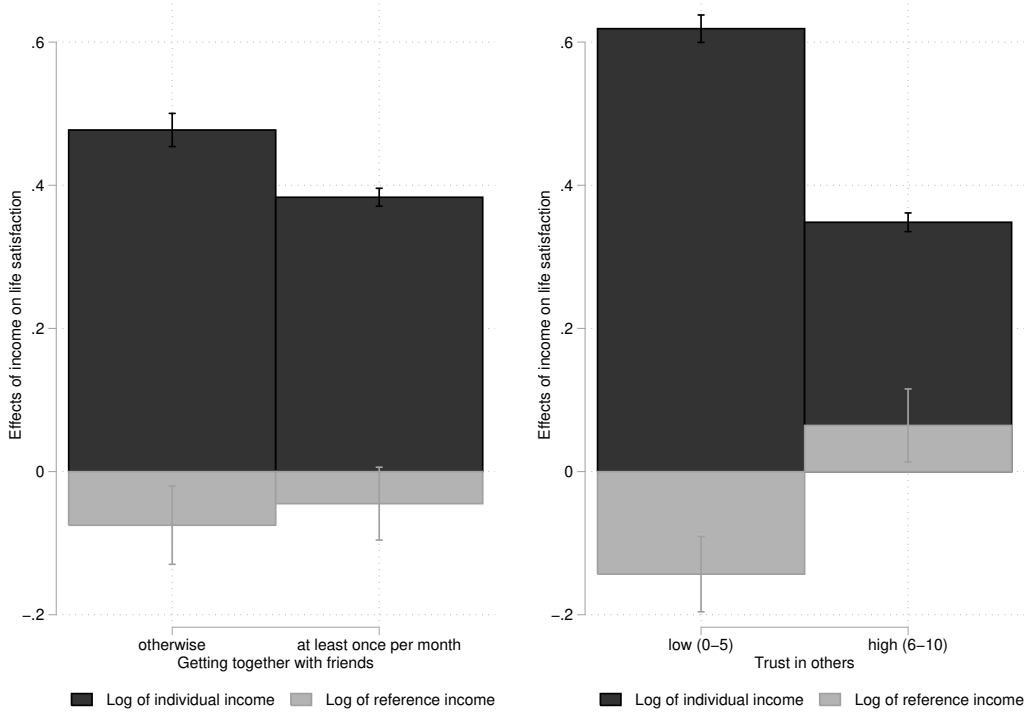
Note: OLS with robust standard errors. Dependent variable: Life satisfaction. Controls: sex, age group, marital status, education level, labour market status, house owner, country dummies. * p< 0.1, ** p< 0.05, *** p< 0.01, t statistics in parentheses.

Table A4: Interacting social capital dummies: moderation effects (EU-SILC 2013).

	Getting together with friends	Trust in others
Log of individual income	**-20%**	**-44%**
Log of reference income	**-40%**	**-145%**

Note: Moderation effects express by how much the income coefficient is moderated for a given social capital dummy; the effects are calculated for specifications 1 and 2 from table A3.

Figure A1: Income effects moderated by higher social capital (EU-SILC 2013).



Note: Average marginal effects on the linear prediction of life satisfaction with 90% confidence intervals; calculated for specifications 1 and 2 from table A3.

A.1.3 ESS: social capital index

Table A5: Main results (ESS 2012).

	(1)	(2)	(3)
Log of household income	0.460***	0.642***	0.458***
	(11.87)	(13.83)	(11.84)
Income rank 1-3	-0.157***	-0.156***	-0.294***
	(-3.77)	(-3.75)	(-4.62)
Income rank 8-10	0.148***	0.180***	0.392***
	(4.48)	(5.45)	(6.43)
Social capital index = 1 * Log of household income		-0.163***	
		(-4.49)	
Social capital index = 2 * Log of household income		-0.440***	
		(-10.64)	
Social capital index = 1 * Income rank 1-3			0.0966
			(1.47)
Social capital index = 1 * Income rank 8-10			-0.232***
			(-3.46)
Social capital index = 2 * Income rank 1-3			0.380***
			(5.42)
Social capital index = 2 * Income rank 8-10			-0.392***
			(-5.94)
Social capital index = 1	0.637***	1.779***	0.641***
	(21.96)	(6.67)	(15.12)
Social capital index = 2	1.140***	4.372***	1.109***
	(35.91)	(14.00)	(24.91)
Controls (socio-demographic, country)	Yes	Yes	Yes
Number of observations	35556	35556	35556
Adjusted R^2	0.299	0.302	0.301

Note: OLS with robust standard errors. Dependent variable: Life satisfaction. Omitted categories: "Income rank 4-7", "Social capital index = 0", "Social capital index = 0 * Log of household income" and "Social capital index = 0 * Income rank 4-7". Controls: sex, age, age squared, living with partner, living with children, years of education, labour market status, country dummies. * p< 0.1, ** p< 0.05, *** p< 0.01, t statistics in parentheses.

A.1.4 ESS: social capital dummies

Table A6: Interacting social capital dummies (ESS 2012).

