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ABSTRACT

Age, Life-Satisfaction, and Relative Income: Insights from the UK and Germany*

We first confirm previous results with the German Socio-Economic Panel by Layard et al. (2010), and obtain strong negative effects of comparison income. However, when we split the sample by age, we find quite different results for reference income. The effects on life-satisfaction are positive and significant for those under 45, consistent with Hirschman's (1973) 'tunnel effect', and only negative (and larger than in the full sample) for those over 45, when relative deprivation dominates. Thus for young respondents, reference income's signalling role, indicating potential future prospects, can outweigh relative deprivation effects. Own-income effects are also larger for the older sample, and of greater magnitude than the comparison income effect. In East Germany the reference income effects are insignificant for all. With data from the British Household Panel Survey, we confirm standard results when encompassing all ages, but reference income loses significance in both age groups, and most surprisingly, even own income becomes insignificant for those over 45, while education has significant negative effects.

JEL Classification: D10, I31, J10

Keywords: subjective life-satisfaction, comparison income, reference groups, age, welfare

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1. Introduction

Among the most important results in happiness research, which largely explain the Easterlin Paradox, are the negative effects of comparison or reference income, found in many different contexts (Layard et al. 2010, Clark et al. 2008). However as Hirschman (1973) observed, just before the beginning of modern research on subjective well-being by Easterlin (1974), comparison with a relevant reference group could have two very different effects. The relative income effect, which had already been discussed by a few economists, and more widely by sociologists as ‘relative deprivation’ (Runciman 1966), refers to comparison of one’s own current situation with that of the relevant reference group. However, Hirschman (1973) argued in the context of economic development and resulting inequality combined with rapid growth, that comparison could also indicate one’s own future prospects. Thus a higher reference income in this context might be perceived as only a temporary ‘relative deprivation’, but also as an indicator of a better future, which he denoted ‘the tunnel effect’, with an inherently ambiguous net result on current subjective well-being (SWB).

While such effects in developing countries are plausible, there is also a natural asymmetry in likely response to relative income across age groups, which has received much less attention. Young individuals everywhere are obviously more mobile and likely to see peer success as an indication of their own future prospects, (and perhaps be motivated to greater effort), than less flexible, older people. The careers of the latter group are fully determined at the latest by retirement, so expectations lose relevance and current perceptions of relative deprivation or success should dominate. This asymmetry suggests estimating the effects of relative income separately for young and old subsamples, which is our approach here, and does not seem to have been implemented previously.

If we consider comparisons between stable, developed countries, then it seems obvious that relative deprivation must be exacerbated by inequality of income distribution, but without the countervailing signalling effect that is plausible in development or during the social turmoil after transition. To test this hypothesis, we compare West Germany with the former GDR or East Germany, which is still (21 years after reunification) a region with high unemployment, poor career prospects for the young, and lower inequality than in the West, so we expect weaker effects of relative income for both the young and old samples.

Using the German Socio-economic Panel we estimate life-satisfaction separately for subsamples between 18 and 45, and over 45, in both West and East, as well as for the complete samples with all ages. In West Germany we confirm the results of Layard et al. (2010), and Ferrer-i-Carbonell (2005), who also find strong negative effects of relative income with GSOEP data, using a quadratic in age and many controls. However, in contrast to all previous work that we are aware of, we actually find a *positive significant effect* of comparison income in West Germany for those under 45, and a *negative significant effect* for the older group, the absolute magnitude of which is larger than in the full sample, though less than the own income effect.

Another interesting result is that satisfaction declines for the oldest respondents with all controls, so is only U-shaped in age up to about 75, and the widely used quadratic in age (Blanchflower and Oswald 2008), does not capture declining satisfaction for the oldest; here we use a cubic for whole sample.

Regional effects for the German States (Laender), which proxy for many unobserved public goods (or bads such as pollution), were highly significant, and their omission (as in Senik's (2008) second-stage regressions) led to loss of significance of comparison income. In East Germany, relative income loses significance for all age groups, though the sign of the coefficient remains positive for the young and negative for the old. Other noteworthy differences between the age groups are the weaker effect of marriage – and the much stronger effect of own income – in the older group.

Thus a fundamental result of happiness research changes dramatically after disaggregating the complete sample, a change not captured by the usual quadratic (or our cubic) in age: the robust negative effect of relative income turns positive in younger subsamples, a result quite consistent with Hirschman's (1973) pioneering analysis, though not directly predicted by him. And while Senik (2008) confirms Hirschman's (1973) hypothesis for transition economies, her finding of positive relative income effects for some major Western economies in samples containing all age groups are convincingly rejected by other studies, and hence raise concerns about her methodology.

A control variable which is often neglected is the potential for face-to-face interviewing to affect responses, and we find that use of interviews instead of a postal survey raises reported life-satisfaction by more than marriage. This and other new controls provide much higher

explanatory power of our estimates than is usual in cross-sectional regressions. For data reasons we do not use the full panel with individual fixed effects, but Layard et al. (2010) show that fixed effects only reduce the size of the coefficients of own-income and relative income, but do not change signs or statistical significance. They also show that adaptation provides only small additional explanatory power in the GSOEP panel. We also control for employment, health and disability, which have strong effects, and in contrast to some studies, including our following UK results, we find strong positive direct effects of education, even after controlling for own household income and reference income. Another important variable which is not always included is social interaction, which has a powerful influence on life-satisfaction.

We next use the British Household Panel Survey, a large representative survey similar to the GSOEP, to compare the effects of disaggregation in the two countries, and though the results for the whole sample are similar, splitting by age reveals some remarkable differences. First, reference income is *insignificant* for both young and old in the separate estimates, though negative and significant for the whole sample in the usual way. Even more surprisingly, own income has *no effect* on life-satisfaction for the older group, though it is positive and significant as expected for the young, when all controls are included.

