Information Technologies and Subjective Well-being: Does the Internet Raise Material Aspirations?

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Abstract

This paper examines whether access to modern information technologies, in particular the internet, has an impact on invididual positionality – the degree to which subjective well-being is affected by income relative to others rather than absolute income. We provide empirical evidence that positionality and internet access are intertwined. Exploiting variation over time in a panel of European households, we find stated material aspirations to be significantly positively related to computer access in areas with advanced internet infrastructure. Furthermore, we report cross-sectional evidence from the World Values Survey suggesting an indirect negative effect of internet access on subjective well-being since people who regularly use the internet as a source of information derive less satisfaction from income. Together, the empirical findings highlight the importance of information sets for how individuals evaluate their own living conditions relative to others and suggest a vital role for informational globalisation to affect positionality.

Keywords: Subjective well-being, positionality, relative income, informational globalisation

JEL Classification: D03, I31

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1 Introduction

This paper examines whether access to modern information and telecommunication technologies (ICTs), in particular access to the internet, has an effect on invididual positionality – the degree to which subjective well-being is affected by how one's own living conditions compare to those of others. We hypothesise that information sets are crucial for how people evaluate their own living conditions relative to their social environment. If the internet provides information about lifestyles of others, this can potentially shift material aspirations upwards. Therefore, subjective well-being of those doing relatively worse might be negatively affected by rising material aspirations triggered by ICTs.[1] Compared to more conventional information technologies, such as television or radio, the internet is distinct in that it typically transcends national and continental borders and can involve instantaneous interpersonal interactions, both of which increase the volume and frequency of the information it can transmit.

Our research builds on a growing economic literature documenting that subjective well-being and economic decision-making are affected by how individuals see themselves within their social environment and how their living conditions compare to those of their peers.[2] Of particular interest in existing theoretical and empirical work is the concept of relative income. It is commonly attributed to Duesenberry (1949) who was among the first to study the implications of relative income preferences for consumption behaviour. Clark et al. (2008) provide a detailed survey of the relative income concept in the context of the Easterlin paradox.[3]

During the last decade, a number of empirical studies have identified positional concerns in terms of income and their implications. Most analyses report a negative link between subjective well-being and the income of a reference group. This reference group is mostly exogeneously defined and comprises people with similar age, professional and educational background, or in the same geographic environment (see, e.g., Luttmer 2005; Senik 2008; Dynan and Ravina 2007; Clark and Senik 2010a; Fischer and Torgler 2013). Ferrer-i-Carbonell (2005) finds that the negative effect of high reference incomes on well-being can be as high as the positive effect of own income. Experimental work has revealed evidence that the income rank matters for economic decisions independently of absolute income levels (Mujcic and Frijters 2013). Increasing concerns about relative status in turn are ascribed by some authors to influence the degree of social and institutional trust (Gustavsson and Jordahl 2008; Fischer and Torgler 2013) and can also

[1] Throughout this paper, we use the terms 'subjective well-being' and 'life satisfaction' interchangeably. Although there may be philosophical and semantic differences, we take the stand of Van Praag (2011) and many other economists that both essentially cover a similar empirical concept.

[2] See, e.g., Van Praag et al. (1979) for an early empirical illustration and Manski (2000) for a broader overview of the economics behind social interactions.

[3] The Easterlin paradox describes the empirical puzzle that increases in gross national income have not been accompanied by proportional increases in average happiness at the country level.

contribute to the discussion on how inequality in incomes and opportunities translates into subjective well-being (see, e.g., Oishi et al. 2011; Bjørnskov et al. 2013).

What has been less considered in existing empirical studies is that relative income concerns require sufficient information about the lifestyles of others. This was only considered in the recent theoretical work of Van Praag (2011) where he synthesises that "the phenomenon of social transparency or lack of transparency plays a role in the evaluation of social subjective well-being". Our research hypothesis thus stems from the fact that relative concerns are crucially determined by the flow of information between individuals – which is increasingly facilitated by modern ICTs.

A couple of studies have recently confirmed the empirical relevance of ICT-driven relative concerns and material aspirations. Hyll and Schneider (2013) provide evidence that television consumption drives material aspirations by using a natural experiment which exploits the fact that in former Eastern Germany only some areas could receive a TV signal from Western Germany due to geographical reasons. They find a positive relationship between watching (West German) TV and material aspirations which are defined by individual assessments of the importance of material possessions. Bruni and Stanca (2006) find suggestive evidence that people who watch TV for more than two hours per day only experience half the increase in life satisfaction from a rise in income compared to low-frequency TV viewers. Finally, Frey et al. (2007) analyse data on life satisfaction and TV consumption in Europe and provide evidence that TV viewers are on average less satisfied with their financial situation even after controlling for actual income. Clark and Senik (2010a) is, to our knowledge, the only study which looks beyond TV and briefly touches on the internet. They find that respondents with internet access tend to attach greater importance to income comparisons. Similar results hold for the consumption of television. People who watch TV also stated that the primary direction of income comparisons is towards people outside the spheres of family, friends, or working colleagues. Moreover, respondents who find it important to compare their own income report lower happiness levels on average. However, the results are suggestive, rather than definite, as there is no direct analysis on the happiness-internet nexus. Systematic evidence on the role of the internet in determining material aspirations and relative concerns in subjective well-being is therefore missing in the empirical literature.

The empirical analysis in this paper delivers a systematic test of the relationship between internet access and material aspirations. An ideal dataset for the empirical analysis would include information on subjective well-being, individual income positions, and the individual composition of the reference group for different degrees of exposure to ICTs. This would

allow us to observe how the relevance of income comparisons as well as the composition of the reference group change with increasing access to ICTs. Since, to our knowledge, there is no such dataset available, we present a two-parted empirical analysis using two different datasets. As a measure of material aspirations or reference income, most existing studies calculate the average income of a *fixed* reference group, such as other people in the same geographic area or from a similar demographic background. This is, however, less meaningful in the context of ICT-induced changes in the income comparison process. On the contrary, the argument of ICT-driven material aspirations implies that reference groups are – at least to some extent – endogenous and may change with varying access to information technologies. Since we do not observe reference groups of each and every individual, we choose to take a more abstract measure of material aspirations and regard such reference groups as a 'black box'.[4]

More specifically, we first directly investigate the relationship between ICT possession and a measure of reference income using panel data from the European Union Statistics on Income and Living Conditions (EU-SILC). As the empirical proxy of reference incomes, we take the answer to what people consider as a minimum income to "make ends meet". To underpin this choice, we analyse data from the German Socio-Economic Panel (GSOEP), one of the few surveys that contain both the minimum-income and a life satisfaction question for a number of years, and find that this measure of reference income features a robust negative effect on life satisfaction – and as such behaves like standard measures of reference income based on exogeneously given demographic or geographic characteristics. It therefore seems plausible that the minimum-income question indeed provides an empirical benchmark against which individuals evaluate their actual income position. Relating this measure to ICT possession, our findings show that households in possession of a computer report needing significantly higher levels of minimum incomes, after controlling for their actual level of income, a range of socio-economic characteristics, as well as household fixed effects in a sample of 29 European countries. The estimated effect prevails in regions which become more advanced in their internet infrastructure. Subsequently, we explore the implications of access to information technologies for subjective well-being. Based on recent data on life satisfaction, ICT usage, and income from 57 countries in the World Values Survey (WVS), we find that individuals who regularly use the internet as a source of information derive less satisfaction from their income, pointing to an increase in material aspirations driven by the usage of the internet. We find tentative evidence that the internet is distinct from other media, such as newspapers or television and that material aspiration effects matter when going up in the income distribution. In sum, the empirical results

[4]Recent empirical evidence on the relationship between subjective well-being and income comparisons suggests that individuals are mostly unaware of the well-being impacts of income comparisons (Mayraz et al. 2009). For the empirical analysis, this dilutes the potential bias that would arise if individuals were to self-select reference groups in a systematic relationship to their ICT usage.

suggest that internet access lowers the satisfaction that people derive from their income position and that one explanation for this pattern lies in the positive link between internet access and aspired incomes against which actual incomes are evaluated.

Given the limited range of papers on ICT-driven material aspirations, our paper contributes to the existing literature in four ways. Different from Bruni and Stanca (2006), this paper takes a closer look at material aspiration effects differ between different parts of the income distribution. The relation of ICT access and satisfaction derived from income therefore does not need to be the same across all income groups. Next, we employ a more comparable and continous measure of material aspirations in using the response to the minimum-income question. This contrasts with the experimental study of Hyll and Schneider (2013) which relies on broad survey questions to measure material aspirations.[5] Finally, our paper is the first to provide systematic evidence on the role of the internet and we resolve some of the endogeneity concerns present in previous cross-sectional studies by controlling for time-invariant unobserved heterogeneity in our measure of reference income in the panel analysis of European households.

The remainder of this paper is structured as follows: To illuminate the mechanism behind ICT-driven relative concerns in subjective well-being, we lay out a simple theoretical argument in section 2. We derive the testable implications that more ICT-driven information flows in society lead to an increase in material aspirations and indirectly to a lower satisfaction with actual income. Section 3.1 provides the results from an empirical model of reference incomes that is estimated with the data from the EU-SILC. Section 3.2 describes the WVS data, explains the choice of control variables in light of identification problems in the simple cross-section, and presents results from an empirical model of subjective well-being with heterogeneous income effects dependent on the usage of different information technologies. Section 4 concludes.

