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Nicolai Suppa[1]

Towards a Multidimensional Poverty Index for Germany

Abstract

This paper compiles a multidimensional poverty index for Germany. Drawing on the capability approach as conceptual framework, I apply the Alkire-Foster method using German panel data. I suggest new operationalizations for two dimensions: social participation and practical reason, the latter drawing on recent findings in experimental economics. The results are consistent with earlier findings, but also reveal several new insights. Specifically, numerous decompositions of the poverty index prove helpful in better tracking and understanding developments. Moreover, I find poor individuals to be adversely affected by general trends in deprivation indicators. Comparing multidimensional and income-based methods, I find only a modest overlap of people considered as poor by both approaches. Moreover, I address the role of income as a dimension in multidimensional poverty indices.

JEL Classification: I3, I32, D63, H1

Keywords: Multidimensional poverty; Alkire-Foster method; capability approach; SOEP

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1 Introduction

Background. The last two decades have witnessed increasing interest in both concepts and measures of well-being. Remarkable efforts have been made, from the Human Development Index in 1990, to the Millennium Development Goals in 2001, to the OECD Better Life Index in 2011.[1] Conceptual frameworks related to well-being, such as the capability approach (CA), the subjective well-being literature, and the theory of fairness, are burgeoning alike. In 2009 the so-called Stiglitz-Sen-Fitoussi Commission, appointed to explore alternative measures of welfare and social progress, presented its report. By now, the importance of well-being in general and poverty and social exclusion in particular is acknowledged even in advanced economies.

Along with these developments, significant improvements in the methodology of multidimensional measurements have been made as well (e.g., Tsui, 2002, Bourguignon and Chakravarty, 2003, Alkire and Foster, 2011a). So far, these measures have been systematically employed to analyze poverty in the developing world; see in particular Alkire and Santos (2011) and UNDP (2011). However, applying these techniques to advanced economies requires appropriately adapted specifications and operationalizations, such as choosing the relevant dimensions, appropriate indicators, and reasonable cutoffs. Moreover, these choices are also contingent upon the concrete purpose of the poverty measure: Is the task to carry out cross-country comparisons for a specific region and to identify general trends or to assess countries' relative performance in fighting poverty? Alternatively, is the goal to tailor a poverty index that suits a specific society for tracking the influence of adopted policy measures or to obtain a more detailed account of both structure and dynamics of poverty in that society? As these overall objectives crucially affect the response to many of the arising trade-offs, their explication is imperative.

Previous Research. Recent attempts applying the Alkire-Foster method (AFM) to advanced economies include Whelan *et al.* (2014) and Alkire *et al.* (2014). Both studies focus on cross-country comparisons and use EU-SILC data, where most indicators are located in resource space. While Whelan *et al.* (2014) only exploit the cross-section, Alkire *et al.* (2014, p. 3) emphasize that currently their contribution is not an empirical one, for reasons of data availability and coverage. Busch and Peichl (2010) also apply the AFM (among other methods), using SOEP data. However, they only consider education, health, and income and only loosely relate their work to a conceptual framework. Also

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[1]See UNDP (1990), UN (2012), OECD (2011).

using SOEP data, Rippin (2012) employs another method (a correlation-sensitive poverty index) and a different specification. Moreover, her focus is on regional and dimensional decompositions. Finally, there is also the literature on material deprivation in the tradition of Townsend (1979) and Yitzhaki (1979), thanks to which new indicators have been widely introduced. This research, however, primarily examines resources. Thus, despite some attempts in this direction, both a common full-fledged multidimensional poverty index and country-tailored comprehensive indexes are still lacking.

Contribution.   The present study contributes to research on multidimensional poverty measurement in several ways. First, I suggest how to specify two further dimensions—practical reason and social participation—which prove empirically important. Second, I demonstrate that in particular the decomposition of changes over time is helpful to better track and understand relevant developments. Specifically, this feature can reveal both offsetting and intensifying trends in single deprivation indicators. Such complexities are otherwise easily missed. Third, a refined analysis of changes uncovers that general trends in single deprivation indicators seem to have a differential influence not only on socio-demographic subpopulations, but also on poor and non-poor. This finding underlines the importance of both genuine multidimensional poverty measures and features allowing one to consistently track and analyze changes in multidimensional poverty. Moreover, the results are also consistent with previous findings. Specifically, I find systematic discrimination against people with a background in migration and an important role of the educational background of the father. Finally, I add to the debate on income and multidimensional poverty measurement. In particular, when comparing genuine multidimensional and income measures I find only a small overlap of people identified as poor by both measures. Additionally, I exploit information about the deprivation of the non-poor to argue that deprivations strongly related to income tend to be double-counted if income is added as a dimension.

Significance.   The present study enhances multidimensional poverty measurement for Germany and, thereby, also for advanced economies in general. Since, by now, the importance of poverty in advanced economies is widely acknowledged, several governments, started to compile dedicated reports, documenting numerous poverty-relevant developments. The German government, for instance, now releases an official report on poverty and wealth (RPW) for each legislative session.[2] The reports publish and analyze selected

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[2]The latest three reports are Bundesregierung (2005, 2008, 2013).

core indicators, and also provide advice on policy measures. However, what the RPWs so far lack is both a composite measure, nicely summarizing the various trends, and a systematic account of multiple deprivation. Although the RPWs occasionally address multiple deprivation,[3] the analysis usually draws on marginal rather than joint distributions of deprivation. The Stiglitz Commission, however, identifies the relevance of the joint distribution as an important cross-cutting issue. Taking account of the joint distribution is, in fact, precisely what indexes on multidimensional poverty can do.[4] The present study aims to close this gap and promote a multidimensional poverty index tailored to German society. Such an index complements the official reports with (i) a comprehensive summary measure (which still allows a detailed analysis) that (ii) takes account of the joint distribution of deprivations and (iii) improves the measurement of poverty as capability deprivation. Indeed, the latest RPW finds difficulties in measuring functionings, capabilities, and capability deprivations (see Bundesregierung, 2013, pp. 23–24).

Procedure. A cogent poverty measure must (i) be embedded within a grounded conceptual framework, (ii) have a sound technical basis, and (iii) use high-quality data for the calculation. To meet these requirements I first adopt the CA, essentially as developed by Sen (1985, 1992, 1999b), as a conceptual foundation. Dimensions are understood as functionings, which in turn constitute human well-being. Because of this inherently multidimensional concept of well-being, the CA offers a comprehensive and coherent account of deprivations. Moreover, for the inevitable value judgments (normative exercises) the CA requires any application to draw on a relevant public debate. Second, I apply the dual cutoff counting approach suggested by Alkire and Foster (2011a). The AFM fulfills several desirable axioms that allow a sensible analysis (e.g., numerous decompositions). Moreover, the AFM is sensitive to changes in both the breadth and the incidence of poverty. Finally, as an "open-source technology", it reveals rather than buries the value judgments and thereby allows for a constructive exchange with the public debate. Third, I use the SOEP, a high-quality and comprehensive German panel data set.

The official RPWs are not only to be complemented, but also serve as a starting point. When it comes to the inevitable value judgments (e.g., selection of dimensions, indicators, cutoffs, or weights), the CA assigns chief importance to public discussion (e.g., Sen, 1999b, ch. 6). The so-called core indicators analyzed in the RPWs had been previously suggested on theoretical grounds (Arndt and Volkert, 2007). Their selection is therefore reasoned

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[3]For a link between health and social participation, see, e.g., Bundesregierung (2013, p. XXXVI).
[4]See also Duclos *et al.* (2006), Ferreira (2011) on this.

and transparent and yet open to critique and modification. Thus, the selection issue is already under public discussion.

Outline. Section 2 provides a brief exposition of the underlying methods; section 3 introduces both the data and the adopted specification. Section 4 presents the results, and section 5 contains a brief discussion of selected issues. Finally, section 6 offers some concluding remarks.

2 Methodology

The Alkire-Foster method offers numerous benefits for the evaluation of both poverty-relevant developments and policy measures. The exposition here is restricted to those aspects used in the subsequent empirical analysis. Further aspects are found, e.g., in Alkire and Foster (2011a,b).

