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Cross-sectional and longitudinal equivalence scales for West Germany based on subjective data on life satisfaction*

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Abstract

The present study calculates variable, cross-sectional as well as longitudinal equivalence scales on the basis of the German 1984-2010 Socio-Economic Panel (SOEP) database for West Germany. It follows the "individual variant" for calculating subjective equivalence scales using "life satisfaction" as a proxy variable for "utility".

The cross-sectional scale estimates are characterized by relatively low scale values which is typical for the subjective scale approach. As a further main result, the estimated longitudinal equivalence scales reveal some but rather slight cohort-specific scale differences. Especially, the unsatisfactory fit of the paper's regressions points to the need for more research activities in this strand of social science research.

The latter must be emphasized since equivalence scales are very important for social policy. Specifically, this holds true for longitudinal scales in order to capture cohort effects and, thus, to deal with intra- and intergenerational aspects of well-being (and corresponding differences).

Keywords: Equivalence scales, life satisfaction, longitudinal analysis, cohorts' well-being.

JEL Classification: D30, D31, D60.

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Content

1. Introduction

Equivalence scales are an essential prerequisite in distributional analyses, e. g., for measuring poverty, as they make households comparable which may differ from each other concerning size and composition.

In this context, longitudinal equivalence scales contrast to cross-sectional equivalence scales. While, in an age-related perspective, the latter scales are calculated on cross-sectional data representing needs and economies of scales for different age groups in a certain period of time, longitudinal scales refer to scale values for age cohorts over one's life cycle. To be consistent with microeconomic theory, cross-sectional scales correspond with intratemporal utility functions and longitudinal scales with intertemporal utility functions (see Betti, 1999; furthermore, see Pashardes, 1991, or Banks, Blundell, and Preston, 1994). Typically, in distributional analyses or for creating needs-based socio-political schemes, cross-sectional scales are used but this neglects intertemporal aspects of well-being over the individual life cycle (see Betti, 1999: 5) – especially, this shortcoming corresponds with the neglect of cohort-specific effects. As Fachinger (2001) has shown, there are strong hints concerning such life-cycle effects in Germany – primarily regarding consumer behaviour, i. e., regarding needs. Furthermore, cohort-specific differences, e. g., between age groups with respect to organizing household production might exist which might result in differences of economies of scale (as the second main element of concrete equivalence scale values besides needs). Also, if we interpret the economic concept of utility in a broader sense as "happiness" or "life satisfaction", empirical evidence (see Yang, 2008, or Fukuda, 2012) demonstrates that cohorts might be different regarding such utility categories.

Besides the decision for cross-sectional versus longitudinal equivalence scales, a further distinction in the context of equivalence scales is the one between constant, i. e., income-independent scales on one hand and variable, i. e., income-dependent scales on the other hand. Usually, in well-being studies, constant equivalence scales are used but there are many good reasons – such as (relatively) decreasing accommodation costs with respect to an increasing income – to use variable scales (see Muellbauer and van de Ven, 2004, or Faik, 2012). Those scales, typically, have higher values for the low incomes and lower values for the higher incomes which implies increasing values on a diminishing scale over the entire range of incomes.

Referring to such relationships, the present study calculates variable, cross-sectional as well as longitudinal equivalence scales on the basis of the German 1984-2010 Socio-Economic Panel (SOEP) database.[1] Thereby, the paper is organized as follows: Section 2 discusses the applied methodology and the used data, Section 3 presents empirical results, and Section 4 concludes.

2. Methodology and database

2.1 Operationalisations within the German Socio-Economic Panel

The material well-being variable used in this paper is annual equivalent household net income (of the previous year such that the years analyzed belong to 1983-2009, regarding income[2]). Each calculation is concerned to western Germany since this guarantees a relatively long time

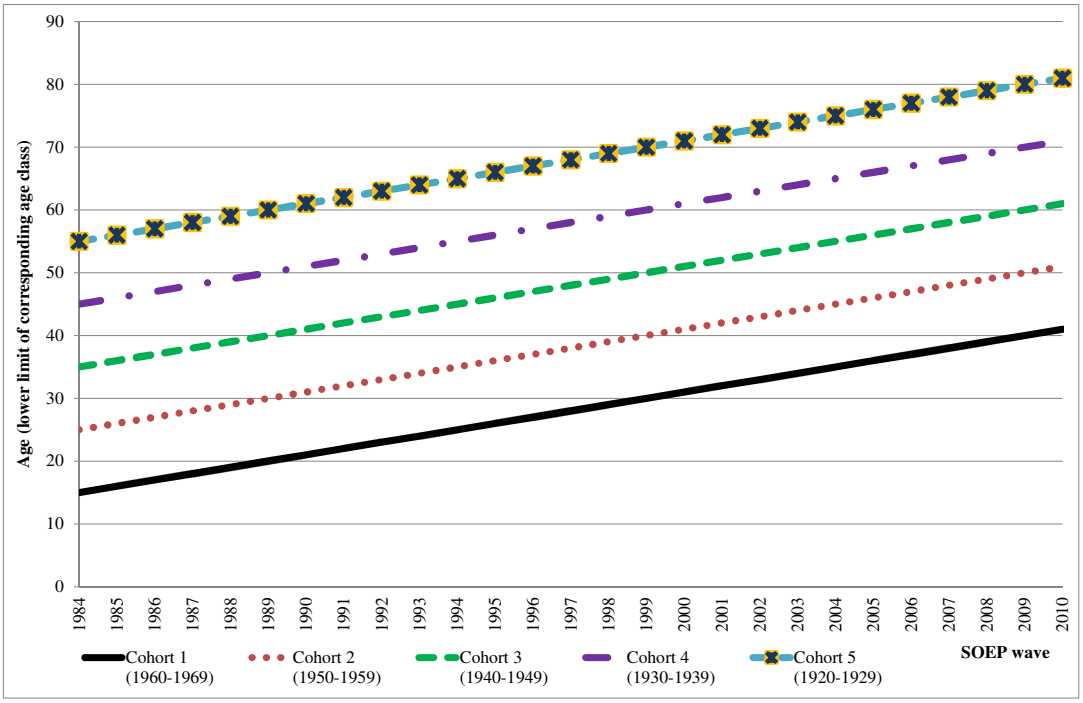
[1] For a description of the SOEP database of the German Institute for Economic Research (*DIW* Berlin) see, e. g., Wagner, Frick, and Schupp, 2007.

[2] The SOEP has been drawn since 1984, and the latest SOEP wave usable in this paper was the 2010 wave with information on annual income of 2009. The used data could be categorized as follows: Socio-Economic Panel (SOEP), data for years 1984-2009, version 26, SOEP, 2010, doi:10.5684/soep.v26.

series of 27 years. In my analyzes, I insofar use a quasi-panel as I refer to cohorts in the sense that the members of the different age groups do not necessarily have been included in each SOEP wave. This ensures sufficient sample sizes for each of the analyzed age cohorts.

Each cohort is characterized by ten years of one's life: cohort 1: 1960-1969, cohort 2: 1950-1959, cohort 3: 1940-1949, cohort 4: 1930-1939, and cohort 5: 1920-1929. Thus, in the first wave (1984; with income information on the year 1983), the following age groups are differentiated from each other: (1) 15-24 years, (2) 25-34 years, (3) 35-44 years, (4) 45-54 years, and (5) 55-64 years, and in the last used wave (2010; income information on 2009), the age groups are: (1) 41-50 years, (2) 51-60 years, (3) 61-70 years, (4) 71-80 years, and (5) 81-90 years. This is illustrated by the following Lexis diagram.

Figure 1: A Lexis diagram for five cohorts in West Germany, 1984-2010 SOEP



Source: Present author's own illustration

For these cohorts, in a first step, (cardinal) "utility" levels are determined following the ideas stated by the so-called subjective equivalence scale approach. In this context, the ordinal SOEP numbers concerning satisfaction with life[3] are (approximately) interpreted as such utility levels (see, in this context, especially, van Praag and Ferrer-i-Carbonell, 2008: 15ff.). The lowest satisfaction level "0" means "not satisfied with life at all", and the highest satisfaction level "10" corresponds with "completely satisfied with life".[4] The individual "utility" levels are methodically connected with the income levels for different household sizes and household compositions.

In this vein (and following the "individual variant" for calculating subjective equivalence scales), for each household type, a separate utility-income curve is derived.[5] In a next step and

[3] Within the SOEP, besides overall life satisfaction, different domain satisfactions are asked for: financial, job, health, family, environmental satisfaction, etc. For an empirical differentiation of those kinds of satisfaction – in the context of unemployment – see, e. g., Faik and Becker's 2010 study which is based on 1984-2007 SOEP.

[4] As Frick et al. (2004) have shown, the individual answers on (life) satisfaction within the SOEP should be taken with caution, at least concerning the corresponding first two waves when these individual answers were given.

[5] While the individual variant asks for well-being classifications the interviewees perform for their own, the alternative, societal variant refers to assessments of societal needs (in the meaning of societal norms), e. g., re-

in accordance with the concept of variable equivalence scales (see, e. g., Faik, 2012), such scales are calculated for different (reference) utility levels (implicitly concerning the low, the middle, and the high income region). On this basis, individual equivalence weights for each age group in all periods are derived by applying the "method of differences" for households which only differ with respect to one additional person (e. g., scale value for a household consisting of two adults and one child minus scale value for a household consisting of two adults in order to obtain the child's individual weight).

Another subjective equivalence scale analysis for Germany using satisfaction values of the SOEP is from Schwarze (2003), but he refers to income-related satisfaction values and not to the variable "overall life satisfaction" as is the case here. In (partial) accordance with Charlier's (2002) subjective equivalence scale estimates for West Germany according to 1984-1991 SOEP (which are based on life satisfaction as well as on satisfaction with the individual income), I have consciously chosen this more comprehensive variable – as a placeholder for "utility" – since it reflects what Pollak and Wales (1979) have termed as "unconditional equivalence scales" which are derived from utility functions depending on material as well as on immaterial benefits (the latter, e. g., resulting from happiness connected with child-rearing).

Table 1 gives an overview of the age ranges for which satisfaction information is available in the SOEP. Obviously, the life-cyclical results only comprise the age range of persons with a minimum age of 14 years. Thus, no statements on the equivalence scale values of younger children can be directly made by using the sketched subjective information out of the SOEP.

Table 1: Minimum and maximum age – with information on overall life satisfaction in western Germany, 1984-2010 SOEP

SOEP wave	Minimum age	Maximum age	Sample size
1984	16 years	102 years	4,920 persons
1985	15 years	97 years	4,420 persons
1986	16 years	98 years	4,256 persons
1987	15 years	94 years	4,222 persons
1988	16 years	95 years	4,033 persons
1989	16 years	95 years	3,940 persons
1990	14 years	96 years	3,875 persons
1991	15 years	95 years	3,876 persons
1992	16 years	96 years	3,875 persons
1993	16 years	96 years	3,922 persons
1994	15 years	97 years	4,045 persons
1995	16 years	98 years	4,213 persons
1996	17 years	97 years	4,162 persons
1997	17 years	98 years	4,087 persons
1998	15 years	99 years	4,709 persons
1999	16 years	98 years	4,492 persons
2000	16 years	98 years	8,420 persons
2001	17 years	99 years	7,552 persons
2002	17 years	99 years	8,146 persons
2003	16 years	100 years	7,726 persons
2004	16 years	99 years	7,543 persons
2005	17 years	96 years	7,330 persons

garding the subsistence levels of differently structured household types (see, in this context, Faik, 1995: 48ff. or Coulter, Cowell, and Jenkins, 1992: 96).

(Table 1 continued:)

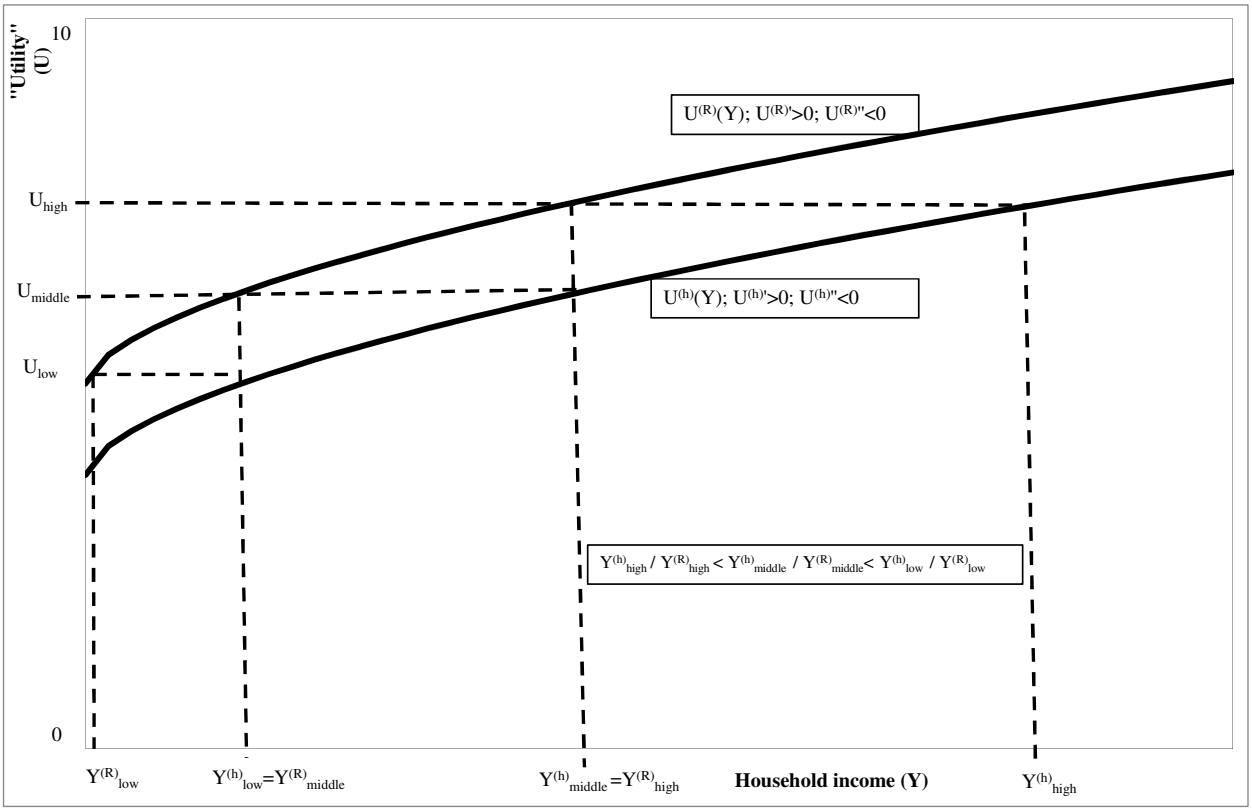
SOEP wave	Minimum age	Maximum age	Sample size
2006	17 years	97 years	7,974 persons
2007	18 years	98 years	7,459 persons
2008	18 years	99 years	7,064 persons
2009	17 years	100 years	7,529 persons
2010	18 years	100 years	6,923 persons

Source: Present author's own calculations

2.2 An approach for calculating subjective equivalence scales

The following Figure 2 sketches the methodical framework of this paper concerning the estimation procedure. In this figure, for different reference "utility levels" – a low one, a medium one, and a high one –, the empirically estimated utility-income curves of two household types (i. e., the reference household type R and another type h) are analyzed with respect to needs-related and other, e. g., age-related, income differences. For instance, the setting of the (low) utility level U_{low} corresponds with the income levels $Y^{(R)}_{low}$ and $Y^{(h)}_{low}$ for the household types compared with each other. The relation between $Y^{(h)}_{low}$ and $Y^{(R)}_{low}$, then, is the equivalence scale searched for. Obviously, this relation is higher than the corresponding relations for the higher reference utility levels U_{middle} and U_{high} in Figure 2 and, therefore, also for the higher reference income levels $Y^{(R)}_{middle}$ and $Y^{(R)}_{high}$; this results from the declining slopes of the utility-income curves. The latter reveals the usual theoretical, microeconomic reflection of decreasing marginal utility levels with rising incomes.

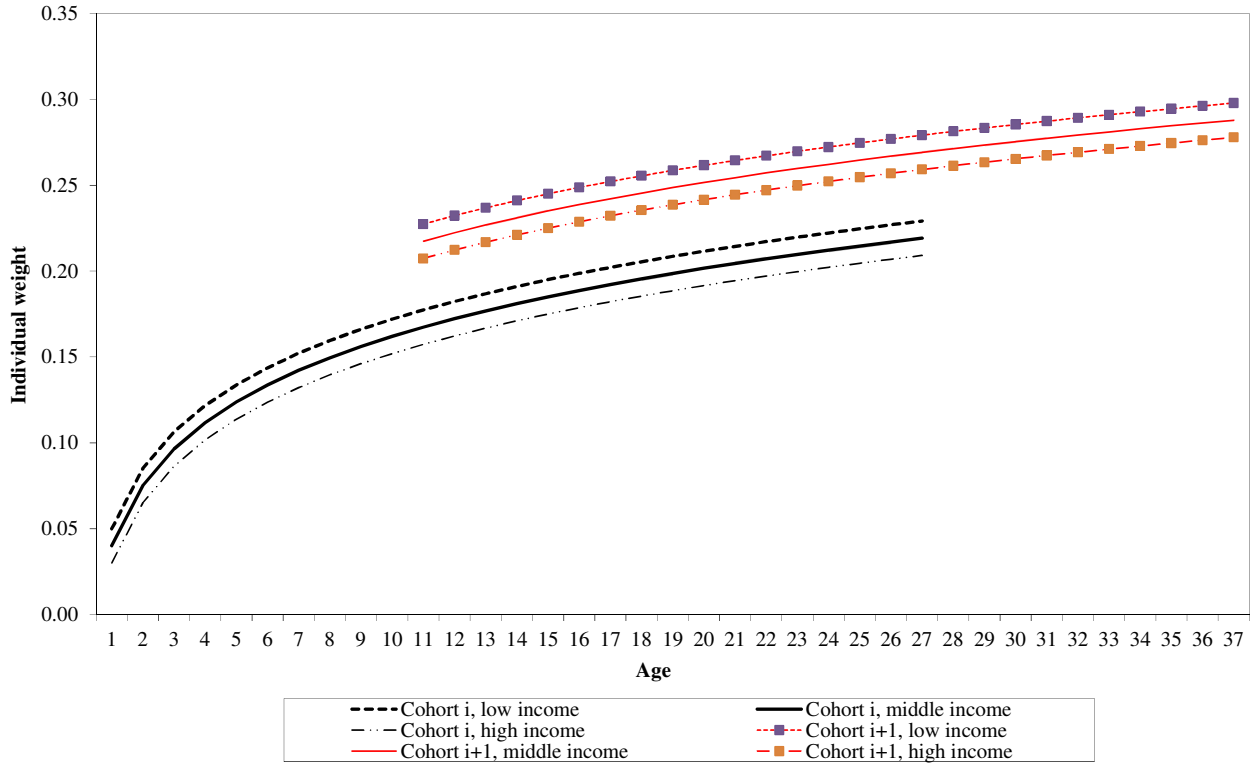
Figure 2: Subjective method for calculating variable equivalence scales



Source: Present author's own illustration on the basis of Coulter, Cowell, and Jenkins, 1992: 96

In a longitudinal perspective, the derived, variable (i. e., reference income-dependent) equivalence weights, e. g., for several age classes might result in a pattern like the following idealized one (see Figure 3).

