Oldenburg Discussion Papers in Economics

Income Comparison, Income Formation, and Subjective Well-Being:
New Evidence on Envy versus Signaling

Heinz Welsch
Jan Kühling

April 2013

Department of Economics
University of Oldenburg, D-26111 Oldenburg

Income Comparison, Income Formation, and Subjective Well-Being:

New Evidence on Envy versus Signaling

Heinz Welsch

Jan Kühling

Department of Economics

University of Oldenburg

26111 Oldenburg, Germany

Abstract: Drawing on the distinction between envy and signaling effects in income comparison, this paper uses 307,465 observations for subjective well-being and its covariates from Germany, 1990-2009, to study whether the nature of income comparison has changed in the process of economic development, and how such changes are related to changes in the nature of income formation. By conceptualizing a person's comparison income as the income predicted by an earnings equation, we find that, while in 1990-1999 envy has been the dominant concern in West Germany and signaling the dominant factor in East Germany, income comparison was non-existing in 2000-2009. We also find that the earnings equation reflects people's ability more accurately in the second than in the first period. Together, these findings suggest that comparing one's income with people of the same ability is important only when ability is insufficiently reflected in own income.

1. Introduction

The subjective evaluation of income has been an important issue in economic analysis in recent years. An intriguing result of the pertinent literature is that individuals typically evaluate their own income in comparison with some comparison income, that is, the typical income of people with whom they share some relevant characteristics (see Clark et al. 2008 for a survey).

As suggested by Hirschman (1973), comparison income may affect a person in two different ways. One mechanism builds upon the "relative income" and "conspicuous consumption" hypotheses known in the literature for more than a century (Duesenberry 1949, Veblen 1899; see Clark et al. 2008 for a survey). In this perspective, a higher level of comparison income triggers a feeling of envy and thus has a negative effect on a person's utility. The second mechanism involves the idea of signaling. In this view, a higher level of comparison income serves as an indicator for the income level a person may attain in the future, thus affecting her utility positively.

Building on this distinction, Hirschman (1973) conjectured that the signaling value of comparison income may be dominant in early stages of economic development that are characterized by a high degree of social and economic uncertainty. Consistent with the idea of signaling when economic prospects are uncertain, Senik (2004, 2008) found a positive relationship between utility, measured by subjective well-being, and a measure of people's comparison income in Russia and in several other transition economies of Eastern Europe in the 1990s, whereas the relationship tended to be negative in West European countries.

This paper addresses the roles of envy and signaling in a more long-term perspective, aiming to identify whether the nature of income comparison changes when social and economic circumstances change. Following previous literature, we use data on subjective well-being (SWB) as an empirical proxy for utility (see Frey and Stutzer 2002, DiTella and MacCulloch 2006, Kahneman and Krueger 2006 for surveys) and investigate how SWB is

2

related to the survey respondents' own income and a measure of comparison income. Our analysis refers to Germany, 1990-2009, and involves 307,465 observations, of which 74,254 come from East Germany and 233,209 come from West Germany. Our measure of comparison income is income "predicted" by an earnings equation on the basis of a person's productivity-relevant characteristics (age, sex, level of education). To account for changes in the economic and institutional environment, we differentiate our analysis with respect to East and West Germany and with respect to two periods, 1990-1999 and 2000-2009.

The differentiation between East and West Germany and the time frame considered, including 20 years after unification, allows us to study explicitly if and how the relationship between well-being and comparison income differs between East and West and by the stage in the development process. With regard to the latter, it can be argued that economic instability and uncertainty were high in East Germany in the early years after unification. A person from East Germany may thus have perceived a high income level of people with similar characteristics as an indicator of her own future prospects, but this signaling value may have declined over time as economic conditions became more stable and predictable. In West Germany, conversely, being more economically stable and advanced, it is likely that envy rather than signaling has been the dominant factor in income comparison.

Consistent with this reasoning we find that in the period 1990-1999 the well-being of East Germans was significantly positively related to the income of people with similar characteristics (dominance of signaling effect), whereas the well-being of West Germans was significantly negatively related to the income of similar people (dominance of envy effect). In the period 2000-2009, all of these relationships became insignificant.

