A behaviouristic approach for measuring poverty: the decomposition approach - empirical illustrations for Germany 1995-2009

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A Behaviouristic Approach for Measuring Poverty: The Decomposition Approach – Empirical Illustrations for Germany 1995-2009

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Zusammenfassung*

In diesem Arbeitspapier wird ein alternativer Ansatz der Armutsmessung diskutiert: der so genannte Zerlegungsansatz (siehe auch FaMa-Diskussionspapier Nr. 2/2009). Diese Methode differenziert zwischen verschiedenen sozialen Gruppen in dem Sinne, dass für jede Gruppe eine separate Armutsgrenze bestimmt wird. Beispielsweise könnte die Haushaltsgröße ein Kriterium für eine solche Differenzierung sein. Auf diese Art und Weise kann das Problem der traditionellen Armutsmessung, die Bezugnahme auf einkommensunabhängige Äquivalenzskalen, prinzipiell vermieden werden. Des Weiteren existiert ein weiteres Problem der traditionellen Methode nicht grundsätzlich im Rahmen des Zerlegungsansatzes, nämlich die Bildung einer (allgemeinen) Armutsgrenze als mehr oder weniger willkürlicher Anteil am gesellschaftlichen Wohlstandsmittelwert.

Eigene Berechnungen des Autors offenbaren höhere Armutsniveaus bei diesem Ansatz im Vergleich zur konventionellen Methode der Messung von (Einkommens-)Armut. Da es realistisch erscheint, dass einige Personen ihre Armutsbemessungen in Form einer „Mischung" aus ihren eigenen gruppenbezogenen und den allgemeinen Wohlstandswerten durchführen, können – auf einem plausiblen Niveau der unterstellten Haushaltsgrößenersparnisse (d. h.: Buhmann et al.s $\theta > 0{,}65$) – die Armutsniveaus des Zerlegungsansatzes als obere Grenzen für die „wahren" Armutswerte und, umgekehrt, die Armutsniveaus des konventionellen Ansatzes als untere Grenzen für diese „wahren" Armutswerte interpretiert werden.

Summary*

In this paper an alternative approach with regard to poverty measurement is discussed: the so-called decomposition approach (see also FaMa discussion paper no. 2/23009). This method differentiates between various social groups in the sense that for each group a separate poverty line is determined. E. g., household size might be a criterion for such a social differentiation. By doing this, the problem of traditional poverty measurement to refer to income-independent equivalence scales is principally avoided. Moreover, the further problem of the traditional method, namely to determine a (general) poverty line as a more or less arbitrary fraction of society's mean welfare level, does not exist, on principle, in the decomposition approach.

Present author's own calculations reveal higher poverty levels indicated by this approach compared with the conventional method of measuring (income) poverty. Since it appears to be realistic that some people perform their poverty assessments through a "mixture" of their own group's and overall welfare levels, at a plausible degree of economies of scale (i. e., Buhmann et al.'s $\theta > 0.65$) the poverty levels of the decomposition approach can be interpreted as upper limits for the "true" level of poverty, and, conversely, the degree of poverty ascertained by the conventional approach can be seen as a lower limit for "true" poverty.

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Content

1. Introduction[1]

The paper deals with an alternative approach for measuring poverty: the decomposition approach. This approach is directly linked to behavioural economics since the fixed poverty lines follow socio-psychological theories like Festinger's theory of social comparisons.

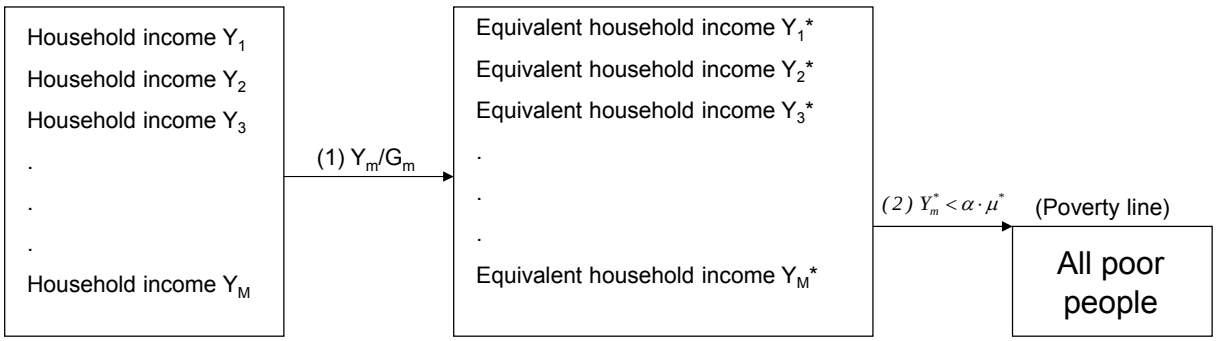
In the centre of the analyses, there will be the determination of the poverty line. Conventionally, this line is fixed by multiplying the entire mean or median (equivalent) income by a factor in the amount of 40, 50, or 60 percent. In this perspective, poverty is directly connected with the personal income distribution, and inevitably it reflects relative poverty.[2] Contrary to this procedure, it is a main purpose of this paper to principally illustrate how poverty lines and in consequence how poverty can be determined without such a (strong) direct link to income inequality.

The paper is organized as follows. In Chapter 2 the conventional method of poverty measurement is presented (as a reference for the subsequent arguments). The so-called decomposition approach is discussed in Chapter 3 as an alternative approach of poverty measurement. On this basis, Chapter 4 contains my empirical poverty findings for Germany 1995-2009 generated by the decomposition approach. Finally, several conclusions are the topic of Chapter 5.

2. Conventional poverty measurement

The common practice in the field of (income) poverty measurement is a division of all incomes by values of an *identical* equivalence scale. In this way one yields equivalent incomes. Subsequently, the mean or median of equivalent household incomes – typically weighted by household size – is used to create the poverty line in terms of a fraction of this mean or median (equivalent) income. A household or a person is called poor if the corresponding equivalent income is lower than the income value assigned to the poverty line (see Figure 1).

Figure 1: Common practice of poverty measurement



Y_m: household income, G_m: equivalence scale value, Y_m*: equivalent household income, μ*: mean equivalent household income, $\alpha \cdot \mu^*$: relative poverty line ($0 < \alpha \leq 1$), m = unit of analysis (m = 1, 2, …, M)

Source: Faik 2011, p. 295

[1] The data of this paper rest on the German Socio-Economic Panel (GSOEP) of the German Institute for Economic Research (DIW Berlin). In this context the author would like to especially thank Professor Joachim Merz, University of Lueneburg, for granting access to this database.

[2] See e. g. Krämer 2000, pp. 26-33, or Faik 2005, p. 542.

Concerning the variation of equivalence scales two opposing effects upon poverty exist: On the one hand and ceteris paribus, it is clear that higher values on the equivalence scale decrease equivalent incomes so that the individual probability to come under the poverty line increases. On the other hand, a diminishment of equivalent incomes leads to a dropping mean equivalent income and thus to a declining poverty line. It cannot be stated theoretically, which of these two effects is more important; answering this question, requires empirical evidence.[3]

In order to undertake such an empirical analysis, Buhmann et al.'s very prominent general equivalence scale formula, that only depends on household size