Identification. The matrix y contains the available data, is of size $N \times D$, and describes for each individual the achievement in each dimension deemed relevant. Specifically, $y_{id} \geq 0$ represents the achievement of individual $i = 1, \ldots, N$ in dimension $d = 1, \ldots, D$. The row vector z, with $z_d > 0$, describes the deprivation cutoffs, i.e., the achievements necessary for not being considered as deprived in the respective dimension. Using this information, we obtain the deprivation vector c by counting individual deprivations, i.e., the column vector's elements are $c_i = \sum_{d=1}^{D} \mathbb{1}(y_{id} < z_d)$. Following Bourguignon and Chakravarty (2003), the discrimination between poor and non-poor individuals depends critically on dimensional achievements and the respective cutoffs. Thus identification can be described by a function $\rho(y_i, z)$. Several approaches have been suggested so far. While the union approach is characterized by $\rho(y_i, z) = \mathbb{1}(c_i \geq 1)$, the intersection approach requires $c_i = D$. The key idea of Alkire and Foster (2011a) is to define $\rho_k(y_i, z) = \mathbb{1}(c_i \geq k)$ for $k = 1, \ldots, D$. Since ρ_k depends on both the dimension-specific cutoffs z_j and the overall cutoff k, it is called the dual cutoff approach. The union and intersection approaches are included as special cases ($k = 1$ and $k = D$).

Aggregation. A simple form of aggregation is the calculation of the headcount ratio, which is defined as $H = q/N$, where $q = \sum_{i=1}^{N} \mathbb{1}(c_i > k)$ is the number of the poor. Additionally, to take account of the breadth of poverty we first censor the counting vector of deprivations for non-poor and thus define $c(k)$ with elements $c_i(k) = \mathbb{1}(c_i \geq k)c_i$ for all $i = 1, \ldots, N$.

As $c_i(k)/D$ is the share of all possible deprivation suffered by i, $A = \sum_{i=1}^{N} c_i(k)/(qD)$ represents the average deprivation suffered by the poor. Alkire and Foster (2011a) then define the adjusted headcount ratio as $M_0 = \frac{1}{N} \sum_{i=1}^{N} c_i = HA$, which is sensitive to both changes in incidence and breadth of poverty. In principle other members of the FGT class of measures (see Foster, Greer, and Thorbecke, 1984) can be applied as well—their discussion is however beyond the scope of this paper.

Weights. So far we have assumed equal weights for all dimensions. To allow for different weights, we introduce a weighting vector w with $\sum_{d=1}^{D} w_d = 1$. Then the weighted deprivation count becomes $c_i = \sum_{j=1}^{d} w_j \mathbb{1}(y_{ij} \leq z_j)$, and $M_0 = \frac{D}{N} \sum_{i=1}^{N} c_i(k)$.

Decompositions. The adjusted headcount M_0 and both its single components and its changes over time have been shown to be decomposable in numerous ways. For instance, subgroup decomposition for the adjusted headcount ratio means that, after allowing for relative population sizes, the subpopulation-specific adjusted headcount ratios exactly add up to the overall adjusted headcount ratio. Let the subscript $g = 1, \ldots, G$ denote the particular subpopulation with $\sum_{g}^{G} N_g = N$ and $\psi_g = \frac{N_g}{N}$. Formally, the subgroup decompositions for the adjusted and the censored headcount ratio then are

$$M_0(y; z) = \sum_{g=1}^{G} \psi_g M_0(y_g; z) \qquad \text{and} \qquad H(y; z) = \sum_{g=1}^{G} \psi_g H(y_g, z). \qquad (1)$$

If data on more than one point of time is available, we also can calculate and decompose changes of aggregate measures. Let the superscript t denote the respective period. The percentage change of M_0 from $t - a$ to t then is

$$\Delta\%_a M_0^t \equiv \frac{M_0(y^t; z) - M_0(y^{t-a}; z)}{M_0(y^{t-a}; z)}. \qquad (2)$$

The percentage changes of $H(k)$ and $A(k)$ can be defined analogously; in general they are not independent of each other. Consequently, a basic decomposition of the change in M_0 is as follows:

$$\Delta\%_a M_0^t = \Delta\%_a H^t + \Delta\%_a A^t + \Delta\%_a H^t \times \Delta\%_a A^t. \qquad (3)$$

Changes in the censored headcount, in turn, can be traced back to subpopulation-specific headcount ratios, $H(y_g; z)$, and changing shares of the respective subpopulations (ψ_g).

Formally,

$$\Delta\%_a H^t = \sum_{g=1}^{G} r_g(t-a)[\Delta\%_a \psi_g^t + \Delta\%_a H(y_g^t; z) + \Delta\%_a \psi_g^t \times \Delta\%_a H(y_g^t; z)] \quad (4)$$

with $r_g(t-a) = \frac{\psi_g^{t-a} H_g(y_g^{t-a}; z)}{H(y^{t-a}; z)}$ being the subpopulation's contribution to the overall headcount in $t-a$. The adjusted headcount can also be decomposed into the contributions of each dimension (dimensional breakdown). First, the dimension-specific censored headcount is $\underline{H}_d \equiv \frac{1}{N} \sum_{i=1}^{N} \mathbb{1}(c_i \geq k \wedge y_{id} \leq z_d)$, allowing us to rewrite the adjusted headcount as

$$M_0 = \sum_{d=1}^{D} \frac{w_d}{D} \underline{H}_d. \quad (5)$$

Then, the contribution of dimension d to overall poverty is $\frac{w_d}{D} \frac{\underline{H}_d}{M_0}$. Additionally, changes in the adjusted headcount can be decomposed into changes in dimension-specific censored headcount ratios. Specifically,

$$\Delta\%_a M_0^t = \sum_{d=1}^{D} s_d(t-a) \Delta\%_a \underline{H}_d, \quad (6)$$

where $s_d(t-a) = \frac{\theta_d A_d(y^{t-a}; z)}{A(y^{t-a}; z)}$ is the contribution of dimension d to the average intensity.

3 Data and Specification

Sample. For the analysis I use data of the German Socio-Economic Panel (SOEP) and calculate a multidimensional poverty index for three periods of time (2001–02, 2006–07, 2011–12).[5]

The SOEP not only allows one observe the same individuals in different years, but also provides information on various aspects of a respondent's life. However, to avoid an overload of the respondents, some questions are only asked every other year (or less frequently), whereas other items are only collected in between these years. Consequently, for using these items simultaneously I merge two consecutive years into one period. Nat-

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[5]We use SOEP data v29.1, provided by the DIW; see Wagner *et al.* (2007) for more details. The data used in this paper was extracted using the add-on package PanelWhiz for Stata. PanelWhiz (http://www.panelwhiz.eu) was written by Dr. John P. Haisken-DeNew (john@PanelWhiz.eu). See Hahn and Haisken-DeNew (2013) and Haisken-DeNew and Hahn (2010) for details. The PanelWhiz-generated DO file to retrieve the data used here is available from me upon request. Any data or computational errors in this paper are my own.

urally, this comes at the cost of losing those observations not observed in both years of a period. Since the target population consists of adults, the sample is further restricted to respondents older than 18.

Operationalization. The importance of the conceptual framework for empirical exercises was already outlined and emphasized by Lazarsfeld (1958). The operationalization of the present study draws on both the capability approach and the German government's official reports on poverty and wealth. Relying simultaneously on both is possible, since the official reports by now explicitly use the CA as well.[6] The capability view not only considers human well-being as inherently multidimensional; moreover, it assigns intrinsic importance to functionings, i.e. the doings and beings individuals have reason to value. Note that intrinsic importance naturally leaves room for instrumental importance as well, as being able to read and write or being healthy nicely illustrate.[7] Poverty, then, is understood as capability deprivation, implying both a shortfall in one or several of the functionings deemed relevant and their infeasibility for the individual in question.[8] Consequently, indicators of deprivation both (i) need to be located in the functioning space and (ii) need to take account of the functioning's infeasibility.

