DISCUSSION PAPER SERIES

IZA DP No. 4825

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March 2010

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
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March 2010

ABSTRACT

Multidimensional Measurement of Richness: Theory and an Application to Germany*

Closely following recent innovations in the literature on the multidimensional measurement of poverty, this paper provides similar measures for the top of the distribution using a dual cutoff method to identify individuals, who can be considered as rich in a multidimensional setting. We use this framework to analyze the role of wealth, health and education, in addition to income, as dimensions of multidimensional well-being in Germany. Our analysis shows that more than half of the German population is affluent in at least one dimension and less than 1% is affluent in all four dimensions. The likelihood of being rich in all dimensions is highest for prime-aged males from the West who live in couple households without children. Mobility between different affluence counts between 2002 and 2007 is rather low and existing changes are mostly driven by health and to a lesser extent by wealth.

JEL Classification: D31, D63, I0, I31

Keywords: affluence, multidimensional measurement, mobility, elites

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* We thank Joachim R. Frick as well as participants of the Fifth Winter School on Inequality and Social Welfare Theory (IT5) in Alba di Canazei (Italy), the Sixth International Young Scholars SOEP Symposium in Delmenhorst (Germany) and seminar participants at IZA in Bonn (Germany) for helpful suggestions and comments.

1 Introduction

In the literature on the distribution of income and well-being, unlike poverty and inequality, richness has been a field of research that was rarely regarded. This can partly be explained by larger policy demand for the analysis of deprivation and unequal distribution of incomes at the bottom of the distribution. While it is indisputable that society should ensure a certain minimum subsistence level, the top of the income distribution has just recently become a particular focus of attention (see e.g. Piketty and Saez, 2006; Atkinson and Piketty, 2007; Atkinson, 2007).

Barry (2002) argues that social exclusion exists not only at the bottom but also at the top of the distribution in form of elite separation. The rich have the ability to use "exit" as a strategy and buy their way out of common institutions, e.g. by means of private provision of education or health care. Social exclusion (both at the bottom and the top) violates social justice and solidarity as it conflicts with the concept of equal opportunities. Hence, it is important to identify affluence at the top of the distribution as a complement to poverty at the bottom. In addition, Atkinson (2007) identifies three main reasons why one should care particularly about the rich: their command over resources (taxable capacity), their command over people (income as a source of power), and their global significance.[1]

The majority of empirical analyses of the top of the distribution of well-being are generally concerned with only one dimension, namely (monetary) income (Cowell, 2008). Nevertheless, income does not capture every single component that arguably might influence well-being. That is why multidimensional measurement – particularly with regard to poverty and inequality – has received growing interest (see e.g. Atkinson, 2003; Bourguignon and Chakravarty, 2003; Alkire and Foster, 2008, among others). Furthermore, qualitative studies, like surveys on attitudes towards perception and evaluation of richness, also reveal that people have a multidimensional concept of richness: The perception of richness is not only restricted to material wealth, but it is emphasized that there is a high importance of, for example,

[1] Especially in the context of income taxation and its reforms, the top of the income distribution is of special interest as, for instance, the top 10% (1%) of the taxpayers pay 50.6% (19.7%) of all income taxes in Germany (see e.g. Merz, Hirschel, and Zwick, 2005).

health and education (see e.g. Glatzer, Becker, Bieräugel, Hallein-Benze, Nüchter, and Schmid, 2008). In addition, a multidimensional understanding of richness is related to some concept of *elitism*, since it is argued that being at the top of the income distribution correlates with being member of society's elite (Bach, Corneo, and Steiner, 2009). However, as for the measurement of well-being, income alone does not explain everything. Therefore, especially in the sociological literature on elites, members of the elitist group are distinct from the rest of the society with respect to their possibility to influence the development of society due to their income/wealth, status, intellect and abilities (see e.g. Hartmann, 2006; Bazen and Moyes, 2010).

Our contribution to the literature is twofold: First, we extend the one-dimensional richness measures developed by Peichl, Schaefer, and Scheicher (2008) to the multidimensional case by closely following the work of Alkire and Foster (2008), who proposed a class of multidimensional poverty measures based on the one-dimensional FGT poverty measures (Foster, Greer, and Thorbecke, 1984). Central to our approach is a *dual cutoff method* that identifies those individuals in a population that are considered to be multidimensionally rich. Therefore, multidimensional measurement of richness can be seen as a tool to identify the sources of (economic) elitism as well as the individuals "on top" of the society. Furthermore, our derived measures do not only take into account the number of individuals' affluent dimensions, but are also sensitive to changes in achievements within each dimension, which allows to investigate inequality among "the rich".

Second, we apply our framework to German micro data in order to analyze multidimensional richness as well as its mobility and determinants in Germany. In addition to income, we incorporate individual wealth, health, and education, as dimensions of multidimensional richness.[2] Data from the German Socio-Economic Panel Study (GSOEP) is especially suited for our analysis as it contains very de-

[2] The choice of dimensions is related to the literature on the measurement of human development and the *Human Development Index* (HDI). According to this, the "most basic and critical dimensions are a long and healthy life, access to knowledge, and a decent standard of living" (United Nations, 2008, p. 2). The health status of an individual can be considered quite obviously as an indicator for well-being, since their is large evidence of an association between economic status and health outcomes. However, there is a debate on the direction of a causal relationship (Smith, 1999; Deaton and Paxton, 1998). Education can be seen as a proxy for potential lifetime income, that is not necessarily captured by conventional income measures.

tailed information on income, education, health, and wealth.[3] Furthermore, due to oversampling of the top of the distribution by means of a special high income sample, it overcomes several drawbacks of comparable survey data sets.

Our analysis yields the following results: We find that it is justified to incorporate additional dimensions of well-being beyond income, since the (rank) correlation across dimensions is relatively weak. I.e., an individual's position in the income distribution does not necessarily predict its position in the distribution of other dimensions. Our results indicate that more than half of the German population is affluent in at least one of the four dimensions under consideration. Less than 1% is affluent in every single dimension. Moreover, the relative importance of different dimensions heavily depends on the choice of richness measure. The likelihood of being rich in all four dimensions is highest for prime-aged males from the West who live in couple households without children. Mobility between different affluence counts between 2002 and 2007 is rather low and existing changes are mostly driven by health and to a lesser extent by wealth. In general, there is more downward than upward richness mobility in Germany.

The paper is further organized as follows: Section 2 introduces our concept for the measurement of multidimensional richness. After a description of the data in Section 3, we present our results in Section 4. The paper is concluded in Section 5.

2 Measuring Multidimensional Richness

The dual cutoff method of multidimensional richness works as follows: In a first step, an individual is considered as *dimension-specific affluent* when its achievement in a

[3] Despite problems that arise with the measurement of individual wealth, especially with respect to comparability (OECD, 2008, p. 254 ff.), we believe it to be worthwhile to integrate wealth as an additional dimension in the multidimensional measurement of well-being. Wealth fulfills several functions, e.g. as a source of income, utility, economic and/or political power, and social status (Frick and Grabka, 2009). In addition, wealth helps to stabilize consumption over time, serves as a measure of "sustainable consumption" (Wolff and Zacharias, 2009, p. 83) and reduces vulnerability in times of crisis as "permanent income" (Michelangeli, Peluso, and Trannoy, 2009). Typical features of wealth distributions are described by Jenkins and Jäntti (2005). Especially, wealth is highly unequally distributed (Davies, Sandström, Shorrocks, and Wolff, 2009) and is positively but not perfectly correlated with income (see OECD, 2008; Davies, Sandström, Shorrocks, and Wolff, 2009; Wolff and Zacharias, 2009). In addition, wealth and income represent distinct dimensions of satisfaction with life (see D'Ambrosio, Frick, and Jäntti, 2009).

specific dimension of well-being exceeds the respective cutoff value. In a second step, we define which individuals (among those who are affluent with respect to at least one dimension) are considered to be rich in a multidimensional sense with the help of a *counting methodology* (Atkinson, 2003; Alkire and Foster, 2008). An affluent individual is defined to be *multidimensionally rich*, if the number of its affluence counts across all dimensions is greater than or equal to a certain threshold (second cutoff). After having identified the rich persons, their individual achievements are aggregated to single-value measures of multidimensional richness, which are not only sensitive to the number of individuals' affluent dimensions but also take into account changes in the achievements of the rich.

2.1 One-dimensional richness

While an extensive literature on poverty indices exists, little research has yet been carried out on the measurement of richness. The scarce research on affluence has concentrated nearly without exception on proportions of rich individuals within a given population (headcount ratio) or the income share of the top $p\%$ of the income distribution (see e.g. Atkinson, 2005; Dell, 2005; Piketty, 2005; Saez, 2005; Saez and Veall, 2005; Piketty and Saez, 2006; Atkinson and Piketty, 2007; Roine and Waldenström, 2008). However, neither the headcount nor income shares are satisfying measures for either poverty or richness. The headcount is only concerned with the number of people below (above) a cutoff. Therefore, if nobody changes his or her status, an income change will not affect this index. A top income share does not account for changes in the composition of the population or changes in the distribution of income among the top $p\%$.[4]

To tackle these issues, Peichl, Schaefer, and Scheicher (2008) propose a class of richness measures analogously to well-known measures of poverty. The general idea is to take into account the number of rich people (i.e. the composition of the rich subpopulation) as well as the intensity of richness (i.e. the distribution of incomes among the rich). Thereby, an index of affluence is constructed as the weighted sum

[4] Of course, the same holds for poverty measurement, for which more sophisticated measures have already been available for a long time (Foster, Greer, and Thorbecke, 1984).

of the individual contributions to affluence. The weighting function of the index shall have some desirable properties which are derived following the literature on axioms for poverty indices (see e.g. Chakravarty and Muliere, 2004) and include the focus, continuity, monotonicity and subgroup decomposability axioms. However, the transfer axiom of poverty measurement can be translated to richness measurement in two different ways:

- *Transfer axiom T1 (concave):* a richness index shall increase when a rank-preserving progressive transfer between two rich persons takes place.
- *Transfer axiom T2 (convex):* a richness index shall decrease when a rank-preserving progressive transfer between two rich persons takes place.