2 Theoretical considerations

Recent work on the economics of well-being shows that subjective well-being and economic decision-making are affected by how individuals see themselves within their social environment. Brosnan and De Waal (2003) report that such so-called relative concerns might have been formed in an evolutionary process. One core finding of their study is that, in an experimental setup, monkeys reject formerly acceptable food deals after observing that other monkeys got a better

[5]Specifically, Hyll and Schneider (2013) use responses from the following questions to measure aspirations : "To what extent do you attach importance to acquiring valuable personal possessions (real estate, expensive cars, etc.)?", "To what extent do you attach importance to making use of all opportunities offered to earn money?", and "To what extent do you attach importance to living a comfortable and pleasant life without much effort?".

deal. In conclusion, they conjecture that "during the evolution of cooperation it may have become critical for individuals to compare their own efforts and pay-offs with those of others" (Brosnan and De Waal 2003, p. 297).

Obviously, concerns about other people's incomes requires sufficient information about their living conditions. The income comparison process should therefore be crucially affected by the availability of information and environmental transparency (Diener and Fujita 1997; Van Praag 2011). Scarce empirical evidence confirms the crucial role of information. In a study on rural China, Knight et al. (2009) find strong evidence for the importance of individual information sets for the formation of reference groups. Most rural people have rather narrow scopes of comparison, often limited to their local village. Having lived outside of the community for more than a year in turn leads to a negative effect on subjective well-being, potentially via increasing material aspirations. The findings are in line with an early study by Van Praag et al. (1979) who find that people in less urbanised regions attach more weight to their own income than to incomes of others.

If information is central to evaluate one's own living conditions, one obvious question evolves around the potential impact of modern information technologies, most importantly the internet. Ex ante, the literature points to two main theoretical channels through which increasing exposure to ICTs can impact subjective well-being. First, firms market their new products through modern information technologies, meaning that people with access to ICTs are increasingly confronted with material temptations. Second, modern information technologies can create new reference points. Following the distinction by Castronova and Wagner (2011), "virtual" reference groups (rather than "literal" ones) might gain importance. Individuals that used to have relative concerns vis-à-vis their closest environment may now be inclined to compare their living conditions with individuals in other regions, countries, continents, or even in the virtual world (Bruni and Stanca 2006; Layard 2003; Castronova and Wagner 2011). Compared to more conventional information technologies, such as television or radio, the internet is distinct for at least two reasons. First, the internet by its very nature is not a local, but a global medium that connects people separated by national and continental borders, particularly when common platforms or news websites are used in different countries. Second, the internet is potentially a much more interactive technology than, e.g., television, that gives users the ability to easily, frequently and instantaneously exchange information with one another. This has been particularly reflected in the emergence of social networks and instant messaging services. In both cases, the internet can function as a vehicle to deliver information about the living conditions and consumption patterns of others – and therefore trigger new material aspirations. This situations provides one of the hypotheses that will be tested in the following empirical analysis.

Hypothesis on the level of aspired reference income: *The aspired income level rises with increased access to modern ICTs.*

If existing material possessions do not grow in line with these aspirations, the gap between aspirations and actual income can have a detrimental effect on subjective well-being. This phenomenon is commonly referred to as the "satisfaction treadmill": The more information people have about other people's living conditions, the more relevant status concerns will be for subjective well-being. To illustrate this point, we refer to a stylized composite subjective well-being (SWB) function commonly used in empirical analyses of well-being (e.g. Stutzer 2004; Ferrer-i-Carbonell 2005). Individuals derive well-being from own income (Y) and from comparing their own income to their aspired income (Y^*). To accommodate for the fact that available information matters for the formation of aspired incomes, we model it to endogeneously depend on the availability of information (π), where $\frac{\partial Y^*(\pi)}{\partial \pi} > 0$:

$$SWB = \alpha + \beta Y + \gamma \frac{Y}{Y^*(\pi)}, \tag{1}$$

where $\beta > 0$ captures the well-being component from one's own income and γ from relative income. Assuming that people suffer deprivation when falling short of their aspired income (and, conversely, enjoy happiness when being above), we suggest that $\gamma > 0$. Increasing social transparency thus has an additional effect on subjective well-being over and above own income concerns by changing the ratio of actual and aspired income. Against this framework, we formulate the following testable hypothesis about differential income effects in the well-being function:

Hypothesis on differential income effects: *If material aspirations increase with the availability of information about others, this will lower the positive effect of income on subjective well-being.*

3 Empirical Analysis

The empirical analysis builds on the presumption that the access to modern ICTs, especially the internet, is crucially linked to the availability of information about other people's living conditions. First, we directly investigate the relationship between ICT possession and a measure of reference income using panel data from the European Union Statistics on Income and Living Conditions (EU-SILC). Subsequently, we explore the implications of access to information technologies for subjective well-being using a broader set of countries in the World Values Survey (WVS).

3.1 The effect of ICT possession on material aspirations

3.1.1 Empirical strategy and data

This part of the empirical analysis directly tests whether ICT access has an impact on the level of aspired reference income in a sample of industrialised European countries. As the measure of material aspirations, we take the response to the minimum-income question, i.e., how much a household states it needs to "make ends meet" at the end of the month. The precise wording is: "In your opinion, what is the very lowest net monthly income that your household would have to have in order to make ends meet, that is to pay its usual necessary expenses?". There are two concerns with using the minimum-income question as an empirical proxy of aspirations.

First, it might just be a noisy measure of actual income, especially given that households were asked how much it needs to "make ends meet, *that is to pay its usual necessary expenses* [emphasis added]." In figure A.1 in the appendix, we plot country means of the response to the minimum-income question against actual household income. As can be seen, the estimated quadratic fit is significantly different from the 45-degree line, such that we do not have any reason to believe that the minimum-income question was misunderstood to reflect current expenses, but that households indeed stated what they considered as some kind of subsistence level of income. The pattern resembles typical pictures from development economics where households are asked about subjective minimum incomes (e.g. Vos and Garner 1991; Pradhan and Ravallion 2000). Households in poorer countries locate themselves around their actual income levels while in richer countries households' actual incomes are well above subsistence. With higher incomes, the response to the minimum-income question rises, but at a diminishing rate.

Second, it remains uncertain to what extent the minimum-income question contains information about the standard of living against which people actually evaluate their actual income, i.e., whether it is meaningful in the context of well-being analyses. There is no dataset available that allows us to investigate the relationship between the answer to the minimum-income question and life satisfaction for a broad set of countries and years. However, we can use selected waves of the German Socio-Economic Panel (GSOEP) to alleviate some of these concerns. The GSOEP covers information on life satisfaction, income, and internet access for the years 2002-2011. The minimum-income question, i.e., the measure of material aspirations used in the paper, is not asked in every year – which prevents a comprehensive test of the relationship between internet usage, material aspirations, and subjective well-being in one dataset. For those years where the minimum-income question is available (2002, 2007, 2012), however, table A.1 in the appendix shows that the response to the minimum-income question is found to have a robust negative association with life satisfaction, controlling for actual income and a range of

socio-economic and demographic characteristics. It therefore behaves like standard measures of reference income based on exogenously given demographic or geographic characteristics (see, e.g., Ferrer-i-Carbonell (2005) using the same dataset and similar control variables). Similar conclusions follow when life satisfaction is regressed on the difference between actual and minimum income. We take this as an indication that the minimum-income question serves as one reasonable reference point against which households evaluate their actual income position and thus reflects different levels of material aspirations that we seek to identify in this paper.

In the empirical model, this measure of material aspirations is related to ICT access in the household. As is commonly done in literature using minimum-income questions (e.g., Van Praag et al. 1980; Pradhan and Ravallion 2000; Stutzer 2004), we transform the minimum-income response into logs. With subscript i denoting households, c countries, and t denoting the time dimension, our basic estimation equation with household fixed effects reads:

$$\text{Log(MinIncome)}_{it} = \alpha + \beta_1 \text{ ICT}_{it} + \beta_2 \text{ Log(Income)}_{it} + \mathbf{\Phi Z}_{it} + \boldsymbol{\delta}_i + \boldsymbol{\delta}_{ct} + \epsilon_{it}, \tag{2}$$

where the variable ICT reflects whether a household has access to a specific ICT. We define binary variables taking the value 1 if the household possesses a computer, a television set, or a phone, respectively. The simplifying assumption that computer possession is an imperfect proxy for internet access seems reasonable, given that our data span the second half of the first decade of the 2000s.[6] We furthermore analyse if the effect of computer possession depends on the availability of modern internet infrastructure below. We expect β_1 to be positive and significant if possession of ICTs increases material aspirations.