The other surprise is that education controls are uniformly negative and significant for the older, and generally insignificant for the younger.¹ To gain further insight we experimented with (unreported) parsimonious regressions of satisfaction, first on age, income and reference income, and found that own income was then positive and significant, though reference income had no effect on the older. Adding a few controls including employment and health status removed the own income effect for the old, (though it remained significant for the young). Education is of course highly correlated with income, so its negative effect combined with the lack of any influence from income remains puzzling. We also regressed satisfaction on age and education variables, which were positive and significant in the whole sample and the older group, probably due to the strong association between education and health and employment status, since adding these controls reversed the signs of education. Estimation of

¹ Clark and Oswald (1996) also find negative education effects on job satisfaction and satisfaction with pay, using 1991 BHPS data, but own and relative income had the usual effects, and they did not split the sample by age but relied on a quadratic in age. Boyce and Brown (2008) find negative education effects on life-satisfaction with newer BHPS data.

well-being in samples combining young and old respondents thus generates serious bias, in two countries, in spite of controls for age, and some surprising differences in certain respects.

The plan of the paper is to provide a brief review of some more relevant literature in section 2, followed by a discussion of the GSOEP data, its descriptive statistics and subsequent empirical results in section 3. Parallel discussion of the BHPS data and estimates is presented in section 4. Conclusions are summarized in section 5, and tables of descriptive statistics and regression results are in the appendix.

2. A Brief Literature Review

While Hirschman's ideas have long been neglected, they were tested by Drichoutis et al. (2010), who found insignificant effects of reference income for the transition economies of Eastern Europe, and by Senik (2008, 2004), who found positive effects of relative income on life-satisfaction or financial satisfaction for most transition economies and Russia. She ascribes this contrast to 'old' Europe, with mainly negative effects of reference income, to social and economic turmoil after transition and consequent high mobility. Much less plausibly, Senik (2008) also finds a strong *positive* effect of relative income on happiness in the US, attributed to high perceived mobility, but this result is directly contradicted by Layard et al. (2010), using the same GSS data, and by Luttmer (2005) and others with various data sets. Senik argues that Luttmer's neighbourhood mean income does not have the same informational content as comparison with an educational or professional peer-group, but this is questionable. Living in a more prosperous area surely also offers better career prospects than being surrounded by poverty, with lower mobility costs, as well as probably providing various local public goods, better quality services, etc., which are likely to directly raise well-being. Thus Luttmer's negative comparison effect (for all ages) arises *in spite of* several potential underlying positive neighbourhood effects.

Senik (2008) omits regional effects, and most seriously, both employment status and health from her second-stage explanatory variables, which are generally found to be among the most important determinants of SWB, so these omissions could cause omitted variable bias. She also uses individual income instead of the more natural household income; thus some women with low or no income may be living in affluent households, but the precise reasons for her anomalous results are unclear. Very surprisingly, Senik (2008) also reports *positive* significant relative income effects on financial satisfaction for Germany, Netherlands, Ireland

and Spain in her Table 3, though she discusses these effects for only Ireland and Spain in the text. These results for stable western countries are clearly contradicted by studies mentioned above – and ours below – for West Germany at least.² She claims ‘predominantly negative’ relative income effects in her sample of 14 West European countries, but reports negative significant coefficients for only 6 countries.

In a previous version of the above paper, Senik (2006) reports quite different results for financial satisfaction in the same West European countries, with highly significant, negative effects of reference income in all cases, but she does not mention these differences in the later, published version.

A different kind of test of the signalling effect of reference income has been carried out by Clark et al. (2009), using Danish establishment wage data, with the plausible finding that job-satisfaction is higher in establishments with higher average pay, which signals one’s own prospects. Interestingly in the light of our findings below, they find less effect for those near retirement. However, it is also likely that higher average pay will be correlated with workplace public goods as part of rent-sharing with workers, which may explain part of the observed influence.

By contrast, in an early study with UK data for employees, Clark and Oswald (1996) found a strong negative effect of reference income on job-satisfaction (which is generally an important component of life-satisfaction), equal in magnitude and opposite in sign to the own-income effect. Separating sub-samples of young and old does not seem to have been considered previously.³

3. Empirical Evidence from the GSOEP

The data used for this section comes from the German Socio-Economic Panel (GSOEP), which is a representative micro data set providing detailed information on persons, families and households in Germany. The GSOEP was started in 1984 and has become a widely used database for sociologists and economists. A major advantage is the comprehensive nature of

² Senik (2008) uses ‘jealousy’ in her title and text, to refer to the relative deprivation effect of comparison (sometimes interpreted as preference for fairness, or as envy). In fact, jealousy refers to ‘an anticipated loss’ and ‘is not to be confused with envy’ (Wikipedia).

³ Senik (2008) uses an age-interaction term to find stronger positive effects of reference income for younger respondents in Eastern Europe, and in the US, but reports no evidence of negative comparison effects for older individuals.

the data set, which combines objective indicators (e.g. income, employment status, family structure), as well as subjective or self-assessed life-satisfaction. In our paper, we make use of the entire 2008 wave of the GSOEP and analyse the nexus between happiness, relative income and age based on 17,865 individual observations.

Our dependent variable is an individual's self-reported life-satisfaction which is measured on an 11 point scale, 0 being the lowest value, while 10 is reported by individuals who are very satisfied with their actual life. Our main explanatory variables of interest are individual and reference income, which are both measured at the household level after deducting taxes and social insurance contributions.⁴ For the identification of the reference income, we follow Layard et al. (2010) and assume that an individual compares his/her own income with the average income of people in his/her own country, who are in the same age range, have the same gender and have attained a similar education level. We therefore define an individual's reference group by his/ her age (6 categories), education (2 categories) and gender. Additionally, we distinguish between the place of residence of an individual (West vs. East Germany). Moreover, we present our analysis separately for East and West Germany. This is motivated by large and persisting socio-economic and cultural differences between both regions, which are highlighted in table 1A. The table provides summary statistics and detailed definitions of all variables used in the analysis, including our dependent and main explanatory variables described above.