The question behind the definition of these two opposite axioms is: shall an index of richness increase if (i) a billionaire gives an amount x to a millionaire, or (ii) if the millionaire gives the same amount x to the billionaire. This question cannot be answered without moral judgement. Peichl, Schaefer, and Scheicher (2008) define two different classes of richness indices which are either fulfilling the concave (T1) or the convex (T2) transfer axiom. The first challenge is to define a richness line. We define it analogously to the poverty line as a cutoff income point above (below) which a person or household is considered to be rich (non-rich). Like the poverty line, it is possible to define the richness line in absolute terms (e.g. 1 million euros) or relative terms (e.g. 200% of median income). Let y_i be the income of individual i, γ the richness line and $r = \#\{i | y_i > \gamma,\, i = 1, \ldots, n\}$ the number of rich persons.

For T1 the relative incomes y_i/γ have to be transformed by a function that is concave on $(1, \infty)$. Peichl, Schaefer, and Scheicher (2008) use $f(x) = \left(1 - \frac{1}{x^\beta}\right) \cdot \mathbf{1}_{x>1}$, $\beta > 0$, to obtain an index analogous to the poverty index of Chakravarty (1983):

$$R_\beta^{Cha}(\mathbf{y},\gamma) = \frac{1}{n} \sum_{i=1}^{n} \left(1 - \left(\frac{\gamma}{y_i}\right)^\beta\right)_+ , \beta > 0. \tag{1}$$

For T2, Peichl, Schaefer, and Scheicher (2008) use $f(x) = (x-1)^\alpha$ for $x > 1$, with $\alpha > 1$, to obtain an affluence index that resembles the FGT index of poverty:

$$R_{\alpha}^{FGT,T2}(\mathbf{y},\gamma) = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{\gamma} - 1\right)^{\alpha} \cdot \mathbf{1}_{y_i>\gamma} = \frac{1}{n}\sum_{i=1}^{n}\left(\left(\frac{y_i - \gamma}{\gamma}\right)_+\right)^{\alpha}, \alpha > 1. \qquad (2)$$

2.2 Dimension-specific affluence

The number of individuals in the population is denoted with n, while $d \geq 2$ denotes the number of dimensions of affluence under consideration. Define the matrix of achievements with

$$\mathbf{Y} = [\ y_{ij}\ ]_{n \times d}\,, \qquad (3)$$

where y_{ij} denotes the achievement of individual $i \in \{1, \ldots, n\}$ in dimension $j \in \{1, \ldots, d\}$. For each dimension j, there is some cutoff value γ_j. Hence, γ denotes a $1 \times d$ vector of dimension-specific cutoffs. With the help of this vector of dimension-specific cutoffs, it is possible to identify, whether individual i is affluent with respect to dimension j or not. Therefore, define an indicator function θ_{ij}:

$$\theta_{ij}(y_{ij};\gamma) = \begin{cases} 1 & \text{if } y_{ij} > \gamma_j, \\ 0 & \text{otherwise,} \end{cases} \qquad (4)$$

and with its help construct a $0 - 1$ matrix of dimension-specific affluence:

$$\mathbf{\Theta^0} = [\ \theta_{ij}\ ]_{n \times d}\,, \qquad (5)$$

where each row vector of $\mathbf{\Theta^0}$, denoted with $\theta_{\mathbf{i}}$, is equivalent to individual i's affluence vector. Hence, this yields us a vector of affluence counts, denoted $\mathbf{c} = (c_1, \ldots, c_n)'$. Its elements $c_i =\mid \theta_i \mid$ are equal to the number of dimensions, in which an individual i is defined to be affluent.

In case of cardinal variables in the achievement matrix $\mathbf{Y}$, it is possible to construct matrices that, in addition, do not only provide the information whether an individual i is affluent with respect to dimension j or not, but also inform about the intensity of affluence associated with the dimension under consideration. Thereby, one can distinguish between two ways of evaluating the intensity of affluence, namely a concave or a convex way (see above). If we are interested in the *convex* case, we replace the matrix of dimension-specific affluence $\mathbf{\Theta^0}$ and instead look at the following matrix for a given cutoff γ_j:

$$\mathbf{\Theta}^\alpha = \left[\left(\frac{y_{ij} - \gamma_j}{\gamma_j} \right)_+^\alpha \right]_{n \times d} \quad \text{for } \alpha \geq 1. \tag{6}$$

In the *concave* case we have

$$\mathbf{\Theta}^\beta = \left[\left(1 - \left(\frac{\gamma_j}{y_{ij}} \right)^\beta \right)_+ \right]_{n \times d} \quad \text{for } \beta > 0. \tag{7}$$

The subscript "+" indicates that the entries of matrices $\mathbf{\Theta}^\alpha$ and $\mathbf{\Theta}^\beta$ respectively must be positive. If the expressions in brackets should happen to be negative for single individuals, they are replaced with a zero entry. This is equivalent to multiplying the expressions with the indicator function $\theta_{ij}(y_{ij}; \gamma)$. The parameters α and β are sensitivity parameters for the intensity of richness. For larger (smaller) values of α (β) more weight is put on more intense affluence.[5]

2.3 Multidimensional richness

We now define multidimensional richness with the help of the dual cutoff method of identification. For an integer $k \in \{1, \dots, d\}$ define the identification method as

$$\phi_i^k(y_i, \gamma) = \begin{cases} 1 & \text{if } c_i \geq k, \\ 0 & \text{if } c_i < k. \end{cases} \tag{8}$$

This yields a $0-1$ vector $\phi^{\mathbf{k}}$ with entries ϕ_i^k equal to one if the number of affluent dimensions of individual i is not less than k, and is zero otherwise. In other words, individual i is considered to be *multidimensionally rich*, if the number of dimensions in which its achievement is considered as affluent attains a certain threshold.[6] So,

[5] Note that $\mathbf{\Theta^0}$ is simply a special case of $\mathbf{\Theta}^\alpha$ for $\alpha = 0$ and of $\mathbf{\Theta}^\beta$ for $\beta \to \infty$ respectively. For $\alpha = 1$ the function $(y_{ij} - \gamma_j)/\gamma_j$ is just linear in y_{ij}.

[6] Note that, throughout the paper, we speak of *affluence*, when we refer to affluence *with respect to a specific dimension* (or a set of dimensions). In contrast, we consider an individual to be *(multidimensionally) rich*, if and only if its number of affluent dimensions (c_i) is not smaller than

we can define the subset of multidimensionally rich individuals among the whole population as $\Phi_k = \{i : \phi_i^k(y_i, \gamma) = 1\} \subseteq \{1, \ldots, n\}$. The number of rich individuals is denoted with $s^k = \mid \Phi_k \mid$.[7]

In order to obtain matrices that provide information on rich individuals only, we replace the row i of $\mathbf{\Theta}^\alpha$ and $\mathbf{\Theta}^\beta$ respectively with vectors of zeros, whenever it holds that $\phi_i^k(y_i, \gamma) = 0$. Formally, define

$$\mathbf{\Theta}^\alpha(\mathbf{k}) = \left[\left(\frac{y_{ij} - \gamma_j}{\gamma_j} \right)^\alpha \cdot \phi_i^k(y_i, \gamma) \right]_{n \times d} \quad \text{and} \tag{9a}$$

$$\mathbf{\Theta}^\beta(\mathbf{k}) = \left[\left(1 - \left(\frac{\gamma_j}{y_{ij}} \right)^\beta \right) \cdot \phi_i^k(y_i, \gamma) \right]_{n \times d} \tag{9b}$$

respectively. Since, according to the focus axiom, a measure of richness must take into account information on the rich only, we replace the elements of the vector of affluence counts $\mathbf{c}$ with zero, when the number of affluence counts of the according individual i does not attain the threshold k. Formally:

$$c_i^k = \begin{cases} c_i & \text{if } c_i \geq k, \\ 0 & \text{if } c_i < k. \end{cases} \tag{10}$$

This yields the vector $\mathbf{c^k} = (c_1^k, \ldots, c_n^k)'$, which contains zeros for those not considered to be rich and the number of dimensions, in which the rich individuals are considered as affluent. I.e., even when an individual is affluent in several dimensions, its entry in $\mathbf{c^k}$ nevertheless might be zero. This is the case, when its number of affluent dimensions is smaller than the threshold k.

Now we are able to define measures of multidimensional richness based on the definitions that were introduced in the previous two subsections. In order to derive

the multidimensional threshold (k). So, an individual i can be affluent in one or more dimensions and, at the same time, not be multidimensionally rich (when it holds that $c_i < k$), while a rich person by definition is always affluent in at least k dimensions. Here, we assume equal weighting of dimensions. In principle, it would be possible to allow for different weights.

[7] Hereby, one can think of two extreme cases. First, in case of $k = 1$, individual i is multidimensionally rich when it is considered as affluent in only one single dimensions (union approach). Second, in case of $k = d$, it is only considered as rich, if it is affluent in all dimensions (intersection approach). In case of $1 < k < d$ we have an intermediate approach (Alkire and Foster, 2008).

a first multivariate measure of richness, define the *headcount ratio* (HR) as

$$HR^k = \frac{s^k}{n}, \tag{11}$$

which is simply the proportion of rich individuals among total population and the *average affluence share* (AAS^k) as

$$AAS^k = \frac{\mid \mathbf{c^k} \mid}{s^k \cdot d}, \tag{12}$$

where $\mid \mathbf{c^k} \mid$ denotes the number of affluence counts among the multidimensionally rich population. The average affluence share is hence equal to the relation of this number to the maximum number of affluence counts that would be observed when *all rich* individuals were rich among *all* dimensions. It holds that $1/d \leq AAS^k \leq 1$. For a given number of dimensions under consideration, the value of AAS^k is close to one, when there is a very strong correlation of affluence across dimensions, i.e. those who are rich tend to be affluent in all dimensions. The value becomes smaller when the number of dimensions, according to which the rich are affluent, decreases. It reaches its minimum value of $1/d$, when all rich individuals are only affluent with respect to one single dimension.