(1) $G_h = S^{\theta} \quad (0 \le \theta \le 1)$,

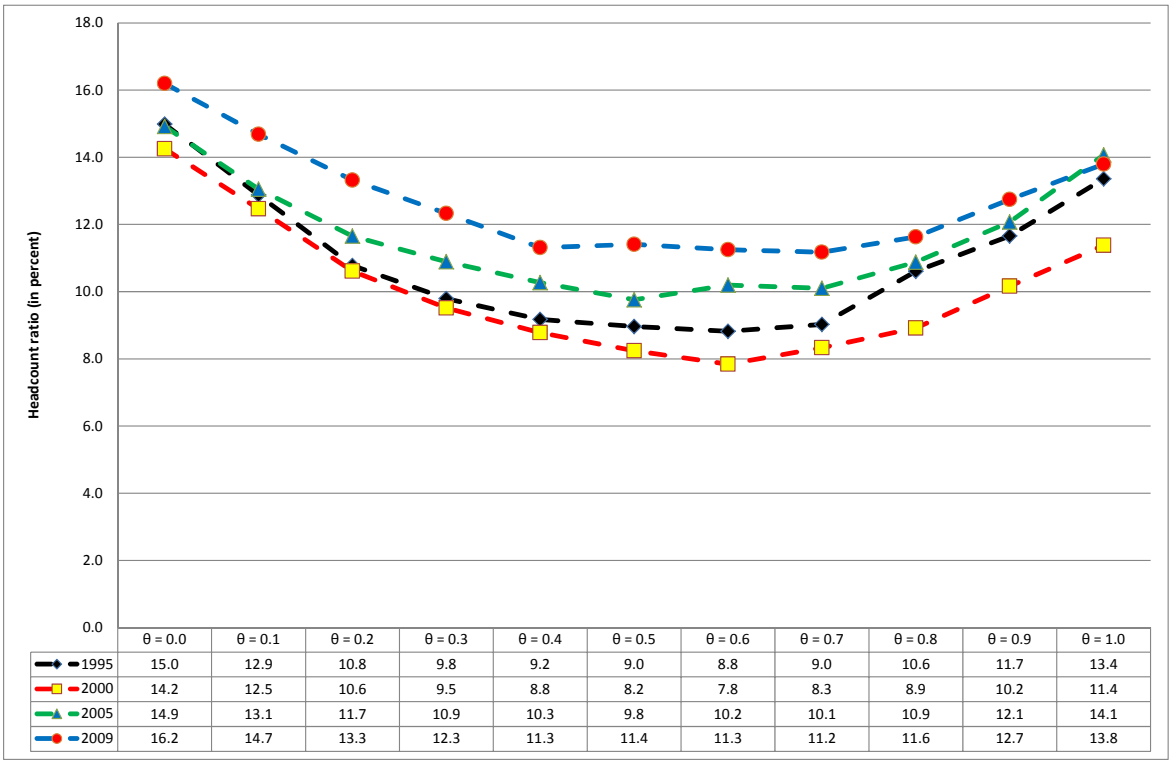
can be used [with: G_h: equivalence scale of household type h (with respect to the reference household type, in this case a single-person household[4]), S: household size, θ: elasticity of the equivalence scale with regard to household size and therefore the degree of economies of scale].[5] In a sensitivity analysis one can start with the assumption of greatest economies of scale ($\theta = 0.0$) and thus with equivalence scale values in the amount of 1.0 for all household types. Subsequently, the degree of economies of scale is reduced in increments. This corresponds with higher equivalence scale values for larger households and means a levelling concerning the equivalent household incomes.

In empirical analyses typically a U-shaped curve across a broad range of equivalence scale values results (see Figure 2 for headcount ratios). When assessing income poverty in this way, the correlation between household size and household income is important. Typically, the correlation between these two variables is positive. For instance, in 2009 (GSOEP[6]) and for Germany as a whole, a Pearson's correlation coefficient in the amount of +0.393 resulted.[7]

Against this background, the poverty area is initially – i. e. at low θ-values – dominated (or at least populated to a high degree) by households of small size, e. g. single-person households. At the following θ-values, equivalence scale values and in consequence equivalent incomes of single-person households remain unchanged, whereas at first multi-person households' equivalent incomes decline weaker than the overall poverty line (which reduces poverty); later on, the decreases of households' equivalent incomes are, however, stronger than the diminishments of the overall poverty line (which impacts on poverty in the direction of a rise and which results from increasing poverty of multi-person households). These opposing effects on measured poverty, ultimately, lead to the U-shapes of the headcount ratios presented in Figure 2.

[3] See Coulter, Cowell, and Jenkins 1992, pp. 1075-1076.
[4] For the dependency of equivalence scales on the chosen reference household type see Ebert and Moyes 2003.
[5] See Buhmann et al. 1988, p. 119.
[6] GSOEP: German Socio-Economic Panel (see in this context Section 4.1).
[7] Author's own calculations.

Figure 2: Headcount ratios for Germany 1995, 2000, 2005, and 2009 (GSOEP)
at different levels of θ (Buhmann et al. formula,
equivalent household net incomes, constant equivalence scale values
across the entire spectrum of incomes, poverty line at half of the mean equivalent
household net income)



	θ = 0.0	θ = 0.1	θ = 0.2	θ = 0.3	θ = 0.4	θ = 0.5	θ = 0.6	θ = 0.7	θ = 0.8	θ = 0.9	θ = 1.0
1995	15.0	12.9	10.8	9.8	9.2	9.0	8.8	9.0	10.6	11.7	13.4
2000	14.2	12.5	10.6	9.5	8.8	8.2	7.8	8.3	8.9	10.2	11.4
2005	14.9	13.1	11.7	10.9	10.3	9.8	10.2	10.1	10.9	12.1	14.1
2009	16.2	14.7	13.3	12.3	11.3	11.4	11.3	11.2	11.6	12.7	13.8

Source: Author's own calculations

3. An alternative approach for measuring poverty: The decomposition approach

In my eyes, the conventional approach of poverty measurement suffers from two essential deficiencies: Firstly, the usage of an *identical* equivalence scale across the entire income distribution is problematic, and secondly, the (continuous) orientation of individual welfare levels upon *overall* (mean) well-being should be criticized.

3.1 Orientation on group-specific poverty lines

With respect to the latter aspect one fundamental criticism on the conventional proceeding is that an individual is not a homo oeconomicus. Especially, this means that people do not have a complete overview about society's entire income situation. Since such welfare comparisons refer to *household* incomes and since households are (very) different from each other with respect to size and composition, it seems like a Herculean task for each individual to consider all these aspects in the context of his/her well-being rankings.

Rather, it appears much easier for individuals to compare themselves with household types which are similar to their own type ("keeping up with the Joneses"). This implies a kind of bounded rationality.[8] As a consequence, my proceeding is based on an orientation of welfare levels only on the behaviour of one's *own* group of households;[9] it is based on socio-

[8] Concerning this issue see e. g. Simon 1957 or Leibenstein 1976.
[9] With respect to the issue of reference groups in distributional analyses see, basically, e. g. Amiel and Cowell 1999, pp. 2-6.

psychological approaches like Festinger's theory of social comparisons which exactly suggest that people compare themselves with similar people.[10] A number of empirical findings point towards this direction.[11] This so-called decomposition approach is also in congruence with subjective methods of assessing poverty lines where respondents are asked for their evaluations of different well-being situations for *themselves* as "very good", "good", "satisfying", "bad", etc.[12]

In my eyes, the decomposition approach emphasizes what people feel about their own well-being, and insofar it reflects a kind of subjective poverty – at least more than the conventional approach does since people confront their own material situation with other people's material situation which is – in a practical sense – relevant for them. It is like a sprinter who compares his/her achievements rather with another sprinter than with a long-distance runner. Opposed to the conventional approach, which in my eyes assumes a rather fictional reference situation for many members of society, the decomposition approach seems to be more relevant for social policy. This is because (a kind of) "subjective poverty" seems more important for societal processes – especially in case of a crucial number of unsatisfied society's members – than "fictional objective poverty".

However, a more or less large number of persons probably orientate their own well-being on a mixed benchmark consisting of their own group's and other groups' achievements where the other groups are structured not very different from their own group (e. g. with respect to household size). Moreover, if – exemplarily for household size – small households have higher (unadjusted) incomes than larger households, a ranking in favour of small households is ambiguously possible.