Moreover, the CA requires value judgments to be exposed rather than concealed, and in addition they must be subjected to public debate. Only with clear presentation of the normative problem can a public debate about these issues be expected to fulfill its constructive role; see Sen (1999a, p. 10) or Suppa (2014). Value judgments are needed for (i) the selection of functionings included in the index, (ii) the respective deprivation cutoffs, and (iii) the assigned weights. The official reports provide a first set of indicators, which aim at measuring important functionings. Specifically, so-called core indicators are to be regularly reported, and their selection is based on scientific advice (Arndt and Volkert, 2007).[9] This selection is thus reasoned and transparent, and yet open to criticism and modification. Hence, the choice of dimensions is subjected to public debate and thereby complies with the aforementioned requirement of the CA (see also Sen, 2004, on this). Subjecting the choice of the deprivation cutoff to public debate, however, further constrains the choice of

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[6]Moreover, the RPWs also use another framework, the condition-of-life approach, essentially developed by (Neurath, 1917 [2006], 1937 [2006]). For a comparison of the two approaches see Leßmann (2009).

[7]For the distinction between intrinsic and instrumental relevance see, e.g., Sen (1999b) or Suppa (2014).

[8]On poverty as capability deprivation, see in particular Sen (1992, ch. 7) and Sen (1999b, ch. 4).

[9]Note that other contributions and debates reach similar conclusions, for instance the report of Stiglitz et al. (2011), or the European efforts for social inclusion (e.g., Atkinson et al., 2002, 2004, Marlier and Atkinson, 2010), but also the earlier Scandinavian approach to welfare (e.g., Allardt, 1993, Erikson, 1993).

a functioning's *indicators*. Specifically, indicators should allow for deprivation cutoffs that are similar and meaningful across individuals, such that a public debate can study the pros and cons and eventually agree upon those cutoffs. Limitations of available data, however, prompt us to draw on imperfect indicators as well. In some cases a functioning may be only captured incompletely; in others, measurement remains within the resources space. Finally, the CA clearly assigns income an instrumental role only, howsoever important it may be.

Specification. Although an in-depth discussion of all indicators is beyond the scope of this study, I briefly comment on the selected indicators, particularly on those measuring *social participation* and *practical reason*. Table 1 shows the selected functionings and their indicators, along with their weights. Note that almost all indicators are either already core indicators of or analyzed within the RPWs (e.g., Bundesregierung, 2013, 461–491, or Wissenschaftszentrum Berlin für Sozialforschung (WZB) and Institut für Arbeitsmarkt- und Berufsforschung (IAB), 2013).

Education. Education is meant to capture not only achievements in reading and writing, but also the abilities to use one's senses, to imagine, think, and reason (see Nussbaum, 2001). The first indicator (dep_educ) switches to deprivation if a respondent failed to complete primary education or completed primary education but later failed to obtain a vocational qualification. Beyond formal education, I also consider the number of books within the household. Members of a household owning less than 10 books are considered deprived (dep_Nbooks). This information proxies both the educational climate within the household and effective literacy (see, e.g., Dronkers, 1992).[10] However, as a proxy located in the resource space, it suffers the usual limitations (potentially important conversion factors are ignored).

Health. Deprivation in health, which is multidimensional itself, is signaled by three indicators. First, respondents are deemed deprived of bodily integrity if they are partially or severely disabled ($dep\_disability$). Second, problems with climbing stairs (dep_stairs) capture bad health originating from quite different sources, such as myopathy, cardiovascular diseases, or asthma.[11] Finally, a BMI larger than 30 ($dep\_obesity$) indicates, according

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[10]This indicator is used frequently to study the influence of constructs like "scholarly culture" of the parental household on children's educational attainments (see, e.g., Evans *et al.*, 2010), and is, moreover, applied by the OECD as well (see, e.g., OECD, 2014).

[11]Additionally, this indicator may point to deprivation of other functionings, such as moving about freely or social participation (instrumental relevance). Actually, there is more information for the relevant time

to WHO (2000, p. 242), obesity and thus is medically critical. Note that for these indicators the deprivation cutoffs are similar and meaningful across individuals—avoiding a common drawback of indicators like subjectively assessed health state or health satisfaction.

Housing.   Housing indicators are to capture the functionings of being sheltered and enjoying privacy. To measure housing, I resort to resource indicators. Specifically, I consider a person to be deprived of adequate shelter and privacy if any of bath, kitchen or toilet is missing in her accommodation ($dep\_hhfacilities$) or if the respondent reports that her house either "requires major renovation" or is "ready for demolition" ($dep\_housecond$). Finally, I use a simple overcrowding index ($dep\_overcrowded$), which indicates deprivation if there is less than 1 room per person in the household (see Bundesregierung, 2013, p. 243). However, drawing on these resource indicators ignores relevant conversion factors (e.g., the power relations within the family). Moreover, the housing situation may also contribute to healthy living conditions more generally. In addition, it may support self-respect or facilitate social participation.

Social Participation.   The measurement of social participation exploits information about the frequency with which certain activities are reported to be performed. These activities represent common forms of social life. Respondents may report *at least once a week*, *at least once a month*, *less often*, or *never*. Table A.1 contains the exact wording of the questions. While meeting friends or relatives, the social activity *par excellence*, is of central importance, many other activities also facilitate relatedness and social interaction. To emphasize the importance of meeting one's friends (for its own sake), I consider a person deprived if she reports to *never* meet her friends. The remaining items are used to construct an activity index. Specifically, the activity index considers an individual deprived if she reports *never* performing six or all of a list of seven activities or, alternatively, *never* performing five activities and, additionally, performing one or two activities *less often*.

Since nowadays at least some aspects of social participation (e.g., being related to a group) may well be achieved via communicational and social networks, I add the absence of appropriate means for accessing these networks as an indicator of deprivation. dep_comm equals 1 if a phone or an Internet connection is missing. Lacking appropriate questions for the respective "digital activities" is why I fall back on resource information

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period in the data set, e.g., on whether poor health makes tasks tiring, or whether it limits social or other activities. These indicators would then, however, explicitly shift the focus from the intrinsic to the instrumental relevance of health.

in this case. However, access to these resources fails to imply proper handling. Also note that not having Internet access is a more reasonable deprivation indicator in 2011 than in 2001.

Practical Reason. Nussbaum (2001) explicitly suggests the functioning practical reason, referring to the capacity to act. Moreover, *deliberate* decisions figure prominently in Sen's account as well.[12] The present study uses a comprehensive understanding of practical reason, referring to the ability to perform deliberate and reasoned actions. In economic choice theory this corresponds to the activity of balancing costs and benefits.[13]

The proposed operationalization draws on recent research from behavioral economics. Specifically, Mullainathan and Shafir (2013) summarize findings surrounding the so-called scarcity mindset, i.e., subjectively experienced scarcity, be it in terms of money, time or calories. Important results include the so-called focus dividend and tunneling.[14] As Mullainathan and Shafir (2013, p. 119,) conclude, "When we focus so intensely on making ends meet now, we plan less effectively for the future." Later (pp. 120–121), they continue, "myopia is not a personal failure. Tunneling is not a personal trait. [...] rather, it is the context of scarcity that makes us all act that way."[15] The key idea for the proposed operationalization is that people struggling hard to make ends meet focus on, and thus pay most attention to, monitoring every penny spent and any penny to be earned. Then these economic conditions induce *inter alia* myopia, i.e., long-run effects (costs or benefits) that are outside the tunnel. Hence, balancing of now incurred costs and faraway benefits is systematically distorted. Moreover, the economic situation that matters is rather comprehensive, including the household composition, the current employment situation, and wealth.

Consequently, though failing to put money aside for emergencies ($dep\_emergency$) may result in further capability deprivation later, it indicates tunneling now and thus a reduced capacity to act, and thus a capability deprivation itself. Similarly, the absence of

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[12]Examples include the exercise of valuation (Sen, 1985, p.19) or *choosing* what one values, which is a functioning itself (e.g., Sen, 1992, p.41)

[13]Though both related to agency, the two concepts are distinct. Agency refers to the ability to set one's own goals and eventually strive for them, such as whether to devote one's life to a country's independence, to opt for an austere and spiritual life style, or to maximize one's well-being (e.g., Sen, 1992, ch. 4). In contrast, practical reason refers also to technical and operational decisions.

[14]An example of a focus dividend that poorer people are able to extract is their immunity to commonly found framing effects, specifically, whether sums of money are expressed in absolute or relative terms (Mullainathan and Shafir, 2013, ch. 4, surveys the evidence). Tunneling, a drawback of focusing, however, is found to induce myopia, a phenomenon also well documented by behavioral economics.