The vector $\mathbf{Z}$ includes various time-variant demographic and socio-economic control variables on the household level. $\boldsymbol{\delta}_{ct}$ represents a full set of country-year fixed effects which are required to capture all unobservable factors that are constant within a country and a given year, most importantly a country's general economic environment. As we have multiple observations per household over time, we can also include unobserved household fixed effects $\boldsymbol{\delta}_i$ in the model and absorb all time-invariant determinants of material aspirations. This is essential to our analysis as there are various unobserved reasons why some households typically report to need higher incomes than others – and these are likely to be related to the possession of information technologies. Some of these influences might be on the country-level, e.g., some countries might generally be more or less modest in answering these questions. Other factors might be on the individual-level, such as cultural or religious values that we cannot observe. As it seems

[6] Also, the World Values Survey, analysed in detail below, reveals that almost 80 % of those respondents who stated that they used personal computers "frequently" also said that they used the internet as a source of information.

likely that the household fixed effects are correlated with the values of the other regressors in (2), we use the within-estimator to identify the coefficients. That is, the estimate of β_1 reflects the variation in computer possession in one household over time. If $\beta_1 > 0$, then households report to need a higher minimum income in years where they have access to ICTs given all other covariates, particularly actual income. In the empirical analysis, we estimate several forms of (2). Consistency of the estimate depends on the assumption that there are no time-variant unobserved factors that determine both the possession of computers and the response to the minimum-income question. As we argue below, we employ the most important time-varying determinants of ICT access. Below, we go further and estimate (2) with the ICT variable interacted with a measure of broadband internet infrastructure to make a step towards establishing a causal interpretation linked to internet access.

Equation (2) is estimated using the EU-SILC dataset, a household survey carried out in 29 European countries (27 EU member states plus Norway and Iceland) for the purpose of studying monetary and non-monetary aspects of living conditions and social inclusion throughout Europe.[7] Typically, the survey is conducted annually in 3,000 to 5,000 households within each country as a rotating panel.[8] For our analysis, we use data from the waves of 2004 to 2009 for all available households, such that the resulting panel is unbalanced. Including all control variables used in the main specification, the dataset for the analysis comprises 367,264 households that are observed over an average period of 2.2 years up to a maximum of seven years.[9]
In the sample, we find that 56 % of the households in our sample stated that they possess a personal computer in the year of the survey. Television and (mobile) phones are much more diffused and coverage extends to almost the whole sample. Figure A.3 in the appendix depicts how computer possession changed within countries throughout our sample period. Almost all countries feature a notable increase in the diffusion of personal computers. Less developed and transition countries, e.g., Estonia, saw computer ownership rates growing by about 20 percentage points between 2005 and 2009. Countries that already had high ownership rates at the beginning of the sample period, e.g., Luxembourg or Finland, still experienced a moderate increase of around 10 percentage points. For our identification strategy, we rely on within-household variation of computer possession over time. We find that 13 % of all households acquired a

[7]The countries are: Austria (AUT), Belgium (BEL), Bulgaria (BUL), Cyprus (CYP), Czech Republic (CZE), Germany (GER), Denmark (DEN), Estonia (EST), Spain (ESP), Finland (FIN), France (FRA), Greece (GRE), Hungary (HUN), Ireland (IRE), Iceland (ICE), Italy (ITA), Lithuania (LTH), Luxembourg (LUX), Latvia (LAT), Malta (MAL), Norway (NOR), Poland (POL), Portugal (POR), Romania (ROM), Sweden (SWE), Slovak Republic (SVK), and the United Kingdom (UK).

[8]Since the EU-SILC survey harmonises different national household surveys, the sampling procedure is not uniform, but rotating periods vary between four years for most of the countries and eight years in Norway. The survey in Luxembourg is even implemented without rotation as a pure panel.

[9]All income variables in the dataset are denominated in Euros.

personal computer within the sample period.

As for control variables, we use disposable household income, being the sum of all gross personal income components among the household members after taxes and transfers, as the main measure of the actual income position of a household. We allow for different measures of wealth when testing for robustness. On the household level, we furthermore control for the degree of urbanisation (rural, mid-urban, and high-urban areas), household size, and whether the household includes children. Additional controls are the respondent's age, gender, marital status, educational attainment, and economic status.

3.1.2 Results

Figure A.2 in the appendix presents the mean response for all countries in our sample differentiated by whether or not the household has access to a personal computer. The figure reveals that on average in all countries households in possession of a computer report that they need a higher income to make ends meet. In many countries, the difference between owners and non-owners is stark, going up to about 50 % in Latvia, for instance. The simple comparison of mean values is, of course, only descriptive. There are various reasons why households with computers report to need more money, the major one being that both variables are jointly determined by actual household income.

To disentangle the determinants of the response to the minimum-income question, table 1 reports the regression results when we pool all countries in our sample. In column (1), logged minimum income is regressed solely on the binary computer indicator, household fixed effects, and country-year fixed effects. We find that for the respondents in our sample, the possession of a computer is associated with a significant increase of about 7.2 % (=exp(0.0699)-1) in the reported minimum income needed. In column (2), we add the television and phone indicators. The coefficient for computer possession drops slightly to 0.069, but stays highly significant. TV possession features a smaller, but also significant effect with 0.054. Phone possession is not associated with a significant increase in the response to the minimum-income question. In column (3), we add the log of actual household income. As can be seen, a 10 % increase in household income is associated with an increase in the minimum income needed of 1.4 %. As the computer and TV variables are positively related to household income, their estimates drop, but stay significantly different from zero. In column (4), we finally include demographic and socio-economic characteristics as control variables. The control variables have the expected signs. Higher household income is linked to higher material aspirations, with an estimated elasticity of about 0.12. Material aspirations increase with age, but at a declining rate. An increase in household size is associated with a higher minimum income needed, as does being married.

Table 1: EU-SILC: Determinants of subjective minimum-income

	(1)	(2)	(3)	(4)	(5)
Computer	0.0699***	0.0694***	0.0558***	0.0410***	0.0005
	(0.0171)	(0.0169)	(0.0130)	(0.0077)	(0.0087)
Broadband coverage					-0.0002
					(0.0007)
Computer × Broadband					0.0005**
					(0.0002)
TV		0.0535***	0.0446***	0.0422***	0.0281***
		(0.0104)	(0.0091)	(0.0091)	(0.0070)
Phone		0.0075	-0.0009	-0.0144	0.0190
		(0.0348)	(0.0326)	(0.0306)	(0.0199)
Log(Income)			0.1345***	0.1162***	0.0890***
			(0.0216)	(0.0170)	(0.0202)
Age				0.0202***	0.0354***
				(0.0040)	(0.0079)
Age-squared				-0.0003***	-0.0002***
				(0.0000)	(0.0000)
Household size				0.0068***	0.0033***
				(0.0007)	(0.0009)
Male				0.0776***	
				(0.0169)	
Married				0.1114***	0.1005***
				(0.0138)	(0.0184)
Mid-education				0.0256	-0.0037
				(0.0205)	(0.0030)
High-education				0.0529	0.0047
				(0.0314)	(0.0146)
Employee				0.0393***	0.0184**
				(0.0053)	(0.0066)
Self-employed				0.0044	0.0049
				(0.0042)	(0.0050)
Unemployed				-0.0024	-0.0138*
				(0.0084)	(0.0064)
In-training				-0.0028	0.0094
				(0.0050)	(0.0102)
Retired				0.0108	-0.0012
				(0.0084)	(0.0063)
Mid-urban				0.0108	0.0046
				(0.0146)	(0.0347)
High-urban				0.0509	-0.0478
				(0.0322)	(0.0291)
Household-FE	YES	YES	YES	YES	YES
Country-Year-FE	YES	YES	YES	YES	YES
Observations	881,668	881,564	881,564	791,551	218,006

Dependent variable: Logged minimum income to make ends meet. Fixed-effects within panel regression.
Standard errors clustered at the country level in parentheses. ***/**/*: significant at 1 %/5 %/10 %
Source: EU-SILC (2004-2009) and EUROSTAT (2012)

Male respondents are found to have higher aspirations. Being employed (as compared to being economically inactive) significantly raises the response to the minimum-income question.

Turning to the interpretation of the ICT variables, we see that the possession of a computer as well as a TV is related to an increase in the response to the minimum-income question of roughly 4.2 to 4.3 %. Compared to column (1), the coefficient of computer ownership decreased notably which points to omitted individual characteristics having biased the estimate upwards in the univariate analysis.[10]

Although we have presented some evidence that computer possession and internet usage are

[10]Note that the sample size differs across the columns as the panel is unbalanced. The results do not change significantly if we restrict our sample in column (1) to the same 791,551 observations as with including all covariates.

highly correlated, we next test whether computer possession actually reflects ICT-based social interaction via the internet. To this end, we estimate a model that tests for heterogenous effects by regions with different broadband internet infrastructure. Recalling that the argument of ICT-driven material aspirations due to increased social transparency rests in the usage of highly interactive technologies such as the internet, we would expect stronger effects in regions with better internet infrastructure. Regional statistics on broadband usage of internet are obtained from EUROSTAT (2012) for eleven countries in our sample for the 2006-2009 period. In column (5), we estimate equation (2) adding an interaction between computer possession and the regional share of household with access to broadband internet with the reduced sample.[11] Although our statistical analysis loses some power due to a much lower number of observations, we find the estimated effect of computer possession to be non-linear. The computer indicator gains statistical significance when it is interacted with the measure of the penetration of broadband internet technology. With the mean value of the broadband coverage variable around 40 % and a maximum share of around 80 % of all households, the combined effect is of a similar magnitude as in the original specification in column (4). This constitutes the second central finding of our paper: Households with computer acccess in areas with advanced internet infrastructure report to need significantly more income "to make ends meet". We thus have some confidence that the empirical proxy of computer possession in the full sample is in fact capturing the extent of ICT-based social interaction via the internet.[12]

3.2 Does internet access affect life satisfaction through material aspirations?

3.2.1 Empirical strategy and data

If access to ICTs increases the level of material aspirations, this potentially has repercussions on subjective well-being through fostering relative deprivation (for the relatively poor) or relative happiness (for the relatively rich). Table A.1 in the appendix already revealed that material aspirations are robustly negatively linked to life satisfaction for the case of Germany. Using cross-sectional data from the World Values Survey, we aim at testing the relation between internet access and life satisfaction for a broader set of countries. The testable hypothesis is

[11] As our sample size decreases significantly, we no longer have intra-household variation for the respondent's gender and thus drop this variable from the analysis. We also checked that the results from column (4) hold qualitatively when using the same sample of column (5).