Van Praag cuts right to the chase of the matter: *"The reference effect depends on how frequently individuals compare with others and on the degree of social transparency in society."*[13] Hence, answering the question about the correct benchmark or peer group(s) satisfyingly, requires much more empirical research in this (socio-psychological) field than was done up to now.[14]

3.2 Variable equivalence scales

Furthermore and typically, poverty studies refer to (reference) income-independent, constant equivalence scale values which are applied to the entire income distribution, although there are good reasons for basing distributional analyses on variable equivalence scales which means different equivalence scale values for the various income areas. It might be argued, for example, that in the higher income ranges the reference consumption levels (e. g. concerning accommodation costs) would be fairly high so that a new household member's appearance (e. g. the "adding" of a child) would increase the corresponding costs only marginally, and this would culminate in low *relative* costs, that is flat equivalence scales for larger households in the upper income range compared with the lower incomes. Another reason for variable scales might be that prices of commodities can differ across income groups such that members of the upper income classes obtain price advantages.[15] Another argument in favour of variable equivalence scales is that credit constraints for households in the bottom income range can shift the consumption bundles of these households towards lower expenditure shares of durables which are connected with relatively high economies of scale.[16] All in all, there are good reasons for higher scale values in the bottom income area than in the upper income areas.

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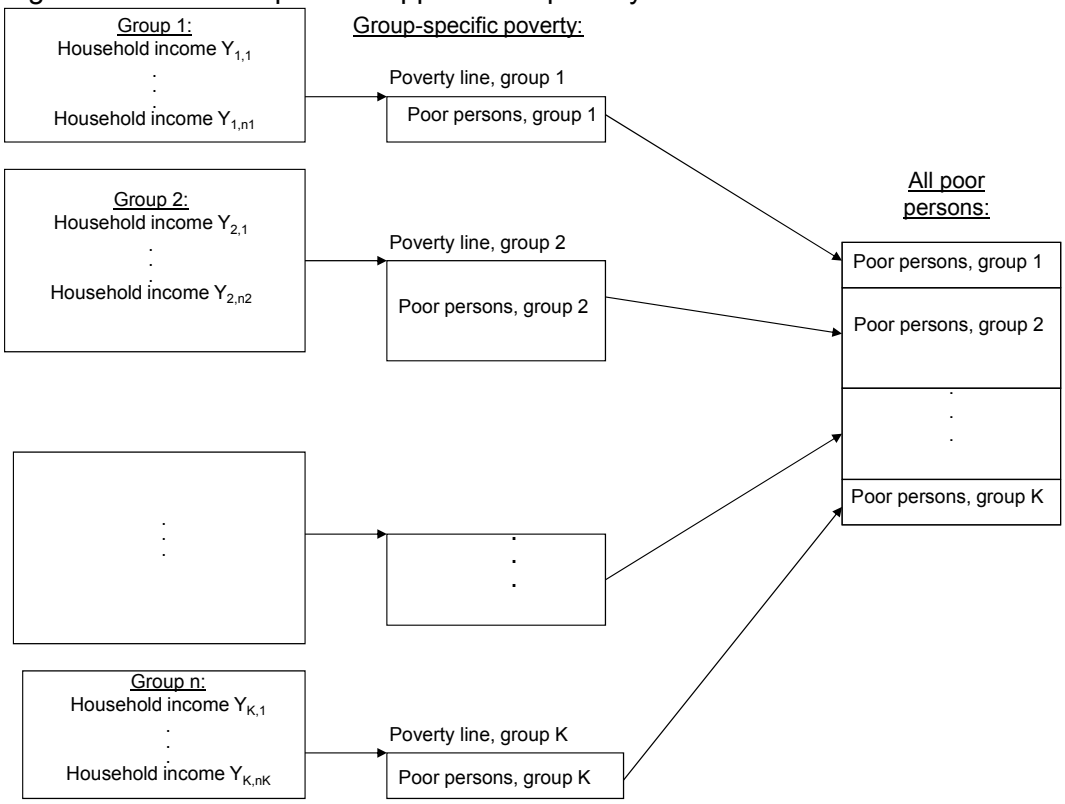
[10] See Festinger 1954.
[11] See e. g. Clark and Oswald 1996, or Frey and Stutzer 2002, pp. 88-90.
[12] For an overview see e. g. Amiel 1998, Chapter 4.
[13] Van Praag 2011, p. 111.
[14] For some instructive hints see e. g. Herrera, Razafindrakoto, and Roubaud 2006, Castilla 2010, or Van Praag 2011.
[15] See Schröder 2004, p. 42.
[16] See Koulovatianos, Schröder, and Schmidt 2005, p. 969.

In the latter sense I principally divide the whole income range at least into two areas, the bottom and the upper income area. According to my regression results on the basis of the Functionalized Extended Linear Expenditure System (FELES) in Faik (2011), there seems to be an empirically based low-income limit at 70 percent of single-person households' mean net incomes. Alternatively, in the following the poverty line will be fixed at 50 percent of single-person households' mean net incomes; this approximately corresponds to the level of social-assistance payments to single-person households in Germany.[17] For multi-person households,[18] the low-income limits are computed on the basis of the (approximate) old OECD scale, i. e.: on the basis of θ = 0.8 (in the Buhmann et al. formula) since this approximation also corresponds to German regulations on social assistance fairly well (in this case for multi-person households).[19]

Figure 3 illustrates the analytical framework of the decomposition approach. It becomes evident that for each group of persons separate poverty lines are relevant. Persons, whose (unadjusted) incomes are below their group-specific poverty lines, are counted as poor persons. Thus, within each of the K groups a group-specific level of poverty is calculated. In a next step, these group-specific poverty levels are summed up to the overall amount of poverty.[20]

Figure 3: The decomposition approach of poverty measurement



Please note: In each of the K groups there are n_k units of analysis (k = 1, 2, …, K); Y: household income.

Source: Faik 2011, p. 300

[17] The percentage value stated above (50 %) is based on calculations of Becker and Hauser 2009, p. 223.

[18] The calculations of the paper are restricted to single- to six-person households since the number of cases for household sizes with seven and more persons is too low for statistical reasons, as can be seen by Table A.1 in the Appendix.

[19] With respect to this issue see Faik 1997.

[20] For illustrative purposes, in Figure 3 exclusively *cases* are depicted (by the way, the same was valid concerning Figure 1). On principle, it is also possible to refer e. g. to the income levels of poor persons by considering the incomes of poor persons within the several groups in order to consider other aspects of poverty like the so-called poverty gap.

It can be shown quite easily that popular poverty indices like

(2a) the headcount ratio: $H = \frac{p}{n}$,

(2b) the poverty gap ratio: $I = \frac{Z - \mu_p}{Z} = 1 - \frac{\mu_p}{Z}$, and

(2c) Foster, Greer, and Thorbecke's (FGT) indicator: $P_{FGT}(\beta) = \frac{1}{n} \cdot \sum_{o=1}^{p} \left[\frac{(Z - Y_o)}{Z} \right]^{ß}$, ß > 0, [21]

can be decomposed into K group-specific values what is a prerequisite for applying the decomposition approach [p: number of poor people, n: population's number, Z: poverty line, μ_p: poor persons' mean income, Y_o: poor person's income, ß: sensitivity parameter in the sense of poverty aversion]. This shows the far-reaching range of application the decomposition approach has.