Now, we can define a first measure of multidimensional richness by simply multiplying the headcount ratio and the average affluence share. I.e., the **dimension adjusted headcount ratio** is defined as

$$R^M_{HR}(k) = HR^k \cdot AAS^k = \frac{\mid \mathbf{c^k} \mid}{n \cdot d}, \tag{13}$$

which is equal to the proportion of the total number of affluence counts to the maximum number of affluence counts that one would observe when every single individual in the population under consideration would be affluent with respect to every single dimension.[8] Contrary to the simple headcount ratio HR, the measure R^M_{HR} satisfies the property of *dimensional monotonicity*, which requires that a measure of multi-

[8] Hence, the nomenclature of a *headcount* ratio is somewhat misleading. However, in order to remain consistent with the literature on multidimensional poverty (Alkire and Foster, 2008) we stick to this naming. Moreover, the measure R^M_{HR} is the multidimensional analogue to the one-dimensional headcount ratio.

dimensional richness increases (decreases) when a rich individual ($c_i \geq k$) becomes (is no more) affluent in some dimension. That is why the AAS is incorporated in R^M_{HR}. However, the dimension adjusted headcount ratio does not satisfy the property of *monotonicity*, i.e. the measure R^M_{HR} does not necessarily increase (decrease) when the achievement y_{ij} of a rich individual i in dimension j increases (decreases).[9] Hence, it only reveals information about the width and not the depth of affluence.

The following additional measures of multidimensional richness by contrast do satisfy the monotonicity property. Again, one can distinguish between a convex and a concave measure respectively. The **dimension adjusted multivariate richness measures** are defined as

$$R^M_c(k) = HR^k \cdot AAS^k \cdot \frac{\mid \mathbf{\Theta^c(k)} \mid}{\mid \mathbf{c^k} \mid} = \frac{\mid \mathbf{\Theta^c(k)} \mid}{n \cdot d} \tag{14}$$

for $c \in \{\alpha, \beta\}$ and hence are equal to the sum of the elements of the matrices $\mathbf{\Theta}^{\alpha}(\mathbf{k})$ and $\mathbf{\Theta}^{\beta}(\mathbf{k})$ divided by the value $n \cdot d$ respectively.[10]

Since we are interested in analyzing the role of dimensions (especially income and wealth) with respect to the measurement of multidimensional richness, it seems helpful to formally disentangle the dimensions-specific contributions. Therefore, we write Equation (14) as

$$R^M_c(k) = \frac{\mid \mathbf{\Theta^c(k)} \mid}{n \cdot d} = \frac{\sum_{j=1}^{d} \mid \theta^{\mathbf{c}}_{\mathbf{j}}(\mathbf{k}) \mid}{n \cdot d} = \frac{1}{d} \cdot \sum_{j=1}^{d} \frac{\mid \theta^{\mathbf{c}}_{\mathbf{j}}(\mathbf{k}) \mid}{n} = \frac{1}{d} \cdot \sum_{j=1}^{d} \mathbf{\Pi^c_j(k)} \tag{15}$$

for $c \in \{\alpha, \beta\}$. Hence, $\mathbf{\Pi_j}^c(k)$ denotes the contribution of each dimension j multiplied by the total number of dimensions d. More intuitively, it is equal to the proportion of individuals that are multidimensionally rich *and* affluent with respect to dimension j at the same time. The simple mean of all these contributions over the d dimensions yields the overall multidimensional richness measure R^M_c. One can show that the proportional contribution of dimension j to the overall measure R^M_c,

[9] It does so only marginally around dimension-specific thresholds γ_j.

[10] Note that the concave measure R^M_β is normalized between zero and one, while the convex measure R^M_α is not. Although one would prefer to have normalized measures only, this is not possible in the convex case in general without violating the monotonicity axiom. Hence, the choice of R^M_α implies a certain normative view, since it emphasizes intense rather than moderate richness.

denoted with $\pi_j^c(k)$, can be written as

$$\pi_j^c(k) = \frac{\mid \theta_{\mathbf{j}}^{\mathbf{c}}(\mathbf{k}) \mid}{\mid \mathbf{\Theta^c}(\mathbf{k}) \mid}. \tag{16}$$

Obviously, it holds that $\sum_{j=1}^{d} \pi_j^c(k) = 1$. Hence, it is possible to decompose the measures proportionally into the contributions of the single dimensions.

3 Data

The German Socio-Economic Panel Study (GSOEP) is a panel survey of households and individuals in Germany that has been conducted annually since 1984. A weighting procedure allows to make respondents' data to be representative for the German population.[11] We use information from individuals aged 17 or older.

With respect to measurement of richness, the representativeness of individuals with (very) high incomes in the survey clearly is an issue that should be addressed. Usually, survey samples are said to be less meaningful with respect to the top of the income distribution because of small numbers of observations (see e.g. Burkhauser, Feng, Jenkins, and Larrimore, 2008). Since there are only few households with very high incomes within the German population, it is – of course – less likely that they are drawn into a sampled survey population. In order to improve its "statistical power" and the reliability of statements referring to high incomes (and hence richness), an additional sample of high income households was included into the GSOEP in wave 2002. This increased the number of observations within the top 2.5% of the income distribution considerably and hence reduced potential bias due to poor representativeness of rich households. Since these additional observations were oversampled, population weights were adjusted accordingly (see Frick, Goebel, Grabka, Groh-Samberg, and Wagner, 2007).

The **income** variable that we use is the three-year average of equivalent post-government income as a proxy for permanent income, which is defined as follows (Grabka, 2007, p. 41 f.): A household's post-government income encompasses

[11] A detailed overview of the GSOEP is provided by Wagner, Frick, and Schupp (2007).

pre-government income, public transfers, and social security pensions minus total tax-payments of all household members. We use the modified OECD equivalence scale for equivalence weighting in order to make incomes of individuals living in different-size households comparable to each other.[12]

The 2002 and 2007 waves of the GSOEP contain information on **wealth** that was surveyed in additional questionnaires. Different from most other surveys that provide information on wealth, the GSOEP data were collected at the *individual* level rather than on the *household* level (Frick, Grabka, and Marcus, 2007; Frick and Grabka, 2009). The variable that provides information on net worth of individuals aged 17 and older aggregates the following single components: owner-occupied housing and other property (net of mortgage debt), financial assets, business assets, tangible assets, private pensions and consumer credits. Frick and Grabka (2009) provide a detailed overview and description of the distribution of overall wealth as well as of its single components based on the 2007 wave of the GSOEP wealth data.[13] In order to handle the problem of measurement error arising from item or unit non-response, the GSOEP provides editing and multiple imputation procedures that are described in detail by Frick, Grabka, and Marcus (2007).[14]

The indicator for an individual's overall **health** status we apply relies on two generally accepted and widely used health measures: the Mental Component Scale (MCS) and the Physical Component Scale (PCS), the so-called SF-12v2$^{\text{TM}}$ indicators. These measure eight domains of health in total, which are grouped into two dimensions of mental and physical health respectively.[15] Our health measure is just

[12] The modified OECD scale assigns a weight of 1.0 to the first (adult) household member. Every additional adult is assigned a weight of 0.5 and every child a weight of 0.3.

[13] Due to the difficulty of collecting information on pension claims of individuals that are still in the labor force, these information are not included in the wealth measure of the GSOEP. Frick and Grabka (2010) report results from a statistical matching procedure of the GSOEP wealth data with data from the *German Statutory Pension Insurance Scheme*. It turns out that, compared to wealth from financial and tangible assets only, the inclusion of a discounted (present) value of pension claims increases mean (+76%) as well as median wealth (+430%) and decreases inequality (−20%). Unfortunately, these data are not freely available and hence cannot be included into our analysis. In addition, Frick and Heady (2009) show that neglecting social security wealth can yield misleading results in cross-country comparison.

[14] Both income and wealth are expressed in euro prices of 2006 according to the Consumer Price Index (CPI) provided by the German Statistical Office (Grabka, 2007, p. 43).

[15] See Nübling, Andersen, Mühlbacher, Schupp, and Wagner (2007) for a detailed description of the computation of the GSOEP's version of SF-12v2 health measures.

the mean of the measures for mental and physical health (MCS and PCS).

Education is measured by the number of years of education, which is assigned to respondents corresponding to their level of completed education (Grabka, 2007, p. 23). For example, individuals with a school leaving degree are assigned between nine and twelve years, individuals with a university degree up to 18 or 19 years.

Table 1: Descriptive statistics, dimension-specific cutoffs, and poverty lines

			% of median[a]		80%/40% quantile[b]	
	mean	median	cutoff	poverty line	cutoff	poverty line
			Germany 2002			
Income	18,472	17,072	34,145	10,243	23,793	15,503
	(101)	(88)	(176)	(53)	(184)	(100)
Wealth	83,114	33,580	134,320	20,148	144,620	15,117
	(1,647)	(1,571)	(6,285)	(943)	(2,483)	(739)
Health	49.09	50.16	55.18	45.14	55.82	48.17
	(0.08)	(0.11)	(0.12)	(0.10)	(0.05)	(0.13)
Education	10.95	11	12	9	13	10.5
	(0.04)	(0.20)	(0.00)	(0.00)	(0.33)	(0.00)
			Germany 2007			
Income	19,376	17,222	34,444	10,333	25,049	15,512
	(127)	(113)	(227)	(68)	(209)	(111)
Wealth	87,225	34,776	139,107	20,866	144,438	16,333
	(2,026)	(1,646)	(6,584)	(988)	(2,701)	(1,130)
Health	49.41	50.79	55.87	45.71	55.93	48.68
	(0.09)	(0.14)	(0.16)	(0.13)	(0.08)	(0.13)
Education	11.15	11	12	9	13	10.5
	(0.04)	(0.09)	(0.00)	(0.00)	(0.25)	(0.00)

Note: Income and wealth are measured in euro (prices of 2006) and are equivalence weighted with the modified OECD scale. Income and wealth data were trimmed (i.e. bottom and top 0.5% of respective distribution dropped). Income is the three-year average between 2000–2002 or 2005–2007 respectively. Health: mean of Mental (MCS) and Physical Component Summary Scale (PCS). Education: years of education. Bootstrapped standard errors of empirical distribution in parentheses (1,000 replications). Source: GSOEP, own calculations.

[a] Cutoff (poverty line) for wealth corresponds to 400% (60%) of median wealth, cutoff (poverty line) for income corresponds to 200% (60%) of median income, and cutoff (poverty line) for health corresponds to 110% (90%) of median health. Cutoff and poverty line for education are set to 12 and 9 years of education respectively.