Initially, Table 1A shows that individuals in East Germany are on average less satisfied with their life than those living in West Germany. This corresponds to the fact, that East Germans are more affected by unemployment and have significantly lower household income than West Germans. Due to the construction of the variable, the latter also holds true for reference income. The well-known regional disparities in employment and income between West and East Germany are therefore clearly reflected in our data. However, the average life-satisfaction score in East Germany is still about 6.6, which is fairly high compared to self-reported happiness in the US (Layard et al. 2010). Furthermore, the table shows distinct regional differences with respect to the ethnic composition of the population. While only 1% of the respondents in East Germany have no German citizenship, about 7% of the West

⁴ We adjust for the number of adults in the household, though this makes little difference to the results. In cases with 2 adults, we divide household income by 1.6. In cases of three or more adults within a household, we use a divisor of 2.1.

German respondents have a foreign nationality. Finally, the large share of individuals with higher education qualifications in East Germany is striking.

Table 2A contains summary statistics of our dependent and independent variables broken down by age groups. It becomes obvious that the differences in happiness and economic outcomes between West and East Germany holds true when we compare people within age groups. However, the educational structure of individuals below the age of 46 is quite similar in West and East Germany. This indicates that individuals who have been fully educated in the former GDR mainly drive the superior qualification structure in East Germany. In particular, East German women are characterised by a high share of university graduates. Finally, the table shows that young adults in East and West Germany are on average more satisfied with their life than older individuals.

To test the influence of reference income on life-satisfaction we estimate the following model:

$$(1) \quad H = \beta_0 + \beta_1 Age + \beta_2 Age^2 + \beta_3 Age^3 + \beta_4 \ln Y + \beta_5 \ln \bar{Y} + \alpha X + \varepsilon,$$

where H measures self-reported life-satisfaction on an 11-point scale, and X is a vector of individual covariates including individual characteristics like gender, employment status and self-reported health as well as dummies for federal states. Through the inclusion of a cubic in age, the specification allows life-satisfaction to vary during the life cycle as described above. Y captures annual net household income of an individual, while \bar{Y} describes the mean income of the corresponding reference group defined by age, gender, education and region.

Column (1) of table 3A reports the results of our benchmark specification for West Germany. Our positive and significant income coefficient has almost the same size as the one found by Layard et al. (2010) who exploit the panel aspect of the GSOEP and use individual fixed effects.⁵ With respect to the role of relative income, we confirm the recent findings of Layard et al. (2010), Luttmer (2005) and Ferrer-i-Carbonell (2005): reference income has a negative effect on individual well being. However, the positive influence of own income is still larger than the negative effect of reference income.

⁵ However, they exclude immigrants and individuals under 30 and over 55. Due to the cross-sectional nature of the data used, we do not control for unobserved heterogeneity of the respondents. Layard et al (2010) find that individual fixed effects preserve a highly significant, negative reference income effect, nearly as large in magnitude as the own income effect, though in general fixed effects reduce the size and significance of other controls.

By estimating a simple OLS model, we treat life-satisfaction scores as cardinal and comparable across respondents. This assumption is sometimes criticised in the economic literature, but estimates from an ordered probit model are qualitatively similar to the ones reported in table 3A. This is in line with the findings of Ferrer-i-Carbonell and Frijters (2004) who demonstrate that the assumptions on cardinality or ordinality of answers to life-satisfaction questions have no substantial impact on the empirical results. Our main findings are also similar if we weight our individual observations.

The other individual factors influence individual life-satisfaction in the usual way: being married is positively associated with individual well-being, while respondents with a child in the household are less happy than the ones without children. The impact of health status and work status is as expected positive. It is noteworthy that, in contrast to some studies, we find a strong positive association between education and life-satisfaction even after controlling for own and reference income. Furthermore, our results highlight the important role of social interactions and contacts (e.g. sport, friends, and voluntary services) for individual well-being. An interesting and unique result is that interview techniques have a substantial impact on self-reported life-satisfaction. Respondents who use a written survey questionnaire, instead of a face-to-face interview, report significantly lower individual well-being scores. This finding has considerable implications for cross-country comparisons and the design of future happiness studies. Finally, regional dummies for the Federal States (Laender), which proxy for many unobserved regional factors and public goods were highly significant in the West. Our cubic in age captures declining satisfaction with age up to 45, and after about 75, though not reaching the minimum of the early 40s, according to unreported plots. Similar results are found by Wunder et al. (2011), and Boyce and Brown (2008).

The results for East Germany are presented in column (2). As expected, the income coefficient has a larger magnitude than the one found for West Germany. In regions that are characterized by low income and high unemployment levels, own income has a higher relevance for individual well-being. In addition to this, the results indicate that reference income does not matter for individuals in East Germany. Similar results are found by Drichoutis et al. (2010) for East European transition economies. The results in column (2) show a number of further differences with respect to West Germany. For example, being married in East Germany is not associated with higher well-being. On the other hand, the negative coefficient of having a child at home is twice as large as the one in the West German

sample (in spite of better child-care facilities in the East). A similar relation holds true for the coefficient of the interview form. The negative effect of postal surveys (instead of a face-to-face interview with social interaction) is larger for East Germans. This result indicates that cultural norms and habits still differ between West and East Germany.