	(1) SC = Meeting socially	(2) SC = Meeting socially	(3) SC = Social trust	(4) SC = Social trust
Log of household income	0.623*** (14.52)	0.488*** (12.46)	0.570*** (13.88)	0.475*** (12.19)
Income rank 1-3	-0.160*** (-3.80)	-0.288*** (-5.34)	-0.146*** (-3.49)	-0.226*** (-4.61)
Income rank 8-10	0.171*** (5.13)	0.291*** (6.42)	0.181*** (5.45)	0.278*** (6.31)
SC * Log of household income	-0.237*** (-8.10)		-0.249*** (-8.28)	
SC * Income rank 1-3		0.221*** (4.12)		0.213*** (4.10)
SC * Income rank 8-10		-0.207*** (-4.22)		-0.231*** (-4.92)
SC (main effect)	Yes	Yes	Yes	Yes
Controls (socio-demographic, country)	Yes	Yes	Yes	Yes
Number of observations	35556	35556	35556	35556
Adjusted R^2	0.283	0.282	0.295	0.294

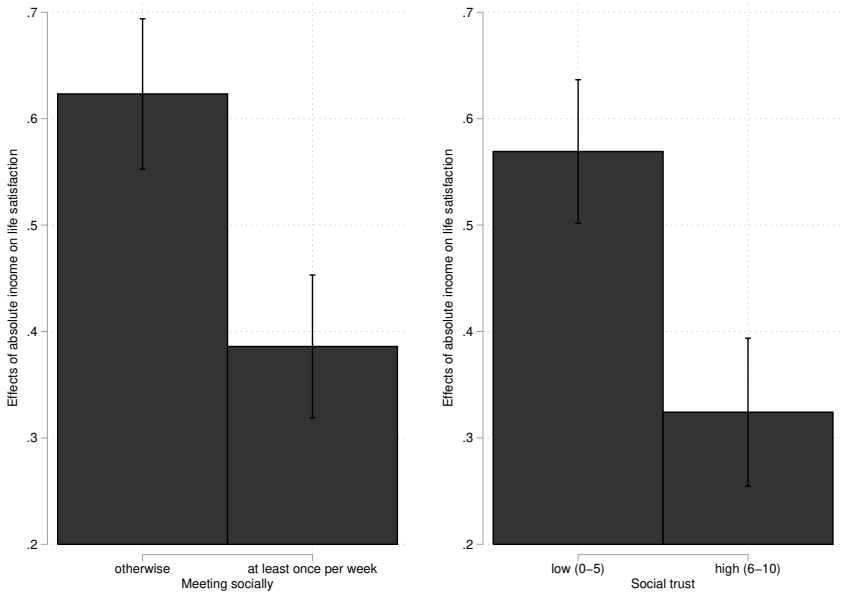
Note: OLS with robust standard errors. Dependent variable: Life satisfaction. Controls: sex, age, age squared, living with partner, living with children, years of education, labour market status, country dummies. * p< 0.1, ** p< 0.05, *** p< 0.01, t statistics in parentheses.

Table A7: Interacting social capital dummies: moderation effects (ESS 2012).

	Meeting socially	Social trust
Log of household income	**-38%**	**-43%**
Income rank 1-3	**-77%**	**-94%**
Income rank 8-10	**-71%**	**-83%**

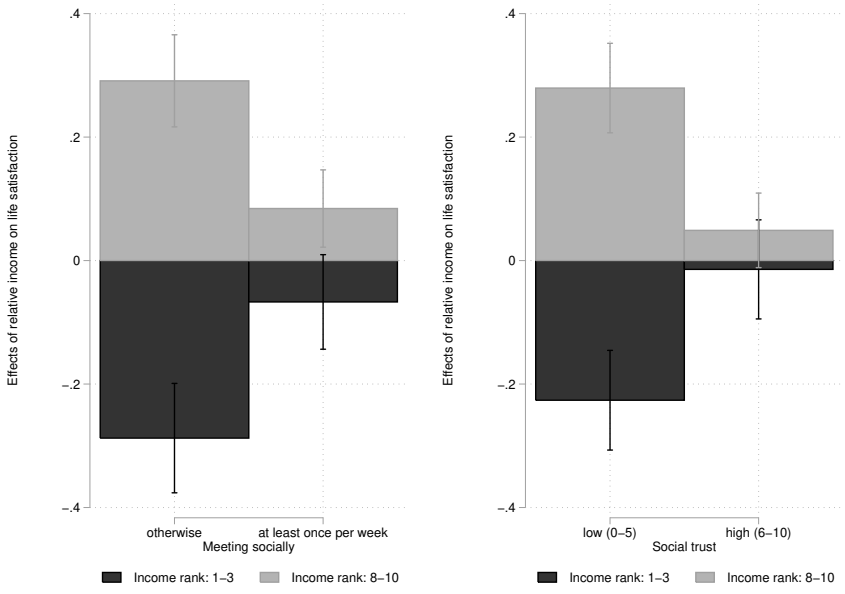
Note: Moderation effects express by how much the income coefficient is moderated for a given social capital dummy; the effects are calculated for specifications 1-4 from table A6.

Figure A2: Absolute income effects moderated by higher social capital (ESS 2012).



Note: Average marginal effects on the linear prediction of life satisfaction with 90% confidence intervals; calculated for specifications 1 and 3 from table A6.

Figure A3: Relative income effects moderated by higher social capital (ESS 2012).