Figure 3: Longitudinal (variable) equivalence scales for two cohorts – idealized illustration



Source: Present author's own illustration

In concrete terms, I assume – based on best-fitted regressions – a square-rooted relationship between "utility" and household net income. Concerning the cohort variables, one possibility would be to operationalize them as multiple dummies for the number of persons belonging to a certain cohort within a household – following a proposal made by Faik (1995: 175ff.) in order to generate household types in a flexible manner. Thus, e. g., the age-related variables for a four-person household composed of 1 member of cohort 1, 2 members of cohort 2, and 1 member of cohort 3 would be as follows: number of members of cohort 1 = 1, number of members of cohort 2 = 2, and number of members of cohort 3 = 1. These cohort-specific values would be multiplied by the corresponding estimated parameters.

However, there is a big drawback restricting the applicability of this flexible operationalisation in our context: The number of persons for whom data on life satisfaction are available is less than the total number of persons (due to the minimum ages stated in Table 1). That means that we have to incorporate household-size effects into my model in another way. Such an alternative is the explicit usage of a variable "household size" and, additionally, the reformulation of the cohort variable as a 0/1 dummy with 1 = belonging to a certain cohort (and 0 = not belonging to this cohort); one of the cohorts would serve as a reference group (implying a value of c in the amount of zero):

$$(1)\quad U = a + b \cdot \sqrt{Y} + \sum_{i=1}^{n} c_i \cdot C_i + d \cdot S$$

[where: U = "utility" level in the sense of overall life satisfaction ranging from 0 to 10; a = constant; b = parameter with respect to household net income; Y = household net income; c_i =

parameter with respect to cohort i (i = 1, 2, …, n); C_i = 0/1 dummy concerning the membership in a certain cohort i (i=1, 2, …, n); S = household size].

As is sketched in Figure 2, the utility-income functions of the several household types (h) are compared with the one, a reference household (R) has, in order to finally obtain an equivalence scale:

reference household type: (2) $U^{(R)} = a + b \cdot \sqrt{Y^{(R)}} + d \cdot S^{(R)}$,

other household types: (3) $U^{(h)} = a + b \cdot \sqrt{Y^{(h)}} + c^{(h)} + d \cdot S^{(h)}$.

To ensure that the household types h and R, compared with each other, have the same living standard or, equivalently, the same utility level, the identity

(4) $U^{(R)} \overset{!}{=} U^{(h)}$

must be fulfilled.

This identity corresponds with:

(5) $a + b \cdot \sqrt{Y^{(R)}} + d \cdot S^{(R)} = a + b \cdot \sqrt{Y^{(h)}} + c^{(h)} + d \cdot S^{(h)}$.

Resolving this equation with respect to the equivalence scale, leads to:

(6) $$\frac{Y^{(h)}}{Y^{(R)}} = \left[1 + \frac{d \cdot \left(S^{(R)} - S^{(h)} \right) - c^{(h)}}{b \cdot \sqrt{Y^{(R)}}} \right]^2 .$$

To illustrate the procedure afore-mentioned, I will give a numerical example. In this example, I make the following settings: a = 0.40, b = 0.02, d = 0.10, and $U^{(R)} = U^{(h)} = 5.00$. Moreover, I assume that both households, compared with each other, are both single-person households [so that $S^{(R)} = S^{(h)} = 1$], and I use a coefficient $c^{(h)}$ in the amount of 0.10 for household type h. As a result, we obtain – according to Equation (2) – a reference income level $Y^{(R)}$ which amounts to 50,625 money units [$= (4.50/0.02)^2$]. Alternatively, $Y^{(R)}$ can be fixed at the income level mentioned (and the utility level of 5.00 would be derived in this case). In a next step, this value for the income variable is inserted into the formula for the equivalence scale, giving:

(7) $$\frac{Y^{(h)}}{Y^{(R)}} = \left[1 + \frac{-0.1}{0.02 \cdot \sqrt{50{,}625}} \right]^2 \approx 0.9560.$$

That means that the equivalent income of single-person household type h is 95.60 per cent of the above stated income level of the reference single-person household type R in the amount of 50,625 money units which corresponds with 48,400 money units for household type h.

The sensitivity of such an equivalence scale with respect to changes of reference income, of household size, and of cohort-related influences may be illustrated by differentiating Equation (6) with respect to the three variables mentioned (in all cases, the reference household type is a single-person household, and $c^{(h)} = c$ is interpreted not as the parameter for a 0/1 dummy as before but for a more or less "continuos" cohort variable $C^{(h)}$):

$$(8a)\quad \frac{\partial\left[\frac{Y^{(h)}}{Y^{(R)}}\right]}{\partial Y^{(R)}} = -z \cdot \left(\frac{\sqrt{Y^{(R)}} - z}{{Y^{(R)}}^2}\right) \qquad where: \quad z = \frac{d \cdot \left(1 - S^{(h)}\right) - c \cdot C^{(h)}}{b};$$

$$(8b)\quad \frac{\partial\left[\frac{Y^{(h)}}{Y^{(R)}}\right]}{\partial S^{(h)}} = \frac{-2 \cdot d \cdot b \cdot \sqrt{Y^{(R)}}}{b^2 \cdot Y^{(R)}} + \frac{d \cdot \left(1 - S^{(h)}\right)}{b^2 \cdot Y^{(R)}} - \frac{c \cdot C^{(h)}}{b^2 \cdot Y^{(R)}};$$

$$(8c)\quad \frac{\partial\left[\frac{Y^{(h)}}{Y^{(R)}}\right]}{\partial C^{(h)}} = \frac{-2 \cdot b \cdot \sqrt{Y^{(R)}} \cdot c}{b^2 \cdot Y^{(R)}} - \frac{2 \cdot d \cdot c \cdot \left(1 - S^{(h)}\right)}{b^2 \cdot Y^{(R)}} + \frac{2 \cdot c^2 \cdot C^{(h)}}{b^2 \cdot Y^{(R)}}.$$

With respect to changes in reference income, Equation (8a) reveals for typical constellations (i. e., for higher positive values of $Y^{(R)}$ compared to z) a negative relationship between equivalence scale and reference income values. This is completely in accordance with the implications of the concept of variable equivalence scales.

Regarding the impacts of household size changes on the equivalence scale values, Equation (8b) principally gives an answer. This answer depends on the concrete values of b, c, and d, especially on the sign of these parameters: Assuming, e. g., $b > 0$, $c < 0$, and $d < 0$, leads to a positive relationship between equivalence scale and household size. In contrast, in the case of $b > 0$, $c > 0$, and $d > 0$, the corresponding relationship would be negative.

In the third case, presented via Equation (8c), the relationship between equivalence scale values and cohort-specific influences also depends on the concrete values (and signs) of the mentioned parameters b, c, and d. If, e. g., all of these parameters would be positive, the first term of Equation (8c) would be negative, while the second and the third term of Equation (8c) would be positive (for $S^{(h)} > 1$). Under the alternative assumptions of $b > 0$, $c < 0$, and $d < 0$ (and, once more, for $S^{(h)} > 1$), one would obtain positive signs for the first and for the second term of Equation (8c) but a negative sign for the third term of Equation (8c).

3. Results

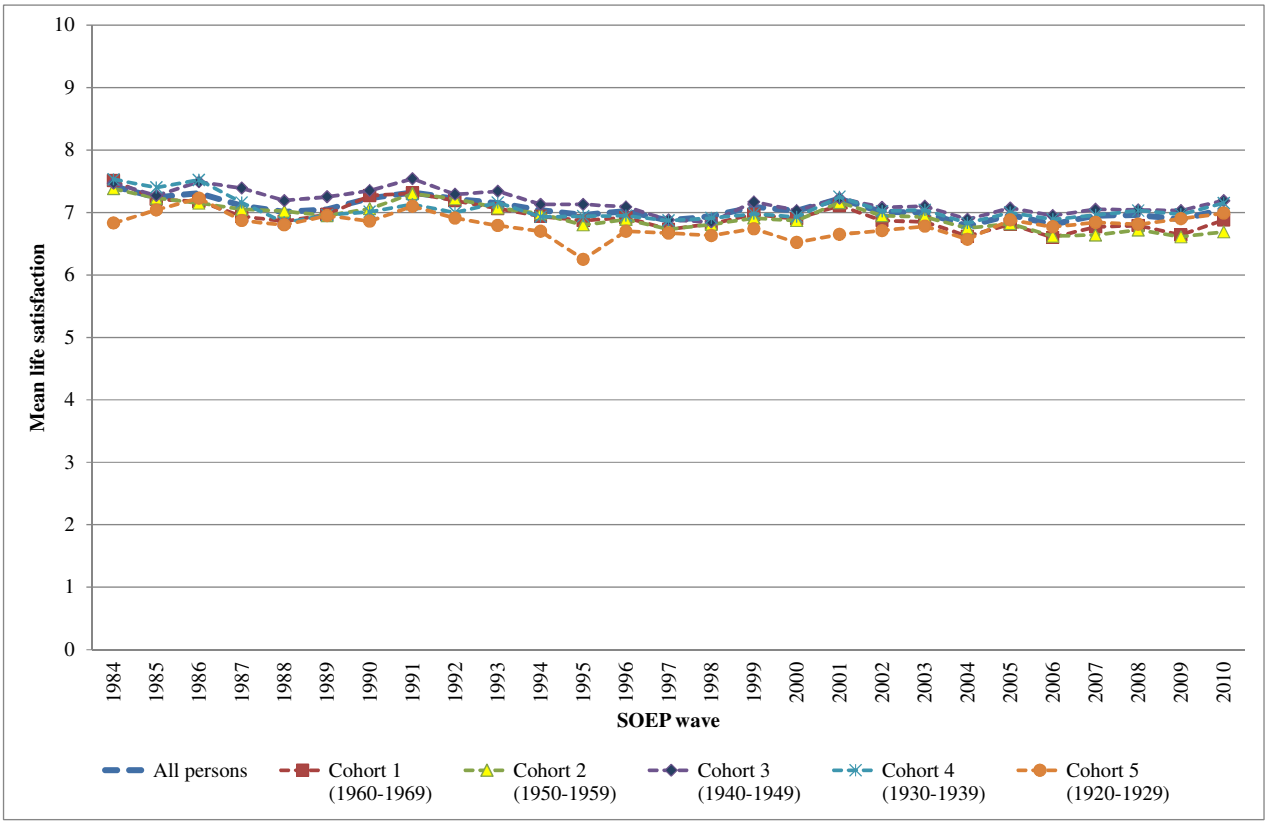
3.1 Descriptive findings

In the following, I will present descriptive information on the variables which, later on, will play a major role in my equivalence scale calculations. In concrete terms, I will deal with the variables life satisfaction, household net income, household size, and age (as a proxy variable for the cohorts defined above).

Figures 4a to 4c show the time-related development of the average values of life satisfaction, household net income (as real income values, deflated by a consumer price index included in the SOEP database, with 2006 as base year), and household size for the five age-related cohorts differentiated from each other in this paper.

Thereby, Figure 4a illustrates that the mean life-satisfaction levels between the several cohorts do not deviate very much from each other and from the overall mean values. Up to 2003, the oldest cohort 5 (1920-1929) had (slightly) the lowest mean values but, thereafter, the corresponding values "moved" above the corresponding values of cohorts 1 (1960-1969) and 2 (1950-1959). Since the differences between the several cohorts are very small, such "movements" should not be over-interpreted, and, thus, it is speculative and not reputable to give reasons for them.

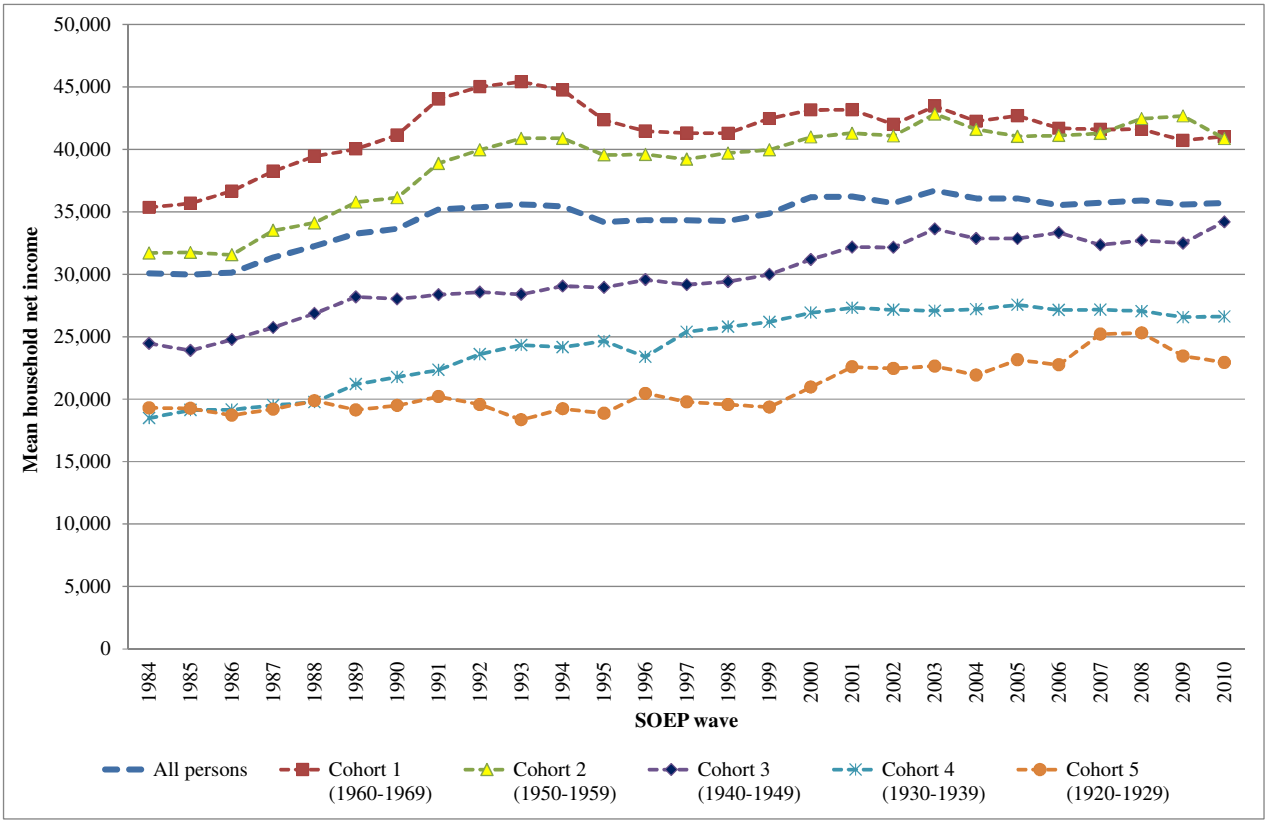
Figure 4a: Cohort-specific average life-satisfaction levels in West Germany, 1984-2010 SOEP



Source: Present author's own calculations

Regarding the cohort-specific average household net incomes (real values), a relatively clear ranking appears: The levels of the mean incomes are negatively correlated with the mean ages of the cohorts (see Figure 4b). As is shown later on (in Figure 5b), this ranking is due to age and to cohort effects but also to different mean household sizes between the several cohorts.