[15]See also Shah *et al.* (2012), Mani *et al.* (2013), who provide more evidence and elaborate this line of thought.

such resources as life insurance, a pension, or an owned house indicates a lack of what Mullainathan and Shafir (2013, ch. 3,) call slack (dep_wealth).[16] Finally, though precarious employment ($dep\_precemp$) may be better than unemployment (dep_unemp), it is likely to be associated with tunneling as well. The current specification accounts for this difference by assigning different weights (see below). Note that while *scarcity* may also induce shortfalls in other functionings, what matters here is its direct effect of limiting the capacity to choose. Further discussion of issues in operationalization and specification is deferred to section 5.

Weights.   The main specification assigns equal weights to each dimension and, within a dimension, equal weights to each indicator. Consequently, all indicators receive a weight of $1/15$ except the education indicators, which receive $1/10$ each. The only exception to this rule is precarious employment, which receives a weight of $1/20$. The reason is that, although precarious employment is still associated with deprivation, it represents an improvement if someone leaves unemployment for a precarious job.

Who is poor?   Many instances of the subsequent empirical analysis use a poverty cut-off $k = 40$, implying an individual is considered poor if she suffers at least 40% of the (weighted) maximal possible deprivation. By way of illustration: There is a male respondent aged 34, who (i) failed to obtain a vocational qualification, (ii) exhibits obesity, (iii) is considered at least partially disabled, (iv) is currently observed to be unemployed, (v) fails to put money aside for emergencies, and (vi) reports critically low social activity. As his (weighted) deprivation count amounts to 0.43 ($1/10 + 5/15$), he is considered multi-dimensionally poor. Alternatively, consider a female respondent aged 76, who (i) failed to complete general elementary education, (ii) reports problems with climbing stairs, (iii) calls neither a life insurance policy, a pension, nor a house her own, (iv) lacks current important communicational means, (v) never meets friends, and also (vi) reports critically low social activity. This woman is also considered poor, since her weighted deprivation count sums to 0.5. Note that although these deprivations, such as education and unemployment, might even be causally related, each of them inherently diminishes the life the person leads, which is ultimately why we count it.

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[16]In their suitcase-packing metaphor, slack is space accidentally left here and there. Slack indicates the scarcity mindset and trade-off thinking to be absent. Among other things, it also provides room to fail, i.e., less disastrous consequences of erroneous actions. For more details see Mullainathan and Shafir (2013, ch. 3).

Raw and Censored Deprivation Headcounts. Figure 1 shows the raw headcount ratios for each deprivation indicator in each period. Salient features are (i) the relatively low headcount ratios of the housing indicators (1–7%) and (ii) the high headcount ratio of dep_comm in 2001–02 (66%), which however dramatically falls to ca. 24% in 2011–12. The latter observation is due to the expansion of broadband Internet connections during that decade.[17] Moreover, the figure shows that raw headcount ratios of the remaining indicators vary from 10% to 40%. Instead, figure 2 compares deprivation headcounts of poor and non-poor (with $k = 40$) for the period 2011–12. For instance, only 17% of the non-poor people exhibit obesity, whereas 46% of the poor do.

Figure 3 shows what we ignore in the subsequent analysis, viz., the share of the raw incidence of deprivation that is suffered by *non*-poor, by year and poverty cutoff k. For instance, for $k = 40$ we discard at least 50% percent of each indicator's deprivation, since it fails to be accompanied by sufficiently many other deprivations. This share is necessarily non-decreasing in k: as less people are identified as poor, a larger part of a deprivation's distribution is apportioned to the non-poor. Standing out across periods and k-cutoffs is (i) that deprivation of books in household always ranks lowest, while (ii) the precarious employment indicator exhibits systematically the largest share. To some extent, however, these observations might result from the weighting scheme: dep_Nbooks received an above average weight, making it more likely to end up above the k-cutoff. $dep\_precemp$, in contrast, has weight less than average. It is further noteworthy that a larger part of deprivation in means of communication is only discarded in 2001–02, particularly for $k \in [20, 40]$.

With a dashboard approach, which is exclusively based on the the marginal distributions (i.e., the raw indicators shown in figure 1), it must remain unclear whether those deprived of education are also those deprived of, say, health. Worse, observing an indicator's raw headcount ratio to decline allows no valid inference about what happens to the multiply deprived people—in particular, given shares of deprived non-poor of about 50% (see figure 3). Thus, a multidimensional poverty index exploits the joint distribution of deprivations to better target the seriously deprived. In fact, the next section shows this to be important, as it demonstrates general developments that affect multidimensionally poor persons adversely, i.e., make them substantially worse off.

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[17]As the cogency of this indicator rests on a significant part of the society actually using the Internet for socializing, the indicator is more reasonable for 2011–12.

4 Results

Aggregate Measures. Figure 4 depicts the multidimensional poverty measure M_0 (the adjusted headcount ratio), the incidence H (the censored headcount ratio), and the average intensity A (the average number of deprivations suffered by the poor)—each for all three periods and for poverty cutoffs $k \in [10, 70]$. Figure 4 suggests that both M_0 and H decrease from period 2 to 3 for all k. Moreover, we observe no clear-cut trend either of M_0 and H for the first half of the decade, or of the average intensity throughout the whole decade.

In order to obtain a more detailed account of multidimensional poverty, figures 5 and 6 contain adjusted and censored headcount ratios, each computed for specific subpopulations. Figure 5 (a), for instance, documents that individuals with a background of migration exhibit both a larger M_0 and a larger H—in all years for all relevant k. Similarly, figure 5 (b) suggests both a higher M_0 and a higher H for East Germany—this difference is, however, much less pronounced. Finally, figure 5 (c) documents systematic differences according to age. Clearly, people aged 65 and above exhibit both a higher M_0 and higher H. In contrast, people of prime working age exhibit the lowest multidimensional poverty.

Figure 6 uncovers further substantive differences in multidimensional poverty among groups, for $k \in [10, 60]$. Specifically, persons in single households tend to experience more poverty than individuals in households of couples, regardless of eventual children in the household (figure 6 (a)). Figure 6 (b) clearly documents the importance of the father's education on an individual's deprivation. Four groups appear to be distinguished: First, persons with fathers completely lacking education are associated with the highest M_0, followed by those whose fathers had uncompleted or unknown education. The third group consists of individuals whose father completed *Hauptschule* or other schools, while the fourth contains those whose fathers completed *Realschule* and *Abitur*. Finally, figure 6 (c) suggests both a slightly higher M_0 and H for women.

Differences in average intensity vary less by subgroup; see figure A.2. For instance, average intensity varies little among age groups. However, respondents whose father's education is *Realschule* or better display a lower intensity on average than those whose father's education is at best incomplete or unknown (at least for $k < 50$).

In sum, figure 5 and 6 document that the insights generated by the adjusted headcount ratio are consistent with earlier findings. The systematic discrimination of individuals with migration backgrounds is just as well documented as the influence of the family background on the offspring's educational achievements (e.g., Bundesregierung, 2008, ch. IX

and III.5).

Contributions of Subpopulations.   So far, the results suggest that certain socio-demographic groups suffer more from multidimensional poverty. This paragraph reveals the shares that specific groups contribute to overall multidimensional poverty, so that relative population sizes matter as well. Specifically, using (1), M_0 and H can be decomposed into contributions of each subpopulation to overall poverty. For this exercise the poverty cutoff is set to $k = 40$. Figure 7 (a), showing such a decomposition for German states, suggests that the populous states NRW, BAV, and BW contribute the lion's share to both overall multidimensional poverty (M_0) and incidence (H).[18] Figure 7 (b) shows that 30–34% of the overall multidimensional poverty (M_0) is contributed by people with a background of migration. Note that this share is disproportionate to their population share (16–19%). Figure 5 (a) also reflects this finding. Likewise, figure 8 (a) shows individuals in single households and in couples without children to contribute most to overall multidimensional poverty (64–74%). Notably, the share contributed by couples with children decreased by ca. 10 percentage points during the second half of the decade, from 23.49% to 13.44%. Finally, figure 8 (b) clearly underlines the importance of the father's educational background. More specifically, respondents reporting their fathers to have completed *Hauptschule* alone make up approximately ⅔. Including those individuals reporting their father's education to be unknown, uncompleted, or absent, the share of multidimensional poverty associated with a handicapped education of the father climbs to ca. 90%.[19]   Although the corresponding population share is ca. 75%, the educational background of the father still figures prominently in multidimensional poverty.