Note: Average marginal effects on the linear prediction of life satisfaction with 90% confidence intervals; calculated for specifications 2 and 4 from table A6.

A.1.5 GSOEP: social capital index

Table A8: Main results (GSOEP 1985-2011).

	(1) All	(2) All	(3) All	(4) West	(5) East
Log of individual income	0.389***	0.483***	0.500***	0.460***	0.622***
	(20.15)	(13.52)	(13.79)	(10.90)	(8.98)
Log of reference income	-0.358***	-0.360***	-0.651***	-0.726***	-1.302***
	(-3.45)	(-3.48)	(-4.72)	(-4.14)	(-4.42)
Social capital index = 1 * Log of individual income		-0.0776**	-0.0917**	-0.0787*	-0.151**
		(-2.19)	(-2.52)	(-1.89)	(-1.97)
Social capital index = 2 * Log of individual income		-0.116***	-0.142***	-0.134***	-0.159*
		(-3.12)	(-3.71)	(-3.09)	(-1.86)
Social capital index = 3 * Log of individual income		-0.205***	-0.235***	-0.233***	-0.235**
		(-4.77)	(-5.34)	(-4.65)	(-2.53)
Social capital index = 1 * Log of reference income			0.260**	0.250*	0.287
			(2.44)	(1.85)	(0.97)
Social capital index = 2 * Log of reference income			0.419***	0.390***	0.988***
			(3.74)	(2.78)	(3.17)
Social capital index = 3 * Log of reference income			0.477***	0.561***	0.901**
			(3.51)	(3.37)	(2.19)
Social capital index (main effect)	Yes	Yes	Yes	Yes	Yes
Controls (socio-demographic, region, year)	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes	Yes
Number of observations	158587	158587	158587	123876	34711
Number of individuals	40919	40919	40919	32264	9158
R^2 within	0.0422	0.0425	0.0427	0.0479	0.0386
R^2 between	0.0490	0.0495	0.0500	0.0231	0.0535
R^2 overall	0.0458	0.0462	0.0466	0.0266	0.0511

Note: OLS with individual fixed effects (robust standard errors). Dependent variable: Life satisfaction. Omitted categories: "Social capital index = 0 * Log of individual income" and "Social capital index = 0 * Log reference income". Each equation includes the main effect of social capital index (three dummies). Controls: sex (omitted due to fixed effects), age, age squared, marital status, years of education, labour market status, house owner, living in East Germany, regional dummies, year dummies. * p< 0.1, ** p< 0.05, *** p< 0.01, t statistics in parentheses.

Table A9: Changes of social capital (GSOEP 1985-2011).

	(1) *t-1*	(2) *t-2*	(3) *t-3*
Log of individual income	0.391*** (15.96)	0.368*** (12.85)	0.352*** (10.32)
Log of reference income	-0.585*** (-4.82)	-0.505*** (-3.72)	-0.531*** (-3.45)
SC index: negative change * Log of individual income	0.0342 (1.23)	0.0863*** (2.76)	0.0684* (1.78)
SC index: positive change * Log of individual income	-0.0702** (-2.57)	-0.0812** (-2.52)	-0.0996*** (-2.69)
SC index: negative change * Log of reference income	-0.172** (-2.09)	-0.314*** (-3.05)	-0.287** (-2.35)
SC index: positive change * Log of reference income	0.175** (2.13)	-0.0199 (-0.20)	-0.00645 (-0.05)
Social capital index change (main effect)	Yes	Yes	Yes
Controls (socio-demographic, region, year)	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes
Number of observations	119202	91738	68145
Number of individuals	30723	26136	20503
R^2 within	0.0391	0.0399	0.0452
R^2 between	0.0392	0.0385	0.0276
R^2 overall	0.0369	0.0414	0.0289

Note: OLS with individual fixed effects (robust standard errors). Dependent variable: Life satisfaction. Omitted categories: "Social capital index: no change * Log of individual income" and "Social capital index: no change * Log reference income". Each equation includes the main effect of social capital index changes (two dummies). Controls: sex (omitted due to fixed effects), age, age squared, marital status, years of education, labour market status, house owner, living in East Germany, regional dummies, year dummies. * p< 0.1, ** p< 0.05, *** p< 0.01, t statistics in parentheses.

A.1.6 GSOEP: social capital dummies

Table A10: Interacting social capital dummies (GSOEP 1985-2011).

	(1) SC = Social gathering	(2) SC = Helping friends	(3) SC = Performing volunteer work
Log of individual income	0.481*** (14.90)	0.433*** (19.93)	0.413*** (19.06)
Log of reference income	-0.588*** (-4.67)	-0.440*** (-4.08)	-0.451*** (-4.16)
SC * Log of individual income	-0.122*** (-3.99)	-0.103*** (-4.38)	-0.0836*** (-3.18)
SC * Log of reference income	0.285*** (3.22)	0.195*** (2.82)	0.224*** (2.79)
SC (main effect)	Yes	Yes	Yes
Controls (socio-demographic, region, year)	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes
Number of observations	158587	158587	158587
Number of individuals	40919	40919	40919
R^2 within	0.0424	0.0391	0.0378
R^2 between	0.0490	0.0407	0.0385
R^2 overall	0.0459	0.0386	0.0369