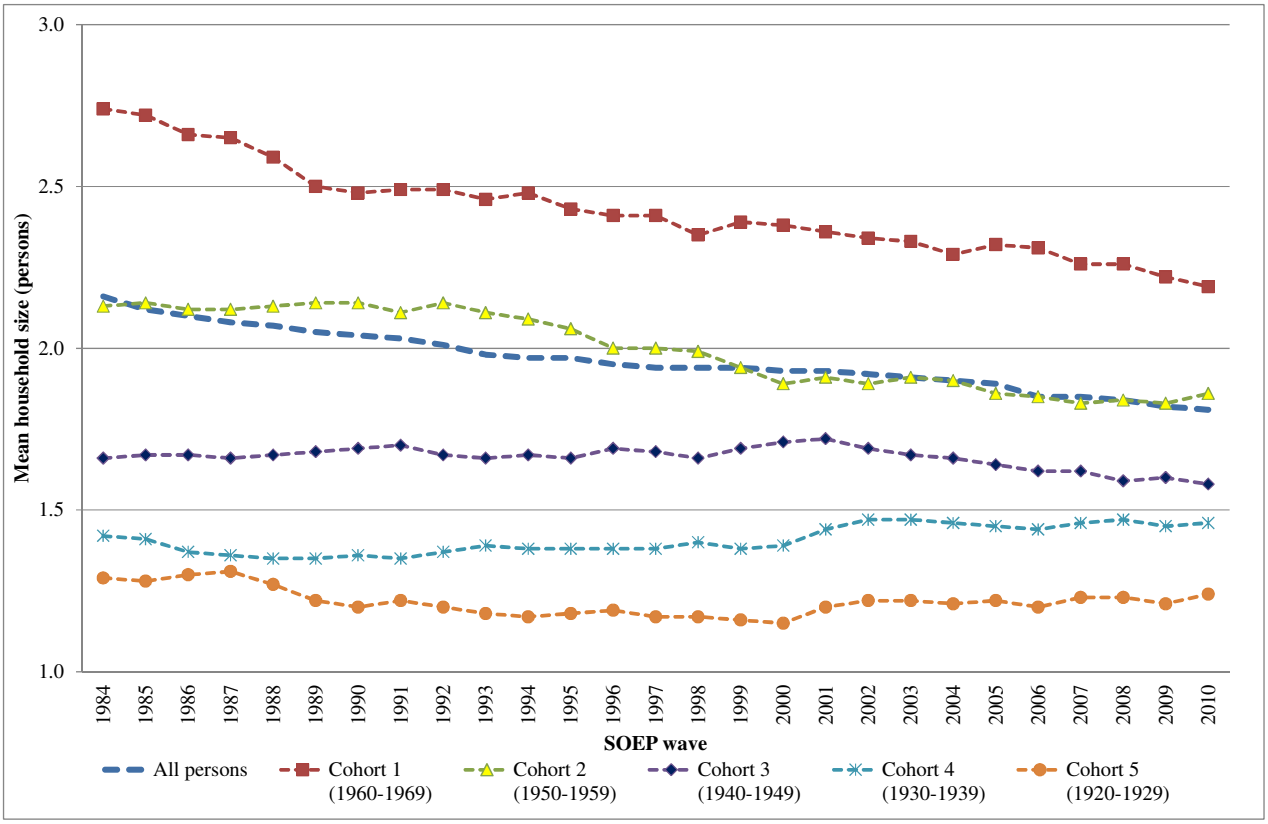
Figure 4b: Cohort-specific average household net incomes (real values) in West Germany, 1984-2010 SOEP



Source: Present author's own calculations

In the sense afore-mentioned, the pattern illustrated in Figure 4b is modified by considering the mean household sizes of the several cohorts. This is because of a more or less negative correlation between mean household size and mean age of the cohorts (see Figure 4c). Thus, in a per-capita perspective, the higher material well-being of the younger cohorts measured by household net income is, at least partly, levelled out by their higher (mean) household sizes.

Figure 4c: Cohort-specific average household sizes in West Germany, 1984-2010 SOEP

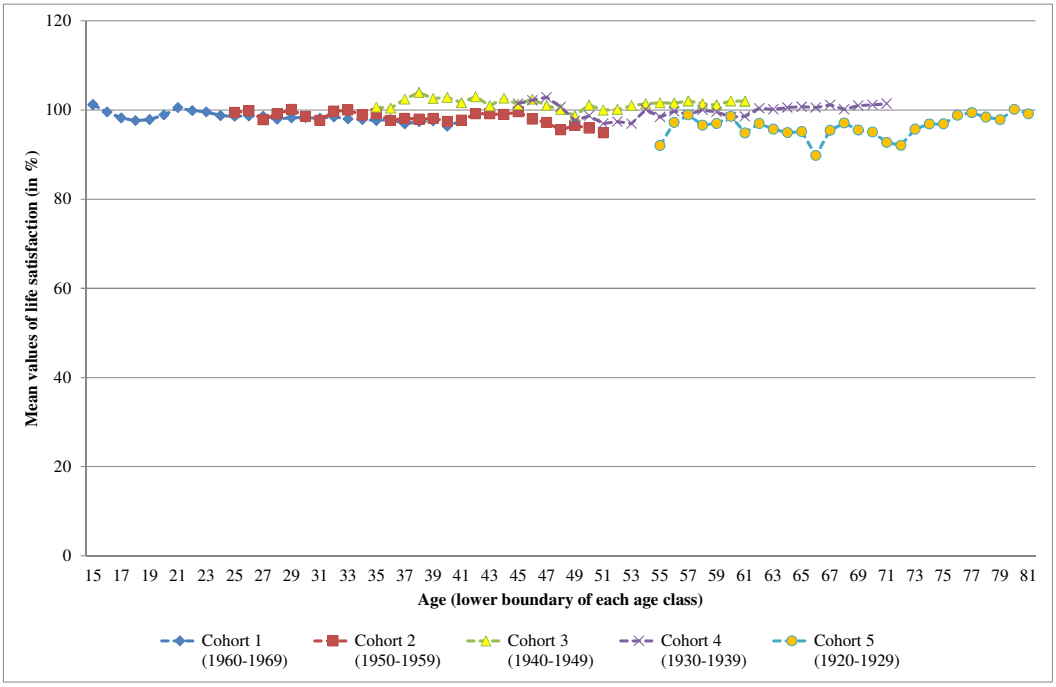


Source: Present author's own calculations

Changing from this chronological, cross-sectional perspective to a more pronounced longitudinal consideration, results in Figures 5a and 5b where I show the cohort-specific patterns for the several age classes and for the variables life satisfaction and relative per-capita household net income – both last-mentioned variables are measured as percentage deviations from the corresponding overall average levels.

In this context, Figure 5a also makes clear that the mean life-satisfaction levels of all cohorts are near to the overall mean value. Between cohorts 1 (1960-1969) and 2 (1950-1959), identifiable cohort effects in the overlapping age range do not exist. The comparison between cohort 2 and 3 (1940-1949) shows higher mean values for cohort 3 within the corresponding overlapping age range. Last but not least, the comparisons between cohorts 3, 4 (1930-1939), and 5 (1920-1929) indicate slightly higher mean life satisfactions in ascending order of the cohorts' index.

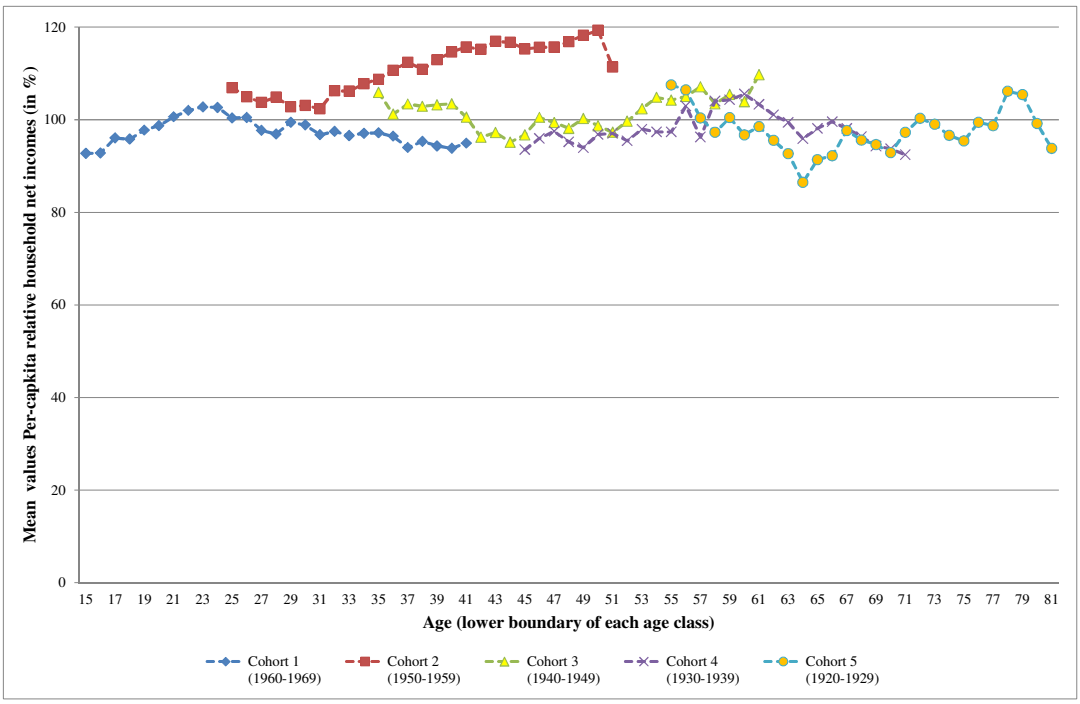
Figure 5a: Cohort-specific profiles for the relationship between age and life satisfaction in West Germany, 1984-2010 SOEP



Source: Present author's own calculations

According to Figure 5b, with the exception of cohort 2, the cohort-specific profiles for the relationship between age and per-capita relative household net income reveal values not substantially different from 100 per cent. Specifically, the relative income positions of cohort 2 are relatively high and clearly about the benchmark of 100 per cent, indicating continuously high well-being levels of this cohort which, in my analysis, is defined within the age ranges from 25 to 34 years in 1984 SOEP and from 51 to 60 years in 2010 SOEP.

Figure 5b: Cohort-specific profiles for the relationship between age and per-capita relative household net income in West Germany, 1984-2010 SOEP



Source: Present author's own calculations

The correlations between the key variables life satisfaction, (real) household net income, and household size are stated in Table 2 (exemplarily, for West Germany 1984-2010 SOEP on the basis of pooled SOEP data for this entire time range). It becomes obvious that the corresponding correlations (according to Pearson's correlation coefficient) are statistically significant at a significance level of 99 per cent, but they are not very high. For instance, the correlation coefficient between life satisfaction and real household net income only amounts to +0.141.

Table 2: Pearson's correlation coefficients for life satisfaction, (real) household net income, and household size, West Germany, 1984-2010 SOEP (pooled data)

Variable	Life satisfaction	Real household net income	Household size
Life satisfaction	+1.000***	+0.141***	+0.047***
Real household net income	+0.141***	+1.000***	+0.302***
Household size	+0.047***	+0.302***	+1.000***

***: significant at a significance level of 99 per cent; (total) number of observations: 337,483 persons (i. e., on average per SOEP wave: 12,499 persons)

Source: Present authors' own calculations

3.2 Cross-sectional equivalence scale values

Primarily to illustrate the scope of the subjective scales approach, in a first step, I calculated cross-sectional scale values. To calculate such equivalence scales, obviously, cohort-specific variables are not needed. Thus, for instance, in Equation (6) above, simply the variable $c^{(h)}$ may be eliminated. This way, for each SOEP wave, cross-sectional equivalence scales according to the subjective, individualistic approach are calculated (see Table A.1 in the Appendix). They are based on OLS[6] regressions also presented in the Appendix (see Table A.2; the reference income levels, which belong to these OLS regressions, may be found in the Appendix in Table A.3). The several regressions are characterized by (extremely) low adjusted determination coefficients.

As is shown in Table A.1 (Appendix), the scale values appear relatively low. Partly, this may be the result of the calculation procedure only for household size which, e. g., neglects age-related differences in needs. Perhaps, my finding may also refer to an under-evaluation of needs in the context of subjective equivalence scales. By the way, the finding of relative low scale values for subjective scales is in line with Buhmann et al.'s 1988 pioneering study (see Buhmann et al., 1988: 122). Due to my conceptualization of square-rooted utility-income curves, moreover, the equivalence scales calculated are variable in the sense that the scale values decrease with increasing reference income levels.

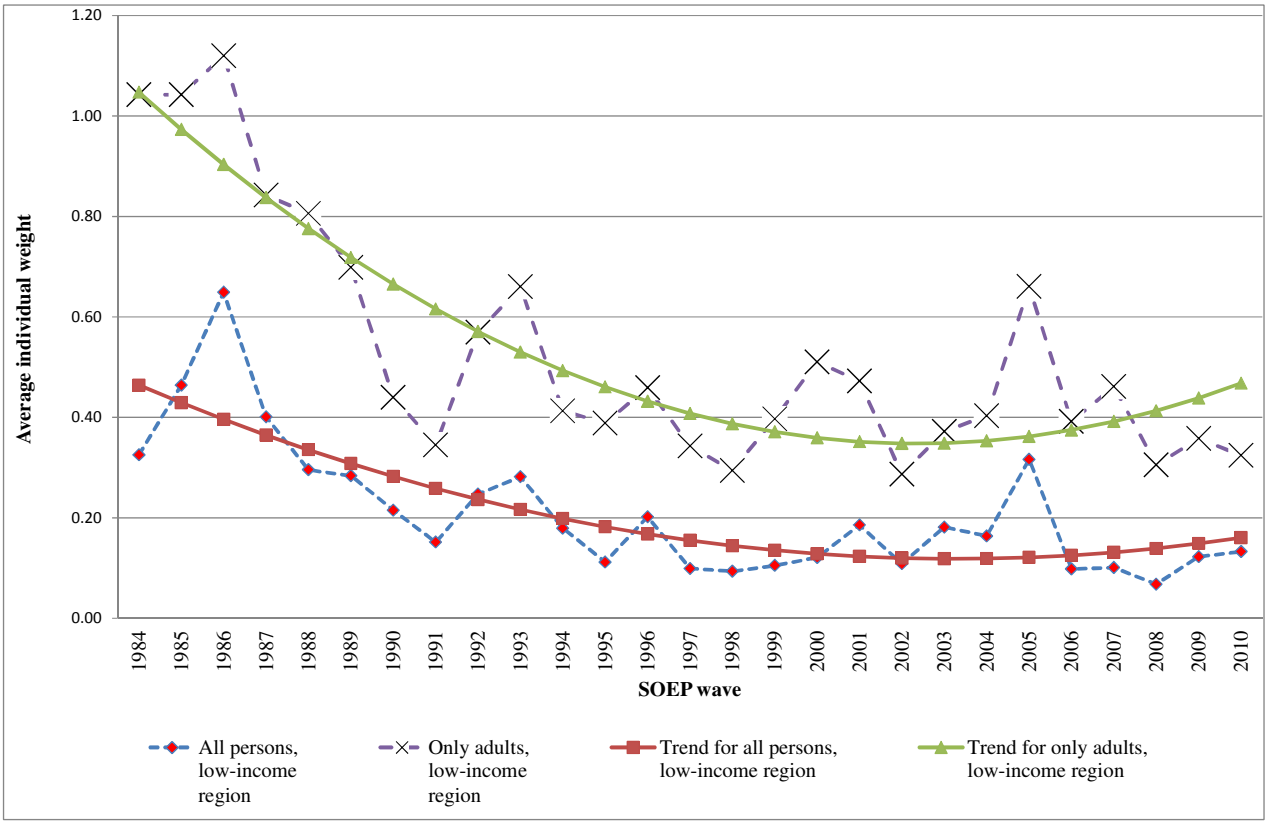
For instance, in the case of pooled SOEP data, we obtain individual scale weights in the amount of 11-13 per cent in the low-income region, of 8-9 per cent in the middle-income region, and of 5-6 per cent in the high-income region. In this context, one problem arises: The individual weights increase with the ranking of the household members. This is not in accordance with the (plausible) assumption of (increasing) economies of scales within households, but it might rest upon differences in the age structures between the differentially sized house-

[6] Especially for purposes of clarity and of simple interpretation regarding the several regression coefficients, the regressions are based on Ordinary Least Squares (OLS).

holds.[7] Technically speaking, this problem is the result of negative estimated household size parameters which indicates lower "utility" levels with increasing household size.[8]

Compared to the afore-mentioned scale estimates, at all reference income levels, alternative scale estimates only for adults (see Tables A.4 and A.5 in the Appendix) reveal higher individual weights in this alternative variant which appears plausible since this indicates higher needs for adults contrasted with the ones for children. The latter is shown by Figures 6a to 6c which entail the average individual weights for further household members in each SOEP wave. In this context, with a few exceptions at the beginning of the time series, the lowest weights in the variant "only adults" (in the high-income region) are higher than the highest weights in the variant "all persons" (in the low-income region). Furthermore, in all variants and in all income regions, polynomial trends of second order become obvious. Hereby, the weights at the beginning of the time series are in all cases higher than at the end of the observation period. This is pointing to decreasing needs over time (at least as they are indicated by the used subjective approach).