Moreover, it can be demonstrated that both the decomposition and the conventional approach yield the same poverty results solely if the equivalence scale of the bottom income area within the context of the decomposition approach equals the overall equivalence scale assumed in the conventional approach and if the fractions of mean group-specific households' incomes in the decomposition approach are the same as the fraction of overall mean equivalent household income in the conventional approach. Otherwise, the poverty results of both approaches differ from each other.[22]

4. Empirical poverty findings for Germany 1995-2009 on the basis of the decomposition approach

4.1 The database

The database used in this paper is from the German Socio-Economic Panel (GSOEP) for the years 1995 to 2009; the most recent GSOEP – conducted in 2010 – is not yet available for scientific purposes. The GSOEP is collected since 1984 in yearly intervals. It comprises roughly between 5,000 and 10,000 households and currently more than 30,000 persons. The participants of the surveys give detailed information on their incomes, household composition, earnings' and family's biographies, health, life-satisfaction, etc.[23]

In order to capture population's dynamics adequately, a lot of subsamples have been drawn over time. As a consequence, the GSOEP consists of the following eight samples:

- *Sample A:* German households in the Federal Republic of Germany since 1984,
- *Sample B:* households of foreigners in the Federal Republic of Germany since 1984,
- *Sample C:* private households in eastern Germany (German Democratic Republic) since 1990,
- *Sample D:* households of immigrants in Germany since 1994/1995,
- *Sample E:* complementary sample of households in Germany since 1998,
- *Sample F:* complementary sample of households in Germany since 2000,
- *Sample G:* sample of high-income receivers (households) in Germany since 2002, and
- *Sample H:* complementary sample of households in Germany since 2006.

[21] For a more intensive consideration of these indicators see e. g. Faik 1995, pp. 317-321.
[22] See Faik 2011, pp. 301-308.
[23] See Frick and Krell 2009, p. 11.

The GSOEP contains income information in two central variables: Monthly household income of the current year and yearly household income of the previous year. For the latter variable, the query is retrospective. With regard to the monthly income the respondents are interviewed during one month; since 1995 these interviews contain the most important income elements (like earnings, capital gains, transfers, etc.).

Until 1995 there was only a global query concerning monthly household net income. Because of this – and because of the fairly overcoming of great economic distortions in eastern Germany in the mid-1990s, approximately five years after German (re-)unification – the analysis of this paper starts with the year 1995. In contrast to the yearly income of the previous year, the monthly income of the current year does not comprise imputed rents.[24]

Nevertheless, I decided to primarily use the monthly, current household net income in my analyses below instead of the yearly, retrospective household net income. The main reason for this decision was that the corresponding current income levels are "fresh" in memories of interviewees so that the information on monthly income appears more precise than that on yearly, retrospective income.

4.2 Results

4.2.1 Comparisons with conventional poverty measurement

Figure 4 shows higher headcount ratios in the framework of the decomposition approach compared to the conventional approach. The corresponding differences are between about five and approximately eight percentage points. The pattern of headcount ratios over time is nearly the same in both cases: At first, poverty decreased by tendency until the millennium. Thereafter, in the centre of the first decade of the 21st century, poverty increased, before – since 2006 – again a tendency towards diminishing poverty has occurred. This latter tendency was much more pronounced by the decomposition than by the conventional approach.

It must be mentioned that the remarkable increase in poverty between 2001 and 2002 might result from a sampling effect – at least partly. As was mentioned above (in Section 4.1), in 2002 the GSOEP was filled up with high-income receivers which caused mean income's increases and thereby jumps in poverty lines.

[24] See Goebel et al. 2008, pp. 86-101.

Figure 4: Headcount ratios in Germany 1995-2009 GSOEP based on the decomposition and on the conventional approach (Buhmann et al. scale with θ = 0.8, poverty lines: 50 percent of mean (equivalent or single-person households') net income)

Source: Author's own calculations

As Table 1 illustrates (exemplarily for 2009 GSOEP), the differences between the decomposition and the conventional approach are the consequence of different (explicit or implicit) poverty lines within the various household types. Not all of the fractions of group-specific means are located at an identical level of 50 percent (especially from three-person households on); thus, one prerequisite for the identity between both approaches is violated.

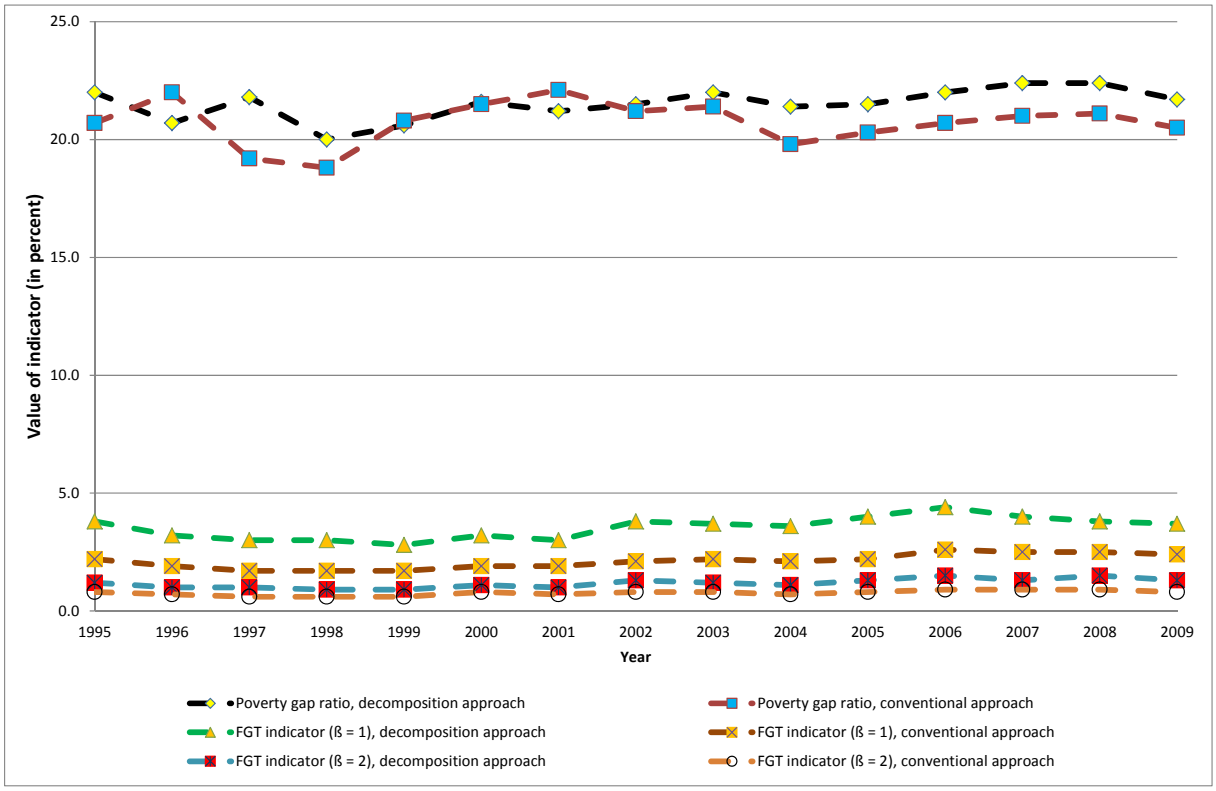
Table 1: Ideal-typical comparison of poverty lines in the decomposition and in the conventional approach 2009 GSOEP (in Euro per month)

Household size	Poverty lines of the decomposition approach (single-person households' mean net income * household size$^{0.8}$)	Implicit poverty lines of the conventional approach (i. e.: fraction of 50 percent of group-specific means of household net income)	Poverty lines of the decomposition approach in relation to group-specific means of household net income
1 person	758	758	0.500
2 persons	1,320	1,316	0.502
3 persons	1,826	1,498	0.609
4 persons	2,298	1,780	0.646
5 persons	2,747	1,773	0.775
6 persons	3,179	1,696	0.937

Source: Author's own calculations

Due to the indicator poverty gap ratio, the measured poverty was also higher – with three exceptions (1996, 1999, 2001) – within the context of the decomposition approach than within the framework of the conventional approach (see Figure 5). However, these differences were not very large. Continuously positive differences between decomposition and conventional approach became also evident in case of FGT indicators (ß = 1 and ß = 2). This is not very surprising since (in every year) both FGT indicators are based – at least widely – on the arithmetic product of headcount ratio and poverty gap ratio.