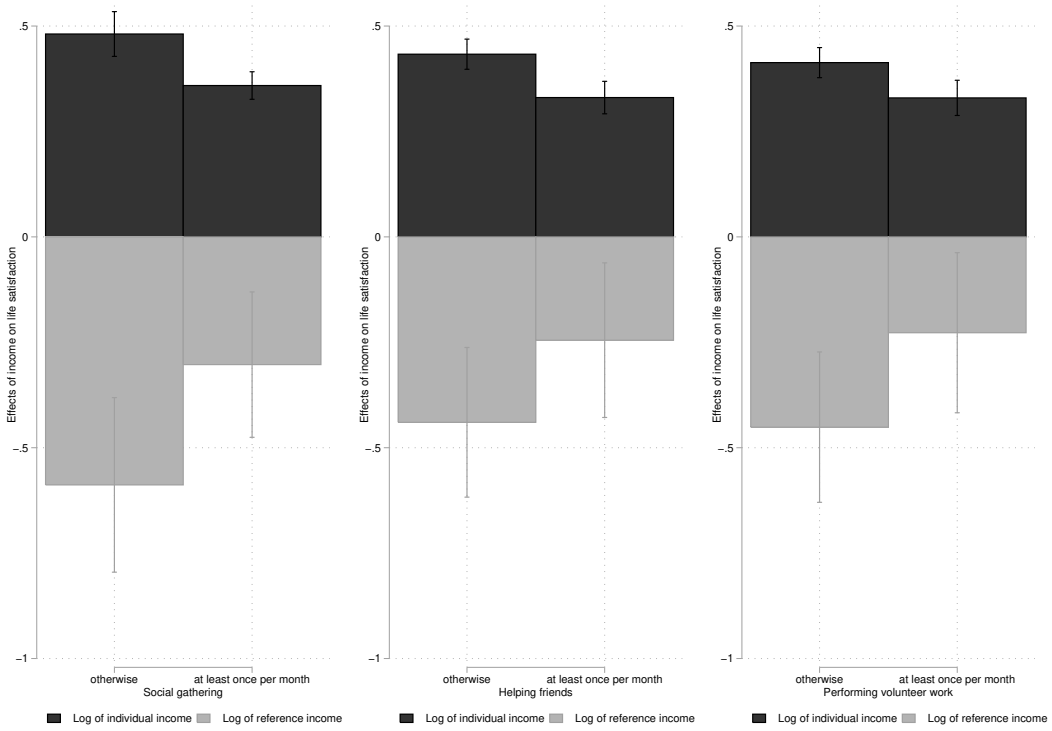
Note: OLS with individual fixed effects (robust standard errors). Dependent variable: Life satisfaction. Controls: sex (omitted due to fixed effects), age, age squared, marital status, years of education, labour market status, house owner, living in East Germany, regional dummies, year dummies. * p< 0.1, ** p< 0.05, *** p< 0.01, t statistics in parentheses.

Table A11: Interacting social capital dummies: moderation effects (GSOEP 1985-2011).

	Social gathering	Helping friends	Performing volunteer work
Log of individual income	**-25%**	**-24%**	**-20%**
Log of reference income	**-48%**	**-44%**	**-50%**

Note: Moderation effects express by how much the income coefficient is moderated for a given social capital dummy; the effects are calculated for specifications 1-3 from table A10.

Figure A4: Income effects moderated by higher social capital (GSOEP 1985-2011).



Note: Average marginal effects on the linear prediction of life satisfaction with 90% confidence intervals; calculated for specifications 1-3 from table A10.

A.2 Descriptive statistics

A.2.1 EU-SILC

Table A12: Descriptive statistics (EU-SILC 2013).

Variable	Obs	Mean	Std. Dev.	Min	Max
Life satisfaction	324059	6.923	2.14	0	10
Individual income (EUR, EU28=100)	324059	1137.251	1256.401	0	110438.8
Log of individual income	324059	6.159	1.905	0	11.612
Reference income (EUR, EU28=100)	324059	1132.845	765.403	1.983	3120.429
Log of reference income	324059	6.309	1.822	1.093	8.046
Getting together with friends	324059	.731	.443	0	1
Trust in others	324059	.575	.494	0	1
Social capital index (0-2)	324059	1.306	.708	0	2
Social capital index = 0	324059	.144	.351	0	1
Social capital index = 1	324059	.405	.491	0	1
Social capital index = 2	324059	.451	.498	0	1
Female	324059	.55	.497	0	1
Under 26	324059	.096	.294	0	1
26-35	324059	.125	.331	0	1
36-45	324059	.168	.374	0	1
46-55	324059	.189	.392	0	1
Above 55	324059	.422	.494	0	1
Single	324059	.245	.43	0	1
Married	324059	.567	.495	0	1
Widowed	324059	.098	.297	0	1
Divorced or separated	324059	.089	.285	0	1
Primary education or no education	324059	.126	.332	0	1
Secondary education	324059	.629	.483	0	1
Tertiary education	324059	.245	.43	0	1
Working	324059	.475	.499	0	1
Unemployed	324059	.076	.264	0	1
Student	324059	.054	.227	0	1
Retired	324059	.279	.449	0	1
Not working	324059	.116	.321	0	1
House owner	324059	.561	.496	0	1
AT	324059	.03	.171	0	1
BE	324059	.03	.171	0	1
BG	324059	.027	.161	0	1
CH	324059	.038	.19	0	1
CY	324059	.031	.173	0	1
DR	324059	.058	.233	0	1
EE	324059	.03	.171	0	1
EL	324059	.042	.2	0	1
ES	324059	.064	.245	0	1
FI	324059	.031	.172	0	1
FR	324059	.045	.207	0	1
HR	324059	.021	.142	0	1
HU	324059	.054	.226	0	1
IE	324059	.018	.134	0	1
IS	324059	.009	.094	0	1
IT	324059	.076	.265	0	1
LT	324059	.024	.154	0	1
LU	324059	.017	.129	0	1
LV	324059	.03	.171	0	1
MT	324059	.021	.142	0	1
NL	324059	.03	.171	0	1
NO	324059	.018	.133	0	1
PL	324059	.067	.25	0	1
PT	324059	.027	.161	0	1
RO	324059	.037	.189	0	1
RS	324059	.035	.185	0	1
SE	324059	.018	.133	0	1
SK	324059	.034	.182	0	1
UK	324059	.039	.193	0	1