Figure 6a: Cross-sectional equivalence scale weights (averages for 2nd to 6th household member) for Germany, 1984-2010 SOEP, based on subjective evaluations for "all persons" versus "only adults" – low-income region



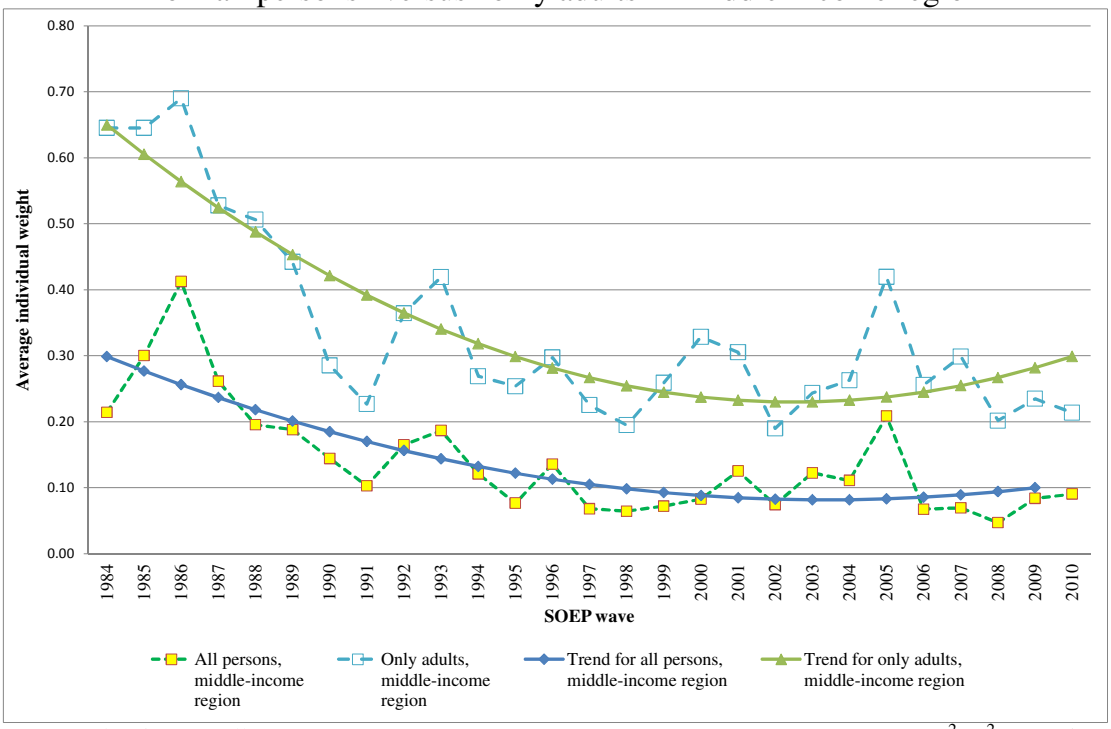
OLS trend estimates: all persons: sw = 0.464*** – 0.036*** (t – 1984) + 0.001*** (t – 1984)^2, R^2_{adj} = 0.590; only adults: sw = 1.047*** – 0.076*** (t – 1984) + 0.002*** (t – 1984)^2, R^2_{adj} = 0.724 [sw = scale weight; t = period of time with t = 1984, 1985, …, 2010, R^2_{adj} = adjusted determination coefficient; ***: significant at a significance level of 99 per cent]

Source: Present author's own calculations

[7] By the way, because of too low samples sizes here and in what follows, households with seven and more household members are excluded from analysis.

[8] As the calculated correlation coefficient for the relationship between life satisfaction and household size is positive (see, once more, Table 1), this conversion is the result of household net income which enters the several regressions as an "intervening" variable.

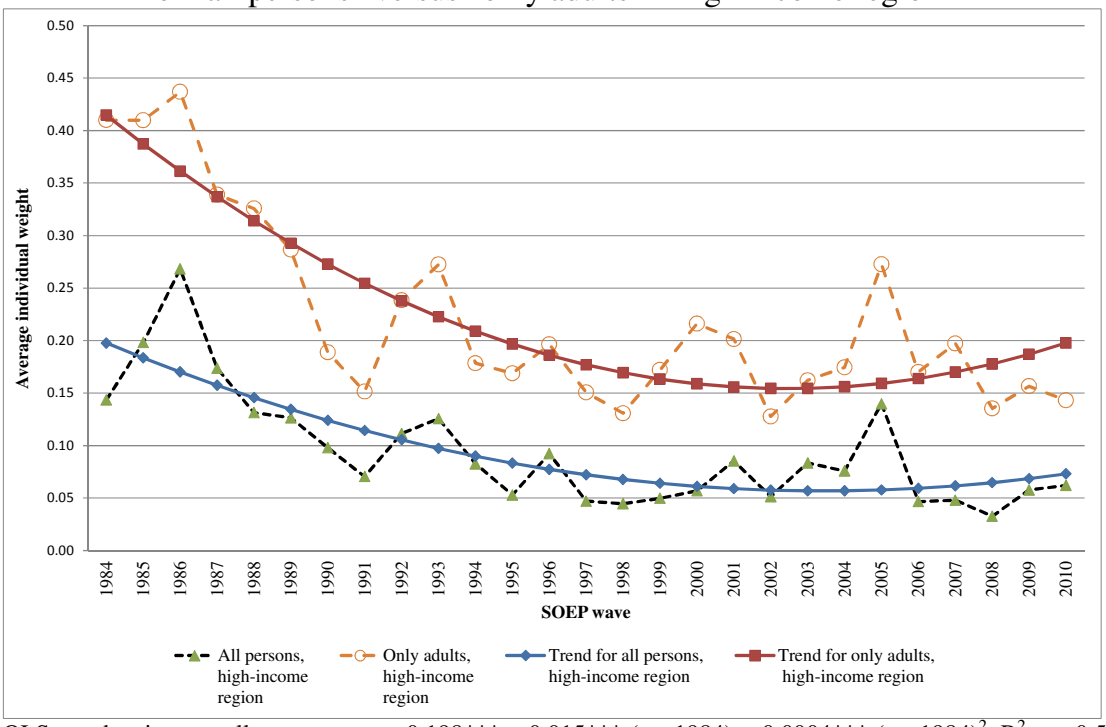
Figure 6b: Cross-sectional equivalence scale weights (averages for 2nd to 6th household member) for Germany, 1984-2010 SOEP, based on subjective evaluations for "all persons" versus "only adults" – middle-income region



OLS trend estimates: all persons: sw = 0.299*** – 0.022*** (t – 1984) + 0.001*** (t – 1984)^2, R^2_{adj} = 0.584; only adults: sw = 0.649*** – 0.045*** (t – 1984) + 0.001*** (t – 1984)^2, R^2_{adj} = 0.719 [sw = scale weight; t = period of time with t = 1984, 1985, …, 2010, R^2_{adj} = adjusted determination coefficient; ***: significant at a significance level of 99 per cent]

Source: Present author's own calculations

Figure 6c: Cross-sectional equivalence scale weights (averages for 2nd to 6th household member) for Germany, 1984-2010 SOEP, based on subjective evaluations for "all persons" versus "only adults" – high-income region



OLS trend estimates: all persons: sw = 0.198*** – 0.015*** (t – 1984) + 0.0004*** (t – 1984)^2, R^2_{adj} = 0.579; only adults: sw = 0.415*** – 0.028*** (t – 1984) + 0.001*** (t – 1984)^2, R^2_{adj} = 0.718 [sw = scale weight; t = period of time with t = 1984, 1985, …, 2010, R^2_{adj} = adjusted determination coefficient; ***: significant at a significance level of 99 per cent]

Source: Present author's own calculations

3.3 Longitudinal equivalence scale values

Contrary to the cross-sectional equivalence scales presented in Section 3.2, in the following, I discuss longitudinal equivalence scale estimates for the cohorts specified in Section 2.1. They are principally based on the model sketched in Section 2.2.

In this context, two alternatives appear possible: considering one of the cohorts as the reference group over the entire observation period or comparisons of the cohorts in each period with a ("fixed") medium age group, let us say: always with persons in the age between 35 and 44 years. In the following, I refer to the last-mentioned variant. To handle such a construction, it makes sense to estimate two equations in each period: one for the reference group and one for the cohorts considered:

(9a) $U^{(R)} = a^{(R)} + b^{(R)} \cdot \sqrt{Y^{(R)}} + d^{(R)} \cdot S^{(R)}$,

(9b) $U^{(h)} = a^{(h)} + b^{(h)} \cdot \sqrt{Y^{(h)}} + c^{(h)} + d^{(h)} \cdot S^{(h)}$.

Applying the above-mentioned mechanism for reaching equal living standards for both household types [$U^{(R)} = U^{(h)}$], generates as equivalence scale:

(10) $$\frac{Y^{(h)}}{Y^{(R)}} = \left[1 + \frac{\left(a^{(R)} - a^{(h)}\right) + \left(d^{(R)} \cdot S^{(R)} - d^{(h)} \cdot S^{(h)}\right) - c^{(h)}}{b^{(h)} \cdot \sqrt{Y^{(R)}}} \right]^2 .$$ [9]

In what follows, indeed, a single-person household in the age between 35 and 44 years is assumed as the reference household type in each SOEP wave. On this basis, longitudinal equivalence scales are estimated.[10] They are reported in terms of graphs in Figure 7 (only single-person households) and in Figures 8a to 8c (individual weights for further household members, calculated as means for the 2nd until the 6th household member).

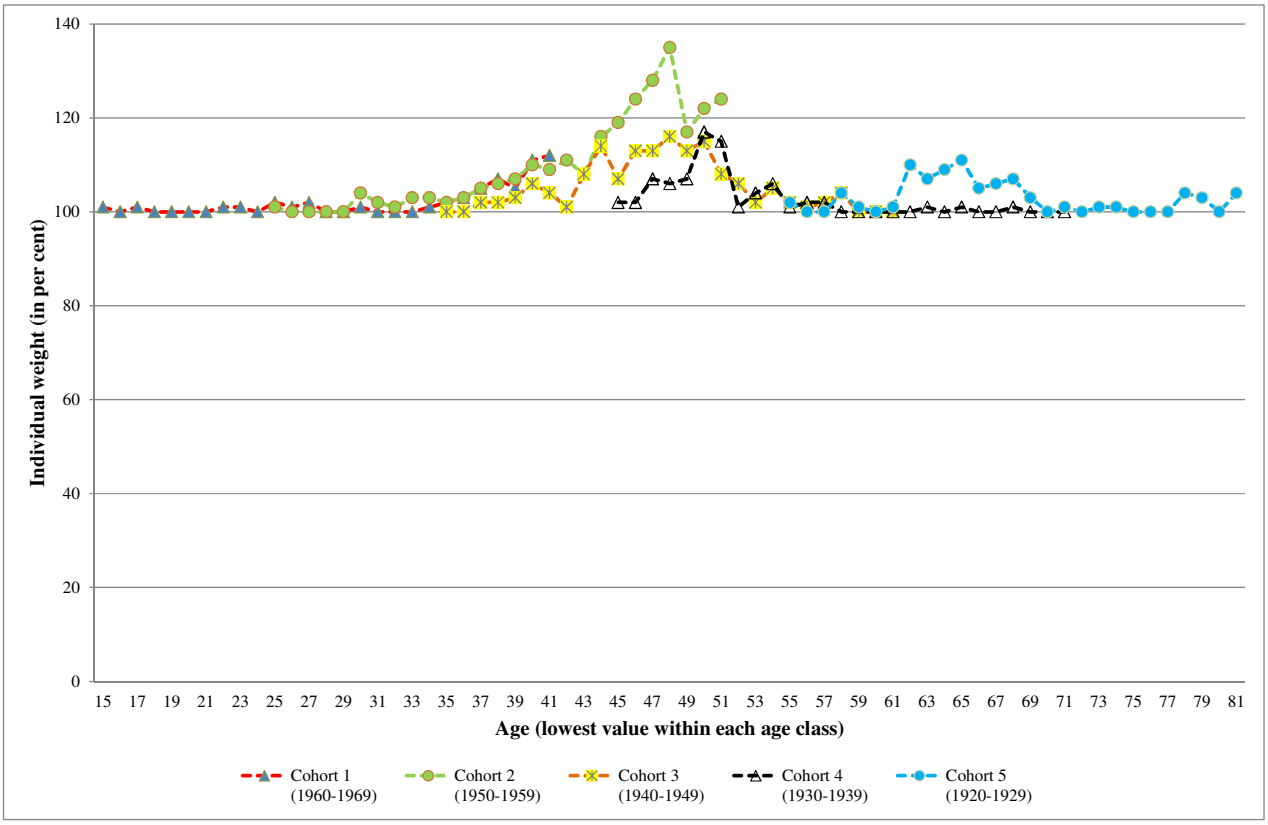
Hereby, Figure 7 shows that especially single-person households in cohorts 2 (1950-1959), 3 (1940-1949), and 4 (1930-1939) are well-off.[11]

[9] In order to handle the different reference groups in the regressions regarding Equations (9a) and (9b), the difference between the constants in 1984 SOEP is added to Equation (10) as a term of the numerator within the bracket.

[10] The corresponding (OLS) regressions might be found in the Appendix in Tables A.6a and A.6b; regarding the reference income levels see Table A.7 in the Appendix.

[11] The scale values for single-person households are, due to methodology, independent of the reference income level.

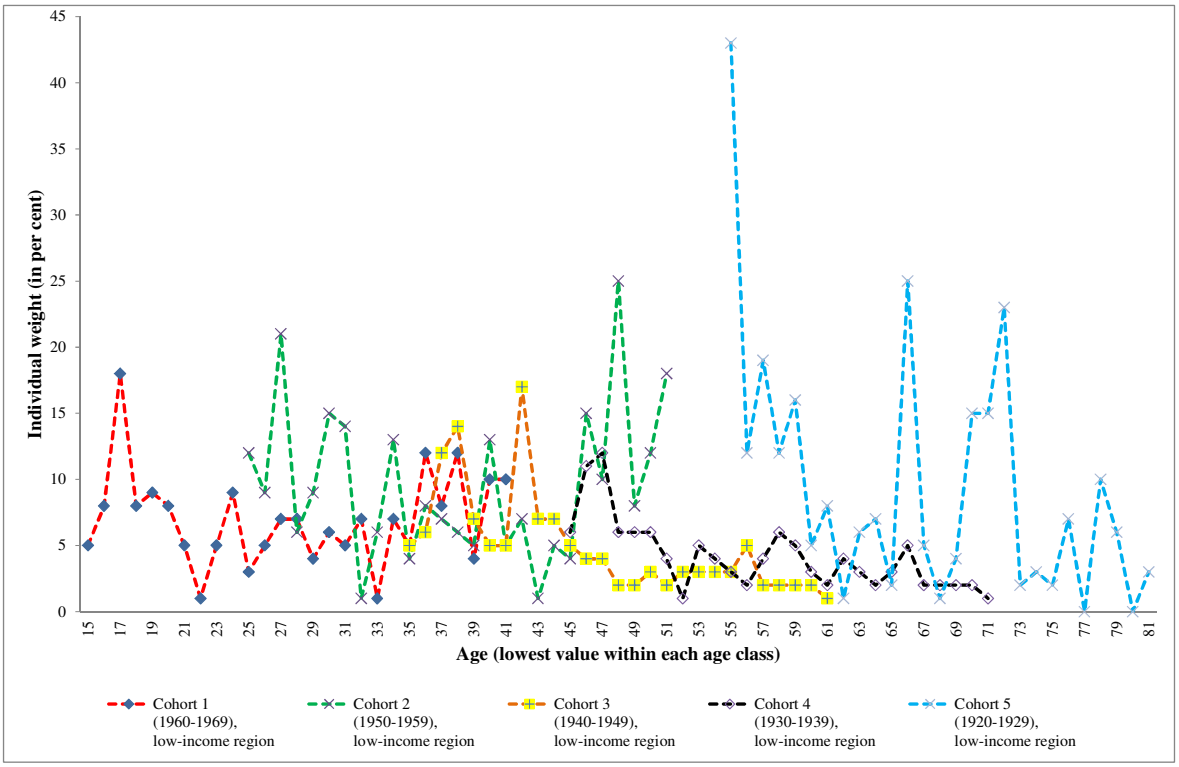
Figure 7: Longitudinal individual weights for different cohorts in West Germany, 1984-2010 SOEP – only single-person households



Source: Present author's own calculations

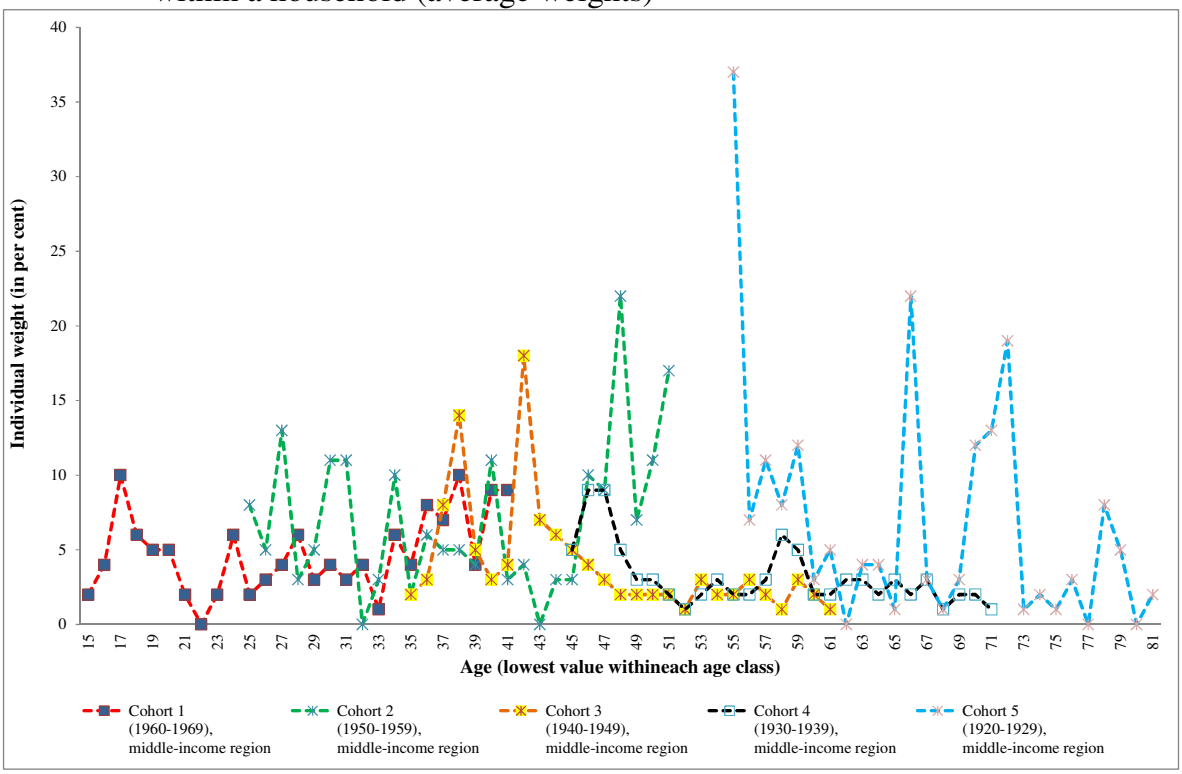
In Figures 8a to 8c, roughly speaking, a clear-cut pattern does not become apparent if we interpret the presented results, so to say, in a cross-sectional sense. The pattern is in some sense erratic. Furthermore, as expected, the scale weights are negatively correlated with income which is the main characteristic of variable equivalence scales. In a cohort-specific perspective, it can be seen that some cohorts are better off than others (especially, cohorts 2 and 5 exhibit, at least partly, relatively high values). It is open to debate what the reasons for this effect are.