The finding that income comparisons with similarly productive people became insignificant in the second period is consistent with the circumstance that the earnings equation, from which comparison income is derived, is more accurate in the second than in the first period. More specifically, the explanatory power (coefficient of determination) of

3

age, sex and the level of education as predictors of income is much greater in the second period than it is in the first. This indicates (i) that in the second period income reflects people's ability more accurately and (ii) that income uncertainty has decreased. As a consequence of (i), a source of envy – income differences that are not justified by differences in ability – has decreased. As a consequence of (ii), the need for an indicator of one's own future income prospects has decreased. Thus, changes in income formation seem to have weakened both factors which drive income comparison with "people like me", rendering the coefficient of comparison income insignificant.[1]

Previous studies on income comparison with "similar" others include Clark and Oswald (1996), Senik (2004, 2008), Ferrer-i-Carbonell (2005), Caporale et al. (2009) and Knies (2012). These papers differ with respect to the way comparison income is measured. While Clark and Oswald (1996) and Senik (2004, 2008) derive comparison income from an earnings equation, Ferrer-i-Carbonell (2005) and Caporale et al. (2009) compute comparison income as the average income (cell mean) of people with similar characteristics (age bracket, education level, country). Knies (2012), using German data, considers average "neighborhood income" in street sections containing an average of 25 households. Independent of the method of measuring comparison income, its effect on subjective well-being is found to be negative in "mature" capitalist economies in Europe, while being positive in transition economies in the 1990s, and in the United States.

Against this background, the present paper contributes (i) by examining income comparison in a dynamic perspective and (ii) by investigating the role for income comparison of changes in the nature of income formation. Our findings lend support to Hirschman's conjecture on the changing roles of income comparison in the development process not just

---

[1] At the institutional level, changes in income formation may have been related to the labor market reforms undertaken in Germany in 2003-2005 (Eichhorst and Marx 2009).

indirectly, based on cross-sectional inference (as do previous studies), but directly, based on inter-temporal evidence. In addition, they suggest that the importance of comparison income for individual well-being varies with the degree to which income reflects ability rather than mere chance.

We follow previous literature by investigating how the level of a pre-defined concept of comparison income affects subjective well-being, rather than the income of a reference group people say they compare themselves to (as do Clark and Senik 2010).[2] One benefit from doing so is that the proxy for comparison income that we use is explicitly connected to ability; this way we are able to study how the strength of this connection may influence the relationship between comparison income and well-being.

The paper is organized as follows. Section 2 presents the methodological framework and section 3 reports and discusses the empirical results. Section 4 concludes.

2. Methodological Framework

2.1 *Conceptual Background*

Following Hirschman (1973) it is assumed that an individual derives utility u from her current income y and her expected future income y^e. In addition, she receives disutility from some comparison income, that is, the "typical" income $\hat{y}$ of persons with similar characteristics as herself:

$$u = f(y, y^e, \hat{y}) \tag{1}$$

---

[2] Clark and Senik (2010) find that colleagues are the most frequently-cited reference group and argue that this is consistent with information effects, as colleagues' income contains more information about the individual's own future prospects than do the incomes of other reference groups.

Expected income is assumed to be an increasing function of comparison income: $y^e = g(\hat{y})$. Hence we get

$$u = f(y, g(\hat{y}), \hat{y}), \tag{2}$$

and the marginal utility from comparison income is

$$\frac{du}{d\hat{y}} = \frac{\partial f}{\partial y^e} \frac{\partial g}{\partial \hat{y}} + \frac{\partial f}{\partial \hat{y}}. \tag{3}$$

In this equation, the first term on the right hand side is the information or signaling effect, which says that in circumstances of social and economic uncertainty an individual takes a change in the income of people with similar characteristics as a signal that her own income is going to change in the same way (Hirschman 1973). It is natural to think that the characteristics relevant for signaling to be effective are those that refer to the person's productivity or ability.

The second term in the above equation refers to the conventional envy phenomenon known in the context of the "conspicuous consumption" and "relative income" hypotheses. Since the signaling channel involves a positive and the envy channel a negative partial relationship between comparison income and utility, the sign of the overall relationship is ambiguous. As argued by Hirschman (1973), the signaling effect is more likely to dominate the envy effect in early stages of development, when economic conditions are volatile and uncertain, than when they are stable.

As already mentioned, for signaling to be effective comparison income should be understood as the "typical" income of people with similar ability as the person considered.

6

We will implement this idea by modeling comparison income as the income "predicted" by a set of ability-relevant characteristics z: $\hat{y} = h(z)$. Empirically, person i's comparison income, $\hat{y}_i$, will therefore be determined from an earnings regression of the form (as in Clark and Oswald 1996 and Senik 2004, 2008):

$$y_i = \alpha + \sum_k \beta_k z_{ik} + \varepsilon_i =: \hat{y}_i + \varepsilon_i . \tag{4}$$

According to this formulation, a person's income is composed of a systematic part $\hat{y}_i$ (which reflects her ability) and a random part ε_i,

The coefficient of determination of the above regression, $R^2 := \operatorname{var} \hat{y}_i / \operatorname{var} y_i$, measures the proportion in which observed income is explained by ability-relevant characteristics. This proportion can be interpreted in two ways. In the first place, R^2 is the extent to which income reflects ability, an interpretation to which we shall refer in discussing our results concerning envy. In a somewhat different perspective, R^2 provides us with a measure of income uncertainty (randomness), namely the proportion of income variance unexplained (by ability), $1 - R^2 = (\operatorname{var} y_i - \operatorname{var} \hat{y}_i)/\operatorname{var} y_i$. From the point of view of signaling, differences in R^2 across regions or over time may therefore correspond to differences in the usefulness of comparison income so determined as a signal of one's future prospects: As R^2 increases, it becomes less necessary to have an indicator that signals one's income prospects.