Table 4A provides estimates for West Germany stratified by age groups. For comparison, column (1) reports estimates from the full sample.⁶ The results in column (2) highlight that reference income plays a positive role for individuals not older than 45. The standard negative relationship between reference income and individual well-being only holds true for individuals older than 45 (see column 3).⁷ Thus a fundamental result of happiness research changes dramatically as soon as we disaggregate the sample into young and old individuals. Our findings suggest that the positive signalling effect dominates the negative deprivation effect for young adults: during early career phases with high job and income mobility, the income of people with same sex and similar education and age functions as a signal for future prospects. In other words, reference income suggests own future earnings and therefore impacts positively upon own satisfaction. Only when an individual has reached a stable position within his/her career, does comparison with reference income signal lasting positive status or relative deprivation in the usual manner, so that higher comparison income reduces corresponding well-being. As an additional result, we find that the positive influence of being married is less pronounced for older people.

The results for age groups in East Germany in table 5A support our previous result that own income has greater importance for individual well-being in the Eastern part of Germany. Reference income matters neither for young adults nor for people older than 45. This may be related to lower average incomes and less inequality, and to the fact that the best career opportunities for young adults in the East are widely perceived to result from moving to the West. The final table 6A reports regional coefficients, showing the residual ‘environmental’ effect after all other controls. Northern regions do best, as in Koecher and Raffelhueschen (2011), though the details differ and they focus on absolute differences rather than regression coefficients.

⁶ The results in column (1) are identical to those reported in column (1) of table 3A.

⁷ Our results are qualitatively similar if we change the age limits for the two subsamples. If we include a squared term in age in the subsample of young adults (column 2), the coefficient of the reference income stays positive, but loses significance, probably due to multicollinearity. We report results of a specification without squared age, because the inclusion of polynomials in age does not increase explanatory power of the regression for the young sample.

4. Empirical Evidence from the BHPS

Our UK data are taken from the Wave 17 of the British Household Panel Survey (BHPS), which is also for 2008, and covers 14,419 individuals in total. We use data for 12,319 of these individuals, in order to avoid missing values on important variables. One point worthy of particular note is the deliberate over-sampling of the smaller nations of the UK – so that about half of the individuals in the BHPS are from Scotland, Wales and Northern Ireland, compared to less than 20% in the underlying overall population. The range of coverage of this data set is similarly broad as the GSOEP, although unsurprisingly not identical. For example, self-reported life-satisfaction is measured on a scale from 1-7, where 7 represents the highest possible level of satisfaction. The average life-satisfaction, at just over 5.2, would equate to just over 7.0 on the 0-10 scale (if a linear translation were used) – similar to the mean for West Germany from the GSOEP⁸. The income variable used from the BHPS data is household income for the month before the survey interview. For reference income, we identify reference group by the same number of age and education bands – as well as separating by gender and splitting England from non-England. For individuals who are married or cohabiting, household income is divided by 1.6.

The methodology parallels our analysis of the GSOEP data above, and the corresponding tables of results are in Appendix B. Summary statistics, overall and for the two sub-samples, are presented in tables 1B and 2B. The benchmark regression for all ages is reported in table 3B, and separate estimates for younger and older individuals in table 4B. Despite the similarities between the surveys, and many of the standard control effects, there are some striking differences between the two countries, many of which really only become apparent after disaggregation. Whereas mean household income is very similar for younger and older workers in the GSOEP data, older members of the BHPS sample suffer an average deficit of roughly 30%. British marriage and cohabitation rates are lower than in both parts of Germany. On education, only 12% of the younger BHPS group are in the lowest (reference) education category. This is bettered only by the 9% for the older age group in East Germany, but is a stark contrast to the older British sample, for which the corresponding level is 31%. It was previously rather common to have no formal qualifications, but there has been large scale change to the British qualifications system in recent decades.

⁸ The averages for England and Scotland are almost identical, just below the UK average, while that for Wales is just above. Only Northern Ireland is a bit different, being a little over 5.3 (slightly better than equivalence with West Germany).

While income variables are significant with expected signs in the overall estimates, only own income in the younger group remains significant after splitting the sample. All education categories are negative and significant in the older sub-sample. The absence of a positive, significant effect of reference income in the younger sub-sample is consistent with the signalling effect we find in West Germany, but the lack of any direct benefit from household income for the older is very surprising. Of course, income is correlated with two of the most important determinants of satisfaction, namely health and labour market status. The negative effects of education, particularly for the older group in the presence of many controls, might result from the larger gap between higher aspirations generated by more education, and actual achievements. As age rises the gap is likely to become more frustrating as chances of further achievement decline.⁹ However, this possibility seems to deepen the puzzle over the insignificant income effect for older UK individuals, unless one assumes that more education just reduces satisfaction with life in general in ways that become less flexible over time, and are not ameliorated by higher income.

Exploiting the panel data and including individual fixed effects typically reduces the size of existing coefficients, and thus seems unlikely to generate a positive significant income effect in the older group. Boyce and Brown (2008) use the BHPS panel with all ages, and a cubic in age, and find that adding fixed effects reduces negative significant education coefficients to insignificance. They use income rank as a proxy for relative income position and find a significant effect, and also confirm other findings that comparison is ‘upward’, or focussed on higher incomes. These results thus resemble ours in cross section with all ages, but do not explain the absence of income effects in the older sub-sample that we find. It is also puzzling that our significant negative relative income effect in the full sample becomes insignificant in the sub-samples, and it seems unlikely that adding fixed effects in the panel would change this. Defining the comparison group in terms of age, region and educational classification, following previous work, seems no less appropriate than the overall income ranking used by Boyce and Brown (2008), (or just the regional mean income which they reject in favour of ranking).

In any case, only splitting the sample by age reveals that both education and income have very different influences on older and younger groups. Occupational classifications remain surprisingly insignificant in both sub-samples. A final table 5B shows regional coefficients,

⁹ German education may relate better to actual achievement, or add cultural contributions to life-satisfaction.

with Scotland worse off than all English regions from the Midlands northwards, and Northern Ireland best by a surprisingly wide margin.