[12] We checked that the estimated relationship between computer possession and aspired incomes is robust to a number of alternative specifications of household income and wealth. These checks include (i) adding the square of income to the model, (ii) allowing for year- and country-specific income deciles, (iii) including indicator variables for other assets (cars, washing machines), and (iv) adding ten occupational variables capturing the different sectors of the labour market in which the respondent operates. Throughout all specifications, the estimated effect for computer possession remains significant at around 3-4 %. We eventually also check that our results for computer and television ownership hold in subsamples of different degrees of urbanisation. Regression results are available upon request.

whether individuals who use different ICTs, particularly the internet, differ systematically in how their income translates into life satisfaction.

The empirical model relates subjective well-being to a measure of own income and the usage of information technologies – and therefore indirectly to the availability of information about the living conditions of others. The crucial element of our estimation equation is the interaction effect between information sources and income, which reflects how well-being effects of income differ between users and non-users of information technologies. This approach resembles the work by Bruni and Stanca (2006), but we allow for varying coefficients of the interaction term and estimate interaction effects for different income groups separately. In this way, the effect of income on well-being does not need to be linear and we can test whether differential income effects matter when going up or down the income ladder. Given that we perform a cross-sectional analysis, this essentially serves to identify in which group (the relatively rich, the relatively poor, or both) such indirect well-being effects matter. If we separate income into deciles, the estimation equation reads:

$$\text{SWB}_i = \alpha + \sum_{k=1}^{10} \beta_k I(Y_i = k) + \sum_{j \in S} \gamma_j \text{info}_{ij} + \sum_{k=1}^{10} \sum_{j \in S} \delta_{kj} \left(\text{info}_{ij} \cdot I(Y_i = k)\right) + \mathbf{\Phi Z}_i + \epsilon_i, \quad (3)$$

where subjective well-being (SWB) is regressed on indicator variables for ten income deciles ($I(Y_i = k)$), binary variables for each source of information from the set S used (info), an interaction term of income and the different sources of information for all income groups, and a set of control variables ($\mathbf{Z}$). If $\beta_k > 0$ and $\delta_{kj} < 0$, the positive effect of additional income on well-being is reduced by the negative effect of ICT-driven material aspirations. The identification of the effect of ICTs on subjective well-being therefore comes from comparing self-reported well-being of individuals who are similar in terms of basic socio-economic and demographic variables, but differ only in incomes and their usage of information technologies.

The WVS (2009) provides individual-level data on subjective well-being as well as values and beliefs towards economic, political, religious, social, and ethical topics. For our analysis of the effects of ICTs on well-being, we use data from the fifth wave which, for the first time, includes questions on the usage of different technologies used to acquire information in everyday life. The survey for the fifth wave has been conducted from 2005 to 2007. It covers six continents and 57 countries.

Self-reported life satisfaction scores will serve as a proxy for subjective well-being. Respondents were asked "All things considered, how satisfied are you with your life as a whole these days?"

which they answered on a scale from 1 (completely dissatisfied) to 10 (completely satisfied).[13] As the dependent variable is discrete and measured on an ordinal scale from 1 to 10, the analysis will focus on ordered probit estimation in addition to simple OLS. As for the variables included in the interaction term, we need to recognise that in non-linear models, the calculation of the interaction effect is not straightforward (Ai and Norton 2003). We finally assume observations to be independent across countries, but account for the possibility of correlated error terms within countries by clustering standard errors at the country level in all specifications.

Our main explanatory variables of interest include a measure of income and a measure of ICT usage. As the income measure, we use self-reported deciles in the national income distribution. So while we do not have a perfectly comparable and objective income measure across countries, we still have a comparable indicator of income within countries.[14] As for a measure of usage of information technologies, respondents were asked the following question: "People use different sources to learn what is going on in their country and the world. For each of the following sources, please indicate whether you used it last week or did not use it last week to obtain information: daily newspaper, news broadcasts on radio or TV, printed magazines, in-depth reports on radio or TV, books, internet and e-mail, talk with friends or colleagues." We define binary variables that take the value of 1 if the respondent used the sources of information last week, and a value of 0 otherwise. As for the usage of internet, it seems sensible to assume that those people who report using the internet as a source of information are also those people who use the internet very often. Similarly, those respondents who do not use the internet as source of information at least once a week, are arguably also less frequent users of the internet in general. Using the internet as a source of information thus provides an adequate proxy for usage of internet in general.

Around 30 % of the respondents in the sample stated that they had used the internet or e-mail as sources of information. Thus, in comparison, the internet is still the least often used source of information. 59 % of the people used the daily newspaper, 35 % used magazines, 31 % used books. 90 % of the respondents followed daily news broadcasts on radio or TV and 66 % followed in-depth reports on these media. Finally, 77 % of all individuals in the sample reported that they had stayed informed through friends and work colleagues. Multiple answers were possible

[13] We thus build on the presumption that reported satisfaction scores convey some information about utility, an assumption commonly made in both the theoretical and empirical happiness literature on the grounds that life satisfaction statements and economic decision-making are highly correlated (e.g., Van Praag 2011; Clark et al. 2008; Frey and Stutzer 2002; Kahneman et al. 2004; Ferrer-i-Carbonell 2012; Clark and Oswald 1996; Van Praag 2011; Benjamin et al. 2012).

[14] To verify that our results are not driven by the imperfect measure of income, we also replicate the results from the WVS with the longitudinal GSOEP dataset that has precise information on income at the household-level. Estimating within-household regressions, we find that the estimated relationship between life satisfaction, income, and ICT usage from the WVS is not sensitive to this proxy measure of income. Results are provided in table A.2 in the appendix.

and the responses are positively correlated.[15] As for those respondents using the internet, 79 % used newspapers, 94 % watched daily news and 75 % followed in depth-reports on TV, and roughly every second person also used books or magazines.

Table 2 shows that there is large variation in internet access across income groups within

Table 2: Internet access by income groups

Income Decile	1	2	3	4	5	6	7	8	9	10
Internet / E-Mail	12.0	14.3	19.3	24.7	27.9	35.2	41.4	43.7	55.2	62.1
Low-income countries	7.5	5.3	8.3	14.2	16.8	19.4	21.2	28.3	36.9	27.5
Lower middle-income countries	3.3	6.1	8.6	10.9	15.3	19.4	24.8	25.8	24.9	21.4
Upper middle-income countries	6.1	9.6	13.1	18.7	22.7	29.8	31.3	35.7	40.9	48.6
High-income countries	31.6	30.3	37.4	44.2	46.4	55.1	64.6	66.5	76.8	77.8

Source: World Values Survey, Wave 5 (2005-2007)

a country as well as across countries in different stages of development when we group the countries into four categories according to the World Bank (2012) classification (low-income, lower middle-income, upper middle-income, and high-income). Internet access is found to be most diffused in high-income countries and higher parts of individual countries' income distributions. While only 12 % of all respondents in the lowest income decile said that they used the internet at least once a week, of those in the highest income bracket 62 % reported doing so. This pattern points to the fact that internet is, in many countries, still one of the more expensive sources of information.[16] The share of users almost quadruples from the lowest to higher income deciles in low-income countries (7.5 % to around 27.5 %). In high-income countries, 30 % of those people at the bottom of the income distribution use the internet regularly. It thus seems likely that if the internet shapes relative concerns, it may do so primarily in wealthy countries. If the trend of decreasing internet usage costs continues, as it will most likely do, one could expect an increasing role of technology-driven relative concerns in lower and middle-income countries as well.

The choice of control variables is motivated by the existing literature on subjective well-being and the usage of information technologies. According to the existing evidence on the micro-level determinants of internet use, e.g., Chaudhuri et al. (2005), socio-demographics, income and education are among the major predictors. As for socio-demographic control variables, we employ standard regressors from well-being regressions (e.g., McBride 2001; Stutzer 2004; Dolan et al. 2008; Bjørnskov et al. 2008; Di Tella et al. 2003) to proxy for the age of the respondent, marital status, labour and educational status, and subjective health status. Additionally, we consider a number of softer attitudinal characteristics (e.g., trust, honesty, perception of

[15] All pairwise correlation coefficients are significantly different from zero.
[16] Other sources of information, not shown here, are used more extensively across all income brackets.