Table A13: Regions used to construct reference groups (EU-SILC 2013).

Variable	Obs	Mean	Std. Dev.	Min	Max
AT1	324059	.013	.112	0	1
AT2	324059	.006	.078	0	1
AT3	324059	.011	.106	0	1
BE	324059	.03	.171	0	1
BG3	324059	.014	.117	0	1
BG4	324059	.013	.112	0	1
CH0	324059	.038	.19	0	1
CY0	324059	.031	.173	0	1
DE	324059	.058	.233	0	1
EE0	324059	.03	.171	0	1
EL1	324059	.014	.117	0	1
EL2	324059	.011	.105	0	1
EL3	324059	.013	.112	0	1
EL4	324059	.004	.065	0	1
ES11	324059	.005	.069	0	1
ES12	324059	.002	.045	0	1
ES13	324059	.002	.042	0	1
ES21	324059	.004	.06	0	1
ES22	324059	.002	.048	0	1
ES23	324059	.002	.048	0	1
ES24	324059	.003	.056	0	1
ES30	324059	.006	.075	0	1
ES41	324059	.004	.066	0	1
ES42	324059	.003	.059	0	1
ES43	324059	.003	.052	0	1
ES51	324059	.007	.08	0	1
ES52	324059	.005	.07	0	1
ES53	324059	.002	.046	0	1
ES61	324059	.008	.088	0	1
ES62	324059	.003	.05	0	1
ES63	324059	.001	.024	0	1
ES64	324059	.001	.026	0	1
ES70	324059	.003	.052	0	1
FI19	324059	.008	.089	0	1
FI1B	324059	.008	.091	0	1
FI1C	324059	.006	.08	0	1
FI1D	324059	.008	.087	0	1
FR10	324059	.005	.069	0	1
FR21	324059	.001	.036	0	1
FR22	324059	.002	.041	0	1
FR23	324059	.001	.036	0	1
FR24	324059	.002	.044	0	1
FR25	324059	.001	.034	0	1
FR26	324059	.001	.038	0	1
FR30	324059	.004	.06	0	1
FR41	324059	.002	.045	0	1
FR42	324059	.001	.037	0	1
FR43	324059	.001	.028	0	1
FR51	324059	.003	.058	0	1
FR52	324059	.003	.052	0	1
FR53	324059	.002	.04	0	1
FR61	324059	.003	.053	0	1
FR62	324059	.002	.045	0	1
FR63	324059	.001	.026	0	1
FR71	324059	.004	.066	0	1
FR72	324059	.001	.033	0	1
FR81	324059	.002	.044	0	1
FR82	324059	.003	.053	0	1
FR83	324059	0	.011	0	1
HR0	324059	.021	.142	0	1
HU1	324059	.011	.106	0	1
HU2	324059	.014	.116	0	1
HU3	324059	.029	.168	0	1
IE0	324059	.018	.134	0	1
IS	324059	.009	.094	0	1
ITC	324059	.018	.134	0	1
ITF	324059	.016	.126	0	1
ITG	324059	.005	.073	0	1
ITH	324059	.019	.137	0	1
ITI	324059	.017	.131	0	1
LT0	324059	.024	.154	0	1
LU0	324059	.017	.129	0	1
LV0	324059	.03	.171	0	1
MT0	324059	.021	.142	0	1
NL	324059	.03	.171	0	1
NO0	324059	.018	.133	0	1
PL1	324059	.014	.119	0	1
PL2	324059	.012	.11	0	1
PL3	324059	.014	.118	0	1
PL4	324059	.01	.101	0	1
PL5	324059	.007	.081	0	1
PL6	324059	.009	.096	0	1
PT	324059	.027	.161	0	1
RO1	324059	.01	.101	0	1
RO2	324059	.01	.101	0	1
RO3	324059	.008	.091	0	1
RO4	324059	.008	.088	0	1
RS	324059	.035	.185	0	1
SE1	324059	.007	.084	0	1
SE2	324059	.008	.088	0	1
SE3	324059	.003	.056	0	1
SK0	324059	.034	.182	0	1
UKC	324059	.001	.038	0	1
UKD	324059	.004	.062	0	1
UKE	324059	.003	.052	0	1
UKF	324059	.002	.049	0	1
UKG	324059	.003	.055	0	1
UKH	324059	.003	.057	0	1
UKI	324059	.003	.055	0	1
UKJ	324059	.005	.07	0	1
UKK	324059	.003	.054	0	1
UKL	324059	.002	.042	0	1
UKM	324059	.006	.075	0	1
UKN	324059	.004	.061	0	1

Table A14: Descriptive statistics: macro variables (EU-SILC 2013).