[b] Cutoff (poverty line) corresponds to the 80%(40%)-quantile of the respective marginal distribution.

Table 1 provides descriptive information on the dimensions that we include in our analysis. Note that we trimmed the income and wealth data by dropping the bottom and top 0.5% of the respective distributions in order to rule out bias due to extreme values. The table also reports the cutoff values (and poverty lines) that we employ in the analysis. We consider two possible ways of defining the dimension-specific cutoffs and poverty lines: One way is to define the cutoff (poverty line) to be a multiple (a fraction) of the median value of the respective distribution.[16] Accordingly, we define the cutoff value for income to be twice the median value. Hence, an individual is considered to be affluent with respect to income when its equivalence weighted annual disposable income exceeds the threshold of 34,145 euros in 2002 (34,444 euros in 2007). The cutoff value for wealth is also defined as a multiple of the median value. Here, we define an individual to be affluent in the wealth dimension if the sum of its wealth holdings exceeds 134,320 euros in 2002 (139,108 euros in 2007) which corresponds to 400% of median wealth. The cutoff for health is 110% of median health, which corresponds to values of 55.2 (2002) and 55.9 (2007). We set the cutoff for education at 12 years of education, i.e. at least having a high school degree.

Another way of defining cutoffs and poverty lines is to argue that the top 20% of the distribution are defined to be the rich and the bottom 40% to be the poor (see e.g. Ainsworth and Filmer, 2002, p. 5). Hence, according to this 40–40–20 approach, we define alternative cutoffs of the distributions under consideration to be equal to the 80%-quantiles (the 40%-quantiles for the poverty lines). Of course, the one-dimensional headcount ratios for richness and poverty then equal 20% and 40% by definition. However, the multidimensional headcount does not necessarily need to take on the same value. Especially for income but to a lesser extent also for the other dimensions, this approach yields different values for the cutoffs and poverty lines (see Table 1). Since differences from these two approaches defining the cutoffs do not differ substantially, the main results presented in the next section are based on the first approach (percentage of median).[17]

[16] For instance, Barry (2002) suggests an "upper threshold" for income at a value of three times the median (p. 28).

[17] Results for the 40–40–20 approach are presented in the Appendix.

4 Empirical Results

4.1 One-dimensional richness and rank correlations

Table 2 provides information on the one-dimensional distributions of the dimensions under consideration, i.e. one-dimensional richness and poverty measures as well as the Gini coefficient as a measure of inequality for the years 2002 and 2007 respectively. It turns out that the richness headcount ratio for income, 4.3% in 2002 and

Table 2: One-dimensional Measures

	R_{HR}	$R_{\alpha=1}$	$R_{\alpha=2}$	$R_{\beta=1}$	$R_{\beta=3}$	I_{Gini}	P_{HR}
				Germany 2002			
Income	0.043	0.008	0.003	0.006	0.015	0.223	0.105
	(0.003)	(0.001)	(0.000)	(0.001)	(0.001)	(0.002)	(0.004)
Wealth	0.219	0.211	0.450	0.084	0.147	0.671	0.438
	(0.010)	(0.020)	(0.071)	(0.006)	(0.009)	(0.005)	(0.003)
Health	0.234	0.010	0.001	0.009	0.027	0.083	0.278
	(0.006)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.004)
Education	0.205	0.056	0.020	0.042	0.097	0.153	0.075
	(0.004)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)
				Germany 2007			
Income	0.069	0.021	0.012	0.014	0.031	0.256	0.120
	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.004)
Wealth	0.211	0.226	0.594	0.082	0.142	0.685	0.429
	(0.011)	(0.020)	(0.092)	(0.005)	(0.009)	(0.005)	(0.003)
Health	0.203	0.007	0.000	0.006	0.019	0.081	0.280
	(0.010)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.004)
Education	0.244	0.072	0.027	0.053	0.121	0.168	0.082
	(0.005)	(0.002)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)

Note: One-dimensional richness (poverty) is measured by the head count ratio R_{HR} (P_{HR}), inequality is measured by the Gini coefficient I_{Gini}. Bootstrapped standard errors of empirical distribution in parentheses (1,000 replications). Source: GSOEP, own calculations.

6.9% in 2007, is relatively small compared to the headcount ratios of the other dimensions: In 2002, 21.9% (2007: 21.1%) are affluent in wealth, 23.4% (20.3%) in health and 20.5% (24.4%) in education. Concerning wealth, one can see that it is distributed very unequally, since its Gini coefficient is very large (nearly 0.7 in both years), compared to a Gini of about 0.22 (0.26) for income, 0.15 (0.17) for education, and 0.08 for health. The poverty rate for wealth (with a poverty line at 60% of the median) is also very high (about 43–44%). This means, roughly speaking, only about one third of the population form the "wealth middle-class", i.e. are neither affluent nor poor with respect to wealth.

Comparing the change of indices for richness, inequality, and poverty between 2002 and 2007 reported in Table 2, reveals an overall picture of distributional change with respect to the four dimensions under consideration. It turns out that richness, inequality, and poverty of income have increased without exception, i.e. the income distribution has become more polarized during this 5-year period. The same holds for education. For health, we find that richness indices have decreased and the poverty rate as well as the Gini coefficient have nearly remained constant. The picture for wealth is less clear-cut: Richness and poverty headcount ratios have slightly decreased, i.e. population proportions at the tails of the distribution became smaller. Nevertheless the overall inequality measure, the Gini coefficient, has increased a little. This could be due to the fact that the small drop in the fraction of wealthy individuals has been overcompensated by a rise in the intensity of richness in wealth: the convex richness measures R_α, which put more weight on the "very rich", both have increased (especially for $\alpha = 2$), while the concave measures (R_β) are lower in 2007 than they were in 2002.

Table 3: Rank correlation coefficients between dimensions

	Income	Wealth	Health	Education
	Germany 2002			
Income	1			
Wealth	0.418	1		
Health	0.130	0.039	1	
Education	0.320	0.111	0.098	1
	Germany 2007			
Income	1			
Wealth	0.510	1		
Health	0.144	0.067	1	
Education	0.389	0.169	0.099	1

Note: Source: GSOEP, own calculations.

Table 3 reports Spearman's rank correlation coefficients of the four dimensions under consideration. In general, it turns out that an individual's positions within the marginal distributions of the single dimensions are not very strongly correlated. The only sizeable rank-correlation coefficients are the ones for income and wealth (2002: 0.42, 2007: 0.51) and to a lesser extent for income and education (0.32, 0.39). But as it has been mentioned before, the correlation (of ranks) between income and wealth is positive, but far from perfect.[18] In addition, the (rank) correlation between the other dimensions are quite weak.

4.2 Combinations of affluence counts and transitions

Table 4 lists the population proportions of the combinations of affluent dimensions for 2002 and 2007 respectively. In both years about half of the German population is not considered to be affluent in any dimension (2002: 48.2%, 2007: 49.3%). According to this, the population is split up into two halves, one has zero affluence counts, the other half has at least one. Besides the combination of no affluence counts, the most frequent ones can be found within the group of individuals with exactly one affluence count: between 10% and 14% are affluent only in wealth, health or education. These three combinations make up about one third of the population in both years. Less than 1% are affluent in income only. With respect to the one-dimensional headcount ratio of 4.3% and 6.9% respectively, this means that the vast majority of those affluent in income are also affluent in at least one additional dimension, which is in line with higher rank correlations of income with the other dimensions (see Table 3). In both years, a very small fraction of the population (less than 1%) is affluent in all four dimensions.

The transition matrix of affluence counts in Table 5 provides information on the mobility in affluence counts between 2002 and 2007: About two thirds (67.7%) of the population did not change their status with respect to their combination of affluent dimensions during this 5-year period. Moreover, we see more downward (19.2%) than upward mobility (13%). More than half of the changers moved from zero counts to one single affluent dimension or vice versa.

[18] The results for the correlation coefficients of levels are very similar.

Table 4: Combinations of dimension-specific affluence: Population proportions

	affluent in*								
	I	**W**	**H**	**E**	**counts**	**2002**		**2007**	
1	0	0	0	0	0	48.16	48.16	49.26	49.26
2	1	0	0	0	1	36.90	0.70	34.16	0.57
3	0	1	0	0			12.08		10.12
4	0	0	1	0			13.69		10.99
5	0	0	0	1			10.44		12.47
6	1	1	0	0	2	12.05	0.88	11.87	1.37
7	1	0	1	0			0.26		0.30
8	1	0	0	1			0.72		1.14
9	0	1	1	0			3.35		2.37
10	0	1	0	1			3.03		2.93
11	0	0	1	1			3.80		3.76
12	1	1	0	1	3	2.49	0.62	3.97	1.88
13	1	1	1	0			0.41		0.56
14	1	0	1	1			0.32		0.37
15	0	1	1	1			1.14		1.16
16	1	1	1	1	4	0.39	0.39	0.73	0.73

Note: Results displayed as percentages. Source: GSOEP, own calculations.
* Value of one if affluent in respective dimension or zero otherwise (I=Income, W=Wealth, H=Health, E=Education).

Table 5: Transition matrix: Affluence counts

Counts	**Counts 2007**					
2002	**0**	**1**	**2**	**3**	**4**	**Total**
0	**39.95**	6.96	0.78	0.06		47.75
1	11.30	**21.56**	3.42	0.42	0.09	36.79
2	1.19	5.03	**5.01**	1.04	0.16	12.43
3	0.02	0.39	1.03	**1.14**	0.11	2.69
4		0.01	0.09	0.18	**0.06**	0.34
Total	52.46	33.95	10.33	2.84	0.42	100.00

Note: Percentages of affluence counts and combinations of affluence differ slightly from those presented in Table 4, since we only use individuals that were observed in both waves. Source: GSOEP, own calculations.

Table 7 in the Appendix reveals that the majority of movements in both directions is due to changes in being affluent with respect to individual health status (and to a lesser extent due to changes in affluence in wealth). Income and education play minor roles for the frequency of changes. This is, however, not surprising, since in both years there is only a relatively small fraction of affluent individuals in income and the level of education does not change very often (and normally cannot be reduced).