Table 3: WVS: Determinants of life satisfaction – Least squares and ordered probit

	Least Squares		Ordered Probit		
	(1)		(2)		Marg. effects
Income	0.1908***	(0.0223)	0.0973***	(0.0112)	
Info source: Internet	0.4406***	(0.0753)	0.1986***	(0.0364)	
Income * Internet	-0.0819***	(0.0142)	-0.0376***	(0.0069)	
Age	-0.0366***	(0.0042)	-0.0214***	(0.0025)	[-0.0350]
Age-squared	0.0004***	(0.0000)	0.0003***	(0.0000)	[0.0004]
Male	-0.1105***	(0.0250)	-0.0621***	(0.0131)	[-0.1020]
Married	0.2102***	(0.0530)	0.1161***	(0.0296)	[0.1906]
Separated	-0.1024*	(0.0512)	-0.0671**	(0.0273)	[-.01102]
Unemployed	-0.2715***	(0.0515)	-0.1347***	(0.0276)	[0.2211]
Middle education	-0.0618*	(0.0334)	-0.0440**	(0.0193)	[-0.0721]
High education	-0.0601	(0.0409)	-0.0489**	(0.0237)	[-0.0802]
Subjective health	0.6088***	(0.0295)	0.3405***	(0.0154)	[0.5588]
Honesty	0.0217***	(0.0067)	0.0130***	(0.0036)	[0.0213]
Trust	0.1745***	(0.0337)	0.0918***	(0.0192)	[0.1506]
Freedom	0.2343***	(0.0109)	0.1333***	(0.0082)	[0.2188]
Family important	0.2138***	(0.0353)	0.1134***	(0.0190)	[0.1861]
Friends important	0.0565***	(0.0201)	0.0313***	(0.0114)	[0.0513]
Leisure important	0.0600***	(0.0187)	0.0367***	(0.0103)	[0.0602]
Politics important	0.0038	(0.0134)	-0.0004	(0.0079)	[-0.0007]
Work important	-0.0512**	(0.0209)	-0.0245**	(0.0113)	[-0.0402]
Religion important	0.1151***	(0.0160)	0.0699***	(0.0085)	[0.1147]
Observations	53,325		53,325		
Adjusted R^2	0.3214				

Dependent variable: Life Satisfaction (1-10)
Standard errors, clustered on country level, in parentheses. ***/**/*: significant at 1 %/5 %/10 %.
49 country dummies are included as additional controls.
Source: World Values Survey, Wave 5 (2005-2007)

freedom) that could potentially affect the propensity to buy access to ICTs. As for their precise definition, we stay in line with Bruni and Stanca (2006). On the macro side, the diffusion of ICTs is highly dependent on the general economic performance of a country. For this reason, and to capture economic, societal and cultural differences in reported life satisfaction that are common within countries, we also include country fixed effects in all the regressions. This also accounts for the empirical fact that measures of subjective well-being are hardly comparable across different countries (Diener and Oishi 2004). Including all control variables, we are left with 53,325 observations from 49 countries.

3.2.2 Results

As a starting point, we only look at the internet as the ICT of interest. Table 3 provides regression results from both OLS and ordered probit estimation. The partial correlations of the control variables are in line with the existing literature (e.g., McBride 2001; Stutzer 2004; Dolan et al. 2008; Bjørnskov et al. 2008; Di Tella et al. 2003; Bruni and Stanca 2006) and confirm that our model of subjective well-being is well-specified.

Turning to our hypothesis that the usage of ICTs reduces the satisfaction effect of income, we find income to be strongly and positively correlated with life satisfaction in the least squares

specification. The results also show that the usage of the internet as a source of information is associated with a highly significant increase in life satisfaction. This is consistent with the hypothesis that people derive satisfaction from using the internet, possibly because it serves as a source of information or because it allows them to engage in other happiness-giving activities. According to the hypothesis, the positive effect of income on life satisfaction should be lower for people with access to ICTs, so that the interaction effect should be negative and statistically significant. We find the interaction term between income and internet in the OLS specification to be significantly negative. The positive satisfaction effect of additional income in the form of climbing to a higher income decile is reduced by more than 40 %.[17]

We have to keep in mind that a negative interaction effect would also imply that going down one rung on the income ladder is associated with a lower loss of satisfaction for those who use the internet. We thus relax the rigid estimation of table 3 in which the income and interaction effects are assumed to be homogeneous across all income groups, and turn to the more flexible estimation of equation (3). This is not only interesting for the abovementioned reasons per se, but also addresses concerns of potential functional form misspecification for the relationship between income and life satisfaction, which might have driven the results in table 3. Due to the ordinal dimension of our dependent variable, we focus on the results of the more adequate ordered probit model in what follows.

To test our hypothesis of different income effects by usage of the internet and by different income groups, we calculate the marginal effects of income on the probability of reporting the highest category of life satisfaction differentiating by users and non-users of internet. As table 4 shows, we find all the estimated marginal effects for income to be positive and significant for the group of non-users. A rise in income up to the eighth income decile is associated with a higher probability to report high life satisfaction. For people who use the internet regularly, it is only from the fifth income decile onwards that there are significantly positive income effects on life satisfaction.

More importantly, the last column of table 4 gives the contrast in marginal effects of income between internet users and non-users.[18] Given a confidence level of 95 %, we find the increase in life satisfaction associated with a progression up the income ladder to be significantly lower for internet users than for non-users from the sixth income decile on. The difference in marginal effects rises from slightly above 2 percentage points in the sixth income decile to almost 5 per-

[17] We also allow for less restrictive specifications where the effect of income as well as the income differential by internet usage may vary with age. Using OLS regressions, we find the effect of income on life satisfaction to be marginally decreasing in age. The estimated interaction effect between internet usage, however, does not change in terms of magnitude or statistical significance (the estimated coefficient is -0.09 with a p-value of 0.003). Furthermore, there is no evidence that the interaction varies with the age of the respondents (the p-value of the triple interaction is 0.785).

[18] The difference is the percentage points that the marginal effect of income on the likelihood to report the highest category of life satisfaction is larger for internet users than for non-users.

Table 4: WVS: Marginal effects of income on life satisfaction by internet users

	Without internet		With internet		Difference	
1st decile			*(omitted)*			
2nd decile	0.01037**	(0.0047)	-.00150	(.0078)	-0.0119	(0.0096)
3rd decile	0.0158***	(.0057)	0.0103	(0.0094)	-0.0055	(0.0100)
4th decile	0.0289***	(0.0067)	0.0115	(0.0088)	-0.0174*	(0.0089)
5th decile	0.0539***	(0.0111)	0.0352***	(0.0090)	-0.0187*	(0.0109)
6th decile	0.0676***	(0.0108)	0.0427***	(0.0103)	-0.0248**	(0.0105)
7th decile	0.0922***	(0.0118)	0.0583***	(0.0125)	-0.0339***	(0.0093)
8th decile	0.1175***	(0.0144)	0.0680***	(0.0157)	-0.0495***	(0.0123)
9th decile	0.1079***	(0.0192)	0.0730***	(0.0152)	-0.0348**	(0.0157)
10th decile	0.1129***	(0.0227)	0.0680***	(0.0179)	-0.0449**	(0.0137)
Observations			53,325			

Ordered probit estimation of (3).
Marginal effects are calculated for the probability to report the highest level of life satisfaction.
Standard errors in parentheses. ***/**/*: significant at 1 %/5 %/10 %.
Source: World Values Survey, Wave 5 (2005-2007)

centage points in higher income deciles. For the fifth income decile, for instance, the marginal effect of income is reduced by roughly 35 %. The highest relative difference occurs for the eighth income decile with a reduction of more than 42 %. The reduction is similar to what we find in the OLS analysis in table 3. For lower income groups, we do not find a statistically significant difference in the marginal effects of income.

So far, we considered the internet as the only technology in our regression. Arguably, the internet is qualitatively different from other sources of information, for the scope of information that can be acquired is typically much wider and it allows for much more interpersonal interaction than, for example, radio or TV. Also, processing of information from the internet might happen more consciously and actively than if information would be passively acquired through TV programmes. We therefore might expect material aspiration effects to be stronger when the internet is used as a source of information. For a test, we include all the information technologies that were covered by the WVS in the empirical model. The contrast in the marginal effects of income between users of the respective sources of information and non-users is depicted in figure A.4 in the appendix. We find the differences in marginal effects to be statistically insignificant for most sources of information. The internet is the only technology for which income effects are systematically different for middle- to high-income groups. Of course, the usage of different sources of information is positively correlated in most cases. People who watch TV are also more likely to use the internet. Finding different patterns for different sources of information thus puts high demands on variation in the WVS dataset.

Against the background that we are performing a cross-sectional analysis and identification comes from comparing incomes and ICT possession *across* individuals, these results imply that indirect well-being effects from ICT-driven material aspirations matter when climbing up the income ladder. This constitutes the second central finding of the paper: Experiencing income

gains yields less life satisfaction for internet users than for non-users. This is consistent with the rationale that internet access increases material aspirations which in turn are negatively linked to subjective well-being.