Overall, differences in the coefficient of determination of the earnings regression across different cross sections or across time can be interpreted as differences in the certainty of income or in the congruence of income with ability.

2.2 Data

7

Our data comes from the German Socio-Economic Panel (SOEP), which is a representative longitudinal panel data set of the population in Germany (see Wagner et al. 2007). The SOEP data are based on surveys in which adult persons (aged 15 and over) are (re)interviewed annually. Annual waves of the survey include more than 20,000 individuals in about 11,000 households. The data set used in this paper refers to the waves 1990-2009. Due to item non-response it includes 307,465 observations for 42,119 individuals.

The dependent variable in our life satisfaction regressions is the answer to the following question: "How satisfied are you at present with your life, all things considered? Please respond using the following scale, where '0' indicates *not at all satisfied* and "10" indicates *completely satisfied*."

Among the main explanatory variables in our life satisfaction regressions is a respondent's monthly net equivalent income. It is computed by dividing total after-tax household income by the square root of the number of household members. Income is measured in Euros at prices of 2005.

Following Clark and Oswald (1996), among others, we use as comparison income the income "predicted" by an earnings equation on the basis of a person's productivity-relevant characteristics (ability). We use a parsimonious specification which includes only those characteristics of reference persons that are likely to be observed by the person considered. Those characteristics are age, sex, and the level of education (see also Senik 2004, 2008).

With respect to the level of education, Germany (unlike most other countries) has a streamed system of secondary schooling with the corresponding certificates representing different levels of qualification. The certificates are, in increasing order of qualification: *Hauptschule* leaving certificate; *Realschule* leaving certificate; technical college entrance qualification (*Fachhochschulreife*); university entrance qualification (*Allgemeine Hochschulreife*). In the earnings equation we will use dummy variables for these types of

certificates rather than the number of years of schooling because the latter inadequately reflect education-related ability in the German schooling system.

Table A1 in the Appendix contains the variable descriptions and the summary statistics of all the variables.

2.3 Econometric Approach

The earnings equation takes the general form of equation (4). More specifically, using *i* to denote the individual, *r* to denote East and West Germany, respectively, and *t* to denote years (1990 – 2009), the earnings equation is given by

$$y_{irt} = \alpha + \beta_1 age_{irt} + \beta_2 age_{irt}^2 + \beta_3 female_{irt} + \sum_s \beta_s edu_{irts} + \varepsilon_{irt} =: \hat{y}_{irt} + \varepsilon_{irt}. \qquad (5)$$

In this equation, age_{irt} is measured in years, $female_{irt}$ is a dummy variable and edu_{irts} denotes dummy variables for the education levels *s* discussed above. The predicted value from this equation, $\hat{y}_{irt}$, is the typical income of a person of given age, sex, and educational level; it will provide our measure of comparison income. The equation will be estimated for total Germany, as well as for East and West Germany separately, and it will be estimated for different time windows, such as to match the corresponding life satisfaction regression with respect to region and time.

The life satisfaction equation is specified as follows:

$$LS_{irt} = \gamma_1 \ln y_{irt} + \gamma_2 \ln \hat{y}_{irt} + \gamma_3' controls_{irt} + person_i + year_t + \eta_{irt}. \qquad (6)$$

In this formulation, $controls_{irt}$ is a vector comprising the socio-demographic variables that have been found in previous studies to have an impact on subjective well-being (age, marital

9

status, household composition, educational level, employment status), see e.g. Dolan et al. (2008), and *person$_i$* denotes person dummies (fixed effects) which capture unobserved time-invariant individual-specific determinants of life satisfaction while *year$_t$* denotes year dummies.

The dependent variable, life satisfaction, is an ordinal variable on an 11-point scale, which suggests estimating equation (6) with an estimator for ordered data. However, in the presence of individual fixed effects, it is ambiguous which ordinal estimator to use. As shown by Ferrer-i-Carbonell and Frijters (2004) with life satisfaction data from SOEP, it is more important to control for fixed effects than to admit for possible non-cardinality. More generally, following Angrist and Pischke (2009), there is little qualitative difference between OLS and ordered-probit or ordered-logit models. We therefore estimate equation (6) using least squares. To account for the fact that comparison income is obtained from a first-stage regression, we report bootstrapped standard errors, based on 1,000 replications.