5. Conclusions

While the results from the entire sample for West Germany confirm previous findings that reference income has a strong negative effect on well-being, our sub-sample regressions for different age groups, show that the effect of comparison income on individual life-satisfaction changes dramatically over the life-cycle, reversing sign, while increasing in magnitude. This confirmation of Hirschman's 'tunnel hypothesis' in the unexpected context of a stable, advanced economy with relatively low mobility clearly has major consequences for the interpretation of well-being, comparison, and relative optimism or deprivation over the life-cycle. Education has strong 'bonus effects' of higher satisfaction, over and above the indirect effects via employment and health status which are of course very important in themselves. Aggregation over ages and relying on a quadratic in age obscures major differences in the role of relative incomes. We are not aware of any other such results in the literature on happiness and relative income.

For the UK we find an even more dramatic change after disaggregating by age. The conventional income and reference income effects in the whole sample disappear, and both incomes become *insignificant* for the older group, though own income remains important for the younger. In addition, education is negative and significant for older people when employment and health controls are included, although of course education is highly correlated with the health and employment chances, which are so important for well-being. A potential explanation in terms of aspirations was outlined above. Perhaps most surprising, when education, health, family and employment are given, more income is *not associated* with greater well-being of older people, a result which seems to be robust for this age group, and, to our knowledge, not previously observed. The differences between the two countries are all the more puzzling since unreported regressions find quite similar relationships between education and income for both age groups in the UK and Germany, and most of the standard controls have expected effects.

Aggregating over age groups and relying on a quadratic in age has obscured this striking switch in the function of the comparison income, and also missed the downturn in life-satisfaction among the oldest individuals, even after controlling for health and many other

variables. Life-satisfaction and other measures of well-being clearly need to be estimated separately for young and old in future research, and the role of expectations, mobility and inequality seem worth exploring for their relevance to well-being and social comparison.

References

- Blanchflower, D. G., Oswald, A., 2008. Is well-being U-shaped over the life cycle? *Social Science & Medicine* 66, 1733 – 1749.
- Boyce, C. J., Brown, G. D. A., 2008. Income rank and upward comparisons. *Warwick Economic Research Papers*, No 883.
- Clark, A. E., Frijters, P., Shields, M. A., 2008. Relative income, happiness, and utility: An explanation for the Easterlin paradox and other puzzles. *Journal of Economic Literature* 46, 95-144.
- Clark, A. E., Kristensen, N., Westergård-Nielsen, N., 2009. Job Satisfaction and Co-worker Wages: Status or Signal? *Economic Journal* 119, 430 – 447.
- Clark, A. E., Oswald, A., 1996. Satisfaction and comparison income. *Journal of Public Economics* 61, 359 – 381.
- Drichoutis, A. C., Nayga, R. M., Lazaridis, P., 2010. Do reference values matter? Some notes and extensions on income and happiness across Europe. *Journal of Economic Psychology* 31, 479 – 486.
- Easterlin, R., 1974. Does Economic Growth Improve the Human Lot? In: David, P.A., Reder, M.W. (Eds.), *Nations and Households in Economic Growth: Essays in Honour of Moses Abramowitz*. Academic Press, New York, pp. 89–125.
- Ferrer-i-Carbonell, A., P. Frijters, 2004. How important is methodology for the estimates of the determinants of happiness. *The Economic Journal*, 114 (July), pp: 641–659.
- Ferrer-i-Carbonell, A., 2005. Income and well-being: an empirical analysis of the comparison income effect. *Journal of Public Economics* 89, 997-1019.
- Hirschman, A. O., M. Rothschild, 1973. The Changing Tolerance for Income Inequality in the Course of Economic Development. *The Quarterly Journal of Economics* 87, 544 – 566.
- Koecher, R., Raffelhueschen, B., 2011. *Gluecksatlas Deutschland 2011*. Deutsche Post.
- Layard, R., Mayraz, G., Nickell, S., 2010. Does Relative Income Matter? Are the Critics Right? Chapter 6. In: Diener, E., Helliwell, J. F., Kahneman, D., (Eds.), *International Differences in Well-being*, Oxford University Press.
- Luttmer, R. F. P., 2005. Neighbors as Negatives: Relative Earnings and Well-Being. *Quarterly Journal of Economics* 30, 963-1002.
- Runciman, W. G., 1966. *Relative Deprivation and Social Justice*. Routledge and Kegan Paul, London.
- Senik, C., 2004. When Information Dominates Comparison: Learning from Russian Subjective Panel Data. *Journal of Public Economics* 88, 2099–2133.
- Senik, C., 2006. Ambition and Jealousy: Income Interactions in the ‘Old’ Europe versus the ‘New’ Europe and the United States. *IZA Discussion Paper No. 2083*.
- Senik, C., 2008. Ambition and Jealousy: Income Interactions in the ‘Old’ Europe versus the ‘New’ Europe and the United States. *Economica* 75, 495–513.
- Wunder, C., Wiencierz, A., Schwarze, J., H. Küchenhoff, 2011. Well-being over the lifespan: Semiparametric evidence from British and German longitudinal data. *Review of Economics and Statistics* (forthcoming).