4.3 Multidimensional richness and its contributions

In Table 6 we present our results for the different multidimensional richness measures for all possible values of the second cutoff threshold k and for different values of α and β respectively.

Table 6: Multidimensional Measures

k	R^M_{HR}	$R^M_{\alpha=1}$	$R^M_{\alpha=2}$	$R^M_{\beta=1}$	$R^M_{\beta=3}$
			Germany 2002		
1	0.175	0.071	0.119	0.035	0.071
	(0.003)	(0.005)	(0.018)	(0.001)	(0.002)
2	0.083	0.036	0.066	0.017	0.035
	(0.003)	(0.003)	(0.011)	(0.001)	(0.002)
3	0.023	0.011	0.021	0.005	0.010
	(0.002)	(0.001)	(0.004)	(0.000)	(0.001)
4	0.004	0.002	0.005	0.001	0.002
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
			Germany 2007		
1	0.182	0.081	0.158	0.039	0.078
	(0.004)	(0.005)	(0.023)	(0.001)	(0.002)
2	0.096	0.050	0.106	0.023	0.044
	(0.003)	(0.004)	(0.017)	(0.001)	(0.002)
3	0.037	0.023	0.054	0.010	0.019
	(0.002)	(0.002)	(0.009)	(0.001)	(0.001)
4	0.007	0.005	0.012	0.002	0.004
	(0.001)	(0.001)	(0.004)	(0.000)	(0.000)

Note: k denotes the second cutoff threshold. Bootstrapped standard errors of empirical distribution in parentheses (1,000 replications). Source: GSOEP, own calculations.

According to the results from Table 4, about half of the population is rich, when it is sufficient to be affluent in at least one dimension. At the same time the multidimensional headcount ratio R^M_{HR} takes a value of 0.175 in 2002 and 0.182 in 2007 for $k = 1$, i.e. the percentage of affluent dimensions among the multidimensionally rich compared to the maximum number of affluent dimensions is 17.5% (18.2%) (see Equation 13). The substantial difference between the percentages of affluent *individuals* and of affluent *dimensions* is due to the fact that for $k = 1$ individuals with only one affluence count are predominant: They make up more than one third of total population in both years, compared to 14.9% and 16.6% respectively for two or more affluence counts. For larger values of k, the proportions of affluence counts decrease considerably to 8.3%/9.6% ($k = 2$), and 2.3%/3.7% ($k = 3$). Less than 1% are rich if it is required to be affluent in every single dimension ($k = 4$).

The resulting values for those multidimensional richness measures putting more weight on intense richness, R^M_α and R^M_β respectively, also decrease with the value for k. Especially from $k = 3$ to $k = 4$, there is a substantial drop, which is not surprising, since there is only a very small number of people with four affluence counts (see above). With regard to the fact that the proportion of individuals with at least one affluence count slightly decreased between 2002 and 2007 and the multidimensional richness measures without exception increased during this period, we can conclude that richness has become more intense and more concentrated among fewer multidimensionally rich individuals.

In addition to looking at the over-all values of the richness measures and making comparisons over time, we provide information how the different dimensions of affluence contribute to the over-all measures of multidimensional richness according to Equation (16). The graphs in Figures 1 and 2 show the proportional contributions of the four dimensions to the richness measures, again for different values of k as well as for different values of α and β. They reveal that the contributions are more or less evenly distributed across dimensions for the multidimensional headcount ratio denoted HR.

Taken together, health and education make up about 60% of the headcount ratio for $k = 1$. Their joint contribution is also above or around 50% for larger

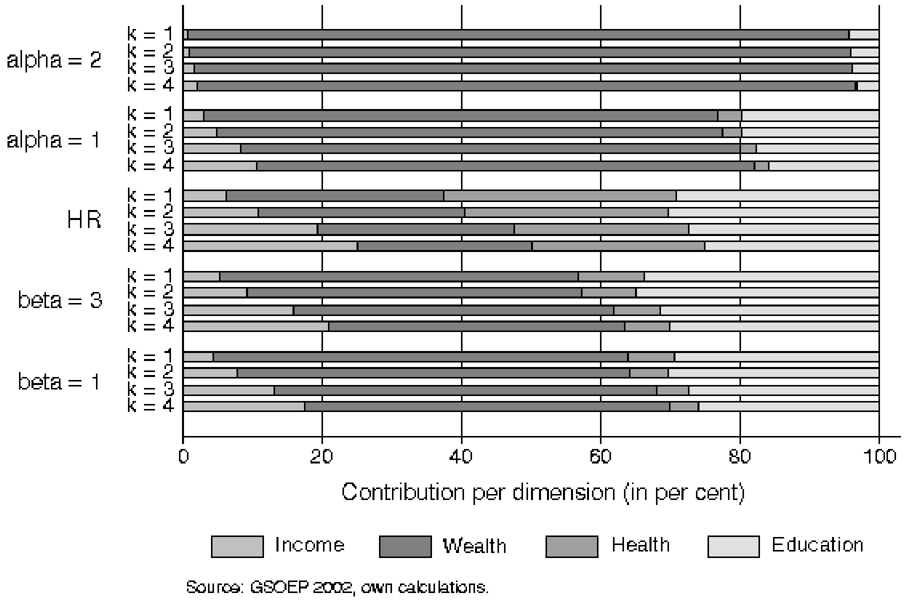

Figure 1: Contributions per dimension (Germany 2002)

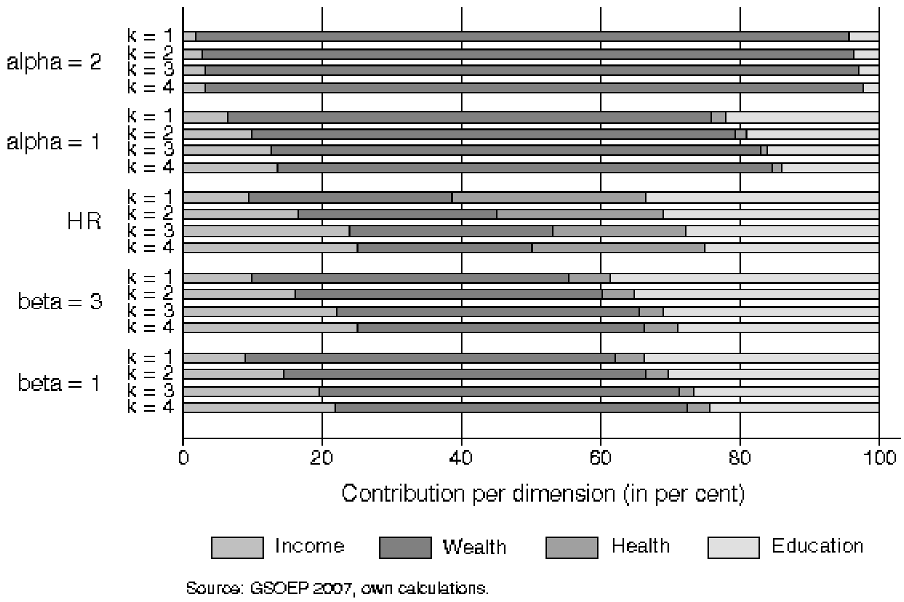

Figure 2: Contributions per dimension (Germany 2007)

values of k. However, besides for the headcount ratio, health plays only a very minor role for multidimensional richness. Its contributions are only marginal for R^M_α and R^M_β respectively, irrespective of the level of k, while the contributions of education to R^M_β are well above 20% and are only slightly below 20% for $R^M_{\alpha=1}$. The only exception is $R^M_{\alpha=2}$, for which we see that wealth plays an overwhelmingly dominant role. Of course, this is due to the fact that the convex measure emphasizes intense richness, especially for larger values of α. The contribution of income is quite small: It does not exceed 25% in any case. However, what can be recognized is a pattern of increasing relative importance of income for increasing values of k. This might be due to the fact that the over-all proportion of individuals who are affluent in income is relatively small. Hence, it is not surprising that income plays a more important role for larger values of the second cutoff threshold k.

4.4 Explaining multidimensional richness

It should be quite obvious that different combinations of affluence are not equally distributed across certain distinct groups in the population, e.g. with respect to age, employment status, type of household, gender or region (i.e. East or West Germany). We present results from multinomial logit estimations in Tables 8 and 9 in the Appendix.[19] Note that these estimation should be interpreted as correlations rather than in a causal way. The coefficients inform whether exhibiting a certain characteristic, e.g. belonging to a certain age group, has a positive or negative effect on the probability of combining certain affluent dimensions and hence reveal how these are associated with certain demographic characteristics.

Not surprisingly, age is positively correlated with being affluent with respect to wealth, since the stock of wealth holdings usually is accumulated over the life cycle (e.g. in case of property assets). At the same time, higher age classes are less often affluent in health or education. The latter could be explained by the fact that older generations, who were born during or shortly after World War II do not exhibit as many years of education as younger generations. Age is however

[19] In addition, Tables 10 and 11 give an overview of population proportions of these characteristics for every combination of affluence described before.

positively associated with affluence in income. This could be due to seniority-based pay, since the positive effect decreases in magnitude for the oldest age category, which corresponds to retirement age. Moreover, being employed is, of course, positively correlated with being affluent in income, wealth, and/or education.

Comparing the results for different household types reveals that living in a couple household is usually related to affluence in wealth. One could conclude that couples, especially those without children, are more able to build a wealth stock, maybe partly by being double-earners. Household types with children are less often affluent in income. One can imagine that these types of households either usually have lower incomes (especially single parents, who are also more often unemployed) or, in case of couple households, are likely to rely on one income while one of the spouses takes care of child-raising. In addition, since we look at equivalent incomes, additional household members ceteris paribus decrease the average disposable income by definition.

Gender is also associated with certain combinations of affluent dimensions. In most cases, being male is positively correlated with several combinations, it is however not significant in every case and with coefficients not very large in magnitude. The only (statistically significant) exceptions are the combinations "only affluent in wealth" (2002) and "affluent in income and wealth" (2007), which are more likely characterized by females. Finally, the distinction between East and West Germany plays an important role: In almost every case, living in West Germany is positively and significantly correlated with being affluent, where the combination "affluent only in education" is the only exception.