Our results are challenged by a number of endogeneity concerns which might prevent the identification of the causal effect of ICTs on the satisfaction effect of income. We choose to analyse the WVS since it reflects a broad set of countries. One obvious limitation of the WVS dataset is that we can only control for individual heterogeneity based on observable characteristics. Using single-country longitudinal data from the GSOEP, however, we find that the central results on differential income effects hold when controlling for unobserved time-invariant characteristics. More specifically, the positive effect of income on life satisfaction is found to be reduced by about one fifth if a household has internet access, even after introducing household fixed effects (see table A.2 in the appendix). This provides some confidence that the empirical patterns that have been identified indeed robustly reflect the influence of ICTs.[19]

[19]The results are furthermore robust to using a different measure of computer and internet usage. In the WVS, respondents were also asked how often they made private use of a personal computer and in another regression we separated the sample into two groups with different frequencies of usage: "frequent/occasional usage" and "no usage". Regression results are available upon request.

4 Conclusion

There is now robust evidence from the emerging literature on the economics of happiness that individual subjective well-being is influenced by relative concerns with respect to the social environment. What has only attained limited attention in previous research is the role of information in shaping relative concerns. Using two micro-datasets with information on life satisfaction, a level of reference income, and usage of modern media, we empirically test whether access to the internet (i) raises material aspirations and (ii) explains differences in the effects of income on reported life satisfaction. Our results show that households in possession of a computer report to need higher incomes "to make ends meet" than those without. The effect of computer possession is found to be contingent on living in an area with an advanced degree of internet infrastructure. Cross-sectional evidence from the fifth wave of the World Values Survey (2005-2007) suggests that individuals who regularly use the internet as a source of information derive less life satisfaction from a rise in income. We find this effect to be restricted to upper parts of the income distribution, which indicates that internet-derived material aspirations matter only when progressing up the income ladder. This pattern could point to the internet shaping material aspirations predominantly for the relatively rich. In summary, the empirical results suggest that internet access lowers the satisfaction that people derive from their income position and that one explanation for this pattern lies in the positive link between internet access and aspired incomes against which actual incomes are evaluated.

The empirical findings on the role of ICTs for material aspirations in this paper provide new insights on the relationship between globalisation and subjective well-being. While the literature has so far mostly focused on the impact of economic globalisation, we contribute to the burgeoning literature on the microeconomic implications of social globalisation on well-being. Second, the evidence on existing material aspirations directly adds to the discussion in the happiness literature on how income translates into well-being. If material aspirations are sufficiently strong, even a constant growth in income does not necessarily imply an increase in subjective well-being. On the macro-level, Deaton (2008) finds that after controlling for national per capita income, the effect of economic growth on life satisfaction is negative. In line with Easterlin (1995), our findings underscore the notion of external and internal norms to evaluate well-being and suggest a vital role for information technologies. Furthermore, material aspirations and positionality concerns matter if we want to understand how individuals make economic decisions within their social environment. Banerjee and Duflo (2011), for instance, describe the consumption of status goods despite low levels of income while Hill and Buss (2010) report that increasing positional concerns can alter the certainty effect in decisions under risk. Finally, our results augment the literature on the determinants of reference groups for interpersonal (income)

comparisons. Clark and Senik (2010b), for instance, conjecture that in the future ICT-driven material aspiration effects might be particularly relevant for less developed countries who are currently experiencing drastic advancements in information technology infrastructure meaning that cross-national standard of living comparisons might gain in importance (see also James 1987).

There are some limitations to our observational study. Most importantly, we are not able to specify an exact channel through which material aspirations enter the well-being function. We do have some indication that ICT access raises the level of reference income, but we cannot identify whether this is driven by internal or external norms. ICTs might allow for stronger comparisons vis-à-vis a given reference group (potentially including the individual themselves), but are also likely to change the entire scope of reference. Such detailed analysis of how informational globalisation changes the nature of reference group formation provides interesting scope for further research.

References

Ai, C. and Norton, E. (2003). Interaction Terms in Logit and Probit Models. *Economics Letters*, 80(1):123–129.

Banerjee, A. and Duflo, E. (2011). *Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty*. Public Affairs, New York.

Benjamin, D., Heffetz, O., Kimball, M., and Rees-Jones, A. (2012). What Do You Think Would Make You Happier? What Do You Think You Would Choose? *American Economic Review*, 102(5):2083–2110.

Bjørnskov, C., Dreher, A., and Fischer, J. (2008). Cross-country Determinants of Life Satisfaction: Exploring Different Determinants Across Groups in Society. *Social Choice and Welfare*, 30(1):119–173.

Bjørnskov, C., Dreher, A., Fischer, J. A., Schnellenbach, J., and Gehring, K. (2013). Inequality and Happiness: When Perceived Social Mobility and Economic Reality Do Not Match. *Journal of Economic Behavior & Organization*, 91(C):75–92.

Brosnan, S. and De Waal, F. (2003). Monkeys Reject Unequal Pay. *Nature*, 425:297–299.

Bruni, L. and Stanca, L. (2006). Income Aspirations, Television and Happiness: Evidence from the World Values Survey. *Kyklos*, 59(2):209–225.

Castronova, E. and Wagner, G. G. (2011). Virtual Life Satisfaction. *Kyklos*, 64(3):313–328.

Chaudhuri, A., Flamm, K., and Horrigan, J. (2005). An Analysis of the Determinants of Internet Access. *Telecommunications Policy*, 29(9-10):731–755.

Clark, A., Frijters, P., and Shields, M. (2008). Relative Income, Happiness, and Utility: An Explanation for the Easterlin Paradox and Other Puzzles. *Journal of Economic Literature*, 46(1):95–144.

Clark, A. and Oswald, A. (1996). Satisfaction and Comparison Income. *Journal of public economics*, 61(3):359381.

Clark, A. and Senik, C. (2010a). Who Compares to Whom? The Anatomy of Income Comparisons in Europe. *The Economic Journal*, 120(544):573–594.

Clark, A. and Senik, C. (2010b). Will GDP Growth Increase Happiness in Developing Countries? *CEPRE Workin Paper No. 1024*.

Deaton, A. (2008). Income, Health and Well-being Around the World: Evidence from the Gallup World Poll. *The Journal of Economic Perspectives*, 22(2):53–72.

Di Tella, R., MacCulloch, R., and Oswald, A. (2003). The Macroeconomics of Happiness. *Review of Economics and Statistics*, 85(4):809–827.

Diener, E. and Fujita, F. (1997). Social Comparison and Subjective Well-being. In *Health, Coping and Well-being*. Buunk, B.P. and R. Gibbons.

Diener, E. and Oishi, S. (2004). Are Scandinavians Happier Than Asians? Issues in Comparing Nations on Subjective Well-being. In *Politics and Economics of Asia*. Hauppauge, New York.

Dolan, P., Peasgood, T., and White, M. (2008). Do We Really Know What Makes Us Happy? A Review of the Economic Literature on the Factors Associated with Subjective Well-being. *Journal of Economic Psychology*, 29(1):94–122.

Duesenberry, J. (1949). *Income, Saving, and the Theory of Consumer Behavior*. Harvard University Press.

Dynan, K. E. and Ravina, E. (2007). Increasing Income Inequality, External Habits, and Self-Reported Happiness. *American Economic Review*, 97(2):226–231.

Easterlin, R. (1995). Will Raising the Incomes of all Increase the Happiness of All? *Journal of Economic Behavior & Organization*, 27(1):35–47.

EUROSTAT (2012). Information Society Database. http://epp.eurostat.ec.europa.eu/portal/page/portal/information_society/data/database.

Ferrer-i-Carbonell, A. (2005). Income and Well-being: An Empirical Analysis of the Comparison Income Effect. *Journal of Public Economics*, 89(5-6):997–1019.

Ferrer-i-Carbonell, A. (2012). Happiness Economics. *Journal of the Spanish Economic Association*, pages 1–26.

Fischer, J. A. and Torgler, B. (2013). Do Positional Concerns Destroy Social Capital: Evidence From 26 Countries. *Economic Inquiry*, 51(2):1542–1565.

Frey, B., Benesch, C., and Stutzer, A. (2007). Does Watching TV Make Us Happy? *Journal of Economic Psychology*, 28(3):283–313.

Frey, B. and Stutzer, A. (2002). What Can Economists Learn From Happiness Research? *Journal of Economic Literature*, 40(2):402–435.

Gustavsson, M. and Jordahl, H. (2008). Inequality and Trust in Sweden: Some Inequalities are More Harmful Than Others. *Journal of Public Economics*, 92(1-2):348–365.

Hill, S. E. and Buss, D. M. (2010). Risk and Relative Social Rank: Positional Concerns and Risky Shifts in Probabilistic Decision-Making. *Evolution and Human Behavior*, 31(3):219–226.

Hyll, W. and Schneider, L. (2013). The Causal Effect of Watching TV on Material Aspirations: Evidence From the Valley of the Innocent. *Journal of Economic Behavior & Organization*, 86:37–51.

James, J. (1987). Positional Goods, Conspicuous Consumption and the International Demonstration Effect Reconsidered. *World Development*, 15(4):449–462.

Kahneman, D., Krueger, A., Schkade, D., Schwarz, N., and Stone, A. (2004). Toward National Well-being Accounts. *American Economic Review*, 94(2):429–434.

Knight, J., Song, L., and Gunatilaka, R. (2009). Subjective Well-being and its Determinants in Rural China. *China Economic Review*, 20(4):635–649.