3. Results and Discussion

3.1 The Earnings Equation

Table 1 reports the main results from several versions of the earnings regression. The versions differ by whether they refer to Germany as a whole or to East and West Germany separately. In addition, the regressions are differentiated according to the time frame: 1990-1999 and 2000-2009.

In all the regionally and temporally defined (sub)samples we obtain the expected qualitative results: Earnings are increasing in age and decreasing in age-squared, they are lower for women than for men, and there are premia for better education, the respective coefficients all being significant at conventional levels. There are, however, considerable differences between East and West and across time:

10

(1) For both time periods, the constant term is greater in the East than in the West, whereas the earnings differences between women and men and the education premium (as indicated, e.g., by the coefficient on *Allgemeine Hochschulreife*) are smaller in the East than in the West.

(2) In total Germany as well as in both East and West, the constant term is greater in 1990-1999 than in 2000-2009, whereas the earnings difference between women and men and the education premium are smaller in 1990-1999 than in 2000-2009.

(3) In total Germany as well as in both East and West, the coefficient of determination (R^2) is greater in 2000-2009 than in 1990-2009.

Finding (1) suggests that earnings are more strongly related to ability in the West than in the East (in both time periods). From a signaling perspective it suggests that income uncertainty is much greater in the East than in the West.

Finding (2) suggests that earnings are more strongly related to ability in 2000-2009 than in 1990-1999 (in both East and West). Finding (3) is consistent with this latter point: In the period 2000-2009 the earnings equation provides a better explanation for the dispersion of earnings than in 1990-1999. From a signaling perspective these findings mean that income uncertainty was less in 2000-2009 than in 1990-1999.[3]

3.2 The Life Satisfaction Equation

Table 2 reports the main estimation results for the life satisfaction equation, 1990-1999.[4] For Germany overall (regression A), the coefficient for own income is positive and

---

[3] At the institutional level, changes in income formation may have been related to the labor market reforms undertaken in Germany in 2003-2005 (Eichhorst and Marx 2009).

[4] More detailed results concerning the controls are presented in Table A2 in the Appendix. These results do not qualitatively differ between East and West and with respect to time. As is

significant, whereas the coefficient for comparison income is negative and significant (at the 5 percent level). The same qualitative results are obtained for West Germany when comparison income is the predicted income for overall Germany (regression B) and when comparison income is specified either as the predicted West German income (regression C) or the predicted East German income (regression D). In all these cases, the coefficients on comparison income are negative and significant.

Results are different for East Germany. When own income and the comparison income for Germany overall are included (regression E), both have a positive and significant coefficient. This result does not change, when comparison income is specified either as the predicted West German income (regression F) or the predicted East German income (regression G). In all these cases, the coefficients on comparison income are positive and significant, even though the coefficients on comparison income and on West German comparison income are significant at the 10 percent level only.

In terms of the envy-signaling framework, our results thus suggest that in West Germany the dominant effect of comparison income in the 1990s was via the envy channel, whereas in East Germany the signaling effect of comparison income was dominant.[5] These results are consistent with earlier findings for the 1990s, namely that the envy effect tended to dominate the signaling effect in Western Europe, whereas the signaling effect was dominant in the transition economies of Eastern Europe and in Russia (Senik 2004, 2008; Caporale et al. 2009).

---

common in data sets for developed countries (see Dolan et al. 2008), life satisfaction is u-shaped in age, highest for married and lowest for separated persons, lowest if being unemployed than in any other employment status, and increasing in income.

[5] The dominance of the envy effect in Germany overall reflects the greater number of observations from West Germany compared to East Germany (75,285 versus 27,451).

Table 3 reports the results for the life satisfaction equation, 2000-2009. In all the regressions presented, own income enters positively and significantly. With respect to (all versions of) comparison income, we find negative coefficients in overall Germany and in West Germany, and positive coefficients in East Germany (except for the case of East German comparison income in East Germany, regression G in Table 3). However, all coefficients of comparison income are entirely insignificant.[6]

3.3 Discussion

We got the intriguing result that, while being predominantly a source of envy in the West and a benchmark for forming income expectations in the East in the 1990s, both of these effects seem to have vanished in the course of time.[7] One explanation for this result may

---

[6] In addition to the qualitative relationships (signs and significance), one might be tempted to interpret the magnitudes of coefficients. In this regard, however, it is important to note that own income and the various versions of comparison income occupy considerably different ranges. As seen in Table A1, the log of own income is in the range -0.068 to 11.226, with standard deviation 0.481, whereas the range of log comparison income was much more narrow, 6.646 to 7.856, with standard deviation 0.204. A one-unit change in comparison income (which is what the estimated coefficients refer to) is therefore a much bigger variation than a one-unit change in own income. Similar incommensurability as in overall Germany exists in East and West Germany separately. Since it is not clear how to standardize effect sizes in such cases, we follow previous literature (for instance Senik 2004, Ferrer-i-Carbonell 2005, Caporale et al. 2009) by not discussing magnitudes.