Figure 5: Poverty levels in Germany 1995-2009 GSOEP measured by different indicators: decomposition versus conventional approach (household net income, Buhmann et al. scale with θ = 0.8, fraction of 50 percent of mean (equivalent or single-person households') net income)



Source: Author's own calculations

4.2.2 Different settings of reference poverty lines

Figure 6 presents, according to the indicator headcount ratio, two alternative time series based on different settings of reference poverty lines. In the first variant the reference "poverty" line – perhaps a better expression is: reference low-income limit – was set to 0.7 times single-person households' mean net income, in the second variant the fraction was 0.5. In both variants the Buhmann et al. scale was again parameterized at θ = 0.8 for the bottom income area.

As can be seen, in case of the higher fraction the "poverty" level (better: the relative number of low-income receivers) was about 40-45 percent, in the other case it amounted to 15-20 percent. Thus and despite the weak tendencies stated in Section 4.2.1, over time there was no substantial fluctuation of income poverty (or: with respect to low-income receivers) in both variants for Germany 1995-2009.

Figure 6: Different (reference) poverty lines and their effects on headcount ratios in Germany 1995-2009 GSOEP based on the decomposition approach (Buhmann et al. scale, θ = 0.8)

Source: Author's own calculations

4.2.3 Different poverty lines for multi-person households

In order to check the sensitivity of German poverty intensively, the poverty lines for multi-person households are varied due to the Buhmann et al. scale parameter θ which has been presented above in Equation (1). That is that the parameter θ is altered from 0.0 to 1.0.

The reference poverty line is calculated as half of single-person households' mean net income. As a consequence, the group-specific poverty values concerning all used poverty indicators are the same for single-person households at all θ-values; contrary to this, the population's shares within the group of poor persons are changing for single-person households in the sense that they decrease with increasing θ–values.[25]

Since – in opposite to single-person households – the level of group-specific poverty lines of multi-person households correlates positively with θ, an increasing number of persons living in multi-person households are counted as poor if θ rises. Hence, the headcount ratio increases with rising θ-values. This can be seen in Figure 7 which corresponds, exemplarily, to 2009 GSOEP; contrary to the conventional approach (see Figure 2), no U-shaped function occurred across the θ-values. Up to θ ≈ 0.65 the headcount ratios of the conventional approach were higher than in the decomposition approach (in Germany 2009); afterwards the opposite was observed.[26]

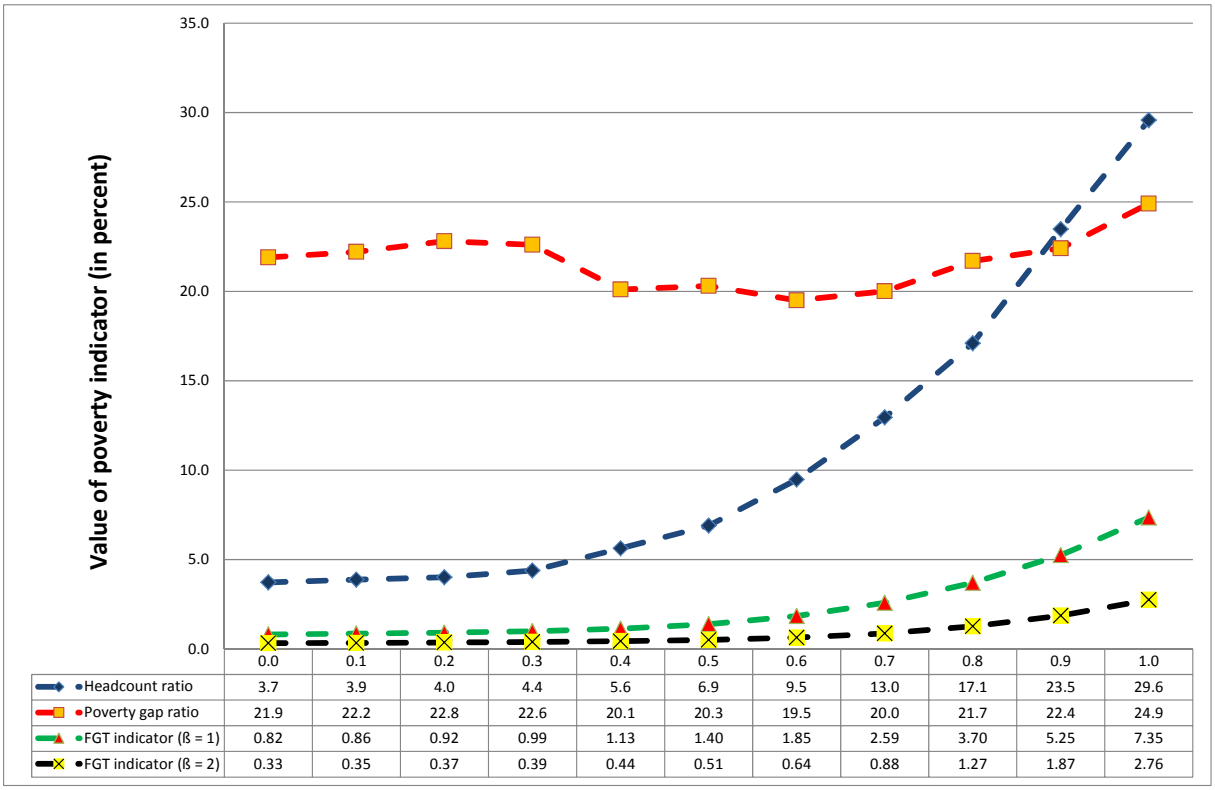
[25] With respect to these aspects see the following Figures 8a and 8b.

[26] When comparing both approaches in this way, the different reference poverty lines matter. While in 2009 the reference poverty line of the decomposition approach is constant at 758 Euro per month across the range of θ-values, the (reference) poverty lines of the conventional approach decrease from 1,361 Euro per month at θ = 0.0 to 582 Euro per month at θ = 1.0. The ranking concerning the poverty lines of both approaches switches indeed at θ ≈ 0.65.

Figure 7 also illustrates that the values of the poverty gap ratio oscillate (weak) around the line of about 22 percent.

Because of the increasing headcount ratios the FGT indicators – essentially the arithmetic product of headcount ratio and poverty gap ratio, as was already mentioned above – also increase across the spectrum of θ-values.

Figure 7: Different poverty lines for multi-person households and their effects on several poverty indicators in Germany 2009 GSOEP based on the decomposition approach (Buhmann et al. scale, θ = 0.0, 0.1, …, 1.0)