Variable	Obs	Mean	Std. Dev.	Min	Max
LS gap between rich and poor	32	1.41	.498	.652	2.657
Trust in others (share of people with scores 6-10)	32	.59	.168	.275	.899
Gini index (for equivalised income)	32	.294	.039	.23	.367
GDP per capita (current prices, PPS per capita, in thousands)	32	27.05	12.005	10.1	70.5

A.2.2 ESS

Table A15: Descriptive statistics (ESS 2012).

Variable	Obs	Mean	Std. Dev.	Min	Max
Life satisfaction	35556	6.885	2.369	0	10
Household income (EUR, EU28=100)	35556	1974.286	1490.118	140.523	11781.15
Log of household income	35556	7.287	.836	4.945	9.374
Income rank 1-3	35556	.355	.478	0	1
Income rank 4-7	35556	.399	.49	0	1
Income rank 8-10	35556	.247	.431	0	1
Social trust	35556	.43	.495	0	1
Meeting socially	35556	.579	.494	0	1
Social capital index (0-2)	35556	1.009	.729	0	2
Social capital index = 0	35556	.261	.439	0	1
Social capital index = 1	35556	.469	.499	0	1
Social capital index = 2	35556	.27	.444	0	1
Female	35556	.527	.499	0	1
Age	35556	49.322	18.056	15	103
Age squared (divided by 100)	35556	27.587	18.328	2.25	106.09
Years of education	35556	12.654	4.126	0	51
Working	35556	.492	.5	0	1
Unemployed	35556	.075	.264	0	1
Student	35556	.069	.254	0	1
Retired	35556	.241	.428	0	1
Not working	35556	.122	.327	0	1
Living with partner	35556	.605	.489	0	1
Living with children	35556	.378	.485	0	1
AL	35556	.031	.172	0	1
BE	35556	.048	.213	0	1
BG	35556	.054	.227	0	1
CH	35556	.034	.182	0	1
CY	35556	.025	.156	0	1
CZ	35556	.037	.188	0	1
DE	35556	.071	.257	0	1
DK	35556	.033	.179	0	1
EE	35556	.055	.228	0	1
ES	35556	.044	.205	0	1
FI	35556	.058	.233	0	1
FR	35556	.05	.218	0	1
GB	35556	.05	.217	0	1
HU	35556	.039	.194	0	1
IE	35556	.054	.226	0	1
IS	35556	.017	.13	0	1
IT	35556	.015	.122	0	1
LT	35556	.048	.213	0	1
NL	35556	.044	.205	0	1
NO	35556	.044	.205	0	1
PL	35556	.041	.199	0	1
PT	35556	.028	.166	0	1
SE	35556	.047	.211	0	1
SI	35556	.026	.158	0	1
SK	35556	.003	.053	0	1

A.2.3 GSOEP

Table A16: Descriptive statistics (GSOEP 1985-2011).

Variable	Obs	Mean	Std. Dev.	Min	Max
Life satisfaction	158587	6.967	1.826	0	10
Individual income (2011 EUR)	158587	1682.892	1017.249	0	44728.43
Log of individual income	158587	7.311	.479	0	10.708
Reference income (2011 EUR)	158587	1677.146	251.864	1192.22	2243.969
Log of reference income	158587	7.414	.147	7.084	7.716
Social gathering	158587	.776	.417	0	1
Helping friends	158587	.399	.49	0	1
Performing volunteer work	158587	.277	.447	0	1
Social capital index (0-3)	158587	1.451	.913	0	3
Social capital index = 0	158587	.16	.366	0	1
Social capital index = 1	158587	.362	.481	0	1
Social capital index = 2	158587	.345	.475	0	1
Social capital index = 3	158587	.133	.34	0	1
Female	158587	.517	.5	0	1
Age	158587	46.891	17.219	16	101
Age squared (divided by 100)	158587	24.953	17.176	2.56	102.01
Single	158587	.22	.414	0	1
Married	158587	.64	.48	0	1
Widowed	158587	.066	.247	0	1
Divorced or separated	158587	.075	.264	0	1
Years of education	158587	11.592	2.638	7	18
Working	158587	.585	.493	0	1
Unemployed	158587	.054	.225	0	1
Student	158587	.029	.168	0	1
Retired	158587	.161	.367	0	1
Not working	158587	.172	.377	0	1
House owner	158587	.474	.499	0	1
East Germany	158587	.219	.413	0	1
Baden-Wuerttemberg	158587	.136	.342	0	1
Bavaria	158587	.142	.349	0	1
Berlin	158587	.038	.19	0	1
Brandenburg	158587	.037	.189	0	1
Bremen	158587	.008	.087	0	1
Hamburg	158587	.015	.122	0	1
Hesse	158587	.075	.264	0	1
Mecklenburg-Western Pomeran	158587	.022	.148	0	1
Lower Saxony	158587	.089	.284	0	1
North Rhine-Westphalia	158587	.209	.407	0	1
Rhineland-Palatinate	158587	.053	.225	0	1
Saarland	158587	.005	.072	0	1
Saxony	158587	.066	.248	0	1
Saxony-Anhalt	158587	.039	.194	0	1
Schleswig-Holstein	158587	.027	.162	0	1
Thuringia	158587	.04	.196	0	1
1985	158587	.065	.246	0	1
1986	158587	.057	.232	0	1
1988	158587	.055	.227	0	1
1992	158587	.073	.261	0	1
1994	158587	.07	.255	0	1
1996	158587	.07	.256	0	1
1997	158587	.069	.254	0	1
1999	158587	.081	.273	0	1
2005	158587	.119	.323	0	1
2007	158587	.119	.323	0	1
2009	158587	.117	.321	0	1
2011	158587	.106	.307	0	1