Appendix A – GSOEP Tables

Table 1A: Summary Statistics: West and East Germany, overall

Variable	West Germany (N=13071)		East Germany (N=4794)	
	Mean	Std. Dev.	Mean	Std. Dev.
Life-Satisfaction	7.11	1.73	6.62	1.74
Age	49.73	17.33	50.03	17.62
Sex	0.52	0.50	0.52	0.50
Married	0.62	0.48	0.56	0.50
Cohabiting	0.17	0.38	0.22	0.41
Child	0.49	0.50	0.44	0.50
Health	0.49	0.50	0.46	0.50
Disabled	0.13	0.34	0.12	0.32
German	0.93	0.26	0.99	0.09
Social	0.84	0.36	0.76	0.42
Education1	0.19	0.39	0.12	0.33
Education2	0.47	0.50	0.50	0.50
Education3	0.13	0.34	0.11	0.31
Education4	0.20	0.40	0.27	0.44
Unemployed	0.04	0.20	0.11	0.31
Not_working	0.38	0.48	0.37	0.48
Working	0.58	0.49	0.52	0.50
HH_income	2016	1280	1545	825
RefIncome	2014	501	1546	329
No_interview	0.39	0.49	0.50	0.50

Life-Satisfaction measures self-reported life-satisfaction on an 11-point scale. Age describes the age of the respondent. Sex is coded as 1 if the respondent is female. Married is coded as 1 if the respondent is married and lives together with his/her partner. Cohabiting is coded as 1 if the respondent lives together with his/her partner without being married. Child is coded as 1 if at least 1 child is living in the household. Health is coded as 1 if respondent describes his own health status as good or very good. Disabled is coded as 1 if the respondent is unable to work, because she/he is severely handicapped. German is coded a 1 if the respondent has German citizenship. Social is coded as 1 if the respondent undertakes any interactive social activity at least once per week. Education1 is coded as 1 if the respondent's education is not higher than ISCED level 2. Education2 is coded as 1 if the respondent has a middle vocational education (ISCED 3). Education3 is coded as 1 if the respondent has Abitur and a vocational education or a higher vocational education (ISCED 4 +5). Education4 is coded a 1 if the individual has higher education (ISCED 6). Unemployed is a dummy that takes the value 1 if the respondent is registered as unemployed. Not_working is coded as 1 if the respondent is not working but not registered unemployed. Working takes the value 1 if the respondent is working. HH_income measures the net monthly household income of the respondent adjusted by the people of adults in the household. RefIncome measures the average net monthly adjusted household income within the skill group (Age (6 categories), Sex, Education (2 categories), Region (East vs. West)) to which the respondent belongs. No_interview is coded as 1 if the interview was carried out using a written questionnaire.

Source: GSOEP, 2008

Table 2A: Summary Statistics, West and East Germany, by Age Groups

Variable	West Germany		East Germany	
	<=45 (N=5654)	>45 (N=7417)	<=45 (N=1929)	>45 (N=2865)
	Mean	Mean	Mean	Mean
Life-satisfaction	7.19	7.06	6.90	6.44
Age	33.42	62.16	32.17	62.06
Sex	0.53	0.52	0.51	0.53
Married	0.49	0.73	0.34	0.70
Cohabiting	0.32	0.06	0.44	0.07
Child	0.70	0.33	0.73	0.24
Health	0.66	0.36	0.65	0.32
Disabled	0.04	0.20	0.03	0.17
German	0.91	0.94	0.99	0.99
Social	0.88	0.82	0.84	0.71
Education1	0.19	0.19	0.17	0.09
Education2	0.47	0.48	0.52	0.49
Education3	0.16	0.11	0.12	0.10
Education4	0.18	0.22	0.19	0.31
Unemployed	0.06	0.03	0.13	0.09
Not_working	0.18	0.53	0.15	0.52
Working	0.76	0.44	0.71	0.39
HH_income	2009	2020	1647	1477
RefIncome	2029	2002	1636	1484
No_interview	0.47	0.33	0.59	0.44

For a description of the variables, see table 1.

Source: GSOEP, 2008

Table 3A, Benchmark Regressions

	West Germany	East Germany
Age	-0.13*** (-6.603)	-0.08** (-2.238)
Age ²	0.00*** (6.409)	0.00 (1.591)
Age ³	-0.00*** (-5.862)	-0.00 (-1.197)
Sex	0.06** (2.097)	0.04 (0.946)
Married	0.50*** (12.230)	0.39*** (6.129)
Cohabiting	0.30*** (5.950)	0.25*** (3.366)
Child	-0.15*** (-4.677)	-0.28*** (-4.901)
Health	1.13*** (39.190)	0.92*** (18.747)
Disabled	-0.50*** (-9.888)	-0.47*** (-5.545)
German	0.26*** (4.447)	-0.20 (-0.780)
Social	0.45*** (10.496)	0.38*** (6.480)
Education2	0.11*** (2.727)	0.07 (0.857)
Education3	0.13** (2.333)	0.24** (2.415)
Education4	0.34*** (6.248)	0.18* (1.954)
Not_working	0.71*** (7.980)	0.71*** (6.854)
Working	0.70*** (8.275)	0.62*** (6.835)
Log HH_income	0.47*** (14.171)	0.81*** (13.561)
Log RefIncome	-0.39*** (-4.442)	-0.15 (-0.901)
Interview	-0.28*** (-9.592)	-0.43*** (-9.142)
Observations	13,071	4,794
Adjusted R-squared	0.218	0.223

Results from OLS regressions. Dependent variable: Life-Satisfaction. Controls for federal states are included. T-ratios in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 4A, West Germany

	All	<=45	>45
Age	-0.13*** (-6.603)	-0.02*** (-4.460)	0.10*** (4.786)
Age ²	0.00*** (6.409)		-0.00*** (-4.179)
Age ³	-0.00*** (-5.862)		
Married	0.50*** (12.230)	0.64*** (9.759)	0.43*** (8.023)
Cohabiting	0.30*** (5.950)	0.36*** (5.559)	0.42*** (4.630)
Log HH_income	0.47*** (14.171)	0.26*** (5.136)	0.61*** (14.043)
Log RefIncome	-0.39*** (-4.442)	0.35** (2.179)	-0.54*** (-4.713)
Observations	13,071	5,654	7,417
Adjusted R-squared	0.218	0.206	0.229