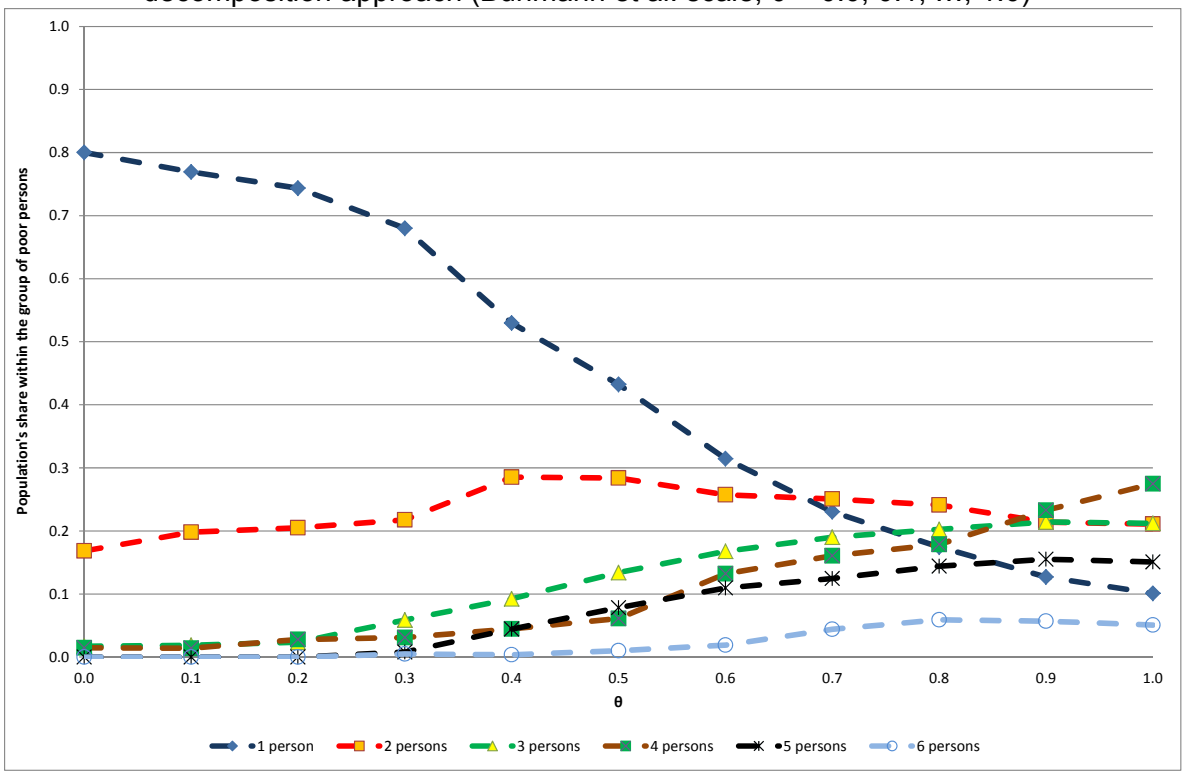


	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Headcount ratio	3.7	3.9	4.0	4.4	5.6	6.9	9.5	13.0	17.1	23.5	29.6
Poverty gap ratio	21.9	22.2	22.8	22.6	20.1	20.3	19.5	20.0	21.7	22.4	24.9
FGT indicator (ß = 1)	0.82	0.86	0.92	0.99	1.13	1.40	1.85	2.59	3.70	5.25	7.35
FGT indicator (ß = 2)	0.33	0.35	0.37	0.39	0.44	0.51	0.64	0.88	1.27	1.87	2.76

Source: Author's own calculations

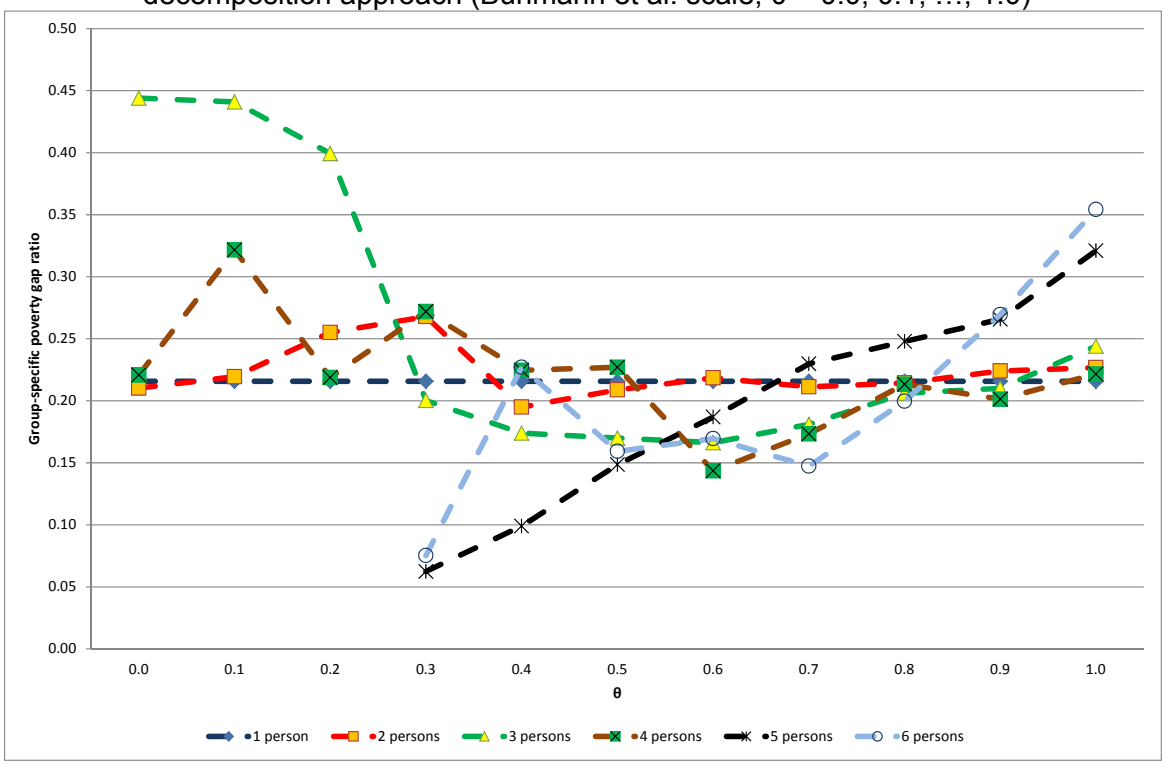
Since the overall poverty gap ratio is the (weighted) mean of the arithmetic product of group-specific population's shares within the poor and group-specific poverty gap ratios, the development of these two elements determines the pattern of the overall poverty gap ratio like the one presented in Figure 7. The development of the two mentioned elements is shown in Figures 8a and 8b.

Figure 8a: Population's structure of poor persons due to different poverty lines for multi-person households in Germany 2009 GSOEP based on the decomposition approach (Buhmann et al. scale, θ = 0.0, 0.1, …, 1.0)



Source: Author's own calculations

Figure 8b: Group-specific poverty gap ratios due to different poverty lines for multi-person households in Germany 2009 GSOEP based on the decomposition approach (Buhmann et al. scale, θ = 0.0, 0.1, …, 1.0)