Dimensional Breakdown.   In figure 9 multidimensional poverty (M_0) is further decomposed to each indicator's contribution using (5). The subsequent figures report both the absolute contribution of a dimension d, $\frac{w_d}{D}\underline{H}_d$, summing to M_0, and the relative contribution, $\frac{w_d}{D}\frac{\underline{H}_d}{M_0}$, summing to 100%. Figure 9 suggests the dimensional contributions to be stable over time. The major contribution comes from social participation, followed by a shortfall of practical reason and deficits in education. Housing indicators add the smallest share (ca. 4%).

In order to display different profiles of poverty, figure 10 (a) shows dimensional breakdowns for different subpopulations. Typically, for persons with a background of migration,

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[18]Naturally, marked differences in population are driving this result. State-specific adjusted headcount ratios reveal differences among states, but fail to provide clear-cut conclusions (results not shown).

[19]The corresponding contributions to the simple headcount ratio are presented in figure A.3.

the dimensions practical reason and housing contribute relatively more to multidimensional poverty, whereas health appears to contribute relatively less. However, the profiles seem to converge over time, as the dimension-specific differences decrease in general (previous year's results not shown). Figure 10 (b), however, shows that virtually any absolute contribution is larger for individuals with migration background. Similarly, figure 10 (a) also suggests that the relative contributions of deprivations in social participation and health increase with age, so that the roles of housing and practical reason decrease. In absolute terms, however, figure 10 (b) shows each indicator's contribution to multidimensional poverty to increase with age.[20] Thus, virtually all indicators contribute absolutely more for the elderly and for people with migration background. However, only for age do relative contributions change: in old age health and social participation become increasingly important.

Dynamics. To better understand the dynamics of poverty, I first calculate the changes in overall multidimensional poverty (M_0), since this allows a deeper and more careful analysis than figure 4. Figure 12 shows the changes in M_0 from period 1 to 2 (2001–02 to 2006–07) and from period 2 to 3 (2006–07 to 2010–11)—each for $k \in [10, 60]$. A clear-cut trend for developments during the first half of the decade is missing: for $k \in [10, 30]$ and $k = 60$, multidimensional poverty decreases, whereas for $k = 40, 50$ it increases. In contrast, during the second half of the decade, i.e., for all $k \in [10, 60]$, I find unambiguously a reduction of multidimensional poverty. An exclusive focus on changes in M_0 may, however, neglect opposing trends in different dimensions. Likewise, possibly opposing trends in the censored headcount and the average intensity are also obscured.

To approach potentially opposing dimension-specific developments, figure 13 shows the percentage change in the dimension-specific censored headcounts, i.e., in the incidence of a certain deprivation of those who are (multidimensionally) poor. For the first half of the decade under consideration, I only find two housing indicators to unambiguously decrease, whereas the practical reason indicators and the obesity indicator clearly increase. For the remaining indicators the findings depend on the chosen poverty cutoff k. In contrast, the period from 2006–07 to 2011–12 can be clearly characterized by decreasing censored headcounts of *all* indicators.

How do these changes compare to the overall changes of the raw deprivation headcounts? If the marginal distributions of deprivations were independent, i.e., if the joint

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[20]Figure 11 shows dimensional breakdowns for the type of household and the father's education. Note that singles and single parents exhibit remarkably similar deprivation profiles.

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distribution were irrelevant, then we should observe equal changes. Put differently, a general trend of a given indicator should affect multidimensionally poor and non-poor equally. Figure 14 (a) depicts the relative changes of the indicators' incidence for all individuals, $\Delta\%H_d^{all}$ (raw headcount ratio), and conditional on being multidimensionally poor, $\Delta\%H_d^{poor}$.[21] For some indicators we can indeed observe similar relative changes (e.g., for $dep\_overcrowded$); for others, however, there are remarkable differences (e.g., $dep\_precemp$). Notably, while unemployment increased during the first half of the decade, the multidimensionally poor were hit more badly than average; whereas during the decline of unemployment in the second half, they benefited less than average. To examine this asymmetry more closely, figure 14 (b) shows the relative-change ratio for each indicator and year. Values greater (smaller) than 1 indicate that the multidimensionally poor are affected by amounts above (below) average. The graphs on the left (right) contain the overall decreasing (increasing) indicators.

Generally speaking, figure 14 (b) suggests multidimensionally poor people are adversely affected by general trends. More specifically, multidimensionally poor people are hurt above average by increasing deprivation headcounts, and benefit less than average from decreasing ones. Evidently, genuine multidimensional measures and simple dashboard-approach poverty may well lead to substantively different conclusions.

To scrutinize potentially opposing trends in H and A, I use (3) to decompose the changes of M_0. Figure 15 reveals that the changes observed in figure 12 generally stem from changes in H. Moreover, for $k \leq 30$ I find A indeed to counteract the effect of H—at least during the first half of the decade. Instead, during the second part the change in A reinforces the incidence's effect. Finally, the interaction turns out to be negligible.

Alternatively, the changes of M_0 depicted in figure 12 can, using (6), also be decomposed into the effects of the changes in the dimension-specific censored headcounts. Figure 16 uncovers important changes taking place, underlying the earlier-found inconclusive development from period 1 to 2. Specifically, I find obesity and the practical reason indicators to clearly increase multidimensional poverty (independently of k). For $k = 30$, however, there are offsetting trends in dep_educ and dep_comm, in sum leading to reduction of M_0 (see also figure 13). For the second half of the decade figure 16 suggests that the decrease in M_0 comes from reductions in *all* dimensions. In sum, both figures 15 and 16 clearly help to understand the developments depicted earlier in figure 12.

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[21]Note that H_d^{poor} is not equal to $\underline{H}_d$, as the former is additionally divided by H. By implication, the respective changes of these quantities may even indicate different directions. Moreover, a refined approach (which is, however, beyond the scope of this study) would systematically exploit the panel information of the data.

Figure 17 decomposes the changes of M_0 into changes of H and A, each calculated by sub-populations using (3). I find that individuals with migration background were more likely to become multidimensionally poor during the first half of the decade, but also even more likely to leave multidimensional poverty during the second half. With respect to age I find that young people (aged 25 and below) are disproportionately more affected. In general, however, all age groups are affected in the same direction. Interestingly, men were more affected by the increase during the first half, while both sexes enjoyed similar reduction in poverty (incidence and multidimensional poverty) during the second half. A similar pattern is found for differences between East and West Germany: While East Germany experienced a disproportionately larger increase from 01–02 to 06–07, West Germany enjoyed the larger decrease in poverty from 06–07 to 11–12. In sum, general trends in single deprivation indicators seem to have a differential influence on (i) poor and non-poor and (ii) socio-demographic subpopulations. Moreover, the MD poverty index also allows one to detect both offsetting and intensifying trends by single deprivation indicators. Thus, it is helpful in the effort to better track, consistently analyze, and understand relevant developments.

Multidimensional and Income Poverty. An important question is: how do income and multidimensional poverty relate to each other? One aspect to analyze is which individuals the respective measure identifies as poor. Naturally, such a comparison is sensitive to the choice of the respective poverty cutoffs. Figure 19 shows the population shares of individuals who are considered poor (i) by both measures (both-poor), (ii) by income poverty only (IO-poor), and (iii) by multidimensional poverty only (MDO-poor). These shares are plotted for $k \in [20, 50]$ and for income poverty cutoffs of 40%, 50%, and 60% of the median net household equivalence income. By construction the sum of IO-poor and both-poor is constant within a subplot. Likewise, the population shares of MDO-poor and both-poor decrease mechanically with k. For $k = 30$ (40) and an income poverty cutoff of 60% only 5% (3%) of the population is identified as poor by both measures. Moreover, the shares that are unique to IO-poor and MDO-poor are 4% and 11% (6% and 4%).[22] Figure 19, therefore, suggests the overlap or the joint identification of the two measures to be rather modest.

Who are the IO-poor people? Figure 21 shows the age distributions by poverty status. Roughly a third of the IO-poor are aged 30 or less. As these individuals are typically students, this gives point to not considering them as truly deprived. Note also that those

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[22]Figures for the other years can be found in the appendix (figure A.4).

who are MDO-poor are, by tendency, elderly people, meaning that although they lead a truly multidimensionally deprived life, they are not considered poor using conventional measures.