Results from OLS regressions. Dependent variable: Life-Satisfaction. Controls for gender, children, health status, citizenship, social activities, education, work status, interview form and federal states are included. T-ratios in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 5A, East Germany

	All	<=45	>45
Age	-0.08** (-2.238)	-0.03*** (-4.650)	0.03 (0.839)
Age ²	0.00 (1.591)		-0.00 (-0.873)
Age ³	-0.00 (-1.197)		
Married	0.39*** (6.129)	0.47*** (4.221)	0.35*** (4.429)
Cohabiting	0.25*** (3.366)	0.23** (2.432)	0.32** (2.306)
Log HH_income	0.81*** (13.561)	0.61*** (7.176)	0.98*** (11.565)
Log RefIncome	-0.15 (-0.901)	0.33 (1.084)	-0.14 (-0.648)
Observations	4,794	1,929	2,865
Adjusted R-squared	0.223	0.223	0.206

Table 6A,
Germany: Differences across Federal States

	(1) West	(2) East
Bavaria	0.13*** (2.792)	
Bremen	0.54*** (3.435)	
Hamburg	0.33*** (3.964)	
Hessen	0.09 (1.636)	
Lower Saxony	0.20*** (3.945)	
North Rhine-Westphalia	0.12*** (2.766)	
Rhineland-Palatinate	0.12* (1.790)	
Saarland	0.21* (1.833)	
Schleswig-Holstein	0.37*** (5.237)	
Brandenburg		-0.06 (-0.741)
Mecklenburg-Vorpommern		0.24** (2.486)
Saxony		0.13 (1.615)
Saxony-Anhalt		-0.09 (-1.025)
Thuringia		0.02 (0.279)
Observations	13,071	4,794
R-squared	0.220	0.227
Adj. R-squared	0.218	0.223

Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Reference categories: West Germany: Baden-Wuerttemberg East Germany: Berlin

Dependent variable: Life-Satisfaction. Controls for age, gender, married, cohabiting, children, health status, citizenship, social activities, education, work status, income, reference income and interview form are included. For the corresponding coefficients see table 3.

Appendix B – BHPS Tables

Table 1B: Summary Statistics: United Kingdom, overall

Variable	UK, all ages (N = 12,319)	
	Mean	Std. Dev.
Life-satisfaction	5.23	1.23
Female	0.55	0.50
Age (linear)	46.96	18.63
Household income	2394.15	1746.41
Reference income	2393.11	749.80
Unemployed	0.03	0.18
Employed	0.51	0.50
Self-employed	0.07	0.25
Retired	0.22	0.41
Family care or maternity leave	0.06	0.24
Long-term sick or disabled	0.04	0.20
Other activity	0.06	0.25
Health positive (good or excellent)	0.70	0.46
Health negative (poor or very poor)	0.09	0.28
Married	0.52	0.50
Cohabiting (unmarried)	0.13	0.33
Children (at least one)	0.48	0.89
SOC group 1	0.16	0.37
SOC group 2	0.15	0.36
Weekly social activity (at least)	0.64	0.48
Education1 (up to ISCED level 2)	0.22	0.42
Education2 (ISCED level 3)	0.46	0.50
Education3 (ISCED level 5b)	0.17	0.38
Education4 (ISCED levels 5a & 6)	0.15	0.36
Southern England	0.19	0.39
Northern England	0.16	0.37
Central England	0.17	0.37
Outside England	0.49	0.50

Unless otherwise stated here, each variable name denotes a dummy variable which takes the value 1 if the named characteristic applies to the respondent.

Life-satisfaction measures self-reported life-satisfaction on a 7-point scale (1-7). Age refers to the age of the respondent. Household income is the household income of the respondent in the month prior to interview, adjusted according to the number of adults in the household. Reference income measures the mean monthly adjusted household income within the skill group (Age (6 categories), Sex, Education (2 categories), Region (England vs. non-England)) to which the respondent belongs. The health variables are self-assessed, and refer to a period of 12 months. SOC group 1 encompasses Standard Occupational Classification (SOC) codings 100-299 inclusive, while SOC group 2 refers to SOC codings 300-499 inclusive. Education2 is coded as 1 if the respondent has a middle vocational education (ISCED 3). Education3 is coded as 1 if the respondent has higher vocational education (ISCED 5b). Education4 is coded a 1 if the individual has higher education (ISCED 5a and 6).

Source: BHPS, Wave 17, 2008.

Table 2B: Summary Statistics: United Kingdom, by Age Groups

Variable	UK aged <45 (N=5919)		UK aged >=45 (N=6400)	
	Mean	Std. Dev.	Mean	Std. Dev.
Life-satisfaction	5.19	1.16	5.27	1.28
Female	0.54	0.50	0.55	0.50
Age (linear)	30.84	8.63	61.86	11.70
Household income	2844.08	1901.11	1978.04	1472.47
Reference income	2843.82	554.25	1976.26	660.64
Unemployed	0.05	0.22	0.01	0.12
Employed	0.64	0.48	0.38	0.49
Self-employed	0.07	0.25	0.07	0.25
Retired	0.0003	0.02	0.42	0.49
Family care or maternity leave	0.08	0.27	0.05	0.21
Long-term sick or disabled	0.03	0.16	0.06	0.23
Other activity	0.13	0.34	0.01	0.07
Health positive (good or excellent)	0.77	0.42	0.64	0.48
Health negative (poor or very poor)	0.06	0.24	0.11	0.32
Married	0.38	0.49	0.65	0.48
Cohabiting (unmarried)	0.20	0.40	0.06	0.24
Children (at least one)	0.82	1.07	0.17	0.52
SOC group 1	0.19	0.39	0.13	0.34
SOC group 2	0.19	0.40	0.11	0.31
Weekly social activity (at least)	0.60	0.49	0.68	0.47
Education1 (up to ISCED level 2)	0.12	0.33	0.31	0.46
Education2 (ISCED level 3)	0.55	0.50	0.37	0.48
Education3 (ISCED level 5b)	0.14	0.35	0.20	0.40
Education4 (ISCED levels 5a & 6)	0.19	0.39	0.12	0.32
Southern England	0.19	0.39	0.19	0.39
Northern England	0.17	0.38	0.15	0.36
Central England	0.17	0.37	0.16	0.37
Outside England	0.47	0.50	0.50	0.50

For a description of variables, see Table 1B.