Figure 8a: Longitudinal individual weights for different cohorts in West Germany, 1984-2010 SOEP, low-income region – persons at the 2nd until 6th position within a household (average weights)



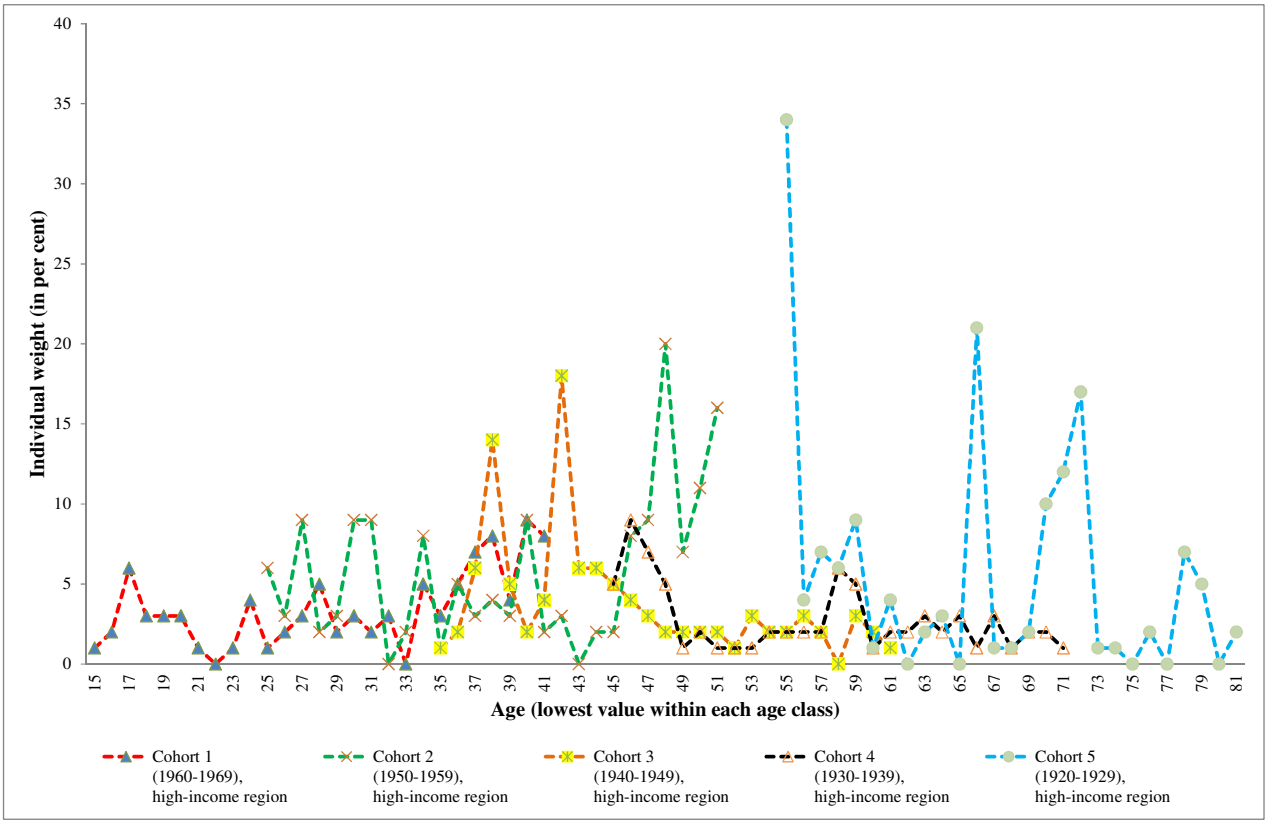
Source: Present author's own calculations

Figure 8b: Longitudinal individual weights for different cohorts in West Germany, 1984-2010 SOEP, middle-income region – persons at the 2nd until 6th position within a household (average weights)



Source: Present author's own calculations

Figure 8c: Longitudinal individual weights for different cohorts in West Germany, 1984-2010 SOEP, high-income region – persons at the 2nd until 6th position within a household (average weights)



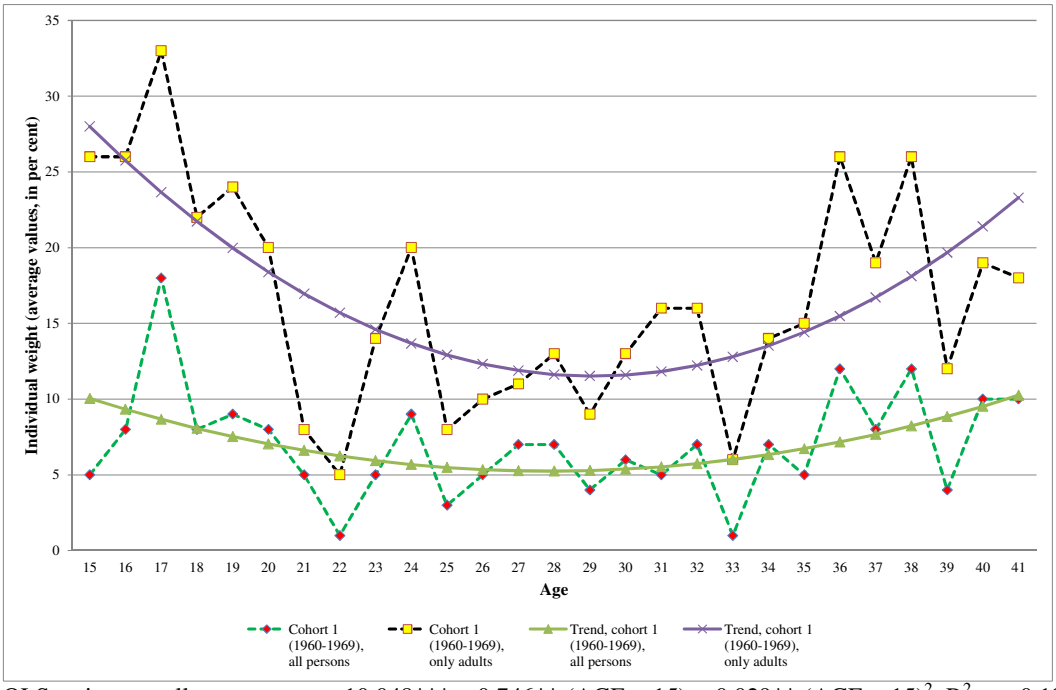
Source: Present author's own calculations

Additionally to the longitudinal equivalence scale weights, I estimated scale weights only for adults in the sense that I restricted household size only to the number of persons aged 15 years and over (see, in this context, the regression results in Tables A.8a and A.8b in the Appendix); this (hypothetical) way, it is taken into account that in the SOEP children are not interviewed regarding their own life satisfaction. The corresponding comparisons between the two variants are presented in the following Figures 9a to 9e (exemplarily for the low-income region). As may be seen by the mentioned figures, in all cases, the values for the variant "only adults" are continuously higher than those for the variant "all persons". This finding confirms my corresponding comparisons in the cross-sectional case I have presented above and stems from the more negative impacts on the scale levels the household size variable in the variant "all persons" has. It indicates negative impacts of children on the scale weights of adults within the paper's (perhaps disputable) methodical framework.

Figure 9a reveals that for the scale weights of cohort 1 a more or less pronounced quadratic, U-shaped tendency becomes obvious over the relevant age range 15 to 41 years. The same is the case for cohort 2 regarding the age range 25 to 51 years (see Figure 9b) whereas for cohort 3 (see Figure 9c), for cohort 4 (see Figure 9d), and for cohort 5 (see Figure 9e), the scale weights rather decrease by tendency concerning the age ranges 35 to 61 years, 45 to 71 years, and 55 to 81 years. The discrepancies between the variants "all persons" and "only adults" are more pronounced for the younger cohorts 1 and 2 than for the other cohorts; this is not really astonishing since the scale influences of children are higher for the younger than for the older cohorts.

However, it must be stressed that all statistical adjustments are far from being perfect.

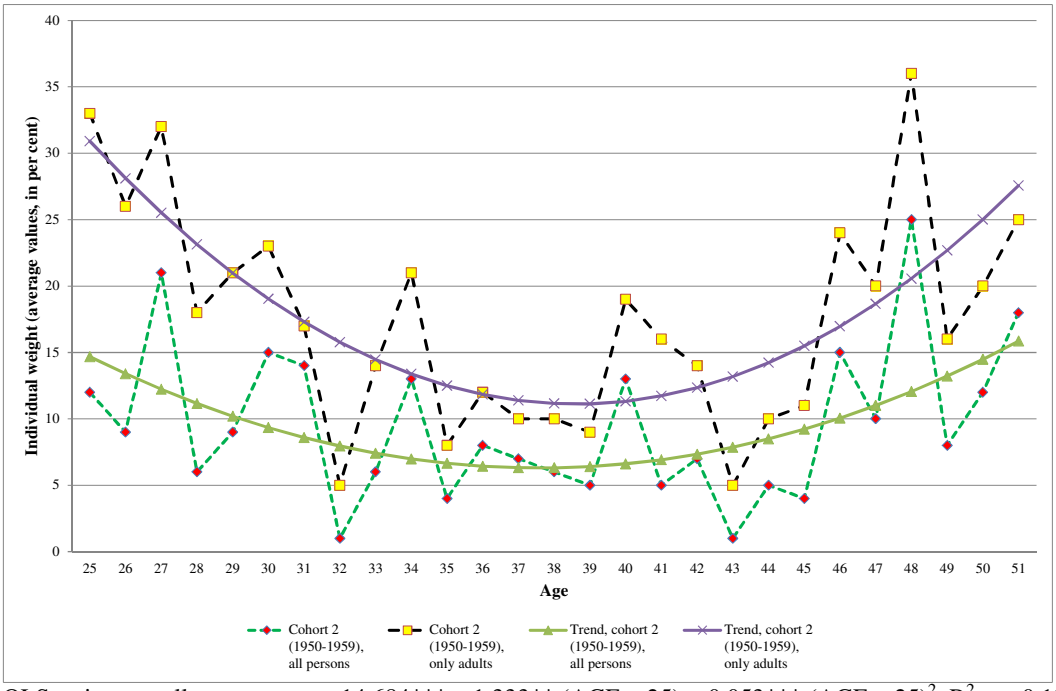
Figure 9a: Longitudinal equivalence scale weights (averages for 2nd to 6th household member) for Germany, 1984-2010 SOEP, based on subjective evaluations for "all persons" versus "only adults" – cohort 1 (1960-1969), low-income region



OLS estimates: all persons: sw = 10.048*** – 0.746** (AGE – 15) + 0.029** (AGE – 15)^2, R^2_{adj} = 0.133; only adults: sw = 28.000*** – 2.339*** (AGE – 15) + 0.083*** (AGE – 15)^2, R^2_{adj} = 0.403 [sw = scale weight; AGE = age (15 to 41 years), R^2_{adj} = adjusted determination coefficient; *: significant at a significance level of 90 per cent, **: significant at a significance level of 95 per cent ,***: significant at a significance level of 99 per cent]

Source: Present author's own calculations

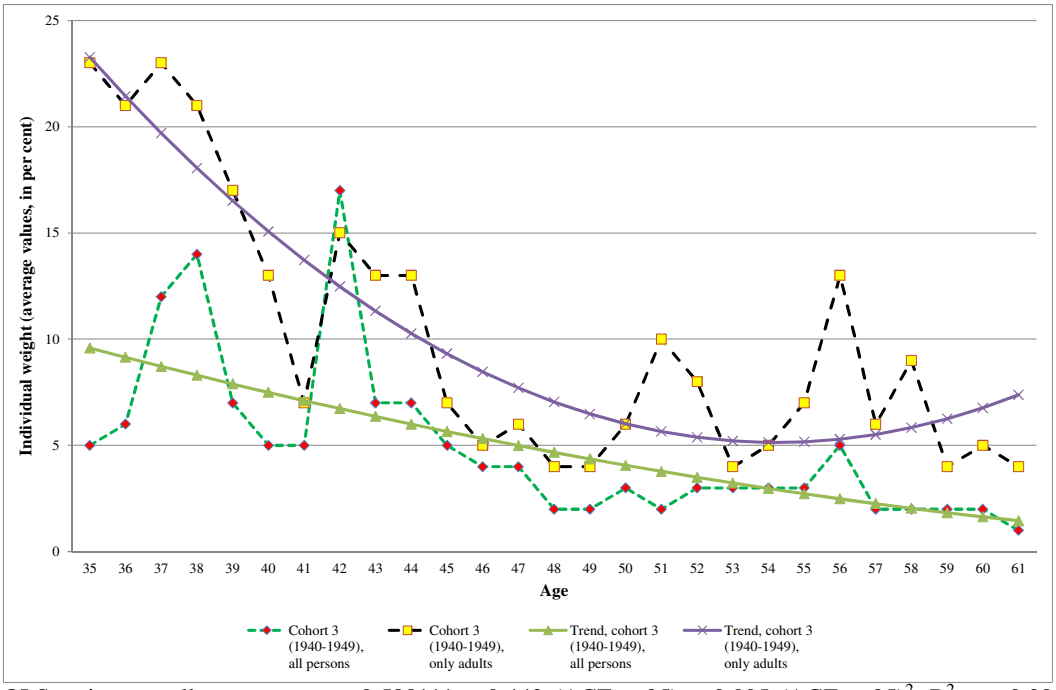
Figure 9b: Longitudinal equivalence scale weights (averages for 2nd to 6th household member) for Germany, 1984-2010 SOEP, based on subjective evaluations for "all persons" versus "only adults" – cohort 2 (1950-1959), low-income region



OLS estimates: all persons: sw = 14.684*** – 1.333** (AGE – 25) + 0.053*** (AGE – 25)^2, R^2_{adj} = 0.198; only adults: sw = 30.912*** – 2.911*** (AGE – 25) + 0.107*** (AGE – 25)^2, R^2_{adj} = 0.484 [sw = scale weight; AGE = age (25 to 51 years), R^2_{adj} = adjusted determination coefficient; *: significant at a significance level of 90 per cent, **: significant at a significance level of 95 per cent ,***: significant at a significance level of 99 per cent]

Source: Present author's own calculations

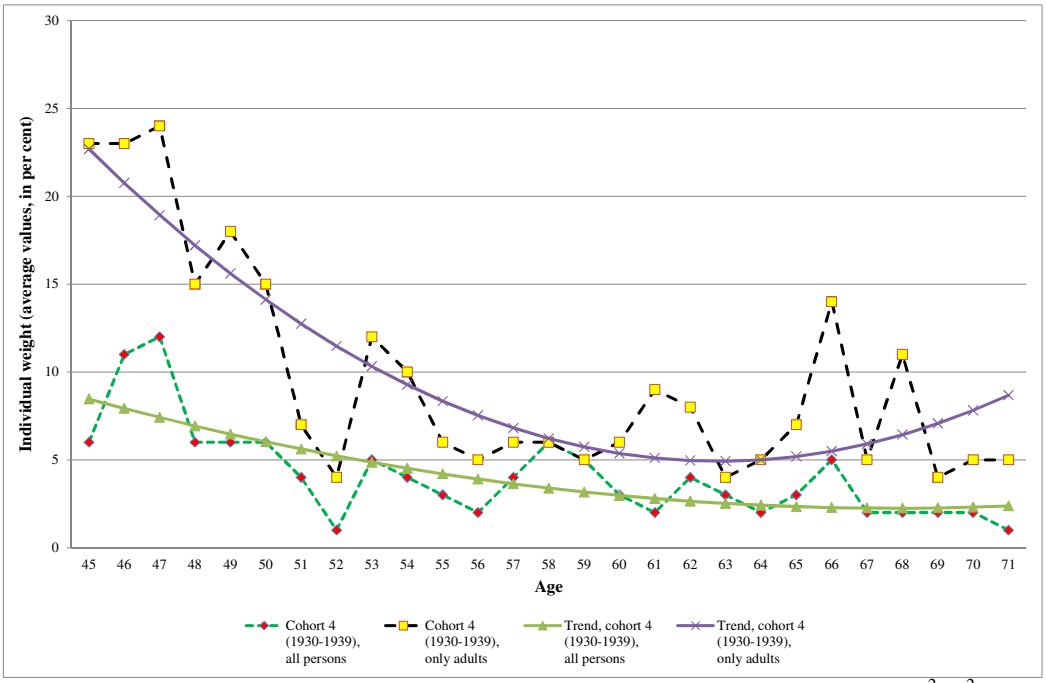
Figure 9c: Longitudinal equivalence scale weights (averages for 2nd to 6th household member) for Germany, 1984-2010 SOEP, based on subjective evaluations for "all persons" versus "only adults" – cohort 3 (1940-1949), low-income region



OLS estimates: all persons: sw = 9.588*** – 0.443 (AGE – 35) + 0.005 (AGE – 35)^2, R^2_{adj} = 0.386; only adults: sw = 23.267*** – 1.885*** (AGE – 35) + 0.049*** (AGE – 35)^2, R^2_{adj} = 0.745 [sw = scale weight; AGE = age (35 to 61 years), R^2_{adj} = adjusted determination coefficient; *: significant at a significance level of 90 per cent, **: significant at a significance level of 95 per cent ,***: significant at a significance level of 99 per cent]