4.5 Robustness checks

We conduct several robustness checks in order to rule out that our results are driven by certain choices in our empirical application.

In Section 3, we described how we operationalize the four dimensions of affluence. E.g., our measure for income in both years, 2002 and 2007, is a three-year average, since we want to prevent bias from fluctuations in income. However, we find that using single year incomes, either for 2002 or 2007, only yields numerically different results, but does not alter the conclusions we draw from the results presented in the previous subsections. In addition, measuring health by the number of days per year *without* doctoral visit also makes no qualitative difference.

Finally, we already pointed to the fact that there are other reasonable ways to define the thresholds for being affluent or not. Results for using the 40–40–20 approach, i.e. using the 80%-quantiles of the marginal distributions as cutoffs for the multidimensional measures of richness yields slightly different results (especially for income). But the relative importance of the dimensions under consideration does not vary significantly and the multidimensional measures yield similar results (see the Appendix for details).

5 Conclusions

In this paper, we derive a methodology for the measurement of richness in a multidimensional setting. We argue that economic well-being, and especially the top of its distribution, should not only consider income as a single dimension, but in addition take into account further dimensions, since richness is not only perceived as a monetary concept. That is why we suggest a multidimensional approach in order to provide a more-sided picture of economic well-being. This approach of multidimensional richness measurement can also be reconciled with the literature on (economic) elitism.

Using income, wealth, health, and education as dimensions of multidimensional well-being and based on survey data from the GSOEP, we provide evidence for Germany. We show that it is justified to look at richness in multiple dimensions since it indeed turns out that an individual's position in the income distribution is a very poor predictor of its position in the distributions of the other dimensions. Moreover, we find that every dimension evenly contributes when multidimensional richness is measured by the multidimensional headcount ratio. However, when more emphasis is put on the intensity of richness, health plays virtually no role, while the contribution of wealth becomes predominant. The contribution of income turns out to be quite moderate, irrespective of the choice of richness measure.

We find that more than 50% of the German population are affluent in at least one of the four dimensions under consideration, less than 1% is affluent in every single dimension. A multinominal logit estimation reveals that the likelihood of being rich in all dimensions is highest for prime-aged males from the West who live in couple households without children. Concerning the mobility of individuals between 2002 and 2007 in terms of multidimensional richness, it can be concluded that mobility is rather low. More than two thirds of the population do not change their status. The remaining changes are mostly driven by health and to a lesser extent by wealth. In general, there is more downward than upward mobility.

However, a qualification has to be made. Our analysis is based on survey data where the top and the bottom of the income distribution are usually underrepresented. If we use a convex function, the estimates of the affluence indices depend extremely on the very high values. However, in many data sets, high incomes can be excluded (due to non-response), top-coded or made anonymous, or are less representative than other income ranges. However, due to the oversampling of very rich households in the GSOEP, we believe that these issues are of minor relevance in our application. Nonetheless, with regard to these restrictions we leave the choice of the weighting function up to the researcher, depending on the research question and the available data. In the end, this is a normative decision.

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A Appendix

A.1 Additional results

Table 7: Transition matrix: Combinations of dimension-specific affluence

Comb.	affluent in*				Combinations of affluence (2007)																
(2002)	I	W	H	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
1	0	0	0	0	**39.95**	0.18	2.20	4.15	0.44	0.09	0.04	0.02	0.47	0.02	0.14		0.06				47.75
2	1	0	0	0	0.39	**0.06**	0.04	0.05		0.04	0.05										0.62
3	0	1	0	0	3.12	0.04	**6.70**	0.26	0.04	0.21			0.62	0.06	0.01	0.01	0.07		0.01		11.16
4	0	0	1	0	7.79	0.05	0.60	**4.74**	0.16	0.01	0.05	0.01	0.30		0.19		0.03		0.01		13.93
5	0	0	0	1					**8.82**			0.31		0.50	1.07	0.10		0.07	0.13	0.09	11.09
6	1	1	0	0	0.11	0.04	0.28	0.03		**0.33**			0.04				0.07			0.01	0.92
7	1	0	1	0	0.01	0.05	0.02	0.05		0.02	**0.09**		0.04								0.29
8	1	0	0	1					0.22			**0.30**		0.05	0.05	0.08		0.07	0.01	0.02	0.79
9	0	1	1	0	1.07		1.14	0.28	0.07	0.03	0.01		**0.74**	0.03			0.02		0.02		3.44
10	0	1	0	1					0.88			0.03		**1.30**	0.13	0.17			0.17	0.07	2.77
11	0	0	1	1				0.01	1.96			0.16		0.12	**1.52**	0.07		0.10	0.24	0.05	4.24
12	1	1	0	1					0.07			0.03		0.19	0.03	**0.35**			0.01	0.03	0.70
13	1	1	1	0	0.02		0.06	0.01		0.16	0.01		0.04				**0.12**				0.41
14	1	0	1	1					0.10			0.09		0.01	0.05	0.02		**0.06**	0.02	0.04	0.38
15	0	1	1	1					0.16			0.01		0.30	0.13	0.10		0.01	**0.45**	0.05	1.19
16	1	1	1	1					0.01			0.01		0.08		0.13		0.02	0.04	**0.06**	0.34
				Total	52.46	0.41	11.03	9.57	12.93	0.90	0.24	0.96	2.26	2.65	3.33	1.02	0.37	0.32	1.12	0.42	100.00

Note: Percentages of affluence counts and combinations of affluence differ slightly from those presented in Table 4, since we only use individuals that were observed in both waves. Source: GSOEP, own calculations.

* Value of one if affluent in respective dimension or zero otherwise (I=Income, W=Wealth, H=Health, E=Education).

Table 8: Multinomial logit estimation of combinations of affluence (Germany 2002)

Affluent in	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Income	1	0	0	0	1	1	1	0	0	0	1	1	1	0	1
Wealth	0	1	0	0	1	0	0	1	1	0	1	1	0	1	1
Health	0	0	1	0	0	1	0	1	0	1	0	1	1	1	1
Education	0	0	0	1	0	0	1	0	1	1	1	0	1	1	1
Age group															
35–44	0.28	0.54***	-0.42***	-0.24**	0.87**	0.37	0.02	-0.12	-0.06	-0.46***	1.56***	0.22	0.70	-0.10	0.53
	(0.54)	(0.00)	(0.00)	(0.01)	(0.03)	(0.42)	(0.94)	(0.49)	(0.77)	(0.00)	(0.01)	(0.62)	(0.11)	(0.69)	(0.23)
45–54	0.63*	1.12***	-0.70***	-0.69***	1.38***	0.31	-0.53*	0.10	0.27	-1.17***	1.60***	0.38	0.42	-0.06	1.21***
	(0.09)	(0.00)	(0.00)	(0.00)	(0.00)	(0.53)	(0.08)	(0.54)	(0.17)	(0.00)	(0.00)	(0.24)	(0.33)	(0.82)	(0.00)
55–64	-0.06	1.58***	-1.03***	-1.01***	1.40***	-1.10	-0.99***	0.50***	0.73***	-1.63***	2.01***	0.95***	-1.17**	0.23	0.77*
	(0.87)	(0.00)	(0.00)	(0.00)	(0.00)	(0.30)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.04)	(0.46)	(0.08)
65 and over	-1.13	1.71***	-1.20***	-1.21***	0.75*	-1.86**	-0.83	-0.04	0.84***	-1.97***	1.60***	0.28	-2.51***	0.16	0.94
	(0.11)	(0.00)	(0.00)	(0.00)	(0.10)	(0.04)	(0.42)	(0.83)	(0.00)	(0.00)	(0.00)	(0.59)	(0.01)	(0.62)	(0.14)
Employment status															
Employed	1.06***	-0.04	0.05	0.47***	0.30	0.62	2.34***	0.29**	0.38**	0.60***	1.79***	0.85**	1.61***	0.32	1.63***
	(0.01)	(0.65)	(0.45)	(0.00)	(0.30)	(0.28)	(0.01)	(0.04)	(0.02)	(0.00)	(0.00)	(0.02)	(0.00)	(0.17)	(0.00)
Household type															
Couple (no chil.)	0.12	0.66***	-0.09	-0.29***	1.09***	0.46	-0.52*	0.52***	0.35*	-0.63***	0.93***	0.50	-0.40	0.00	0.44
	(0.75)	(0.00)	(0.39)	(0.01)	(0.00)	(0.47)	(0.05)	(0.00)	(0.05)	(0.00)	(0.01)	(0.24)	(0.34)	(1.00)	(0.36)
Single parent	-1.36**	-0.37	0.15	-1.02***	-1.70***	-1.76**	-2.54***	-0.62*	-0.44	-1.02***	-2.02**	-1.86*	-0.92	-0.79	-1.15
	(0.01)	(0.12)	(0.32)	(0.00)	(0.01)	(0.04)	(0.00)	(0.08)	(0.27)	(0.00)	(0.01)	(0.09)	(0.33)	(0.13)	(0.16)
Couple (with chil.)	-1.08**	0.54***	0.21**	-0.66***	-0.48	-1.15**	-2.17***	0.37**	0.06	-0.88***	-0.09	0.62	-1.67***	0.53*	0.31
	(0.01)	(0.00)	(0.03)	(0.00)	(0.19)	(0.03)	(0.00)	(0.05)	(0.74)	(0.00)	(0.82)	(0.21)	(0.00)	(0.08)	(0.47)
Gender															
Male	0.25	-0.10**	0.48***	0.07	0.03	0.38	-0.03	0.11	0.35***	0.42***	0.27	0.08	0.91***	1.07***	0.87***
	(0.14)	(0.04)	(0.00)	(0.24)	(0.81)	(0.28)	(0.89)	(0.24)	(0.00)	(0.00)	(0.14)	(0.80)	(0.00)	(0.00)	(0.00)
Region															
West	1.68***	1.64***	0.19***	-0.50***	2.41***	2.19**	0.84***	1.34***	0.85***	0.06	0.98***	3.54***	0.84**	1.69***	1.72***
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.63)	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)
Constant	-6.20***	-4.36***	-1.21***	-0.54***	-7.64***	-7.26***	-5.38***	-4.40***	-4.39***	-1.81***	-8.35***	-9.38***	-6.70***	-6.27***	-8.96***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: Baseline category is zero affluence counts. Reference categories for the regressors are "Less than 35" for age group, "Not employed" for employment status, "Single" for household type, "Female" for Gender, and "East" for region respectively. P-values from robust standard errors clustered at the household level in parentheses (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, $N = 56,073$, Pseudo-$R^2 = 0.08$). Source: GSOEP, own calculations.