Finally, figure 20 contrasts the respective headcount ratios for income poverty and multidimensional poverty, each for several poverty cutoffs. First, $k = 40$ implies roughly the same incidence as a 60%-of-median-income cutoff. Second, the monetary poverty rates are rather stable over time, although a slight increase is registered during the first half, whereas no decrease is detected during the second. Evidently, multidimensional poverty measures provide a more detailed account. These aspects provide an additional rationale for using multidimensional poverty measures.

5 Discussion

Missing Dimensions I: Employment? Previous studies either include an employment dimension or explicitly advocate an *employment capability* (e.g., Leßmann and Bonvin, 2011, Alkire *et al.*, 2014). The proposed poverty index, in contrast, deliberately avoids such a dimension—not, however, because I question the relevance of employment. In fact, by now there is widespread agreement about the importance of employment for human well-being (e.g., Stiglitz *et al.*, 2011, Bundesregierung, 2013). Instead, the argument is that employment is rather a means or resource for achieving several distinct functionings.

The effects of *un*employment on well-being are a case in point. Research on life satisfaction, for instance, documents the importance of non-pecuniary costs of unemployment for subjective well-being and thus demonstrates their importance in principle (Winkelmann and Winkelmann, 1998, Kassenböhmer and Haisken-DeNew, 2009). Further results find identity utility to be important (Hetschko *et al.*, 2013), which from a capability view may indicate an effect on being ashamed or respecting oneself. Some studies also directly examine the effect of unemployment on specific functioning achievements. Kunze and Suppa (2014), for instance, find unemployment to reduce social participation, whereas Schmitz (2011) finds no effect on health in general. If, however, perfect measures for all relevant functionings were available, there would be no need to rely on an unemployment indicator.

Understanding employment as means for functioning achievements and thus including unemployment as a deprivation indicator, however, requires further assumptions. Specifically, what capability deprivation is unemployment assumed to indicate? The current specification tentatively subsumes unemployment under practical reason, for the arguments stated above. This approach is a natural starting point, since important associated

functionings are either already included (e.g., health and social participation) or are still missing entirely (e.g., respecting oneself, appearing in public without shame, or agency). Drawing on future research disentangling the influence of unemployment on well-being more carefully may allow refined specifications. More generally, no claim is made to comprehensively capture labor-related deprivations. Instead, future research has to devise adequate indicators.

Missing Dimension II: Income?   Previous studies frequently include income as a dimension (e.g., Alkire *et al.*, 2014, Rippin, 2012, Whelan *et al.*, 2014). Conceptually, income is clearly a resource—indeed, an important one—which is why it may provide additional information.[23] The underlying question is whether income indeed adds something substantively new or whether income-driven deprivations will only be double-counted. The modest overlap of poverty measures, discussed in the previous section, allows for both. A strong case for adding an income dimension is based on missing functionings, whose shortfall is—arguably or evidently—strongly related to a shortage in income. Likely candidates are agency, appearing in public life without shame, and self-respect. Naturally, if information on further functionings had been available in the current data, they would have been exploited already in the first place. However, what can be studied is not only who the IO-poor are (see section 4), but also what their current deprivations look like. Based on such information, one can better evaluate whether income should be included.

Whether or not IO-poor persons will be considered multidimensionally poor ultimately depends upon their remaining deprivations. To analyze these we can use the (uncensored) counting vector. Figure 22 (a) depicts the average deprivation by poverty status and age. Three features are salient: (i) MDO-poor and both-poor exhibit similar average deprivations; (ii) IO-poor report more deprivations on average than non-poor; (iii) IO-poor and non-poor both appear to have life-cycle trends, although different ones. Specifically, the average number of deprivations is U-shaped for the non-poor, while for IO-poor it increases until the age of 30 and then remains constant. Thus, if income is added as a dimension, the IO-poor aged 30 and older are most likely to added as multidimensionally poor. For a closer examination, figure 22 (b) shows raw deprivation headcount ratios by poverty status and age group. The generally high prevalence of deprivation in $dep\_emergency$ and dep_wealth merely mirrors the high raw deprivation headcount already depicted in figure 1, whereas their relatively high prevalence among non-poor people aged 30 or younger

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[23]From a conceptual point of view, it remains unclear how to interpret a shortage of income in the context of multidimensional measures that aim to capture *intrinsically* important deprivations. What exactly are the functionings the low income reduces?

rationalizes the earlier observed life cycle effect (in their twenties, individuals start accumulating wealth). Striking, however, is the relative importance of $dep\_emergency$ and dep_wealth for IO-poor across all ages. Note, though, that other deprivation headcount ratios also appear to be slighter higher for IO-poor than for non-poor. This finding suggests that if income is added as a dimension, strongly income-driven deprivations receive implicitly a higher weight. More generally, this problem seems important whenever highly income-related resource indicators are employed. To avoid double counting of resource-based indicators, the present specification excludes income as a dimension.

The Alkire-Foster method and Capability Deprivation. The latest RPW finds difficulties in measuring functionings, capabilities, and capability deprivations (see Bundesregierung, 2013, pp. 23–24). However, Suppa (2014) argues that even if functionings are difficult to measure and only imperfect data is at hand, the CA's conceptual structure is still helpful for revealing the underlying assumptions. Empirically, even more challenging than measuring functioning achievements is the detection of capability deprivation. Either we initially assume deprivation for low achievements or we base this assumption on further information.[24] In using the AFM, however, we in fact ground this crucial assumption—that the functionings not chosen are infeasible—on further information, namely the *simultaneous* presence of several low-functioning achievements. Hence, exploiting the joint distribution in the identification step of poverty analysis helps to distinguish between (deliberately chosen) low-functioning achievements and (enforced) capability deprivations.

Limitations. Some cautionary notes help to underline the limitations of the present study. First, the previous analysis of multidimensional poverty and socio-demographic variables is basically descriptive. Not only may confounding factors in the background drive a certain finding, but some variables are also obviously highly endogenous (e.g., type of household). Similarly, in the case of age, it remains unclear whether (i) cohort effects, (ii) year effects, or (iii) genuine age effects account for the findings, e.g., concerning social activity or means of communication. Consequently, a causal interpretation of these findings is out of the question and requires more research. While the previous discussion elaborates on two potential missing dimensions (income and employment), there are also other dimensions already suggested but not included (e.g., agency, appearing in public without shame, respecting oneself). Moreover, a further crucial aspect generally ignored is the role of time, which may, e.g., illuminate the contrasting living conditions of singles without children and

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[24]Often the immediate assumption may be justified; see Robeyns (2005, p. 101) and Robeyns (2006) .

single parents. Unfortunately, its conceptual and empirical integration is complex and requires further research as well.[25] Finally, certain subpopulations of the society are ignored completely. Homeless people, for instance, are not covered by the underlying data basis. Children, on the other hand, are deliberately excluded, since a more tailored specification to adequately capture their being and doing seems called for.

Suggestions for Data Collection. Naturally, indicators for missing dimensions were helpful. However, their development commenced only recently (Alkire, 2007), and their validity and empirical performance are still to be studied. Important missing functionings include in particular agency, appearing in public without shame, and self-respect. That said, to improve the data basis for multidimensional poverty measurement it would be helpful to have more frequent data collection of the items underlying the deprivation indicators, even if not on a yearly basis. Otherwise it will remain difficult to better analyze and understand the influence of severe events such as a labor market reform or the financial crisis. This pertains in particular to important wealth measures. A more frequent collection of the most common forms of wealth and debt might suffice. Finally, to improve social participation, information about the quality and quantity of Internet activities would allow us to discard resource-based indicators. Regular information about child-related activities might be added, too.

6 Concluding Remarks

The present paper compiles a multidimensional poverty index for Germany. This index is (i) implemented using the Alkire-Foster method, (ii) conceptually embedded in the capability approach, and (iii) calculated using SOEP data. By operationalizing the functioning of practical reason the index was made sensitive to important labor market developments. I cannot claim, however, to have accounted for labor-related functionings comprehensively. A reliable agency measure, for instance, is a required complement. Moreover, social participation was operationalized and shown to contribute substantially to multidimensional poverty.