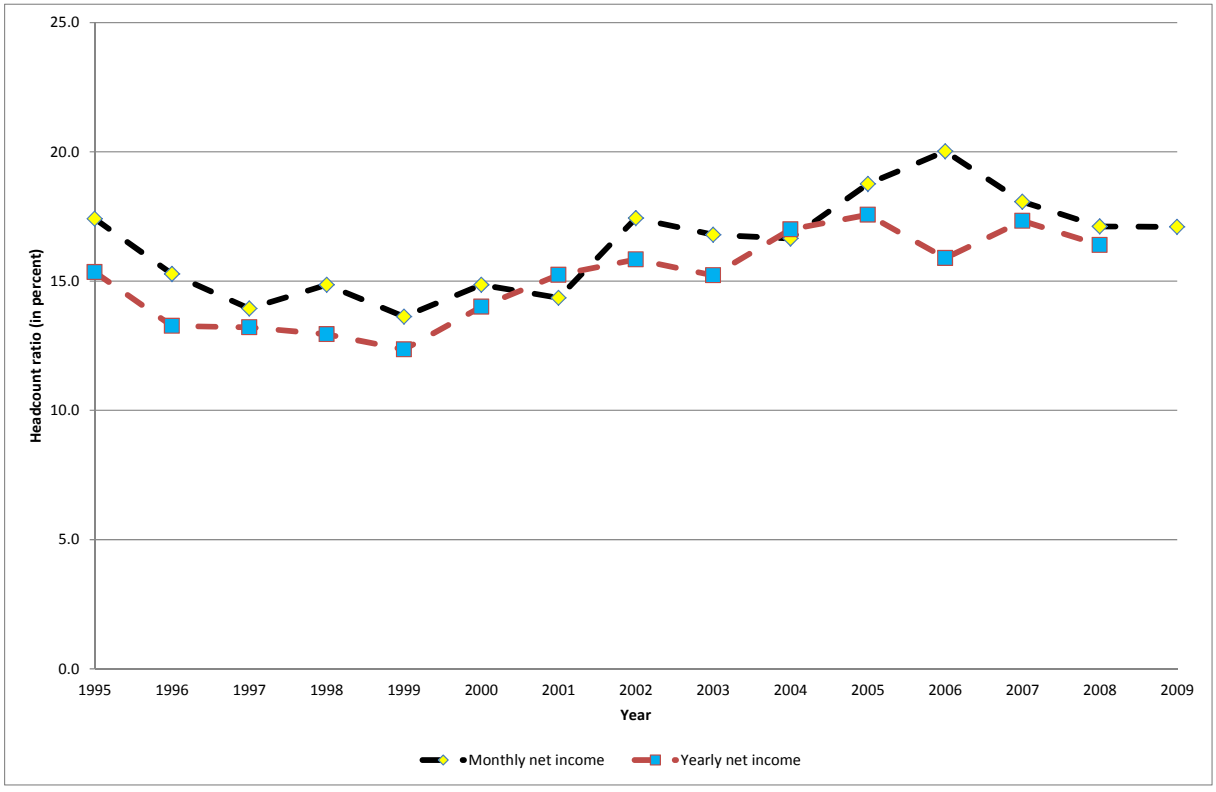
Source: Author's own calculations

4.2.4 Comparison of monthly versus yearly income

According to Figure 9 and in a qualitative sense, with two exceptions (2001 and 2004), the "poverty curve" for monthly net income was above the corresponding curve for yearly, retrospective net income. In those years, but also in all other years, the differences between the headcount ratios of both income concepts were not very substantial; the maximum difference amounted to 4.1 percentage points in 2006. The largest difference nearest to this maximum was 2.1 percentage points in 1995 which indicates a relatively narrow range of values for the mentioned differences.

Furthermore, both "poverty curves" proceed nearly parallel to each other (at least when smoothing both curves). Thus, in the context of poverty, methodical differences between both income concepts seem to play no important role. This holds for the aspect that imputed rents or special payments like Christmas bonuses are not included in the definition of monthly household net incomes in contrast to yearly household net incomes (as was already mentioned in Section 4.1). Another methodical difference which seems to be not very important in the poverty context is the embedding of socio-demographic characteristics: In the case with monthly incomes socio-demographic characteristics belong to the same period of time as the variable "income", whereas in the other case both variables differ from each other by one year regarding chronological reference.

Figure 9: Different income definitions and their consequences for poverty in Germany 1995-2009 GSOEP on the basis of headcount ratios and of the decomposition approach (Buhmann et al. scale, θ = 0.8, fraction of mean single-person households' income = 0.5)



Source: Author's own calculations

4.2.5 Socio-demographic investigations of German income poverty

One "natural" application of the decomposition approach is analysing the structure of poverty. In this sense, Table 2 reveals structural findings for German poverty in 2009.[27] Hereby, the structure of the German poverty (low-income) area is related to the overall socio-demographic structure so that deviations indicate overrepresentations or underrepresentations of social groups within the poverty (low-income) area. An overrepresentation occurs if the algebraic signs in columns (3) and (5) in Table 2 are positive; the opposite is valid in the case of negative signs.

Obviously, out of the selected characteristics the following groups can be named as "vulnerable": Persons living in eastern Germany, female persons, foreigners, young people (until 29 years), unemployed persons, non-qualified people, persons with the family statuses "single" and "divorced", and persons living in larger households.

Table 2: Socio-demographic structure of the entire spectrum of incomes and of low-income areas in Germany 2009 (GSOEP) based on the decomposition approach; population's shares (in percent; differences in percentage points)

Variable	(1) Overall	(2) Low-income area (50 % of single-person households' mean net income)	(3) Difference between (2) and (1)	(4) Low-income area (70 % of single-person households' mean net income)	(5) Difference between (4) and (1)
Residential area:					
Western Germany	81.5	75.0	-6.5	78.2	-3.3
Eastern Germany	18.5	25.0	+6.5	21.8	+3.3
Sex:					
Male	49.2	46.5	-2.7	47.0	-2.2
Female	50.8	53.5	+2.7	53.0	+2.2
Nationality:					
German	91.1	82.8	-8.3	85.3	-5.8
Foreigner	8.9	17.2	+8.3	14.7	+5.8
Age:					
Until 9 years	7.8	13.7	+5.9	12.2	+4.4
10-19 years	9.7	15.8	+6.2	13.8	+4.2
20-29 years	12.2	17.3	+5.1	13.5	+1.2
30-39 years	12.4	11.2	-1.2	12.2	-0.2
40-49 years	16.7	14.3	-2.4	15.2	-1.5
50-59 years	14.0	11.2	-2.8	10.9	-3.1
60-69 years	12.5	7.6	-4.9	10.1	-2.4
70-79 years	10.0	5.9	-4.0	8.3	-1.7
80 years and older	4.6	2.9	-1.7	3.8	-0.9
Household size:					
1 person	20.5	17.4	-3.1	16.3	-4.2
2 persons	33.6	24.1	-9.5	25.4	-8.2
3 persons	18.6	20.3	+1.7	21.2	+2.6
4 persons	18.8	17.9	-0.9	22.4	+3.6
5 persons	6.9	14.4	+7.5	11.2	+4.3
6 persons	1.7	5.9	+4.2	3.6	+1.9

[27] See in this context also Bönke and Schröder 2011.

(Table 2 continued:)

Variable	(1) Overall	(2) Low-income area (50 % of single-person households' mean net income)	(3) Difference between (2) and (1)	(4) Low-income area (70 % of single-person households' mean net income)	(5) Difference between (4) and (1)
Family status:[1)]					
Married	53.3	45.7	-7.6	53.6	+0.3
Single	28.5	34.3	+5.8	28.8	+0.3
Divorced	9.9	14.8	+4.9	10.9	+1.0
Widowed	8.3	5.2	-3.1	6.7	-1.6
Other characteristics:					
Unemployed[2)]	5.1	18.7	+13.6	10.4	+5.3
Non-qualified[3)]	2.0	4.7	+2.7	3.6	+1.6
Very qualified[4)]	15.3	5.0	-10.3	6.2	-9.1

[1)] Missing values: 14.3 % (overall), 24.8 % (low-income area with 50 % of mean income), and 21.9 % (low-income area with 70 % of mean income); [2)] unemployed and non-working; [3)] no school-leaving qualification achieved; [4)] university degree (or the like) achieved

Source: Author's own calculations

Additionally to Table 2, the results of a small binary logistical regression's model are presented in Table 3. Exemplarily, the regression results once more refer to the year 2009. As one result, in Table 3 it becomes evident that in that framework small households – defined as such with two persons at the maximum – have statistically significant parameter values within all considered variants, with negative algebraic signs. Furthermore, the estimates presented in Table 3 indicate significantly higher levels of well-being for Germans, persons living in western Germany, for married persons, and for male household members as well as for very qualified persons compared with the corresponding reference groups, respectively.

Contrasting old household members ("60 years and older") and young household members ("until 29 years") against the reference (dummy) group "30-59 years", reveals that young persons have a relatively high probability (likelihood) for being within the poverty area in the variant with reference poverty line at 50 percent (of single-person households' mean net income), while the opposite is valid for older persons. With respect to the variant with reference poverty line at 70 percent (of single-person households' mean net income) it is statistically significant – concerning the likelihoods of both groups (of the old as well as of the young persons) – to be located within this low-income area.

Concerning the variable "unemployed" the parameters are strongly positive in both variants. This reflects the relatively high likelihood of unemployed persons for being poor (or: for being located in low-income areas).