Table 9: Multinomial logit estimation of combinations of affluence (Germany 2007)

Affluent in	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Income	1	0	0	0	1	1	1	0	0	0	1	1	1	0	1
Wealth	0	1	0	0	1	0	0	1	1	0	1	1	0	1	1
Health	0	0	1	0	0	1	0	1	0	1	0	1	1	1	1
Education	0	0	0	1	0	0	1	0	1	1	1	0	1	1	1
Age group															
35–44	-0.09	0.33**	-0.62***	-0.12	0.19	0.04	0.54*	-0.54**	0.30	-0.52***	0.34	0.06	0.01	0.58*	-0.36
	(0.82)	(0.04)	(0.00)	(0.24)	(0.57)	(0.93)	(0.05)	(0.02)	(0.22)	(0.00)	(0.40)	(0.91)	(0.98)	(0.08)	(0.40)
45–54	0.34	0.86***	-0.99***	-0.56***	1.36***	-0.90*	0.29	-0.11	0.63***	-1.00***	0.69**	0.02	-0.57	0.51	-0.05
	(0.35)	(0.00)	(0.00)	(0.00)	(0.00)	(0.09)	(0.35)	(0.53)	(0.00)	(0.00)	(0.05)	(0.95)	(0.20)	(0.10)	(0.90)
55–64	-0.05	1.38***	-1.18***	-0.79***	1.67***	0.54	-0.89**	0.46**	1.00***	-1.55***	1.13***	0.95***	-0.47	0.58	0.55
	(0.87)	(0.00)	(0.00)	(0.00)	(0.00)	(0.30)	(0.01)	(0.02)	(0.00)	(0.00)	(0.00)	(0.01)	(0.32)	(0.14)	(0.18)
65 and over	-1.46***	1.50***	-1.49***	-0.87***	1.13***	-1.35**	-0.80	-0.16	1.34***	-1.94***	1.27***	0.07	-1.65***	0.58	-0.53
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.04)	(0.18)	(0.51)	(0.00)	(0.00)	(0.00)	(0.90)	(0.00)	(0.16)	(0.21)
Employment status															
Employed	1.14***	0.04	0.02	0.64***	0.62***	0.95***	1.89***	-0.10	0.44***	0.53***	1.34***	1.28***	1.77***	0.20	0.99***
	(0.00)	(0.68)	(0.77)	(0.00)	(0.00)	(0.01)	(0.00)	(0.56)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.42)	(0.00)
Household type															
Couple (no chil.)	0.79*	0.55***	0.05	-0.23**	1.68***	-0.26	0.54*	0.39**	0.57***	-0.35**	0.61**	0.92**	0.20	-0.14	0.99***
	(0.07)	(0.00)	(0.71)	(0.02)	(0.00)	(0.62)	(0.07)	(0.05)	(0.00)	(0.04)	(0.01)	(0.03)	(0.58)	(0.66)	(0.00)
Single parent	-1.12	-0.05	0.27*	-0.56***	0.16	-2.61**	-2.45***	-1.12***	-0.14	-1.34***	-0.91	0.14	-1.14	-0.94*	-0.63
	(0.11)	(0.83)	(0.10)	(0.00)	(0.84)	(0.02)	(0.00)	(0.01)	(0.71)	(0.00)	(0.21)	(0.89)	(0.20)	(0.09)	(0.36)
Couple (with chil.)	-0.24	0.54***	0.35***	-0.49***	0.87**	-0.46	-1.08***	0.54***	0.65***	-0.35**	0.28	0.22	-1.37***	0.45	0.54
	(0.58)	(0.00)	(0.00)	(0.00)	(0.01)	(0.37)	(0.00)	(0.01)	(0.00)	(0.02)	(0.35)	(0.65)	(0.00)	(0.12)	(0.11)
Gender															
Male	0.22	-0.06	0.50***	-0.02	-0.36***	-0.08	0.40**	0.17	0.28***	0.15	0.50***	-0.02	0.56**	0.82***	0.33
	(0.34)	(0.29)	(0.00)	(0.71)	(0.01)	(0.81)	(0.04)	(0.15)	(0.01)	(0.16)	(0.00)	(0.93)	(0.04)	(0.00)	(0.15)
Region															
West	1.66***	1.94***	0.24***	-0.39***	2.27***	2.20***	1.51***	1.61***	1.31***	-0.01	2.26***	1.74**	0.41	1.79***	1.78***
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.96)	(0.00)	(0.05)	(0.24)	(0.00)	(0.00)
Constant	-6.82***	-4.68***	-1.44***	-0.74***	-7.93***	-7.11***	-6.47***	-4.71***	-5.53***	-1.86***	-7.46***	-7.52***	-6.02***	-6.47***	-7.08***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: Baseline category is zero affluence counts. Reference categories for the regressors are "Less than 35" for age group, "Not employed" for employment status, "Single" for household type, "Female" for Gender, and "East" for region respectively. P-values from robust standard errors clustered at the household level in parentheses (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, $N = 56,073$, Pseudo-$R^2 = 0.08$). Source: GSOEP, own calculations.

Table 10: Combinations of dimension-specific affluence: population proportions (Germany 2002)

	Combinations of affluence																
affluent in	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**Total**
Income	0	1	0	0	0	1	1	1	0	0	0	1	1	1	0	1	–
Wealth	0	0	1	0	0	1	0	0	1	1	0	1	1	0	1	1	–
Health	0	0	0	1	0	0	1	0	1	0	1	0	1	1	1	1	–
Education	0	0	0	0	1	0	0	1	0	1	1	1	0	1	1	1	–
Age group																	
Less than 35	22.1	19.7	6.9	40.4	35.2	6.5	24.6	34.9	20.5	14.3	46.5	5.0	16.9	21.8	23.6	11.4	24.6
35–44	18.8	22.7	10.3	23.8	24.8	12.2	28.9	28.2	17.2	12.7	26.9	23.6	22.7	39.4	22.1	22.7	19.4
45–54	16.6	34.7	15.7	15.1	15.5	23.9	31.6	19.1	18.4	15.7	12.5	25.2	21.3	32.0	18.2	38.0	16.5
55–64	15.8	16.8	24.0	9.0	11.1	32.7	9.2	10.7	24.3	22.7	7.0	32.8	25.9	5.6	16.7	16.0	15.8
65 and over	26.6	6.2	43.2	11.7	13.4	24.7	5.7	7.1	19.6	34.5	7.1	13.4	13.3	1.1	19.3	11.9	23.8
Empl. status																	
Not employed	48.5	15.4	61.4	36.6	30.5	44.1	17.0	7.5	40.2	48.6	22.5	17.0	26.9	5.2	35.2	14.4	43.9
Employed	51.5	84.6	38.6	63.4	69.5	55.9	83.0	92.5	59.8	51.4	77.5	83.0	73.1	94.8	64.8	85.6	56.1
Household type																	
Single	22.7	27.7	18.9	16.8	27.9	15.1	24.8	47.6	16.1	21.3	32.1	14.2	14.2	39.3	16.8	15.2	22.1
Couple (no chil.)	31.2	41.4	49.9	19.7	26.3	67.0	46.3	33.5	39.3	44.9	19.3	55.1	34.6	27.7	26.1	33.4	32.2
Single parent	7.3	3.4	2.4	8.7	5.1	0.9	2.2	2.0	2.8	3.2	6.1	0.7	0.8	6.7	2.1	1.5	6.1
Couple (with chil.)	38.8	27.6	28.8	54.8	40.7	17.0	26.7	16.9	41.8	30.6	42.5	30.0	50.5	26.4	55.0	49.9	39.7
Gender																	
Female	56.1	45.0	56.6	43.9	51.5	52.0	42.8	49.8	50.6	45.5	42.5	42.0	48.5	29.0	28.5	28.6	52.1
Male	43.9	55.0	43.4	56.1	48.5	48.0	57.2	50.2	49.4	54.5	57.5	58.0	51.5	71.0	71.5	71.4	47.9
Region																	
East	24.2	5.2	6.5	19.7	32.0	3.2	3.0	9.7	7.9	12.7	20.4	11.0	0.9	10.3	5.5	5.2	20.2
West	75.8	94.8	93.5	80.3	68.0	96.8	97.0	90.3	92.1	87.3	79.6	89.0	99.1	89.7	94.5	94.8	79.8

Note: Results displayed as percentages. Source: GSOEP, own calculations.