Layard, R. (2003). Happiness: Has Social Science a Clue? (Lionel Robbins Memorial Lecture at the Centre for Economic Performance).

Luttmer, E. (2005). Neighbors as Negatives: Relative Earnings and Well-being. *The Quarterly Journal of Economics*, 120(3):963–1002.

Manski, C. (2000). Economic Analysis of Social Interactions. *The Journal of Economic Perspectives*, 14(3):115–136.

Mayraz, G., Wagner, G., and Schupp, J. (2009). Life Satisfaction and Relative Income - Perceptions and Evidence. *SOEP Papers No. 214*.

McBride, M. (2001). Relative-Income Effects on Subjective Well-being in the Cross-section. *Journal of Economic Behavior & Organization*, 45(3):251–278.

Mujcic, R. and Frijters, P. (2013). Economic Choices and Status: Measuring Preferences for Income Rank. *Oxford Economic Papers*, 65(1):47–73.

Oishi, S., Kesebir, S., and Diener, E. (2011). Income Inequality and Happiness. *Psychological Science*, 22(9):1095–1100.

Pradhan, M. and Ravallion, M. (2000). Measuring Poverty Using Qualitative Perceptions of Consumption Adequacy. *The Review of Economics and Statistics*, 82(3):462–471.

Senik, C. (2008). Ambition and Jealousy: Income Interactions in the Old Europe versus the New Europe and the United States. *Economica*, 75(299):495–513.

Stutzer, A. (2004). The Role of Income Aspirations in Individual Happiness. *Journal of Economic Behavior & Organization*, 54(1):89–109.

Van Praag, B. (2011). Well-being Inequality and Reference Groups: An Agenda for New Research. *Journal of Economic Inequality*, 9(1):111–127.

Van Praag, B., Goedhart, T., and Kapteyn, A. (1980). The Poverty Line – A Pilot Survey in Europe. *The Review of Economics and Statistics*, 62(3):461–465.

Van Praag, B., Kapteyn, A., and Van Herwaarden, F. (1979). The Definition and Measurement of Social Reference Spaces. *The Netherlands Journal of Sociology*, 15:13–25.

Vos, K. and Garner, T. (1991). An Evaluation of Subjective Poverty Definitions: Comparing Results from the US and the Netherlands. *Review of Income and Wealth*, 37(3):267–285.

World Bank (2012). Country and Lending Groups. http://data.worldbank.org/about/country-classifications/country-and-lending-groups.

WVS (2009). World Values Survey 1981-2008 Official Aggregate v.20090901, World Values Survey Association (www.worldvaluessurvey.org). Aggregate File Producer: ASEP/JDS, Madrid.

A Appendix

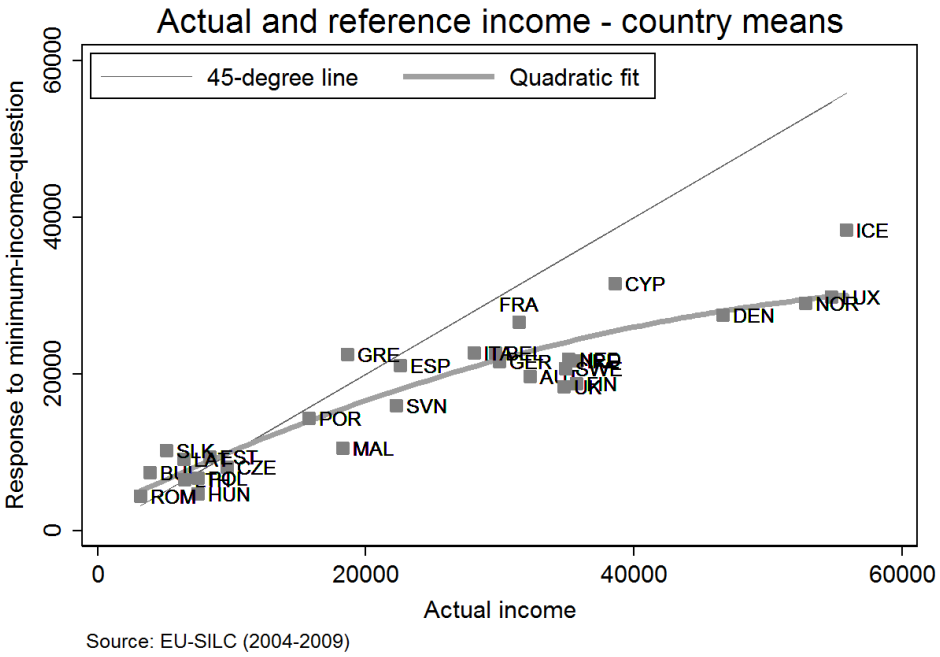


Figure A.1: EU-SILC: Response to minimum-income question and actual household income

Table A.1: The minimum-income question and life satisfaction

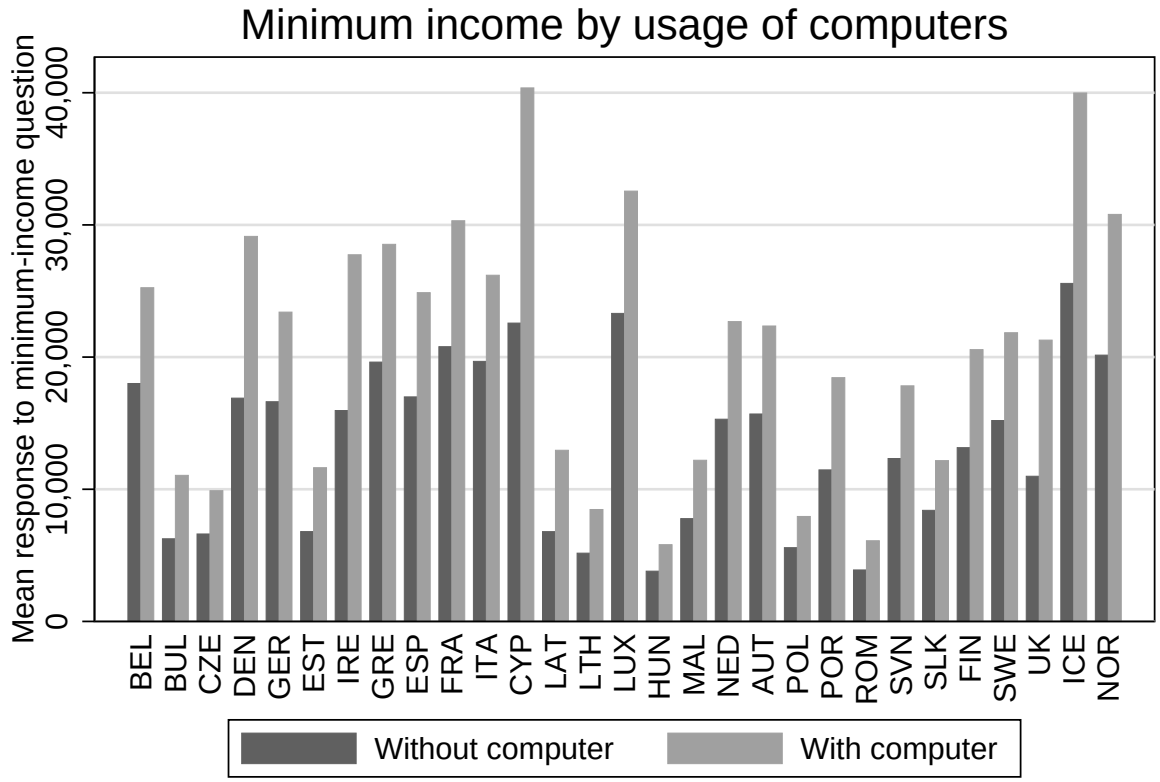
	(1)	(2)	(3)	(4)
(Log) Income	0.3956***		0.4412***	
	(0.0382)		(0.0392)	
(Log) Minimum income		-0.0712**	-0.1475***	
		(0.0284)	(0.0291)	
Log (Actual income) - Log (Min. income)				0.2409***
				(0.0258)
Age	0.0894*	0.1035**	0.0923*	0.1011**
	(0.0477)	(0.0467)	(0.0471)	(0.0463)
Age-squared	-0.0002***	-0.0003***	-0.0002***	-0.0003***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
(Log) Years of education	-0.3768	-0.2829	-0.3064	-0.2290
	(0.3118)	(0.3119)	(0.3138)	(0.3139)
(Log+1) Number of children	-0.0498	-0.1028**	-0.0395	-0.0648
	(0.0413)	(0.0412)	(0.0413)	(0.0412)
(Log) Household size	-0.0752	0.1873***	-0.0628	0.0858*
	(0.0539)	(0.0502)	(0.0539)	(0.0495)
Married	0.0728	0.1015**	0.0832*	0.1028**
	(0.0451)	(0.0452)	(0.0450)	(0.0450)
Unemployed	0.0240	-0.0760*	0.0159	-0.0419
	(0.0397)	(0.0389)	(0.0396)	(0.0389)
Employed part-time	-0.0067	-0.0667**	-0.0122	-0.0472
	(0.0339)	(0.0339)	(0.0339)	(0.0336)
Household-FE	YES	YES	YES	YES
Year-State-FE	YES	YES	YES	YES
Observations	46011	46011	46011	46011
R^2	0.024	0.018	0.025	0.023
Mean of dependent variable	7.03	7.03	7.03	7.03