Table 3: Binary logistical regression's parameters due to different poverty lines in Germany 2009 (GSOEP) based on the decomposition approach

Covariates (0/1 dummies) and statistical information	Reference poverty line at 50 percent of single-person households' mean net income (dependent variable: "being a member of this low-income area", 0/1 dummy)	Reference poverty line at 70 percent of single-person households' mean net income (dependent variable: "being a member of this low-income area", 0/1 dummy)
Absolute term	-0.154*	+1.276***
Living in western Germany	-0.484***	-0.606***
Male household member	-0.136***	-0.125***
German household member	-1.140***	-1.115***
Person living in a small household (not more than two persons)	-0.316***	-0.647***
Until 29 years	+0.517***	+0.426***
60 years and older	-0.176***	+0.239***
Unemployed household member[1)]	+2.182***	+1.965***
Married person	-0.301***	-0.067*
Non-qualified person[2)]	+1.175***	+1.090***
Very qualified person[3)]	-1.332***	-1.409***
Number of observations (in case of dummy variable = 1)	4,007 persons	9,649 persons
Nagelkerke's coefficient of determination	0.179	0.187

*: significant at 10-percent level; **: significant at 5-percent level; ***: significant at 1-percent level

[1)] unemployed and non-working, [2)] no school-leaving qualification achieved, [3)] university degree (or the like) achieved

Source: Author's own calculations

4.2.6 The dynamics of poverty in Germany

Behind all cross-sectional findings presented hitherto the longitudinal perspective is concealed. Nevertheless, the consideration of temporal transitions between the different income areas is instructive to cover income dynamics. Thus, in Table 4 year-to-year transitions between 2004 and 2009 are reported.

I differentiate between five income classes with the corresponding income limits and equivalence scale "inflators" (expressed by Buhmann et al.'s θ):

- "poverty area":]0; 0.5 times mean of single-person households' net incomes[and θ = 0.80,
- "low-income area": [0.5 times mean of single-person households' net incomes; 0.7 times mean of single-person households' net incomes[and θ = 0.75,
- "middle-income area": [0.7 times mean of single-person households' net incomes; 1.5 times mean of single-person households' net incomes[and θ = 0.70,
- "wealthiness area": [1.5 times mean of single-person households' net incomes; 2.0 times mean of single-person households' net incomes[and θ = 0.65,
- "richness area": [2.0 times mean of single-person households' net incomes; +∞[and θ = 0.60.

Table 4: Transition matrices in Germany 2004/05-2008/09 GSOEP based on the decomposition approach (monthly household net incomes)

Well-being position in period t	Well-being position in period t+1				
	PA	LIA	MIA	WA	RA
2004/2005:					
PA	73.8 %	20.3 %	5.7 %	0.1 %	0.2 %
LIA	18.1 %	59.3 %	22.2 %	0.3 %	0.1 %
MIA	3.2 %	12.1 %	80.0 %	3.6 %	1.2 %
WA	0.8 %	0.8 %	38.0 %	47.2 %	13.2 %
RA	1.3 %	2.7 %	13.9 %	17.8 %	64.3 %
2005/2006:					
PA	74.1 %	18.8 %	5.7 %	0.5 %	0.8 %
LIA	18.6 %	54.8 %	25.7 %	0.6 %	0.3 %
MIA	2.9 %	9.0 %	82.9 %	4.0 %	1.1 %
WA	0.4 %	2.0 %	30.7 %	51.1 %	15.8 %
RA	0.5 %	1.4 %	16.0 %	16.1 %	66.1 %
2006/2007:					
PA	69.5 %	21.5 %	8.5 %	0.3 %	0.2 %
LIA	12.5 %	56.7 %	30.2 %	0.4 %	0.2 %
MIA	2.3 %	8.6 %	84.6 %	3.6 %	1.0 %
WA	0.9 %	1.5 %	32.0 %	50.4 %	15.2 %
RA	2.7 %	1.4 %	12.0 %	15.7 %	68.0 %
2007/2008:					
PA	69.2 %	22.9 %	7.7 %	0.0 %	0.2 %
LIA	15.4 %	59.1 %	25.2 %	0.2 %	0.1 %
MIA	2.4 %	8.1 %	84.8 %	3.9 %	0.8 %
WA	0.3 %	1.5 %	28.4 %	51.7 %	18.1 %
RA	1.0 %	0.1 %	11.4 %	15.5 %	72.0 %
2008/2009:					
PA	74.2 %	16.0 %	9.0 %	0.5 %	0.3 %
LIA	15.3 %	60.1 %	24.3 %	0.3 %	0.0 %
MIA	2.3 %	9.6 %	83.2 %	3.9 %	1.0 %
WA	0.2 %	1.6 %	33.1 %	51.6 %	13.4 %
RA	0.4 %	0.5 %	10.6 %	20.0 %	68.5 %

t = 2004, 2005, 2006, 2007, 2008; t+1 = 2005, 2006, 2007, 2008, 2009; PA: poverty area, LIA: low-income area, MIA: middle-income area, WA: wealthiness area, RA: richness area

Source: Author's own calculations

As can be seen by Table 4, there is – not unexpectedly – only small dynamics in the sense of movements from bottom income areas towards upper income areas. For instance, between 2008 and 2009 only about ten percent of persons moved upwards from the poverty area into the middle-income area or higher.

5. Conclusions

The decomposition approach splits the entire income distribution into socio-demographically differentiated parts which are disjoint from each other. As a consequence, the decision, whether a person is poor or not, needs, on principle, no equivalence scale as a prerequisite since for the various homogeneous groups it is sufficient to base those decisions upon unadjusted household net incomes. The levels of the several multi-person households' poverty lines are, principally, not determined by an exogenous overall equivalence scale as in the conventional approach but by experts' views, expenditure-based subsistence levels, etc. which are especially directed to the bottom income area.

This means a pleading in favour of variable equivalence scales which differ from each other in the several areas of income distribution. It appears plausible to assume a higher scaling in the bottom income area than in the upper income areas.[28]

Furthermore, the decomposition approach implicitly refers to bounded rationality and not to the concept of the homo oeconomicus. In my mind, this is a more advantageous proceeding since it appears more realistic than the image of humanity of well-informed, fully rational persons.

My empirical findings showed higher poverty levels in the context of the decomposition approach compared with the conventional approach of poverty measurement (for θ-values above 0.65 in Germany 2009 and for θ = 0.8 in Germany 1995-2009). Thus, because of possible "mixed" orientations on group-specific as well as on overall well-being levels the poverty levels of the decomposition approach can be interpreted as upper limits of actual, "true" poverty, and the lower levels of the conventional approach can be seen as lower limits of actual, "true" poverty. All in all, the decomposition approach of poverty measurement seems to be very valuable for scientific and for political purposes.

Appendix

Table A.1: Unweighted number of households in Germany 1995-2009 GSOEP due to household size

Year	1 person	2 persons	3 persons	4 persons	5 persons	6 persons	7 persons	8 persons and more	Sum
1995	1,443	2,121	1,431	1,250	392	99	36	20	6,792
1996	1,466	2,138	1,378	1,215	366	99	36	16	6,714
1997	1,442	2,194	1,332	1,182	364	85	33	17	6,649
1998	1,735	2,478	1,441	1,258	341	100	34	13	7,400
1999	1,692	2,470	1,356	1,193	340	94	31	11	7,187
2000	3,260	4,336	2,195	1,958	615	151	39	18	12,572
2001	2,943	3,999	1,990	1,788	579	130	39	13	11,481
2002	2,970	4,440	2,115	1,911	611	138	37	14	12,236
2003	2,912	4,238	1,961	1,750	557	122	34	14	11,588
2004	2,864	4,214	1,905	1,691	524	112	28	11	11,349
2005	2,897	4,105	1,815	1,583	494	103	27	8	11,032
2006	3,247	4,523	1,926	1,600	483	105	23	12	11,919
2007	3,100	4,273	1,926	1,600	483	105	23	12	11,262
2008	2,986	4,117	1,696	1,353	388	87	18	8	10,653
2009	3,153	4,352	1,709	1,405	391	91	20	6	11,127

Source: Author's own calculations

[28] See already Faik 2011, pp. 311-313.

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