Source: BHPS, Wave 17, 2008.

Table 3B: Benchmark Regression, United Kingdom

UK, all ages (N = 12,319)		
Adjusted R squared = 0.177		
Variable	Estimate	t ratio
Female	0.016	0.73
Age (linear)	-0.108***	-7.41
Age (quadratic)	0.092***	6.24
Age (cubic)	-0.023***	-4.89
Household income	0.060***	3.71
Reference income	-0.244***	-2.97
Employed	0.438***	5.92
Self-employed	0.459***	5.67
Retired	0.476***	5.56
Family care or maternity leave	0.340***	3.98
Long-term sick or disabled	-0.038	-0.38
Other activity	0.463***	5.37
Health positive (good or excellent)	0.579***	21.34
Health negative (poor or very poor)	-0.643***	-12.01
Married	0.370***	13.26
Cohabiting (unmarried)	0.307***	8.73
Children (at least one)	-0.018	-1.32
SOC group 1	0.035	1.20
SOC group 2	-0.021	-0.68
Weekly social activity (at least)	0.168***	7.59
Education2 (ISCED level 3)	-0.109***	-3.57
Education3 (ISCED level 5b)	-0.031	-0.71
Education4 (ISCED levels 5a & 6)	-0.050	-1.11
Northern England	0.090***	2.72
Central England	0.074**	2.23
Outside England	0.112***	4.06
Constant	7.282***	10.08

Results are from OLS regressions. The dependent variable is life-satisfaction (on a 1-7 scale). Robust t ratios are used. *** denotes p-value < 0.01, ** denotes p < 0.05, * denotes p < 0.1. The quadratic and cubic age regressors are divided by 50 and 2500, respectively – to assist in yielding reasonable scaling of attached estimates.

Table 4B: Benchmark Regression, United Kingdom

Variable	Aged below 45 years		Aged 45 years & above	
	UK, all ages (N = 5919)		UK, all ages (N = 6400)	
	Adj. R squared = 0.158		Adj. R squared = 0.199	
	Estimate	t ratio	Estimate	t ratio
Female	0.035	1.11	0.040	1.30
Age (linear)	-0.012***	-4.22	0.067***	4.05
Age (quadratic)			-0.017***	-2.82
Age (cubic)				
Household income	0.117***	5.11	0.008	0.35
Reference income	0.113	0.86	0.058	0.45
Employed	0.398***	4.70	0.428***	2.76
Self-employed	0.430***	4.44	0.437***	2.73
Retired	-0.867	-0.65	0.402**	2.54
Family care or maternity leave	0.382***	3.79	0.230	1.36
Long-term sick or disabled	-0.132	-0.86	-0.054	-0.32
Other activity	0.527***	5.67	0.095	0.36
Health positive (good or excellent)	0.530***	12.94	0.604***	16.65
Health negative (poor or very poor)	-0.733***	-8.60	-0.590***	-8.72
Married	0.428***	10.06	0.333***	9.03
Cohabiting (unmarried)	0.294***	6.80	0.388***	5.97
Children (at least one)	-0.033**	-2.03	-0.019	-0.65
SOC group 1	-0.006	-0.16	0.062	1.36
SOC group 2	-0.001	-0.04	-0.093*	-1.80
Weekly social activity (at least)	0.105***	3.62	0.232***	6.93
Education2 (ISCED level 3)	0.025	0.45	-0.171***	-4.54
Education3 (ISCED level 5b)	-0.010	-0.14	-0.174***	-2.87
Education4 (ISCED levels 5a & 6)	-0.005	-0.07	-0.245***	-3.54
Northern England	0.122***	2.69	0.057	1.18
Central England	0.060	1.29	0.090*	1.91
Outside England	0.107***	2.75	0.168***	4.31
Constant	2.635**	2.40	0.904	0.66

Results are from OLS regressions. The dependent variable is life-satisfaction (on a 1-7 scale). Robust t ratios are used. *** denotes p-value < 0.01, ** denotes p < 0.05, * denotes p < 0.1. The quadratic and cubic age regressors are divided by 50 and 2500, respectively – to assist in yielding reasonable scaling of attached estimates.

Table 5B: United Kingdom: Differences across Government Office Regions

UK, all ages (N = 12,319)		
Adjusted R squared = 0.178		
Variable	Estimate	t ratio
North East England	0.142**	2.00
North West England	0.114**	2.36
Yorkshire and the Humber	0.153***	3.00
East Midlands	0.172***	3.11
West Midlands	0.105**	1.96
East of England	0.080	1.55
Greater London	0.054	0.96
South West England	0.093*	1.80
Wales	0.134***	3.26
Scotland	0.105***	2.57
Northern Ireland	0.269***	5.94

Results are from OLS regressions. The dependent variable is life-satisfaction (on a 1-7 scale). Robust t ratios are used. *** denotes p-value < 0.01, ** denotes p < 0.05, * denotes p < 0.1. Reference Government Office Region is South East England (excluding Greater London). Other regressors are the same as those listed in Table 3B, except that the three broad regional controls at the end of that table are replaced by the individual Government Office Regions.