[7] This should not be taken to mean that this change occurred exactly at the turn of the century. Our choice of time windows 1990-1999 and 2000-2009, is simply motivated by considerations of symmetry. In spite of this, our results suggest that a change did happen.

relate to our notion of comparison income as the income predicted by an earnings equation, which is supposed to measure how income is related to productivity-relevant characteristics (age, sex, education level).

With respect to comparison income as predicted income, it should be recalled that (as discussed in sub-section 3.1), the explanatory power of the earnings equation is much greater in 2000-2009 than in 1990-1999. This is consistent with the idea that income uncertainty was less in the former than in the latter period: if actual income is more in line with income predicted on the basis of people's characteristics, then predicted income has less additional information content with regard to future prospects than what is already incorporated in actual income. The loss in information content of comparison income, as measured, would explain why comparison income became insignificant in the life satisfaction equation for East Germany in the second period.

From a different point of view, the greater explanatory power of the earnings equation in the second period can be taken to indicate that actual earnings reflect people's ability (as proxied by age, sex and education) more accurately in the second than in the first period. Though somewhat speculative, one could conjecture that envy is less pronounced with respect to income that is based on ability than with respect to income that is of a more arbitrary or random character. The greater congruence of income with ability reflected in the greater explanatory power of the earnings equation would provide an explanation for why comparison income became insignificant in the life satisfaction equation for West Germany in the second period.

Changes in the nature of income formation may thus have reduced the power of comparison income (as measured) as a source of both envy and information, thus rendering comparison income insignificant (both statistically and substantively) as a covariate of life satisfaction.

4. Conclusions

Drawing on the distinction between envy and signaling effects in income comparison, this paper has used 307,465 observations for subjective well-being and its covariates from Germany, 1990-2009, to study whether the nature of income comparison has changed in the process of economic development, and how such changes are related to changes in the nature of income formation. By conceptualizing a person's comparison income as the income predicted by an earnings equation, we found that, while in 1990-1999 envy has been the dominant concern in West Germany and signaling the dominant effect in East Germany, income comparison was non-existing in 2000-2009. We also found that the earnings equation reflects people's ability-relevant characteristics more accurately in the second than in the first period.

The distinction between envy and signaling effects goes back to Hirschman (1973), who conjectured that the roles of these two effects may change in the process of economic development. Unified Germany offers a unique field to study Hirschman's conjecture because the Eastern and the Western part of the country were at different stages of development for a considerable time after unification, East Germany being characterized by considerable economic volatility and uncertainty in the 1990s. These differences in economic uncertainty suggest that the signaling effect may have dominated the envy effect in East Germany, whereas the opposite applies to West Germany.

Our results from subjective well-being regressions for the period 1990-1999 are consistent with these expectations. In addition, considering that economic uncertainty in East Germany may have declined over time, the finding that comparison income became insignificant in East Germany in the period 2000-2009 can be viewed as additional evidence in favor of Hirschman's conjecture. Moreover, the finding that the explanatory power of the earnings equation, which we used to compute comparison income, has been substantially

greater in the second than in the first period constitutes direct evidence for decreasing income uncertainty.

Somewhat more surprising is the result that comparison income became insignificant in the second period not only for East Germany but for West Germany as well. An explanation for this result rests on the idea that the greater explanatory power of the earnings equation in the second period indicates that income reflects ability more accurately in the second than in the first period. Increased congruence of comparison income with ability may have implied that a higher level of comparison income is less of a source for feelings of envy.

While there has been some previous literature on envy vs. signaling in Western and Eastern Europe, those studies focused on the immediate post-transition period of the 1990s. In contrast to those studies, the present paper addresses the envy-versus-signaling issue in a more long-term perspective. Our results for the 1990s are consistent with previous findings, but, in addition, we are able to show that there is some dynamics in the nature of income comparison. Given our findings regarding income formation, we conjecture that those changes in income comparison are related to changes in income uncertainty over time. This is the benefit from modeling comparison income as predicted income rather than as a cell-mean.

Overall, this study has highlighted the importance of income formation for the existence and sign of the income comparison effect. Future research may address the transferability of our results to other countries.

References

Angrist, J.D., Pischke, J.-S. (2009), *Mostly Harmless Econometrics – An Empiricist's Companion*, Princeton University Press.

Caporale, G.M., Georgellis, Y., Tsitsianis, N., Yin, Y.P. (2009), Income and Happiness Across Europe: Do Reference Values Matter?, *Journal of Economic Psychology* 30, 42-51.

Clark, A., Oswald, A. (1996), Satisfaction and Comparison Income, *Journal of Public Economics* 61, 359-381.

Clark, A., Frijters, P., Shields, M. (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., Senik, C. (2010), Who Compares to Whom? The Anatomy of Income Comparisons in Europe, *Economic Journal* 120, 573-594.