Important empirical findings include the following. First, the presented results are consistent with previous findings. Specifically, certain subpopulations (e.g., persons with a background of migration) are more likely to suffer from multidimensional poverty. Moreover, the education of the father also seems to play an important role in understanding mul-

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[25]Contributions approaching this issue include Merz and Rathjen (2014a,b).

tidimensional poverty in Germany. Subpopulation-specific dimensional breakdowns reveal, e.g., for the elderly, marked differences in relative contributions, while in absolute terms virtually every indicator's contribution is increasing in age. Moreover, particularly the decomposition of changes in M_0 proves helpful in better tracking, consistently analyzing, and understanding significant developments. For one thing, a reduction in multidimensional poverty clearly took place in the second half of the decade under consideration. This trend is not driven by a single dimension or indicator—in fact, virtually all indicators contribute to it. For another thing, no clear-cut trend is found in the first half of the decade. However, to conclude that no poverty-relevant changes took place is not warranted, as decompositional exercises reveal. Additionally, the results indicate that the multidimensional-poor tend to be adversely affected by general trends in raw (marginal) deprivation headcounts. Specifically, the multidimensional-poor benefit less than average from decreasing overall deprivation trends, and suffer more from increasing overall deprivation trends.

In contrast, monetary poverty measures only register a slight increase for the first half of the decade, and they fail to register the improvements during the second. A deeper comparison of monetary and multidimensional poverty measures suggests, moreover, that the overlap in identification of the poor is modest (3–4% for $k = 40$). The population share of uniquely identified poor by either measure, on the other hand, varies from 4% to 7% for $k = 40$, and a third of the IO-poor are students aged 30 and below. These findings provide an additional rationale for using multidimensional poverty measures and, by implication, substantially weaken the claim for income poverty to be a good proxy measure. Finally, exploiting information on the deprivation of the non-poor suggests that adding income as dimension may result in double-counting highly income-related deprivations.

The next steps towards a multidimensional poverty index for Germany should include devising reliable measures for important missing dimensions such as agency, self-respect, and appearance in public without shame. In addition, it would be helpful to prove the validity and performance of already suggested operationalizations and indicators currently under development. Moreover, a more detailed account of the effects of both employment and time on well-being (conceptually as well as empirically) is required to better integrate employment-related deprivation into poverty measures. Regarding the data basis, more frequently collected wealth indicators (e.g., major types of indebtedness) were helpful, even if less comprehensive. Collecting items that capture "digital social participation" may allow us to discard the currently used resource-based indicators. In addition, once basic agreement on indicators is reached more frequent collection of these would allow a more detailed monitoring over time. Methodologically, techniques to take account of confound-

ing factors might help to deepen the analysis and to obtain more reliable results.

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Table 1: Functionings, Indicators, and Weights

Functioning	Deprivation cutoff	Variable	Weight
Education	elementary schooling not completed or elementary schooling completed but no vocational qualification	dep_educ	1/10
	less than 10 books in household	dep_nbooks	1/10
Housing	house requires major renovation or is ready for demolition	dep_housecond	1/15
	any of bath, kitchen, water, or toilet is missing	dep_hhfacilities	1/15
	overcrowding index	dep_overcrowded	1/15
Health	partially or severely disabled	dep_disability	1/15
	report problems with climbing stairs	dep_stairs	1/15
	body mass index larger than 30	dep_obesity	1/15
Practical Reason	failed to put some money aside for emergencies	dep_emergency	1/15
	either unemployed	dep_unemp	1/15
	precariously employed	dep_precemp	1/20
	no life insurance or pension, not owning a house	dep_wealth	1/15
Social Participation	activity index	dep_actindex	1/15
	phone or internet access is missing	dep_meetfriends	1/15
	never meeting friends	dep_comm	1/15

Figure 1: Raw Headcounts
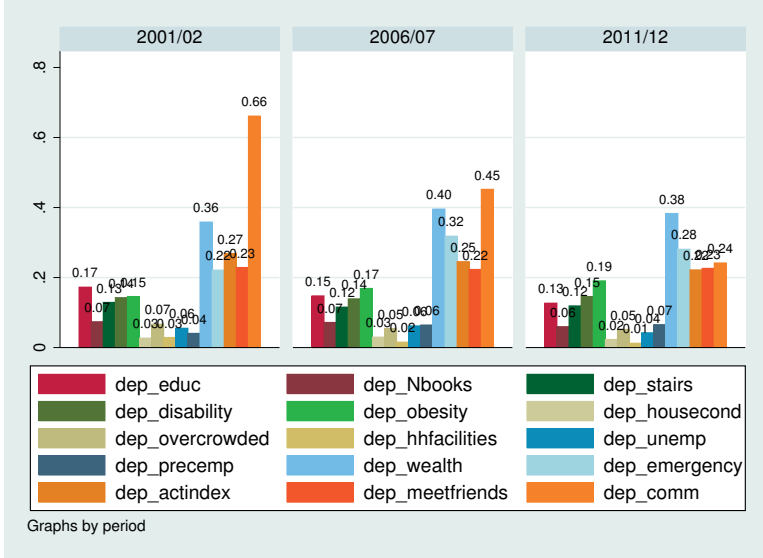
Notes: Data from SOEP v29.1.

Figure 2: Incidence of Deprivations
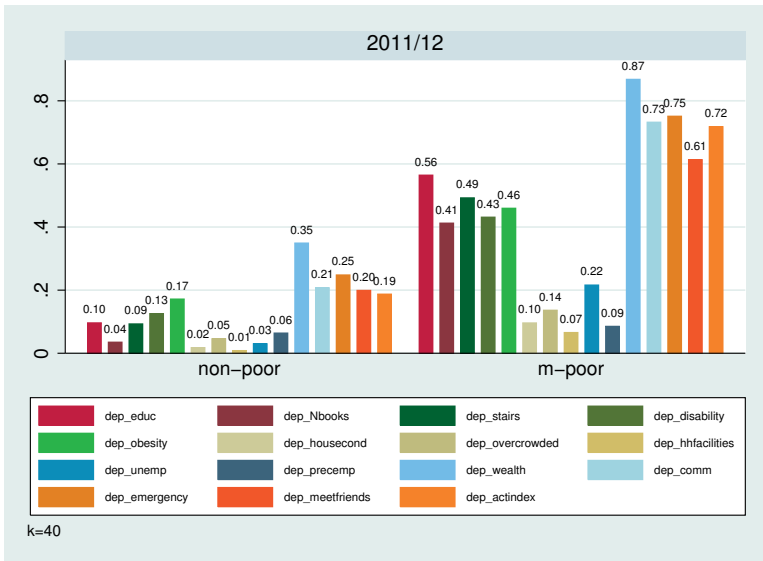
Notes: Data from SOEP v29.1.

Figure 3: Share of Deprivations experienced by Multidimensionally-non-poor

Graphs by period
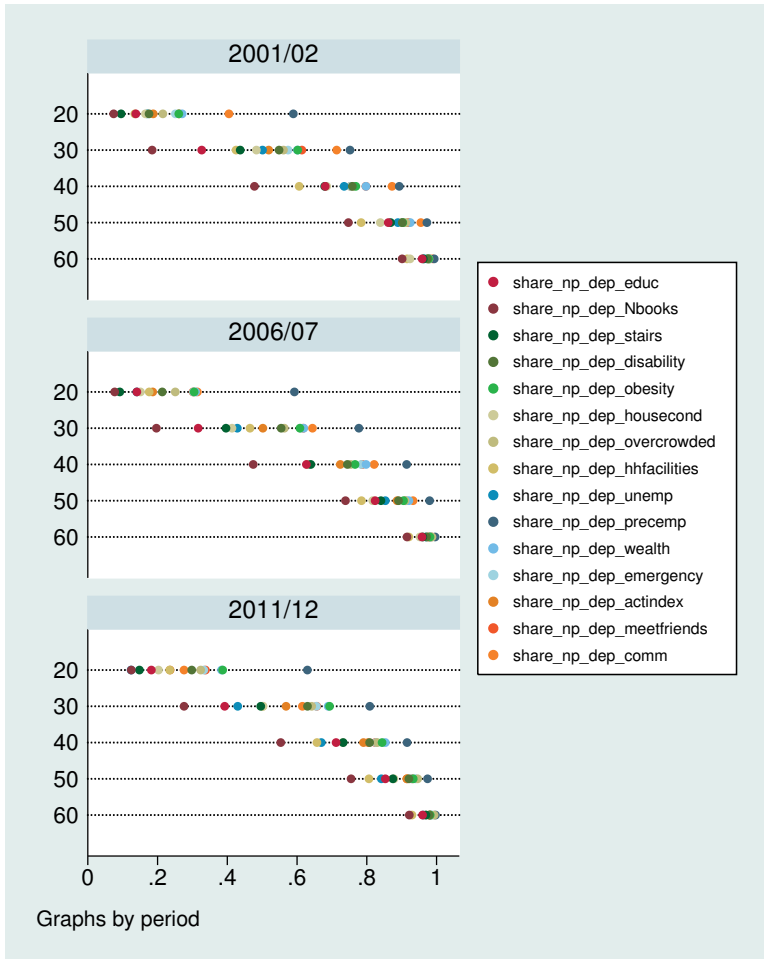
Notes: Data from SOEP v29.1. Calculations by year and *k*-cutoff.