Source: Present author's own calculations

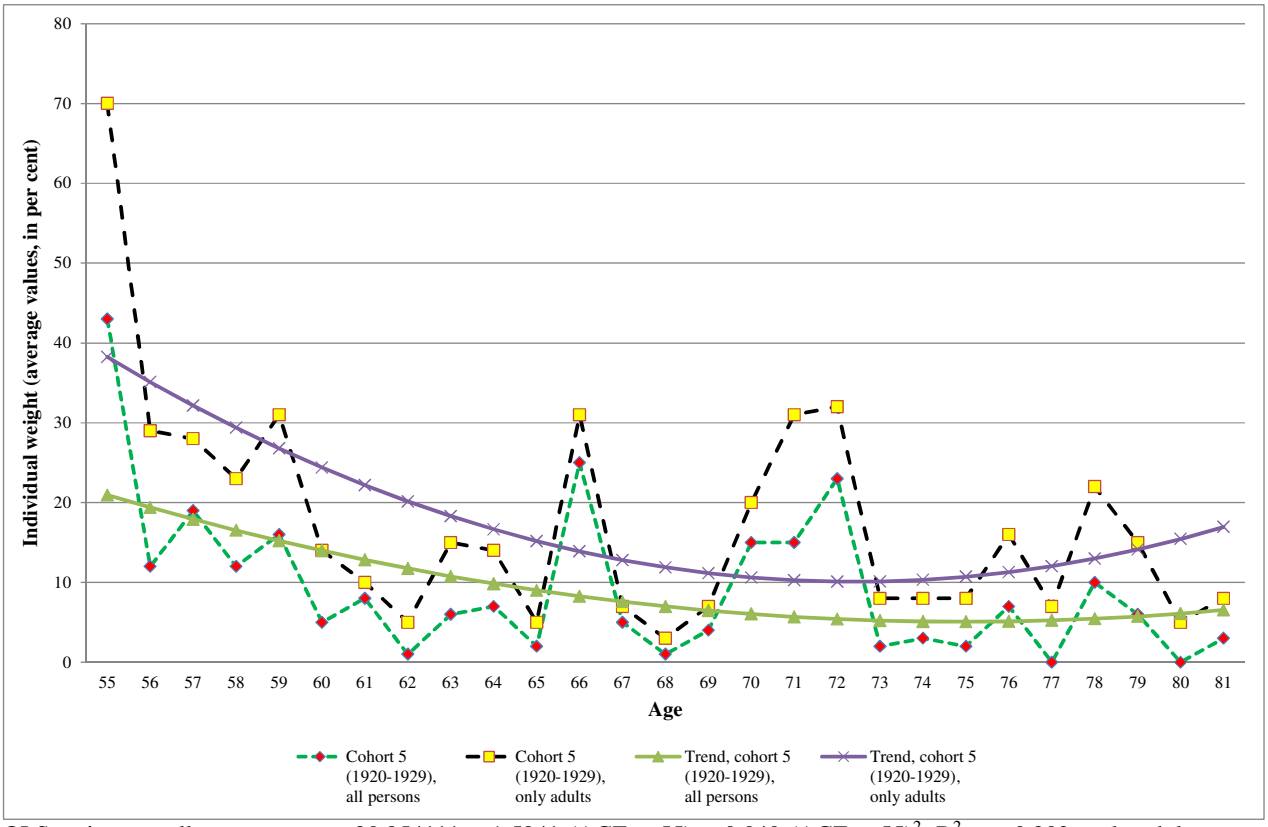
Figure 9d: Longitudinal equivalence scale weights (averages for 2nd to 6th household member) for Germany, 1984-2010 SOEP, based on subjective evaluations for "all persons" versus "only adults" – cohort 4 (1930-1939), low-income region



OLS estimates: all persons: sw = 8.461*** – 0.546*** (AGE – 45) + 0.012*** (AGE – 45)^2, R^2_{adj} = 0.494; only adults: sw = 22.693*** – 1.995*** (AGE – 45) + 0.056*** (AGE – 45)^2, R^2_{adj} = 0.678 [sw = scale weight; AGE = age (45 to 71 years), R^2_{adj} = adjusted determination coefficient; *: significant at a significance level of 90 per cent, **: significant at a significance level of 95 per cent ,***: significant at a significance level of 99 per cent]

Source: Present author's own calculations

Figure 9e: Longitudinal equivalence scale weights (averages for 2nd to 6th household member) for Germany, 1984-2010 SOEP, based on subjective evaluations for "all persons" versus "only adults" – cohort 5 (1920-1929), low-income region



OLS estimates: all persons: sw = 20.954*** – 1.594* (AGE – 55) + 0.040 (AGE – 55)^2, R^2_{adj} = 0.203; only adults: sw = 38.250*** – 3.237** (AGE – 55) + 0.093** (AGE – 55)^2, R^2_{adj} = 0.285 [sw = scale weight; AGE = age (55 to 81 years), R^2_{adj} = adjusted determination coefficient; *: significant at a significance level of 90 per cent, **: significant at a significance level of 95 per cent ,***: significant at a significance level of 99 per cent]

Source: Present author's own calculations

4. Conclusions

The calculation of equivalence scales is necessary to compare households of different size and composition in well-being analyses. However, such a calculation rests upon some assumptions which are, at least partly, problematic (see, in this context, Faik, 1995: 42ff.).

One of those assumptions is the supposition of unchanging styles of life in the case of changing household composition (e. g., in the case a baby becomes a member of a former childless household). Since then additional needs, typically, must be satisfied by an unchanged or disproportionately lower increased household income, the usually applied method of differences for deriving individual weights out of the equivalences scale values of the household types compared with each other leads to an underestimation of individual weights, if the above mentioned (and partly inappropriate) assumption of unchanging styles of life is made. Since it appears realistic that parents restrict their expenditures ("needs") for themselves after the birth of a child, the method of differences expels too low scale weights especially for children compared to their true weights (related to total household resources; see Faik, 1995: 380f.).

Another shortcoming of the calculation of equivalence scales is the so-called "pool assumption". This assumption refers to the within-group distribution of household resources, and it, basically, means that each household member receives a proportional part of household resources due to his/her needs. But this kind of within-group equality must not exist in reality since different degrees of bargaining power between the several household members might

lead to an unequal distribution of household resources within a household (see, e. g., Apps and Savage, 1989, or Haddad and Kanbur, 1990).

Especially regarding subjective approaches for calculating equivalence scales, further drawbacks can be stated. First of all, the "Easterlin paradox" (see Easterlin, 1995) may exist, i. e., an only weak positive correlation between "utility" in the sense of "happiness" or of "life satisfaction" on one hand and income on the other hand. Basically, this is because of individual orientations on the rankings within the income hierarchy and not on the time-related development of average income levels. Also in this study, the calculated correlations between life satisfaction and household net income have been relatively low. The same has been held true for the adjusted determination coefficients in the several regressions of this paper.

Furthermore, one may criticize that the subjective, utility-based measurement in the field of equivalence scales requires (at least approximately) cardinal utility levels. This might be problematized since this needs a dimension for utility which is not known. Moreover, it is questionable whether interpersonal utility comparisons are possible. Another criticism in this context may be that life satisfaction is measured with fixed limits (in the SOEP: "0" as the lowest and "10" as the highest value). Thus, in the extreme case that some members of a society have classified their individual life satisfaction as "10", in the next period, they have no chance to answer that their satisfaction level has increased albeit this might actually be the case.[12] At this, a SOEP-specific problem is that children are not asked for their individual life satisfaction so that their needs cannot be calculated directly (i. e., based on their own utility function).

Because of the methodical problems sketched before, it appears absolutely necessary to interpret the estimated equivalence scale values carefully – preferably in a qualitative manner. In such a careful sense, I obtained as main results:

- The cross-sectional scale values are relatively low with higher values in the variant "only adults" than in the variant "all persons".
- Mean life-satisfaction values are not very different between the several cohorts.
- The same holds true for the relative income positions of the cohorts.
- The calculated longitudinal equivalence scale values reveal the (slightly) highest scale values for cohorts 2 (1950-1959) and – to a lesser extent – 5 (1920-1929).
- The exclusion of children from the household size variable leads to higher scale values for all cohorts.
- Over time, for all cohorts, a U-shaped or a decreasing pattern for the scale weights becomes obvious.

Altogether, especially the unsatisfactory fit of the paper's regressions[13] shows, in my eyes, that much more research is necessary regarding the calculation of cross-sectional as well as longitudinal (subjective) equivalence scales. This may include the search for possibly better models (like an Ordered Response Panel Data model Charlier 2002: 101 has applied) than the simple one presented in this paper.[14]

[12] In this sense, Lelli (2005: 259) has "doubts about the reliability of subjective information, together with a number of debatable assumptions used in the estimation process".

[13] However, this statistical issue is not a specific problem of subjective scale estimates. For instance, Wilke (2005: 22) states regarding expenditure-based scale estimates for Germany, 1998 (primarily performed to obtain the costs of children): "In some cases, estimates appear to be precise and in other cases they suffer from large standard errors."

[14] Further modifications might refer to an extension of the number of explanatory variables as well as to an application of a fixed-effect model, but, in the latter case, one has to keep in mind that the underlying units of analysis are households and not simply individuals and that these units of analysis, typically, change themselves in size and composition over time.

Nonetheless, equivalence scales – and this must be stressed here – are very important for social policy. For instance, this holds true for longitudinal scales in order to capture cohort effects and, thus, to deal with intra- and intergenerational aspects of well-being (and corresponding differences).

Appendix

Table A.1: Cross-sectional subjective equivalence scales for West Germany, 1984-2010 SOEP (in parentheses individual weights for further household members)

SOEP wave	1 person	2 persons	3 persons	4 persons	5 persons	6 persons
Low-income region:[a)]						
1984	1.00	1.26 (0.26)	1.56 (0.29)	1.88 (0.33)	2.24 (0.36)	2.63 (0.39)
1985	1.00	1.36 (0.36)	1.77 (0.41)	2.23 (0.46)	2.75 (0.52)	3.32 (0.57)
1986	1.00	1.47 (0.47)	2.03 (0.56)	2.68 (0.65)	3.42 (0.74)	4.24 (0.83)
1987	1.00	1.31 (0.31)	1.67 (0.36)	2.07 (0.40)	2.52 (0.44)	3.01 (0.49)
1988	1.00	1.24 (0.24)	1.51 (0.27)	1.81 (0.30)	2.13 (0.32)	2.48 (0.35)
1989	1.00	1.23 (0.23)	1.49 (0.26)	1.78 (0.28)	2.09 (0.31)	2.42 (0.33)
1990	1.00	1.18 (0.18)	1.38 (0.20)	1.60 (0.22)	1.83 (0.23)	2.08 (0.25)
1991	1.00	1.13 (0.13)	1.28 (0.14)	1.43 (0.15)	1.59 (0.16)	1.76 (0.17)
1992	1.00	1.21 (0.21)	1.44 (0.23)	1.68 (0.25)	1.95 (0.27)	2.24 (0.29)
1993	1.00	1.23 (0.23)	1.49 (0.26)	1.77 (0.28)	2.08 (0.31)	2.41 (0.33)
1994	1.00	1.16 (0.16)	1.32 (0.17)	1.50 (0.18)	1.69 (0.19)	1.90 (0.20)
1995	1.00	1.10 (0.10)	1.21 (0.11)	1.32 (0.11)	1.44 (0.12)	1.56 (0.12)
1996	1.00	1.17 (0.17)	1.36 (0.19)	1.56 (0.20)	1.78 (0.22)	2.01 (0.23)
1997	1.00	1.09 (0.09)	1.19 (0.10)	1.29 (0.10)	1.39 (0.10)	1.50 (0.11)
1998	1.00	1.09 (0.09)	1.18 (0.09)	1.27 (0.09)	1.37 (0.10)	1.47 (0.10)
1999	1.00	1.10 (0.10)	1.20 (0.10)	1.30 (0.11)	1.41 (0.11)	1.53 (0.11)
2000	1.00	1.11 (0.11)	1.22 (0.12)	1.35 (0.12)	1.47 (0.13)	1.60 (0.13)
2001	1.00	1.16 (0.16)	1.34 (0.17)	1.52 (0.19)	1.72 (0.20)	1.93 (0.21)
2002	1.00	1.10 (0.10)	1.20 (0.10)	1.31 (0.11)	1.42 (0.11)	1.54 (0.12)
2003	1.00	1.16 (0.16)	1.33 (0.17)	1.51 (0.18)	1.70 (0.19)	1.91 (0.20)
2004	1.00	1.14 (0.14)	1.30 (0.15)	1.46 (0.16)	1.64 (0.17)	1.82 (0.18)
2005	1.00	1.26 (0.26)	1.54 (0.29)	1.86 (0.32)	2.21 (0.35)	2.58 (0.38)
2006	1.00	1.09 (0.09)	1.18 (0.09)	1.28 (0.10)	1.39 (0.10)	1.49 (0.11)
2007	1.00	1.09 (0.09)	1.19 (0.10)	1.29 (0.10)	1.40 (0.11)	1.51 (0.11)
2008	1.00	1.06 (0.06)	1.13 (0.07)	1.20 (0.07)	1.27 (0.07)	1.34 (0.07)
2009	1.00	1.11 (0.11)	1.23 (0.12)	1.35 (0.12)	1.48 (0.13)	1.61 (0.13)
2010	1.00	1.12 (0.12)	1.25 (0.13)	1.38 (0.13)	1.52 (0.14)	1.66 (0.15)
1984-2010, pooled	1.00	1.11 (0.11)	1.23 (0.12)	1.35 (0.12)	1.48 (0.13)	1.62 (0.13)

(Table A.1 continued:)

SOEP wave	1 person	2 persons	3 persons	4 persons	5 persons	6 persons
Middle-income region:[b)]						
1984	1.00	1.18 (0.18)	1.38 (0.20)	1.60 (0.21)	1.83 (0.23)	2.07 (0.25)
1985	1.00	1.25 (0.25)	1.52 (0.27)	1.82 (0.30)	2.15 (0.33)	2.50 (0.35)
1986	1.00	1.32 (0.32)	1.69 (0.37)	2.10 (0.41)	2.56 (0.46)	3.06 (0.50)
1987	1.00	1.22 (0.22)	1.46 (0.24)	1.72 (0.26)	2.00 (0.28)	2.31 (0.30)
1988	1.00	1.17 (0.17)	1.35 (0.18)	1.55 (0.20)	1.76 (0.21)	1.98 (0.22)
1989	1.00	1.16 (0.16)	1.34 (0.18)	1.53 (0.19)	1.73 (0.20)	1.94 (0.21)
1990	1.00	1.13 (0.13)	1.27 (0.14)	1.41 (0.14)	1.56 (0.15)	1.72 (0.16)
1991	1.00	1.09 (0.09)	1.19 (0.10)	1.30 (0.10)	1.40 (0.11)	1.51 (0.11)
1992	1.00	1.15 (0.15)	1.30 (0.15)	1.46 (0.16)	1.64 (0.17)	1.82 (0.18)
1993	1.00	1.16 (0.16)	1.34 (0.17)	1.52 (0.19)	1.72 (0.20)	1.93 (0.21)
1994	1.00	1.11 (0.11)	1.22 (0.12)	1.35 (0.12)	1.47 (0.13)	1.60 (0.13)
1995	1.00	1.07 (0.07)	1.15 (0.07)	1.22 (0.08)	1.30 (0.08)	1.38 (0.08)
1996	1.00	1.12 (0.12)	1.25 (0.13)	1.39 (0.14)	1.53 (0.14)	1.68 (0.15)
1997	1.00	1.06 (0.06)	1.13 (0.07)	1.20 (0.07)	1.27 (0.07)	1.34 (0.07)
1998	1.00	1.06 (0.06)	1.12 (0.06)	1.19 (0.06)	1.25 (0.07)	1.32 (0.07)
1999	1.00	1.07 (0.07)	1.14 (0.07)	1.21 (0.07)	1.28 (0.07)	1.36 (0.08)
2000	1.00	1.08 (0.08)	1.16 0.08)	1.24 (0.08)	1.32 (0.09)	1.41 (0.09)
2001	1.00	1.11 (0.11)	1.23 (0.12)	1.36 (0.13)	1.49 (0.13)	1.63 (0.14)
2002	1.00	1.07 (0.07)	1.14 (0.07)	1.22 (0.07)	1.29 (0.08)	1.37 (0.08)
2003	1.00	1.11 (0.11)	1.23 (0.12)	1.35 (0.12)	1.48 (0.13)	1.61 (0.13)
2004	1.00	1.10 (0.10)	1.21 (0.11)	1.32 (0.11)	1.43 (0.12)	1.55 (0.12)
2005	1.00	1.18 (0.18)	1.37 (0.19)	1.58 (0.21)	1.80 (0.22)	2.04 (0.24)
2006	1.00	1.06 (0.06)	1.13 (0.07)	1.20 (0.07)	1.27 (0.07)	1.34 (0.07)
2007	1.00	1.07 (0.07)	1.13 (0.07)	1.20 (0.07)	1.27 (0.07)	1.35 (0.07)
2008	1.00	1.05 (0.05)	1.09 (0.05)	1.14 (0.05)	1.19 (0.05)	1.24 (0.05)
2009	1.00	1.08 (0.08)	1.16 (0.08)	1.24 (0.08)	1.33 (0.09)	1.42 (0.09)
2010	1.00	1.08 (0.08)	1.17 (0.09)	1.26 (0.09)	1.35 (0.09)	1.45 (0.10)
1984-2010, pooled	1.00	1.08 (0.08)	1.16 (0.08)	1.24 (0.08)	1.33 (0.09)	1.42 (0.09)

(Table A.1 continued:)