B Appendix: methodology

B.1 Interpreting the interaction term between a categorical and a continuous variable (EU-SILC specification)

Interacting a categorical variable with a continuous variable means that each category of the categorical one (treated as a dummy) is interacted with the continuous one. In case of equation 1 from section 3.1 (where *SC index* has three categories, each treated as a dummy variable: *SC index =0* - reference category, *SC index =1* and *SC index =2*), the estimated model takes the following form:

$$\begin{aligned} LS_i = \alpha_0 &+ \alpha_1 * log(Ind\ inc_i) + \alpha_2 * log(Ref\ inc_i) + \alpha_3 * (SC\ index\ =1)_i + \alpha_4 * (SC\ index\ =2)_i \\ &+ \alpha_{13} * (SC\ index\ =1)_i * log(Ind\ inc_i) + \alpha_{14} * (SC\ index\ =2)_i * log(Ind\ inc_i) \\ &+ \alpha_{23} * (SC\ index\ =1)_i * log(Ref\ inc_i) + \alpha_{24} * (SC\ index\ =2)_i * log(Ref\ inc_i) \\ &+ \boldsymbol{\gamma}' \boldsymbol{X}_i + \varepsilon_i. \end{aligned} \tag{10}$$

The equation may be rearranged into:

$$\begin{aligned} LS_i = \alpha_0 &+ [\alpha_1 + \alpha_{13} * (SC\ index\ =1)_i + \alpha_{14} * (SC\ index\ =2)_i] * log(Ind\ inc_i) \\ &+ [\alpha_2 + \alpha_{23} * (SC\ index\ =1)_i + \alpha_{24} * (SC\ index\ =2)_i] * log(Ref\ inc_i) \\ &+ \alpha_3 * (SC\ index\ =1)_i + \alpha_4 * (SC\ index\ =2)_i \\ &+ \boldsymbol{\gamma}' \boldsymbol{X}_i + \varepsilon_i. \end{aligned} \tag{11}$$

The marginal effect of $log(Ind\ inc)$ on LS changes with the level of *SC index* and will be equal to the expression:

$$\begin{aligned} \frac{\partial LS}{\partial log(Ind\ inc)} &= \alpha_1 + \alpha_{13} * (SC\ index\ =1) + \alpha_{14} * (SC\ index\ =2) \\ &= \begin{cases} \alpha_1, & \text{for } (SC\ index\ =0) = 1 \\ \alpha_1 + \alpha_{13}, & \text{for } (SC\ index\ =1) = 1 \\ \alpha_1 + \alpha_{14}, & \text{for } (SC\ index\ =2) = 1. \end{cases} \end{aligned} \tag{12}$$

Analogically, the marginal effect of $log(Ref\ inc)$ on LS will be equal to:

$$\begin{aligned} \frac{\partial LS}{\partial log(Ref\ inc)} &= \alpha_2 + \alpha_{23} * (SC\ index\ =1) + \alpha_{24} * (SC\ index\ =2) \\ &= \begin{cases} \alpha_2, & \text{for } (SC\ index\ =0) = 1 \\ \alpha_2 + \alpha_{23}, & \text{for } (SC\ index\ =1) = 1 \\ \alpha_2 + \alpha_{24}, & \text{for } (SC\ index\ =2) = 1. \end{cases} \end{aligned} \tag{13}$$

B.2 Instrumental variables estimation using heteroskedasticity-based instruments (EU-SILC specification)

Social capital index is a categorical variable, thus it is necessary to instrument each category (dummy) and the interactions with each category; the list of the instrumented variables is thus the following:

- $SC\ index\ =1$,
- $SC\ index\ =2$,
- $(SC\ index\ =1) * log(Ind\ inc)$,
- $(SC\ index\ =2) * log(Ind\ inc)$,
- $(SC\ index\ =1) * log(Ref\ inc)$,
- $(SC\ index\ =2) * log(Ref\ inc)$.