Di Tella, R., MacCulloch, R. (2006), Some Uses of Happiness Data in Economics, *Journal of Economic Perspectives* 20, 25-46.

Dolan, P., Peasgood, T., 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, 94-122.

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

Eichhorst, W., Marx, P. (2009), Reforming German Labor Market Institutions: A Dual Path to Flexibility, Bonn: IZA Discussion Paper 4100.

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

Ferrer-i-Carbonell, A., Frijters, P. (2004), How Important is Methodology for the Estimates of the Determinants of Happiness?, *Economic Journal* 114, 641-659.

Frey, B.S., Stutzer, A. (2002), What Can Economists Learn from Happiness Research?, *Journal of Economic Literature* 40(2), 402-435.

Hirschman, A. (1973), The Changing Tolerance for Income Inequality in the Process of Economic Development, *Quarterly Journal of Economics* 87, 544-566.

Kahneman, D., Krueger, A.B. (2006), Developments in the Measurement of Subjective Well-Being, *Journal of Economic Perspectives* 20, 3-24.

Knies, C. (2012), Income Comparison Among Neighbours and Satisfaction in East and West Germany, *Social Indicators Research* 106, 471-489.

Senik, C. (2004), When Information Dominates Comparison: Learning from Russian Subjective Panel Data, *Journal of Public Economics* 88, 2099-2123.

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

Veblen, T. (1899), *The Theory of the Leisure Class*, New York: Macmillan.

Wagner, G.G. Frick, J.R., Schupp, J. (2007), The German Socio-Economic Panel Study (SOEP): Scope, Evolution and Enhancement, *Schmollers Jahrbuch/ Journal of Applied Social Sciences Studies* 127, 139-169.

Table 1: Results for the Earnings Equation

	Variable	Total Germany	West Germany	East Germany
		A	B	C
1990 – 1999	Constant	795.15*** (39.54)	565.54*** (22.90)	1086.59*** (28.92)
	Age	27.94*** (36.74)	38.63*** (40.23)	11.72*** (10.94)
	Age^2	-0.27*** (-35.83)	-0.37*** (-39.25)	-0.10*** (-9.44)
	Male	Reference	Reference	Reference
	Female	-72.93*** (-15.07)	-94.08*** (-15.71)	-39.82*** (-6.00)
	No certificate	Reference	Reference	Reference
	Hauptschule leaving certificate	71.60*** (6.71)	145.06*** (12.67)	-194.44*** (-5.98)
	Realschule leaving certificate	212.40*** (19.21)	408.73*** (32.30)	-12.35 (-0.39)
	College entrance certificate (*Fachhochschulreife*)	528.89*** (27.35)	535.07*** (26.79)	223.68*** (3.25)
	University entrance qualification (*Allgemeine Hochschulreife*)	563.32*** (43.27)	671.80*** (46.14)	292.36*** (8.44)
	Other certificate	-48.85*** (-3.58)	-57.41*** (-3.98)	-153.21*** (-3.76)
	In school	529.88*** (21.19)	710.67*** (22.45)	212.11*** (5.11)
	n (number of observations)	102749	75294	27453
	R^2	0.065	0.084	0.074
2000 - 2009	Constant	-50.25** (-2.19)	-295.63*** (-10.68)	471.87*** (10.02)
	Age	50.08*** (60.95)	59.60*** (58.75)	24.27*** (21.68)
	Age^2	-0.42*** (-52.58)	-0.50*** (-50.98)	-0.198*** (-18.54)
	Male	Reference	Reference	Reference
	Female	-85.39*** (-15.78)	-104.46*** (-15.71)	-49.69*** (-7.47)
	No certificate	Reference	Reference	Reference
	Hauptschule leaving certificate	246.29*** (22.17)	306.13*** (26.11)	134.16*** (3.22)
	Realschule leaving certificate	600.32*** (51.10)	787.16*** (59.78)	395.94*** (9.57)
	College entrance certificate (*Fachhochschulreife*)	941.33*** (58.51)	981.09*** (57.55)	767.59*** (14.60)
	University entrance qualification (*Allgemeine Hochschulreife*)	1283.56*** (89.91)	1422.60*** (88.68)	907.06*** (21.31)
	Other certificate	262.47*** (16.91)	267.37*** (16.25)	222.31*** (4.96)
	In school	1252.73*** (54.29)	1444.05*** (52.53)	788.52*** (16.78)
	n (number of observations)	204746	157935	46811
	R^2	0.103	0.111	0.124