SOEP wave	1 person	2 persons	3 persons	4 persons	5 persons	6 persons
High-income region:[c)]						
1984	1.00	1.13 (0.13)	1.26 (0.14)	1.41 (0.14)	1.56 (0.15)	1.72 (0.16)
1985	1.00	1.17 (0.17)	1.36 (0.18)	1.55 (0.20)	1.77 (0.21)	1.99 (0.23)
1986	1.00	1.22 (0.22)	1.47 (0.25)	1.74 (0.27)	2.03 (0.29)	2.34 (0.31)
1987	1.00	1.15 (0.15)	1.31 (0.16)	1.49 (0.17)	1.67 (0.18)	1.87 (0.20)
1988	1.00	1.12 (0.12)	1.24 (0.12)	1.37 (0.13)	1.51 (0.14)	1.66 (0.14)
1989	1.00	1.11 (0.11)	1.23 (0.12)	1.36 (0.13)	1.49 (0.13)	1.63 (0.14)
1990	1.00	1.09 (0.09)	1.18 (0.09)	1.28 (0.10)	1.38 (0.10)	1.49 (0.11)
1991	1.00	1.07 (0.07)	1.13 (0.07)	1.21 (0.07)	1.28 (0.07)	1.35 (0.07)
1992	1.00	1.10 (0.10)	1.21 (0.11)	1.32 (0.11)	1.44 (0.12)	1.56 (0.12)
1993	1.00	1.11 (0.11)	1.23 (0.12)	1.36 (0.13)	1.49 (0.13)	1.63 (0.14)
1994	1.00	1.08 (0.08)	1.16 (0.08)	1.24 (0.08)	1.32 (0.09)	1.41 (0.09)
1995	1.00	1.05 (0.05)	1.10 (0.05)	1.15 (0.05)	1.21 (0.05)	1.26 (0.06)
1996	1.00	1.09 (0.09)	1.17 (0.09)	1.27 (0.09)	1.36 (0.10)	1.46 (0.10)
1997	1.00	1.05 (0.05)	1.09 (0.05)	1.14 (0.05)	1.19 (0.05)	1.24 (0.05)
1998	1.00	1.04 (0.04)	1.09 (0.04)	1.13 (0.04)	1.18 (0.05)	1.22 (0.05)
1999	1.00	1.05 (0.05)	1.10 (0.05)	1.15 (0.05)	1.20 (0.05)	1.25 (0.05)
2000	1.00	1.05 (0.05)	1.11 (0.06)	1.17 (0.06)	1.22 (0.06)	1.28 (0.06)
2001	1.00	1.08 (0.08)	1.16 (0.08)	1.25 (0.09)	1.34 (0.09)	1.43 (0.09)
2002	1.00	1.05 (0.05)	1.10 (0.05)	1.15 (0.05)	1.20 (0.05)	1.26 (0.05)
2003	1.00	1.08 (0.08)	1.16 (0.08)	1.24 (0.08)	1.33 (0.08)	1.42 (0.09)
2004	1.00	1.07 (0.07)	1.14 (0.07)	1.22 (0.08)	1.30 (0.08)	1.38 (0.08)
2005	1.00	1.13 (0.13)	1.26 (0.13)	1.40 (0.14)	1.54 (0.15)	1.70 (0.15)
2006	1.00	1.04 (0.04)	1.09 (0.05)	1.14 (0.05)	1.18 (0.05)	1.23 (0.05)
2007	1.00	1.05 (0.05)	1.09 (0.05)	1.14 (0.05)	1.19 (0.05)	1.24 (0.05)
2008	1.00	1.03 (0.03)	1.06 (0.03)	1.10 (0.03)	1.13 (0.03)	1.16 (0.03)
2009	1.00	1.05 (0.05)	1.11 (0.06)	1.17 (0.06)	1.23 (0.06)	1.29 (0.06)
2010	1.00	1.06 (0.06)	1.12 (0.06)	1.18 (0.06)	1.25 (0.06)	1.31 (0.07)
1984-2010, pooled	1.00	1.05 (0.05)	1.11 (0.06)	1.17 (0.06)	1.23 (0.06)	1.29 (0.06)

[a)] reference income level: half of the average net income of a single-person household, [b)] reference income level: average net income of a single-person household, [c)] reference income level: two times average net income of a single-person household

Source: Present author's own calculations

Table A.2: OLS regression results for the relationship between life satisfaction and household net income and household size, West Germany, 1984-2010 SOEP

SOEP wave	Constant	Household net income (square-rooted)	Household size	R^2_{adj}
1984	6.390***	0.009***	-0.082***	0.021
1985	6.310***	0.009***	-0.107***	0.021
1986	6.623***	0.007***	-0.106***	0.014
1987	6.443***	0.006***	-0.067***	0.011
1988	6.278***	0.007***	-0.056***	0.013
1989	6.259***	0.007***	-0.058***	0.014
1990	6.254***	0.008***	-0.052***	0.024
1991	6.496***	0.006***	-0.031**	0.017
1992	6.281***	0.007***	-0.059***	0.024
1993	6.146***	0.007***	-0.070***	0.025
1994	6.140***	0.006***	-0.042***	0.021
1995	6.049***	0.006***	-0.029*	0.023
1996	6.149***	0.006***	-0.047***	0.022
1997	5.725***	0.008***	-0.031*	0.031
1998	5.869***	0.008***	-0.029*	0.035
1999	6.021***	0.007***	-0.029*	0.027
2000	6.203***	0.006***	-0.032***	0.028
2001	6.318***	0.006***	-0.043***	0.024
2002	6.083***	0.006***	-0.028***	0.047
2003	6.017***	0.006***	-0.047***	0.045
2004	5.766***	0.007***	-0.046***	0.046
2005	5.902***	0.007***	-0.088***	0.055
2006	5.867***	0.007***	-0.029**	0.052
2007	5.993***	0.006***	-0.027**	0.046
2008	6.028***	0.006***	-0.018	0.042
2009	6.178***	0.005***	-0.028**	0.032
2010	6.194***	0.005***	-0.033**	0.038
Pooled, 1984-2010	6.176***	0.006***	-0.029***	0.028

R^2_{adj} = adjusted determination coefficient, *: significant at the significance level of 90 per cent, **: significant at the significance level of 95 per cent, ***: significant at the significance level of 99 per cent

Source: Present author's own estimations

Table A.3: Arithmetic mean values of equivalent household net incomes (p. a.) of the reference household type (single-person household) for the cross-sectional equivalence scales in West Germany, 1984-2010 SOEP (in Euro)

SOEP wave	Average value	SOEP wave	Average value
1984	9,850	1998	16,266
1985	10,300	1999	16,804
1986	10,358	2000	17,647
1987	10,914	2001	18,089
1988	11,194	2002	18,750
1989	11,828	2003	19,206
1990	12,303	2004	19,064
1991	13,301	2005	19,931
1992	14,190	2006	20,035
1993	14,925	2007	20,009
1994	15,207	2008	20,719
1995	15,644	2009	20,975
1996	16,308	2010	21,180
1997	16,319		

Source: Present author's own calculations

Table A.4: Cross-sectional subjective equivalence scales for West Germany, 1984-2010 SOEP (in parentheses individual weights for further household members) – only adults

SOEP wave	1 person	2 persons	3 persons	4 persons	5 persons	6 persons
Low-income region:[a)]						
1984	1.00	1.69 (0.69)	2.55 (0.86)	3.59 (1.04)	4.81 (1.22)	6.21 (1.40)
1985	1.00	1.69 (0.69)	2.55 (0.86)	3.59 (1.04)	4.81 (1.22)	6.21 (1.40)
1986	1.00	1.73 (0.73)	2.65 (0.92)	3.77 (1.12)	5.09 (1.32)	6.60 (1.51)
1987	1.00	1.58 (0.58)	2.29 (0.71)	3.13 (0.84)	4.11 (0.97)	5.21 (1.11)
1988	1.00	1.56 (0.56)	2.24 (0.68)	3.05 (0.81)	3.98 (0.93)	5.03 (1.05)
1989	1.00	1.50 (0.50)	2.10 (0.60)	2.79 (0.70)	3.59 (0.80)	4.49 (0.90)
1990	1.00	1.34 (0.34)	1.73 (0.39)	2.17 (0.44)	2.66 (0.49)	3.20 (0.54)
1991	1.00	1.28 (0.28)	1.59 (0.31)	1.93 (0.35)	2.31 (0.38)	2.73 (0.41)
1992	1.00	1.42 (0.42)	1.92 (0.50)	2.49 (0.57)	3.13 (0.64)	3.85 (0.72)
1993	1.00	1.48 (0.48)	2.04 (0.57)	2.70 (0.66)	3.46 (0.75)	4.30 (0.84)
1994	1.00	1.32 (0.32)	1.69 (0.37)	2.10 (0.41)	2.56 (0.46)	3.07 (0.50)
1995	1.00	1.31 (0.31)	1.65 (0.35)	2.04 (0.39)	2.47 (0.43)	2.94 (0.47)
1996	1.00	1.35 (0.35)	1.76 (0.41)	2.22 (0.46)	2.73 (0.51)	3.30 (0.57)
1997	1.00	1.28 (0.28)	1.59 (0.31)	1.93 (0.34)	2.30 (0.38)	2.72 (0.41)
1998	1.00	1.24 (0.24)	1.51 (0.27)	1.80 (0.29)	2.12 (0.32)	2.47 (0.35)
1999	1.00	1.31 (0.31)	1.67 (0.35)	2.06 (0.40)	2.50 (0.44)	2.99 (0.48)
2000	1.00	1.39 (0.39)	1.83 (0.45)	2.34 (0.51)	2.92 (0.57)	3.55 (0.64)
2001	1.00	1.36 (0.36)	1.78 (0.42)	2.25 (0.47)	2.78 (0.53)	3.36 (0.58)
2002	1.00	1.24 (0.24)	1.50 (0.26)	1.78 (0.29)	2.10 (0.31)	2.43 (0.34)
2003	1.00	1.30 (0.30)	1.63 (0.33)	2.00 (0.37)	2.41 (0.41)	2.86 (0.45)
2004	1.00	1.32 (0.32)	1.68 (0.36)	2.08 (0.40)	2.53 (0.45)	3.02 (0.49)
2005	1.00	1.48 (0.48)	2.04 (0.57)	2.71 (0.66)	3.46 (0.75)	4.30 (0.85)
2006	1.00	1.31 (0.31)	1.66 (0.35)	2.05 (0.39)	2.48 (0.43)	2.96 (0.47)
2007	1.00	1.35 (0.35)	1.76 (0.41)	2.22 (0.46)	2.74 (0.52)	3.31 (0.57)
2008	1.00	1.25 (0.25)	1.53 (0.28)	1.83 (0.31)	2.17 (0.33)	2.53 (0.36)
2009	1.00	1.29 (0.29)	1.61 (0.32)	1.97 (0.36)	2.36 (0.39)	2.79 (0.43)
2010	1.00	1.26 (0.26)	1.56 (0.29)	1.88 (0.32)	2.24 (0.36)	2.62 (0.39)
1984-2010, pooled	1.00	1.19 (0.19)	1.40 (0.21)	1.62 (0.22)	1.86 (0.24)	2.12 (0.26)

(Table A.4 continued:)

SOEP wave	1 person	2 persons	3 persons	4 persons	5 persons	6 persons
Middle-income region:[b)]						
1984	1.00	1.47 (0.47)	2.02 (0.56)	2.67 (0.65)	3.40 (0.73)	4.23 (0.82)
1985	1.00	1.47 (0.47)	2.02 (0.56)	2.67 (0.65)	3.40 (0.73)	4.22 (0.82)
1986	1.00	1.49 (0.49)	2.08 (0.59)	2.77 (0.69)	3.56 (0.79)	4.45 (0.89)
1987	1.00	1.40 (0.40)	1.86 (0.46)	2.39 (0.53)	2.98 (0.59)	3.64 (0.66)
1988	1.00	1.38 (0.38)	1.83 (0.44)	2.33 (0.51)	2.90 (0.57)	3.53 (0.63)
1989	1.00	1.34 (0.34)	1.73 (0.39)	2.18 (0.44)	2.67 (0.49)	3.21 (0.54)
1990	1.00	1.24 (0.24)	1.50 (0.26)	1.78 (0.29)	2.09 (0.31)	2.43 (0.34)
1991	1.00	1.19 (0.19)	1.40 (0.21)	1.63 (0.23)	1.87 (0.24)	2.13 (0.26)
1992	1.00	1.29 (0.29)	1.62 (0.33)	1.98 (0.36)	2.38 (0.40)	2.82 (0.44)
1993	1.00	1.33 (0.33)	1.70 (0.37)	2.12 (0.42)	2.58 (0.47)	3.10 (0.51)
1994	1.00	1.22 (0.22)	1.47 (0.25)	1.74 (0.27)	2.03 (0.29)	2.34 (0.31)
1995	1.00	1.21 (0.21)	1.45 (0.23)	1.70 (0.25)	1.97 (0.27)	2.27 (0.29)
1996	1.00	1.24 (0.24)	1.51 (0.27)	1.81 (0.30)	2.14 (0.32)	2.49 (0.35)
1997	1.00	1.19 (0.19)	1.40 (0.21)	1.63 (0.23)	1.87 (0.24)	2.13 (0.26)
1998	1.00	1.17 (0.17)	1.35 (0.18)	1.54 (0.19)	1.75 (0.21)	1.97 (0.22)
1999	1.00	1.22 (0.22)	1.45 (0.24)	1.71 (0.26)	1.99 (0.28)	2.29 (0.30)
2000	1.00	1.27 (0.27)	1.56 (0.30)	1.89 (0.33)	2.25 (0.36)	2.64 (0.39)
2001	1.00	1.25 (0.25)	1.53 (0.28)	1.83 (0.31)	2.17 (0.33)	2.53 (0.36)
2002	1.00	1.16 (0.16)	1.34 (0.18)	1.53 (0.19)	1.73 (0.20)	1.95 (0.21)
2003	1.00	1.21 (0.21)	1.43 (0.22)	1.67 (0.24)	1.93 (0.26)	2.22 (0.28)
2004	1.00	1.22 (0.22)	1.46 (0.24)	1.72 (0.26)	2.01 (0.28)	2.31 (0.31)
2005	1.00	1.33 (0.33)	1.70 (0.37)	2.12 (0.42)	2.59 (0.47)	3.10 (0.51)
2006	1.00	1.21 (0.21)	1.45 (0.23)	1.70 (0.26)	1.98 (0.28)	2.28 (0.30)
2007	1.00	1.24 (0.24)	1.52 (0.27)	1.82 (0.30)	2.14 (0.33)	2.49 (0.35)
2008	1.00	1.17 (0.17)	1.36 (0.19)	1.56 (0.20)	1.78 (0.22)	2.01 (0.23)
2009	1.00	1.20 (0.20)	1.42 (0.22)	1.65 (0.23)	1.90 (0.25)	2.17 (0.27)
2010	1.00	1.18 (0.18)	1.38 (0.20)	1.59 (0.21)	1.82 (0.23)	2.07 (0.24)
1984-2010, pooled	1.00	1.13 (0.13)	1.27 (0.14)	1.42 (0.15)	1.58 (0.16)	1.75 (0.17)

(Table A.4 continued:)

SOEP wave	1 person	2 persons	3 persons	4 persons	5 persons	6 persons
High-income region:[c)]						
1984	1.00	1.32 (0.32)	1.69 (0.37)	2.10 (0.41)	2.55 (0.45)	3.05 (0.50)
1985	1.00	1.32 (0.32)	1.69 (0.37)	2.10 (0.41)	2.55 (0.45)	3.05 (0.50)
1986	1.00	1.34 (0.34)	1.73 (0.39)	2.16 (0.44)	2.65 (0.49)	3.18 (0.54)
1987	1.00	1.27 (0.27)	1.58 (0.31)	1.92 (0.34)	2.29 (0.37)	2.69 (0.40)
1988	1.00	1.26 (0.26)	1.56 (0.29)	1.88 (0.33)	2.24 (0.36)	2.63 (0.39)
1989	1.00	1.24 (0.24)	1.50 (0.26)	1.78 (0.29)	2.10 (0.31)	2.43 (0.34)
1990	1.00	1.16 (0.16)	1.34 (0.18)	1.53 (0.19)	1.73 (0.20)	1.94 (0.21)
1991	1.00	1.13 (0.13)	1.28 (0.14)	1.43 (0.15)	1.59 (0.16)	1.76 (0.17)
1992	1.00	1.20 (0.20)	1.42 (0.22)	1.66 (0.24)	1.92 (0.26)	2.19 (0.28)
1993	1.00	1.23 (0.23)	1.48 (0.25)	1.75 (0.27)	2.04 (0.30)	2.36 (0.32)
1994	1.00	1.16 (0.16)	1.32 (0.17)	1.50 (0.18)	1.69 (0.19)	1.89 (0.20)
1995	1.00	1.15 (0.15)	1.31 (0.16)	1.48 (0.17)	1.65 (0.18)	1.84 (0.19)
1996	1.00	1.17 (0.17)	1.35 (0.18)	1.55 (0.20)	1.76 (0.21)	1.98 (0.22)
1997	1.00	1.13 (0.13)	1.28 (0.14)	1.43 (0.15)	1.59 (0.16)	1.75 (0.17)
1998	1.00	1.12 (0.12)	1.24 (0.12)	1.37 (0.13)	1.51 (0.14)	1.65 (0.14)
1999	1.00	1.15 (0.15)	1.31 (0.16)	1.48 (0.17)	1.67 (0.18)	1.86 (0.19)
2000	1.00	1.18 (0.18)	1.39 (0.20)	1.60 (0.22)	1.83 (0.23)	2.08 (0.25)
2001	1.00	1.17 (0.17)	1.36 (0.19)	1.56 (0.20)	1.78 (0.22)	2.01 (0.23)
2002	1.00	1.12 (0.12)	1.24 (0.12)	1.36 (0.13)	1.50 (0.13)	1.64 (0.14)
2003	1.00	1.14 (0.14)	1.30 (0.15)	1.46 (0.16)	1.63 (0.17)	1.81 (0.18)
2004	1.00	1.15 (0.15)	1.32 (0.16)	1.49 (0.17)	1.68 (0.19)	1.87 (0.20)
2005	1.00	1.23 (0.23)	1.48 (0.25)	1.75 (0.27)	2.04 (0.30)	2.36 (0.32)
2006	1.00	1.15 (0.15)	1.31 (0.16)	1.48 (0.17)	1.66 (0.18)	1.85 (0.19)
2007	1.00	1.17 (0.17)	1.35 (0.18)	1.55 (0.20)	1.76 (0.21)	1.99 (0.22)
2008	1.00	1.12 (0.12)	1.25 (0.13)	1.39 (0.14)	1.53 (0.14)	1.68 (0.15)
2009	1.00	1.14 (0.14)	1.29 (0.15)	1.44 (0.16)	1.61 (0.17)	1.78 (0.17)
2010	1.00	1.13 (0.13)	1.26 (0.14)	1.41 (0.14)	1.56 (0.15)	1.72 (0.16)
1984-2010, pooled	1.00	1.09 (0.09)	1.19 (0.10)	1.29 (0.10)	1.40 (0.11)	1.51 (0.11)