First, I regress each of the above mentioned endogenous variables on the vector of controls $\boldsymbol{X}$ from equation 1:

$$(SC\ index\ =1)_i = a_1 + \boldsymbol{B}_1'\boldsymbol{X}_i + \epsilon_{1,i} \tag{14}$$

$$(SC\ index\ =2)_i = a_2 + \boldsymbol{B}_2'\boldsymbol{X}_i + \epsilon_{2,i} \tag{15}$$

$$(SC\ index\ =1)_i * log(Ind\ inc)_i = a_3 + \boldsymbol{B}_3'\boldsymbol{X}_i + \epsilon_{3,i} \tag{16}$$

$$(SC\ index\ =2)_i * log(Ind\ inc)_i = a_4 + \boldsymbol{B}_4'\boldsymbol{X}_i + \epsilon_{4,i} \tag{17}$$

$$(SC\ index\ =1)_i * log(Ref\ inc)_i = a_5 + \boldsymbol{B}_5'\boldsymbol{X}_i + \epsilon_{5,i} \tag{18}$$

$$(SC\ index\ =2)_i * log(Ref\ inc)_i = a_6 + \boldsymbol{B}_6'\boldsymbol{X}_i + \epsilon_{6,i}. \tag{19}$$

Second, I generate the instruments by multiplying the residuals from the "first stage equation" with each of the control variables in mean-centred form:

$$Z_{1,j} = (X_j - \overline{X}_j) * \hat{\boldsymbol{\epsilon}}_{\mathbf{1}} \tag{20}$$

$$Z_{2,j} = (X_j - \overline{X}_j) * \hat{\boldsymbol{\epsilon}}_{\mathbf{2}} \tag{21}$$

$$Z_{3,j} = (X_j - \overline{X}_j) * \hat{\boldsymbol{\epsilon}}_{\mathbf{3}} \tag{22}$$

$$Z_{4,j} = (X_j - \overline{X}_j) * \hat{\boldsymbol{\epsilon}}_{\mathbf{4}} \tag{23}$$

$$Z_{5,j} = (X_j - \overline{X}_j) * \hat{\boldsymbol{\epsilon}}_{\mathbf{5}} \tag{24}$$

$$Z_{6,j} = (X_j - \overline{X}_j) * \hat{\boldsymbol{\epsilon}}_{\mathbf{6}} \tag{25}$$

where j stands for the given control variable from vector $\boldsymbol{X}$. There are 41 control dummy variables (base levels not counted, see table A12), therefore $j = 1, 2, ..., 41$. Each of the 6 endogenous variables will thus have 41 instruments generated in the above described manner.

B.3 Instrumental variables estimation using heteroskedasticity-based instruments (Lewbel, 2012)

"Consider Y_1, Y_2 as observed endogenous variables, X a vector of observed exogenous regressors, and $\varepsilon = (\varepsilon_1, \varepsilon_2)$ as unobserved error processes. Consider a structural model of the form:

$$Y_1 = X'\beta_1 + Y_2\gamma_1 + \varepsilon_1 \tag{26}$$

$$Y_2 = X'\beta_2 + Y_1\gamma_2 + \varepsilon_2. \tag{27}$$

This system is triangular when $\gamma_2 = 0$ (or, with renumbering, when $\gamma_1 = 0$). Otherwise, it is fully simultaneous. The errors $\varepsilon_1, \varepsilon_2$ may be correlated with each other. If the exogeneity assumption, $E(\varepsilon X) = 0$ holds, the reduced form is identified, but in the absence of identifying restrictions, the structural parameters are not identified. These restrictions often involve setting certain elements of β_1 or β_2 to zero, which makes instruments available. In many applied contexts, the third assumption made for the validity of an instrument - that it only indirectly affects the response variable - is difficult to establish. The zero restriction on its coefficient may not be plausible. The assumption is readily testable, but if it does not hold, IV estimates will be inconsistent. Identification in Lewbel's approach is achieved by restricting correlations of $\varepsilon\varepsilon' X$ with X. This relies upon higher moments, and is likely to be less reliable than identification based on coefficient zero restrictions. However, in the absence of plausible identifying restrictions, this approach may be the only reasonable strategy. The parameters of the structural model will remain unidentified under the standard homoskedasticity assumption: that $E(\varepsilon\varepsilon' \mid X)$ is a matrix of constants. However, in the presence of heteroskedasticity related to at least some elements of X, identification can be achieved. In a fully simultaneous system, assuming that $cov(X, \varepsilon_j^2) \neq 0, j = 1, 2$ and $cov(Z, \varepsilon_1\varepsilon_2) = 0$ for observed Z will identify the structural parameters. Note that Z may be a subset of X, so no information outside the model specified above is required. The key assumption that $cov(Z, \varepsilon_1\varepsilon_2) = 0$ will automatically be satisfied if the mean zero error processes are conditionally independent: $\varepsilon_1 \perp \varepsilon_2 \mid Z = 0$. However, this independence is not strictly necessary. In the most straightforward context, we want to apply the instrumental variables approach to a single equation, but lack appropriate instruments or identifying restrictions. The auxiliary equation or 'first-stage' regression may be used to provide the necessary components for Lewbel's method. In the simplest version of this approach, generated instruments can be constructed from the auxiliary equations' residuals, multiplied by each of the included exogenous variables in mean-centered form:

$$Z_j = (X_j - \overline{X}) * \epsilon \tag{28}$$

where ϵ is the vector of residuals from the 'first-stage regression' of each endogenous regressor on all exogenous regressors, including a constant vector."[42]

[42]Source: Baum et al. (2012).