Source: German Socio-Economic Panel (GSOEP). Years 2002, 2007, and 2012.
Linear within-panel regressions. Dependent variable: General life satisfaction (0-10).
Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.2: The differential in satisfaction derived from income by internet access

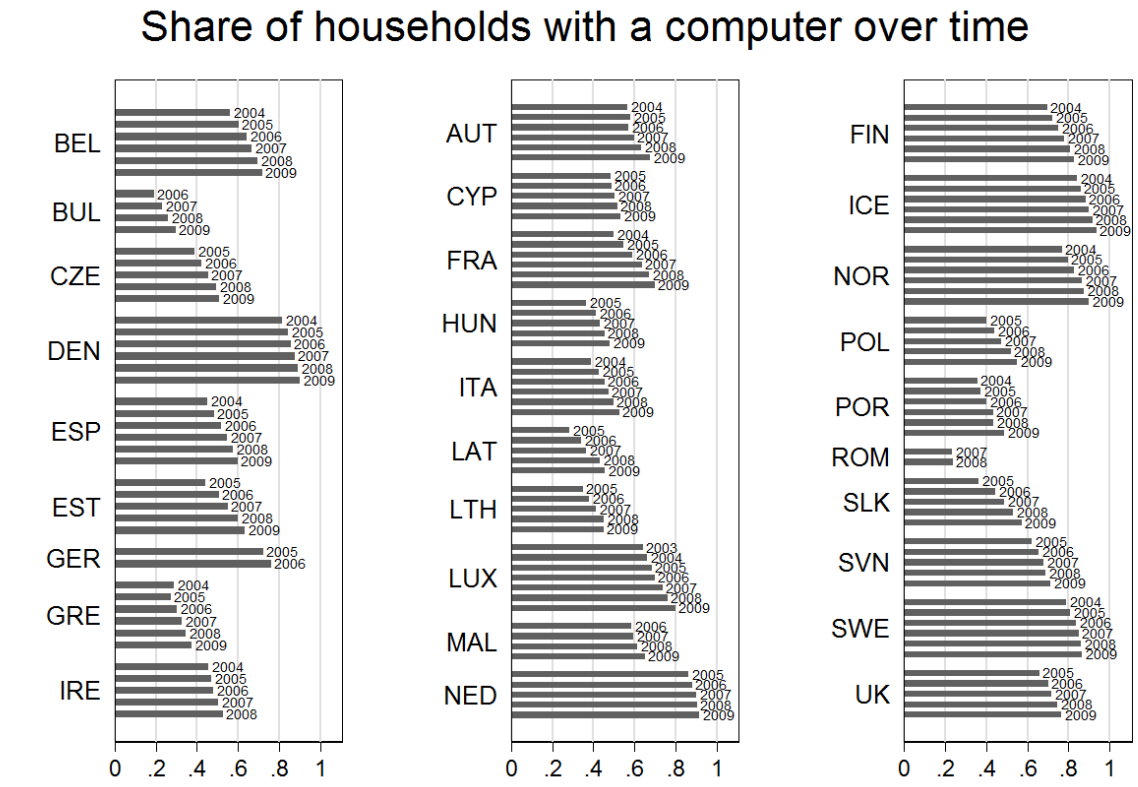
	(1)		(2)	
(Log) Income	0.3848***	(0.0322)	0.3702***	(0.0359)
Internet	0.8216***	(0.2423)	0.6331**	(0.2509)
Internet * (Log) Income	-0.1075***	(0.0315)	-0.0763**	(0.0327)
Age			0.0220	(0.0357)
Age-squared			-0.0004***	(0.0001)
(Log) Years of education			-1.0433***	(0.2036)
(Log+1) Number of children			-0.0783**	(0.0327)
(Log) Household size			-0.0314	(0.0398)
Married			0.1325***	(0.0378)
Unemployed			-0.0914***	(0.0290)
Employed part-time			-0.0750***	(0.0228)
Household-FE	YES		YES	
Year-State-FE	NO		YES	
Observations	91694		87673	
R^2	0.005		0.018	
Mean of dependent variable	6.90		6.89	

Source: German Socio-Economic Panel (GSOEP). Years 2002-2012.
Linear within-panel regressions. Dependent variable: General life satisfaction (0-10).
Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.



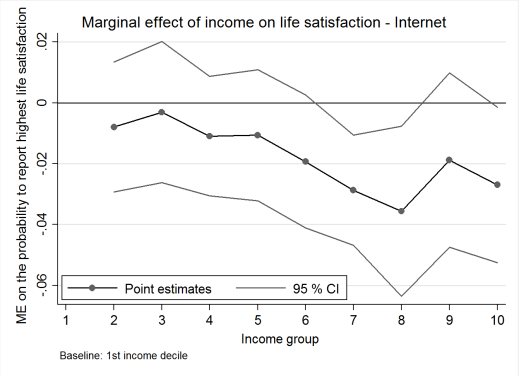
Source: EU-SILC (2004-2009)

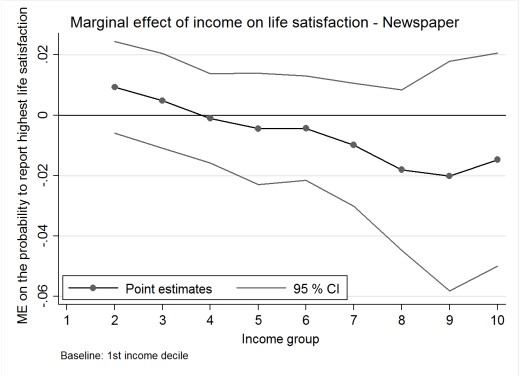
Figure A.2: Difference in response to minimum-income question by computer possession

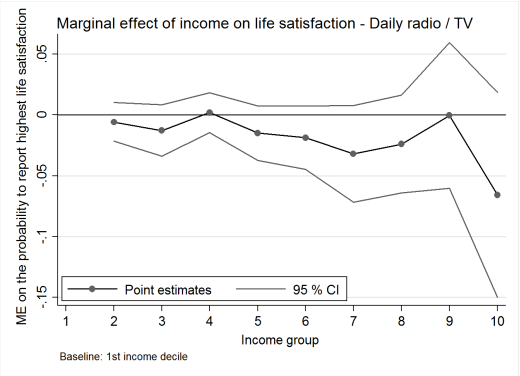


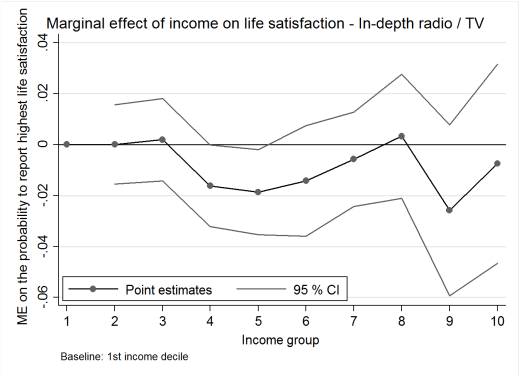
Source: EU-SILC (2004-2009)

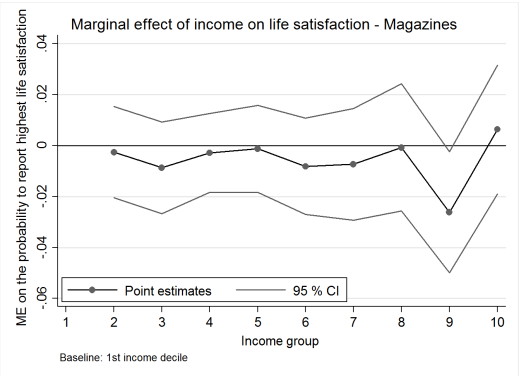
Figure A.3: EU-SILC: Computer possession over the sample period

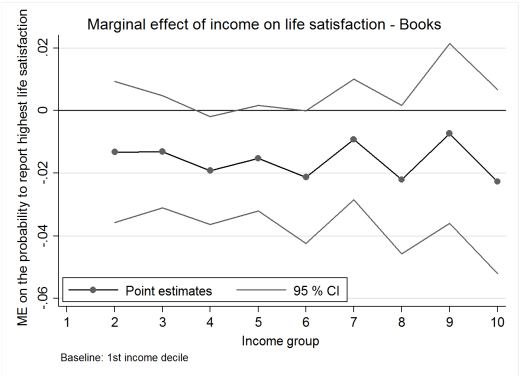












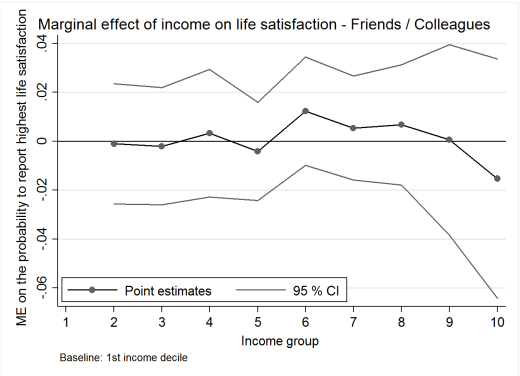


Figure A.4: WVS: Contrast in marginal effects of income by sources of information