[a)] reference income level: half of the average net income of a single-person household, [b)] reference income level: average net income of a single-person household, [c)] reference income level: two times average net income of a single-person household

Source: Present author's own calculations

Table A.5: OLS regression results for the relationship between life satisfaction and household net income and household size, West Germany, 1984-2010 SOEP – only adults

SOEP wave	Constant	Household net income (square-rooted)	Household size	R^2_{adj}
1984	6.471***	0.011***	-0.225***	0.024
1985	6.377***	0.010***	-0.206***	0.022
1986	6.613***	0.008***	-0.171***	0.014
1987	6.429***	0.007***	-0.131***	0.012
1988	6.269***	0.008***	-0.145***	0.015
1989	6.282***	0.007***	-0.128***	0.015
1990	6.254***	0.008***	-0.100***	0.024
1991	6.516***	0.006***	-0.065***	0.016
1992	6.284***	0.008***	-0.125***	0.025
1993	6.170***	0.008***	-0.148***	0.026
1994	6.162***	0.007***	-0.088***	0.021
1995	6.085***	0.007***	-0.088***	0.024
1996	6.162***	0.007***	-0.099***	0.023
1997	5.740***	0.008***	-0.097***	0.033
1998	5.892***	0.008***	-0.084***	0.035
1999	6.061***	0.007***	-0.097***	0.028
2000	6.246***	0.007***	-0.116***	0.030
2001	6.344***	0.006***	-0.099***	0.025
2002	6.113***	0.006***	-0.068***	0.048
2003	6.046***	0.006***	-0.087***	0.046
2004	5.802***	0.007***	-0.100***	0.047
2005	5.951***	0.008***	-0.164***	0.057
2006	5.931***	0.007***	-0.099***	0.053
2007	6.061***	0.006***	-0.105***	0.048
2008	6.084***	0.006***	-0.070***	0.042
2009	6.219***	0.005***	-0.071***	0.034
2010	6.228***	0.006***	-0.072***	0.039
Pooled, 1984-2010	6.347***	0.005***	-0.045***	0.023

R^2_{adj} = adjusted determination coefficient, *: significant at the significance level of 90 per cent, **: significant at the significance level of 95 per cent, ***: significant at the significance level of 99 per cent

Source: Present author's own estimations

Table A.6a: OLS regressions for subjective longitudinal and variable equivalence scale weights for West Germany, 1984-2010 SOEP (in per cent) – regressions for reference group (35 to 44 years old persons)

SOEP wave	Constant	Household net income (square-rooted)	Age group "until 34 years"	Age group "45 years and older"	Household size	R^2_{adj}
1984	6.489***	0.009***	-0.079	-0.110**	-0.090***	0.021
1985	6.304***	0.009***	0.036	-0.006	-0.110***	0.021
1986	6.599***	0.007***	0.130**	-0.021	-0.117***	0.015
1987	6.355***	0.006***	0.199***	0.048	-0.074***	0.012
1988	6.297***	0.007***	0.142**	-0.086	-0.077***	0.015
1989	6.340***	0.007***	0.093*	-0.162***	-0.083***	0.018
1990	6.308***	0.008***	0.131**	-0.130**	-0.076***	0.027
1991	6.396***	0.006***	0.190***	0.057	-0.036**	0.019
1992	6.237***	0.007***	0.191***	-0.031	-0.075***	0.027
1993	6.107***	0.008***	0.180***	-0.042	-0.086***	0.028
1994	6.055***	0.007***	0.257***	-0.014	-0.059***	0.026
1995	6.017***	0.007***	0.251***	-0.121**	-0.058***	0.031
1996	6.061***	0.007***	0.317***	-0.059	-0.072***	0.032
1997	5.621***	0.008***	0.345***	-0.042	-0.057***	0.041
1998	5.803***	0.008***	0.277***	-0.053	-0.056***	0.041
1999	5.979***	0.007***	0.310***	-0.121**	-0.066***	0.038
2000	6.205***	0.007***	0.177***	-0.080**	-0.056***	0.032
2001	6.323***	0.006***	0.196***	-0.086	-0.071***	0.029
2002	6.010***	0.006***	0.254***	0.015	-0.044***	0.051
2003	5.990***	0.007***	0.249***	-0.048	-0.072***	0.050
2004	5.726***	0.007***	0.238***	-0.025	-0.067***	0.049
2005	5.869***	0.008***	0.299***	-0.067*	-0.120***	0.062
2006	5.852***	0.007***	0.275***	-0.073**	-0.058***	0.058
2007	6.084***	0.006***	0.273***	-0.214***	-0.079***	0.058
2008	6.034***	0.006***	0.246***	-0.083**	-0.047***	0.048
2009	6.196***	0.005***	0.229***	-0.084**	-0.057***	0.036
2010	6.252***	0.006***	0.236***	-0.136***	-0.071***	0.045

R^2_{adj} = adjusted determination coefficient, *: significant at the significance level of 90 per cent, **: significant at the significance level of 95 per cent, ***: significant at the significance level of 99 per cent

Source: Present author's own estimations

Table A.6b: OLS regressions for subjective longitudinal and variable equivalence scale weights for West Germany, 1984-2010 SOEP (in per cent) – regressions for cohorts

SOEP wave	Constant	House-hold net income (square-rooted)	Cohort 1 (1960-1969)+	Cohort 2 (1950-1959)+	Cohort 3 (1940-1949)+	Cohort 4 (1930-1939)+	Cohort 5 (1920-1929)+	House-hold size	R^2_{adj}
1984	6.369***	0.010***	0.017	-0.180***	0.083	0.236***	-0.520***	-0.083***	0.023
1985	6.260***	0.009***	-0.085*	-0.137**	0.073	0.250***	-0.190	-0.099***	0.023
1986	6.595***	0.008***	-0.235***	-0.284***	0.143*	0.187**	-0.243	-0.100***	0.019
1987	6.412***	0.007***	-0.257***	-0.226***	0.232***	0.074	-0.349**	-0.058***	0.016
1988	6.368***	0.007***	-0.267***	-0.261***	0.054	-0.187*	-0.422***	-0.067***	0.017
1989	6.310***	0.007***	-0.189***	-0.317***	0.087	-0.135	-0.097	-0.065***	0.018
1990	6.335***	0.008***	-0.198***	-0.391***	0.084	-0.160*	-0.283**	-0.063***	0.030
1991	6.457***	0.006***	-0.140***	-0.177***	0.262***	-0.063	-0.185	-0.026	0.022
1992	6.345***	0.007***	-0.202***	-0.270***	0.062	-0.214**	-0.297*	-0.071***	0.028
1993	6.131***	0.008***	-0.285***	-0.304***	0.138**	0.026	-0.223*	-0.073***	0.033
1994	6.196***	0.007***	-0.263***	-0.313***	-0.014	-0.118	-0.196	-0.054***	0.025
1995	6.163***	0.007***	-0.362***	-0.446***	-0.049	-0.121	-0.677***	-0.051***	0.034
1996	6.243***	0.007***	-0.349***	-0.417***	-0.092	-0.119	-0.336***	-0.065***	0.032
1997	5.747***	0.008***	-0.454***	-0.452***	-0.086	-0.002	-0.155	-0.042**	0.043
1998	5.938***	0.008***	-0.372***	-0.379***	-0.127**	-0.014	-0.365***	-0.048***	0.043
1999	6.147***	0.008***	-0.400***	-0.533***	-0.131**	-0.202***	-0.547***	-0.063***	0.040
2000	6.270***	0.007***	-0.284***	-0.297***	-0.055	-0.039	-0.483***	-0.046***	0.034
2001	6.379***	0.006***	-0.286***	-0.288***	-0.055	0.007	-0.536***	-0.056***	0.031
2002	6.129***	0.006***	-0.245***	-0.215***	-0.027	-0.029	-0.290***	-0.033***	0.051
2003	6.046***	0.007***	-0.336***	-0.290***	-0.002	-0.026	-0.237***	-0.046***	0.052
2004	5.779***	0.007***	-0.321***	-0.270***	-0.010	0.030	-0.178*	-0.042***	0.052
2005	5.968***	0.008***	-0.362***	-0.422***	-0.042	-0.100*	-0.229**	-0.094***	0.064
2006	5.896***	0.007***	-0.406***	-0.438***	-0.021	-0.005	-0.137*	-0.023*	0.064
2007	6.169***	0.007***	-0.452***	-0.616***	-0.173***	-0.210***	-0.424***	-0.051***	0.064
2008	6.110***	0.006***	-0.354***	-0.442***	-0.033	-0.042	-0.402***	-0.020	0.054
2009	6.217***	0.006***	-0.432***	-0.451***	-0.018	-0.017	-0.098	-0.016	0.045
2010	6.272***	0.006***	-0.408***	-0.509***	-0.041	-0.062	-0.220***	-0.030**	0.052

+: age in 1984 SOEP: cohort 1: 15-24 years, cohort 2: 25-34 years, cohort 3: 35-44 years, cohort 4: 45-54 years, cohort 5: 55-64 years; age in 2010 SOEP: cohort 1: 41-50 years, cohort 2: 51-60 years, cohort 3: 61-70 years, cohort 4: 71-80 years, cohort 5: 81-90 years

R^2_{adj} = adjusted determination coefficient, *: significant at the significance level of 90 per cent, **: significant at the significance level of 95 per cent, ***: significant at the significance level of 99 per cent

Source: Present author's own estimations

Table A.7: Arithmetic mean values of equivalent household net incomes (p. a.) of the reference household type (single-person household, 35-44 years old) for the longitudinal equivalence scales in West Germany, 1984-2010 SOEP (in Euro)

SOEP wave	Average value	SOEP wave	Average value
1984	14,121	1998	18,601
1985	14,277	1999	19,960
1986	13,538	2000	21,158
1987	14,265	2001	20,996
1988	15,440	2002	22,448
1989	16,077	2003	21,646
1990	17,383	2004	21,662
1991	18,331	2005	22,544
1992	17,930	2006	22,654
1993	20,062	2007	23,727
1994	19,762	2008	25,897
1995	20,419	2009	25,850
1996	20,962	2010	24,859
1997	20,780		

Source: Present author's own calculations

Table A.8a: OLS regressions for subjective longitudinal and variable equivalence scale weights for West Germany, 1984-2010 SOEP (in per cent) – regressions for reference group (35 to 44 years old persons), only adults

SOEP wave	Constant	Household net income (square-rooted)	Age group "until 34 years"	Age group "45 years and older"	Household size	R^2_{adj}
1984	6.459***	0.011***	0.000	0.019	-0.225***	0.023
1985	6.274***	0.010***	0.111**	0.117**	-0.213***	0.022
1986	6.478***	0.008***	0.219***	0.118**	-0.186***	0.016
1987	6.270***	0.007***	0.281***	0.144***	-0.151***	0.014
1988	6.181***	0.008***	0.236***	0.031	-0.163***	0.018
1989	6.251***	0.007***	0.182***	-0.039	-0.141***	0.018
1990	6.222***	0.008***	0.196***	-0.046	-0.112***	0.028
1991	6.380***	0.006***	0.220***	0.099**	-0.080***	0.018
1992	6.165***	0.008***	0.247***	0.057	-0.142***	0.028
1993	6.039***	0.008***	0.248***	0.070	-0.164***	0.029
1994	6.018***	0.007***	0.298***	0.053	-0.103***	0.026
1995	5.981***	0.007***	0.293***	-0.052	-0.102***	0.031
1996	5.992***	0.007***	0.371***	0.033	-0.117***	0.032
1997	5.567***	0.009***	0.393***	0.033	-0.118***	0.042
1998	5.768***	0.008***	0.320***	0.017	-0.105***	0.042
1999	5.939***	0.008***	0.363***	-0.034	-0.123***	0.038
2000	6.182***	0.007***	0.234***	-0.007	-0.136***	0.034
2001	6.271***	0.007***	0.260***	0.004	-0.123***	0.029
2002	6.006***	0.007***	0.304***	0.067**	-0.096***	0.052
2003	5.953***	0.007***	0.315***	0.039	-0.119***	0.051
2004	5.704***	0.007***	0.309***	0.055	-0.133***	0.051
2005	5.819***	0.008***	0.410***	0.064*	-0.206***	0.065
2006	5.855***	0.007***	0.364***	0.004	-0.143***	0.060
2007	6.059***	0.007***	0.376***	-0.114***	-0.156***	0.061
2008	6.041***	0.006***	0.313***	-0.019	-0.110***	0.048
2009	6.177***	0.006***	0.304***	-0.013	-0.110***	0.037
2010	6.217***	0.006***	0.314***	-0.056	-0.117***	0.046

R^2_{adj} = adjusted determination coefficient, *: significant at the significance level of 90 per cent, **: significant at the significance level of 95 per cent, ***: significant at the significance level of 99 per cent

Source: Present author's own estimations

Table A.8b: OLS regressions for subjective longitudinal and variable equivalence scale weights for West Germany, 1984-2010 SOEP (in per cent) – regressions for cohorts, only adults

SOEP wave	Constant	House-hold net income (square-rooted)	Cohort 1 (1960-1969)+	Cohort 2 (1950-1959)+	Cohort 3 (1940-1949)+	Cohort 4 (1930-1939)+	Cohort 5 (1920-1929)+	House-hold size	R^2_{adj}
1984	6.406***	0.011***	0.039	-0.081	0.150**	0.292***	-0.450***	-0.219***	0.026
1985	6.287***	0.010***	-0.058	-0.056	0.154**	0.307***	-0.109	-0.195***	0.023
1986	6.543***	0.008***	-0.210***	-0.208***	0.221***	0.260***	-0.135	-0.155***	0.019
1987	6.391***	0.007***	-0.254***	-0.195***	0.271***	0.104	-0.291*	-0.117***	0.017
1988	6.325***	0.008***	-0.271***	-0.203***	0.099	-0.147	-0.380**	-0.141***	0.019
1989	6.300***	0.008***	-0.199***	-0.251***	0.137**	-0.091	-0.053	-0.120***	0.018
1990	6.300***	0.008***	-0.199***	-0.352***	0.123*	-0.121	-0.239*	-0.089***	0.030
1991	6.467***	0.006***	-0.139***	-0.153***	0.282***	-0.048	-0.155	-0.060***	0.021
1992	6.309***	0.008***	-0.207***	-0.210***	0.118**	-0.168**	-0.249**	-0.123***	0.029
1993	6.121***	0.009***	-0.277***	-0.294***	0.194***	0.074	-0.175	-0.138***	0.033
1994	6.180***	0.007***	-0.264***	-0.275***	0.032	-0.080	-0.160	-0.081***	0.025
1995	6.151***	0.007***	.0.356***	-0.405***	-0.012	-0.088	-0.640***	-0.078***	0.034
1996	6.203***	0.007***	-0.377***	-0.366***	-0.029	-0.062	-0.284**	-0.085***	0.032
1997	5.748***	0.009***	-0.452***	-0.416***	-0.045	0.024	-0.129	-0.078***	0.044
1998	5.927***	0.009***	-0.355***	-0.336***	-0.087	0.018	-0.330***	-0.076***	0.042
1999	6.130***	0.008***	-0.387***	-0.481***	-0.074	-0.151**	-0.502***	-0.094***	0.040
2000	6.286***	0.007***	-0.273***	-0.264***	-0.021	-0.011	-0.469***	-0.115***	0.035
2001	6.372***	0.007***	-0.277***	-0.246***	-0.011	0.049	-0.499***	-0.097***	0.031
2002	6.141***	0.007***	-0.242***	-0.196***	-0.005	-0.015	-0.286***	-0.067***	0.052
2003	6.054***	0.007***	-0.334***	-0.257***	0.029	0.001	-0.213**	-0.081***	0.052
2004	5.806***	0.007***	-0.321***	-0.240***	0.012	0.044	-0.167*	-0.095***	0.053
2005	5.977***	0.008***	-0.374***	-0.361***	0.013	-0.047	-0.184**	-0.157***	0.066
2006	5.961***	0.007***	-0.411***	-0.424***	-0.020	-0.010	-0.153*	-0.092***	0.065
2007	6.208***	0.007***	-0.459***	-0.581***	-0.149***	-0.190***	-0.416***	-0.112***	0.065
2008	6.165***	0.006***	-0.356***	-0.421***	-0.027	-0.039	-0.411***	-0.071***	0.053
2009	6.270***	0.006***	-0.434***	-0.441***	-0.018	-0.021	-0.112	-0.067***	0.045
2010	6.308***	0.006***	-0.415***	-0.495***	-0.034	-0.056	-0.223***	-0.072***	0.053

+: age in 1984 SOEP: cohort 1: 15-24 years, cohort 2: 25-34 years, cohort 3: 35-44 years, cohort 4: 45-54 years, cohort 5: 55-64 years; age in 2010 SOEP: cohort 1: 41-50 years, cohort 2: 51-60 years, cohort 3: 61-70 years, cohort 4: 71-80 years, cohort 5: 81-90 years

R^2_{adj} = adjusted determination coefficient, *: significant at the significance level of 90 per cent, **: significant at the significance level of 95 per cent, ***: significant at the significance level of 99 per cent

Source: Present author's own estimations

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