Table 2: Results for the Life Satisfaction Equation, 1990-1999

	Germany	West Germany			East Germany		
	A	B	C	D	E	F	G
Own Income	0.413*** (17.73)	0.306*** (11.88)	0.306*** (12.32)	0.306*** (11.83)	0.541*** (11.16)	0.540*** (10.77)	0.541*** (11.50)
Comparison Income	-2.044** (-2.06)	-2.327** (-2.10)			4.763* (1.92)		
Comparison Income West			-1.576** (-2.01)			3.128* (1.77)	
Comparison Income East				-5.152** (-2.34)			13.466** (2.38)
Socio-demographic variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Person dummy variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
n (number of observations)	102736	75285	75285	75285	27451	27451	27451
R^2	0.028	0.013	0.013	0.013	0.000	0.000	0.000

Note: *** , ** , and * denote significance at the 1 percent, 5 percent, and 10 percent level, respectively; bootstrapped standard errors with 1,000 iterations; income variables in logarithms.

Table 3: Results for the Life Satisfaction Equation, 2000-2009

	Germany	West Germany			East Germany		
	A	B	C	D	E	F	G
Own Income	0.285*** (18.12)	0.270*** (15.99)	0.270*** (15.22)	0.269*** (15.11)	0.367*** (10.59)	0.368*** (10.12)	0.366*** (10.19)
Comparison Income	-0.132 (-0.21)	-0.185 (-0.27)			0.514 (0.32)		
Comparison Income West			-0.097 (-0.18)			0.913 (0.69)	
Comparison Income East				-1.513 (-1.10)			-0.486 (-0.15)
Socio-demographic variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Person dummy variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
n (number of observations)	204727	157924	157924	157924	46803	46803	46803
R^2	0.035	0.017	0.017	0.018	0.035	0.035	0.035

Note: *** , ** , and * denote significance at the 1 percent, 5 percent, and 10 percent level, respectively; bootstrapped standard errors with 1,000 iterations; income variables in logarithms.

Appendix

Table A1: Summary Statistics

	Description	Mean	Standard Deviation	Minimum	Maximum
Life Satisfaction	11-point scale	6.956	1.788	0	10
Age	in years	46.574	17.336	17	100
Male	dummy variable	0.480	0.500	0	1
Female	dummy variable	0.520	0.500	0	1
Single	dummy variable	0.235	0.424	0	1
Married	dummy variable	0.617	0.486	0	1
Separated	dummy variable	0.016	0.127	0	1
Divorced	dummy variable	0.066	0.247	0	1
Widowed	dummy variable	0.066	0.248	0	1
Size Household	number of persons	2.184	1.159	1	14
No certificate	dummy variable	0.026	0.160	0	1
Hauptschule leaving certificate	dummy variable	0.375	0.484	0	1
Realschule leaving certificate	dummy variable	0.295	0.456	0	1
College entrance certificate (*Fachhochschulreife*)	dummy variable	0.044	0.204	0	1
University entrance qualification (*Allgemeine Hochschulreife*)	dummy variable	0.175	0.380	0	1
Other certificate	dummy variable	0.061	0.240	0	1
In school	dummy variable	0.023	0.150	0	1
Full Time Employed	dummy variable	0.415	0.493	0	1
Part Time Employed	dummy variable	0.094	0.292	0	1
Short Time Employed	dummy variable	0.001	0.029	0	1
Minor Employment	dummy variable	0.035	0.185	0	1
Military / Social Services	dummy variable	0.003	0.057	0	1
Trainee	dummy variable	0.027	0.161	0	1
Student	dummy variable	0.017	0.129	0	1
Retired / Household	dummy variable	0.343	0.475	0	1
Other Occupation	dummy variable	0.001	0.029	0	1
Unemployed	dummy variable	0.063	0.243	0	1
Own Income	Total after-tax income divided by square root of the number of household members, measured in logarithmic Euros at prices of 2005	7.341	0.481	-0.068	11.226
Comparison Income	Predicted by earnings equation A	7.443	0.204	6.646	7.856
Comparison Income West	Predicted by earnings equation B	7.501	0.221	6.476	7.924
Comparison Income East	Predicted by earnings equation C	7.261	0.176	6.835	7.614

Note: descriptive statistics are computed on the basis of 307,465 observations.