Table 11: Combinations of dimension-specific affluence: population proportions (Germany 2007)

	Combinations of affluence																
affluent in	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**Total**
Income	0	1	0	0	0	1	1	1	0	0	0	1	1	1	0	1	–
Wealth	0	0	1	0	0	1	0	0	1	1	0	1	1	0	1	1	–
Health	0	0	0	1	0	0	1	0	1	0	1	0	1	1	1	1	–
Education	0	0	0	0	1	0	0	1	0	1	1	1	0	1	1	1	–
Age group																	
Less than 35	20.3	20.3	7.7	43.9	29.5	6.4	23.5	18.5	21.6	9.8	42.4	9.5	15.3	27.5	13.6	19.9	22.8
35–44	18.1	20.9	10.5	21.8	26.2	8.3	28.4	35.4	12.3	14.4	26.6	17.2	18.6	30.4	26.5	16.6	19.0
45–54	18.5	34.2	16.4	14.6	18.3	27.7	10.5	31.0	17.3	18.7	16.6	23.2	18.6	19.6	21.8	22.3	18.2
55–64	13.9	19.3	21.1	8.2	10.3	32.0	31.2	8.2	23.5	18.5	6.7	24.3	33.7	17.9	14.7	29.7	14.4
65 and over	29.3	5.3	44.4	11.4	15.7	25.6	6.3	6.9	25.3	38.6	7.7	25.8	13.8	4.6	23.5	11.4	25.6
Empl. status																	
Not employed	50.7	15.0	59.4	41.2	31.1	39.4	21.1	8.5	51.1	48.7	27.2	27.9	22.6	9.1	38.7	23.6	45.1
Employed	49.3	85.0	40.6	58.8	68.9	60.6	78.9	91.5	48.9	51.3	72.8	72.1	77.4	90.9	61.3	76.4	54.9
Household type																	
Single	24.1	17.2	19.8	16.5	28.4	8.2	29.3	26.5	17.9	17.2	27.4	17.1	13.8	32.0	20.8	12.1	22.7
Couple (no chil.)	33.2	47.9	47.8	20.7	27.9	63.6	31.3	49.3	37.8	44.7	21.3	46.7	50.9	44.7	26.0	46.8	33.7
Single parent	7.5	2.4	3.4	10.1	6.9	2.7	0.8	0.9	1.7	3.0	3.7	1.7	5.2	3.8	2.0	2.2	6.4
Couple (with chil.)	35.2	32.4	29.0	52.7	36.8	25.5	38.5	23.3	42.6	35.1	47.5	34.6	30.1	19.5	51.3	38.9	37.2
Gender																	
Female	54.9	45.8	54.7	42.6	53.4	59.6	52.2	39.8	49.4	45.0	48.5	37.7	51.3	36.9	33.6	42.6	51.8
Male	45.1	54.2	45.3	57.4	46.6	40.4	47.8	60.2	50.6	55.0	51.5	62.3	48.7	63.1	66.4	57.4	48.2
Region																	
East	23.6	5.5	4.6	18.5	29.5	3.5	3.0	5.9	5.9	8.1	21.7	3.2	5.1	15.5	4.8	4.9	19.4
West	76.4	94.5	95.4	81.5	70.5	96.5	97.0	94.1	94.1	91.9	78.3	96.8	94.9	84.5	95.2	95.1	80.6

Note: Results displayed as percentages. Source: GSOEP, own calculations.

A.2 Robustness check: 80%-quantile cutoffs

Table 12: One-dimensional Measures

dimension	R_{HR}	$R_{\alpha=1}$	$R_{\alpha=2}$	$R_{\beta=1}$	$R_{\beta=3}$	I_{Gini}	P_{HR}
				Germany 2002			
Income	0.200	0.056	0.031	0.038	0.084	0.223	0.400
	(0.000)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.000)
Wealth	0.199	0.181	0.362	0.074	0.131	0.671	0.400
	(0.000)	(0.007)	(0.035)	(0.001)	(0.001)	(0.005)	(0.001)
Health	0.195	0.007	0.000	0.007	0.020	0.083	0.400
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Education	0.158	0.036	0.011	0.028	0.067	0.153	0.248
	(0.013)	(0.006)	(0.003)	(0.004)	(0.009)	(0.003)	(0.005)
				Germany 2007			
Income	0.200	0.075	0.059	0.046	0.096	0.256	0.400
	(0.000)	(0.002)	(0.004)	(0.001)	(0.002)	(0.003)	(0.000)
Wealth	0.200	0.210	0.535	0.078	0.134	0.685	0.400
	(0.000)	(0.008)	(0.055)	(0.001)	(0.002)	(0.005)	(0.001)
Health	0.200	0.007	0.000	0.006	0.018	0.081	0.400
	(0.002)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
Education	0.199	0.048	0.015	0.037	0.088	0.168	0.231
	(0.004)	(0.004)	(0.002)	(0.003)	(0.005)	(0.003)	(0.005)

Note: One-dimensional richness (poverty) is measured by the head count ratio R_{HR} (P_{HR}), inequality is measured by the Gini coefficient I_{Gini}. Although the cutoff and poverty lines are defined as the 80% and 40%-quantiles respectively which should correspond to affluence and poverty headcounts of 80% and 40% this is not the case for every dimension here, especially for education. This is due to the fact that education is a discrete variable. Bootstrapped standard errors of empirical distribution in parentheses (1,000 replications). Source: GSOEP, own calculations.

Table 13: Combinations of dimension-specific affluence: population proportions

	affluent in*				counts	2002		2007	
	I	W	H	E					
1	0	0	0	0	0	48.86	48.86	48.91	48.91
2	1	0	0	0	1	32.68	6.24	30.37	4.58
3	0	1	0	0			8.60		7.53
4	0	0	1	0			11.40		10.61
5	0	0	0	1			6.44		7.65
6	1	1	0	0	2	13.49	4.38	13.76	3.91
7	1	0	1	0			1.63		1.62
8	1	0	0	1			3.02		3.39
9	0	1	1	0			1.80		1.61
10	0	1	0	1			1.11		1.14
11	0	0	1	1			1.55		2.09
12	1	1	0	1	3	4.26	1.81	5.88	2.89
13	1	1	1	0			1.25		1.15
14	1	0	1	1			0.95		1.37
15	0	1	1	1			0.24		0.46
16	1	1	1	1	4	0.71	0.71	1.08	1.08

Note: Results displayed as percentages. Source: GSOEP, own calculations.

* Value of one if affluent in respective dimension or zero otherwise (I=Income, W=Wealth, H=Health, E=Education).

Table 14: Multidimensional Measures (Germany 2002)

k	R^M_{HR}	$R^M_{\alpha=1}$	$R^M_{\alpha=2}$	$R^M_{\beta=1}$	$R^M_{\beta=3}$
			Germany 2002		
1	0.188	0.070	0.101	0.037	0.076
	(0.007)	(0.002)	(0.009)	(0.001)	(0.002)
2	0.107	0.046	0.071	0.023	0.047
	(0.005)	(0.002)	(0.007)	(0.001)	(0.002)
3	0.039	0.019	0.030	0.009	0.018
	(0.002)	(0.001)	(0.004)	(0.001)	(0.001)
4	0.007	0.004	0.006	0.002	0.003
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
			Germany 2007		
1	0.200	0.085	0.152	0.042	0.084
	(0.004)	(0.003)	(0.014)	(0.001)	(0.001)
2	0.124	0.063	0.123	0.030	0.058
	(0.003)	(0.002)	(0.013)	(0.001)	(0.001)
3	0.055	0.032	0.061	0.014	0.028
	(0.002)	(0.002)	(0.007)	(0.001)	(0.001)
4	0.011	0.006	0.014	0.003	0.005
	(0.001)	(0.001)	(0.002)	(0.000)	(0.000)

Note: k denotes the second cutoff threshold. Bootstrapped standard errors of empirical distribution in parentheses (1,000 replications). Source: GSOEP, own calculations.

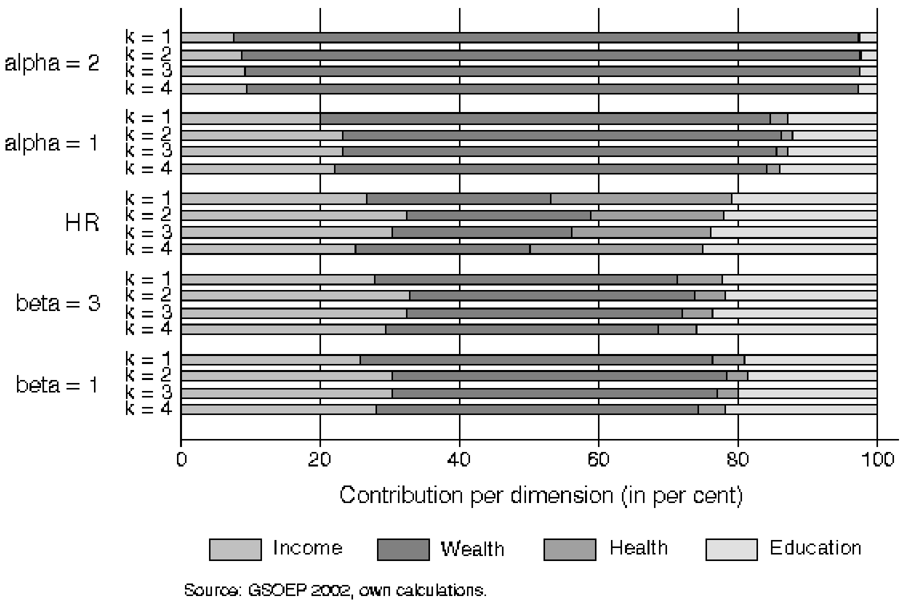

Figure 3: Contributions per dimension (Germany 2002)

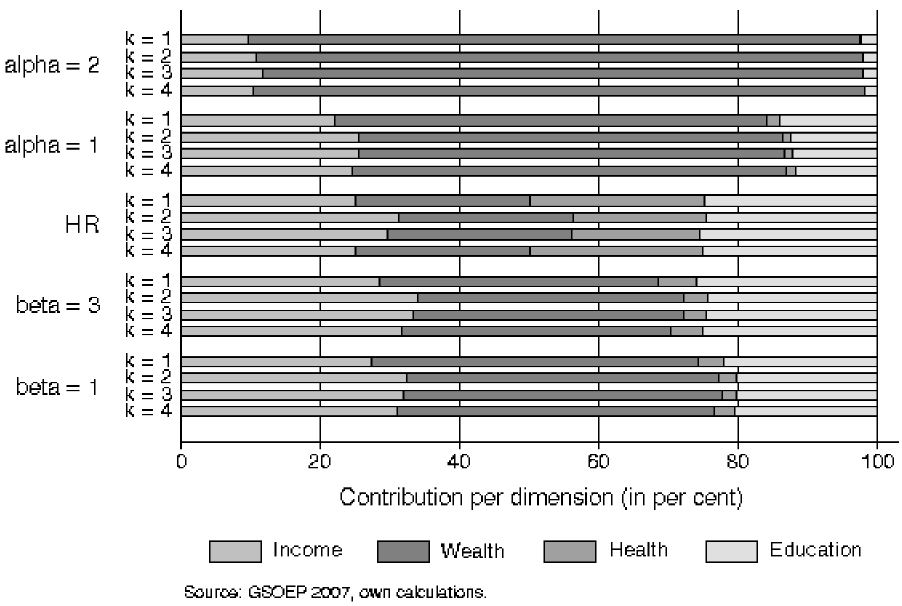

Figure 4: Contributions per dimension (Germany 2007)