Table A2: Detailed Estimation Results for the Life Satisfaction Equation

	1990 - 1999			2000 - 2009		
	Germany	West Ger.	East Ger.	Germany	West Ger.	East Ger.
	A	B	E	A	B	E
Constant	18.557***	22.142***	-32.632*	4.308	5.158	2.328
	(2.92)	(3.09)	(-1.95)	(0.96)	(1.05)	(0.20)
Age	0.034	0.031	-0.035	0.039	0.043	-0.020
	(0.83)	(0.69)	(-0.21)	(1.21)	(1.21)	(-0.19)
Age^2	-0.001***	-0.001***	0.001**	-0.000*	-0.000	-0.000
	(-2.67)	(-2.77)	(2.02)	(-1.82)	(-1.52)	(-0.57)
Single	Reference	Reference	Reference	Reference	Reference	Reference
Married	0.133***	0.145***	0.194*	0.102***	0.148***	-0.088
	(3.34)	(3.28)	(1.94)	(3.13)	(4.16)	(-1.25)
Separated	-0.195***	-0.258***	0.010	-0.223***	-0.250***	-0.076
	(-2.75)	(-3.21)	(0.06)	(-4.15)	(-4.18)	(-0.65)
Divorced	0.088	-0.003	0.431***	0.103**	0.128**	0.031
	(1.42)	(-0.04)	(2.88)	(2.30)	(2.44)	(0.34)
Widowed	-0.111	-0.187*	0.206	-0.226***	-0.200***	-0.358***
	(-1.27)	(-1.83)	(1.21)	(-3.56)	(-2.63)	(-2.68)
Size Household	0.014	-0.000	0.071***	0.016**	0.016*	0.026
	(1.24)	(-0.02)	(3.20)	(2.06)	(1.84)	(1.45)
No certificate	Reference	Reference	Reference	Reference	Reference	Reference
Hauptschule leaving certificate	0.245	0.178	-0.481	0.108	0.136	-0.146
	(1.03)	(0.73)	(-0.80)	(0.40)	(0.47)	(-0.25)
Realschule leaving certificate	0.810*	0.683	-1.167	0.094	0.206	-0.488
	(1.90)	(1.48)	(-1.06)	(0.29)	(0.61)	(-0.63)
College entrance certificate (*Fachhochschulreife*)	1.124*	1.128	-2.500	0.115	0.170	-0.306
	(1.74)	(1.61)	(-1.48)	(0.27)	(0.39)	(-0.29)
University entrance qualification (*Allgemeine Hochschulreife*)	1.674**	1.721**	-3.088	0.207	0.268	-0.352
	(2.14)	(2.00)	(-1.55)	(0.42)	(0.52)	(-0.29)
Other certificate	-0.411	-0.080	-0.809	-0.071	0.017	-0.616
	(-0.83)	(-0.17)	(-0.88)	(-0.26)	(0.06)	(-0.93)
In school	1.834**	1.837**	-2.592	0.413	0.466	-0.155
	(2.39)	(2.19)	(-1.33)	(0.85)	(0.90)	(-0.13)
Full Time Employed	Reference	Reference	Reference	Reference	Reference	Reference
Part Time Employed	-0.118***	-0.131***	-0.075	-0.086***	-0.080***	-0.098**
	(3.98)	(-3.42)	(-1.16)	(-4.42)	(-3.49)	(-2.45)
Short Time Employed	-0.393***	-0.148	-0.344***	Omitted	Omitted	Omitted
	(-4.62)	(-0.77)	(-3.72)			
Minor Employment	-0.168***	-0.172***	-0.118	-0.169***	-0.139***	-0.304***
	(-3.84)	(-3.61)	(-0.88)	(-7.03)	(-5.03)	(-5.40)
Military / Social Services	-0.178**	-0.201**	-0.203*	0.002	0.023	-0.108
	(-2.50)	(-2.21)	(-1.66)	(0.03)	(0.34)	(-0.89)
Trainee	-0.064	-0.037	-0.109	0.062*	0.088**	0.020
	(-1.61)	(-0.77)	(-1.51)	(1.90)	(2.31)	(0.31)
Student	0.040	0.030	-0.023	-0.002	-0.001	-0.005
	(0.77)	(0.49)	(-0.23)	(-0.05)	(-0.02)	(-0.07)
Retired / Household	-0.114***	-0.103***	-0.245***	-0.078***	-0.076***	-0.068*
	(4.05)	(-3.12)	(-4.24)	(-3.89)	(-3.28)	(-1.64)
Other Occupation	-0.084	0.248	-1.617**	-0.167	-0.253	0.142
	(-0.24)	(0.64)	(-2.06)	(-0.36)	(-0.44)	(0.29)
Unemployed	-0.646***	-0.638***	-0.666***	-0.588***	-0.591***	-0.556***
	(-21.43)	(-14.00)	(-15.97)	(-24.66)	(-18.69)	(-14.33)
Own Income	0.413***	0.306**	0.541***	0.285***	0.270***	0.037***
	(17.73)	(11.88)	(11.16)	(18.12)	(15.99)	(10.59)
Comparison Income	-2.044**	-2.327**	4.763*	-0.132	-0.185	0.514
	(-2.06)	(-2.10)	(1.92)	(-0.21)	(-0.27)	(0.32)

n (number of observations)	102736	75285	27451	204727	157924	46803
R^2	0.028	0.013	0.000	0.035	0.017	0.035

Note: ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent level, respectively; bootstrapped standard errors with 1,000 iterations, income variables in logarithms.