Figure 4: Aggregate Measures over Time
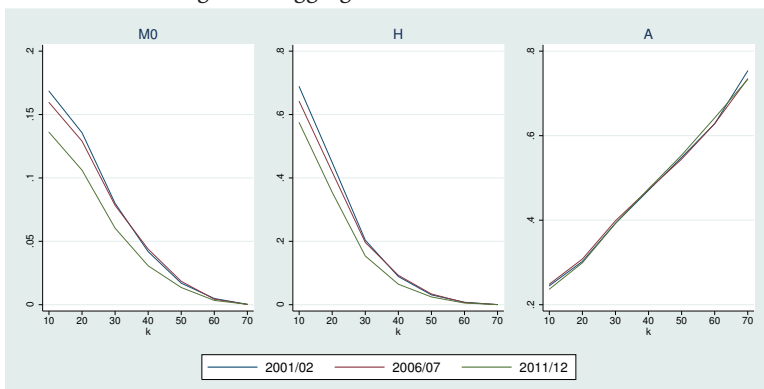
Figure 5: Aggregate Measures by Subpopulations I

(a) migration background
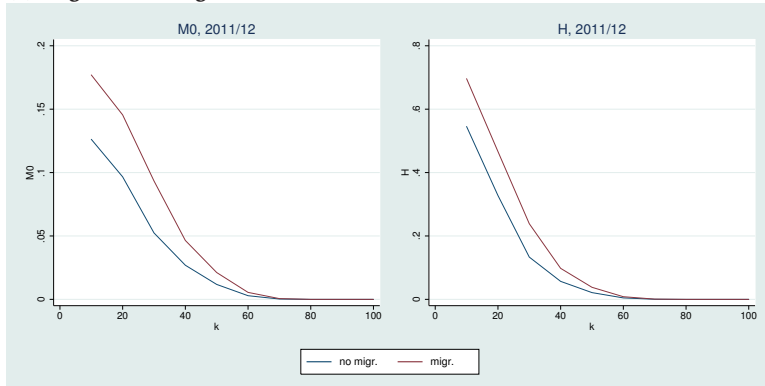
(b) region
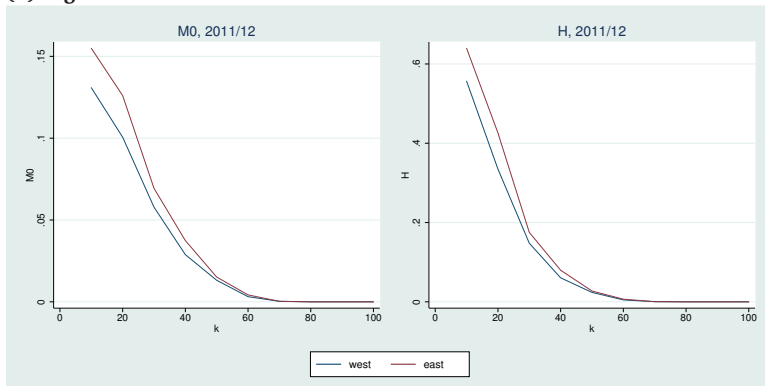
(c) age
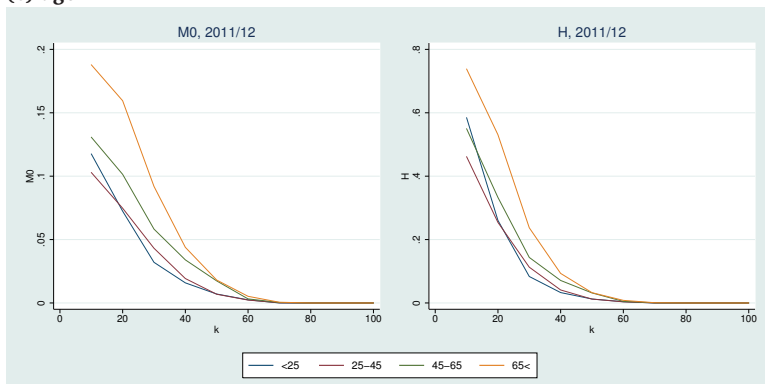
Notes: Data from SOEP v29.1.

Figure 6: Aggregate Measures by Subpopulations II

(a) type of household
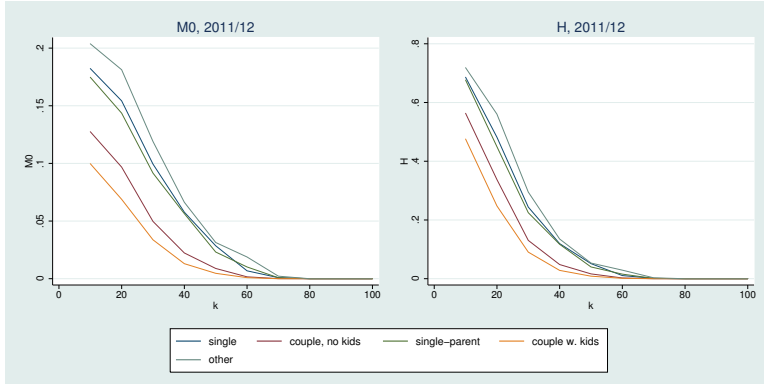
(b) education of father
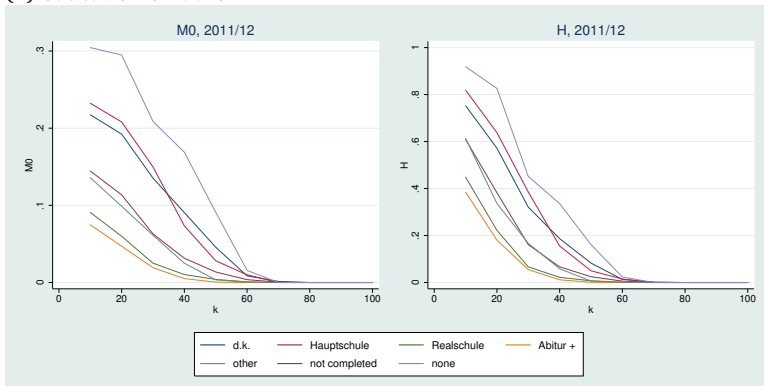
(c) sex
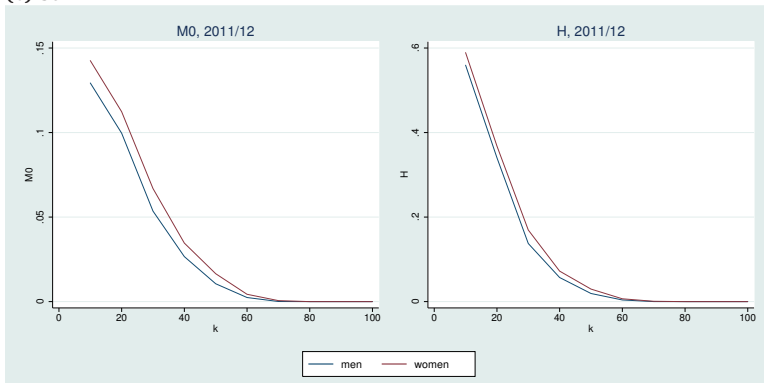
Notes: Data from SOEP v29.1.

Figure 7: Contributions by Subpopulations I

(a) contributions by state to overall M_0

Note: k=40
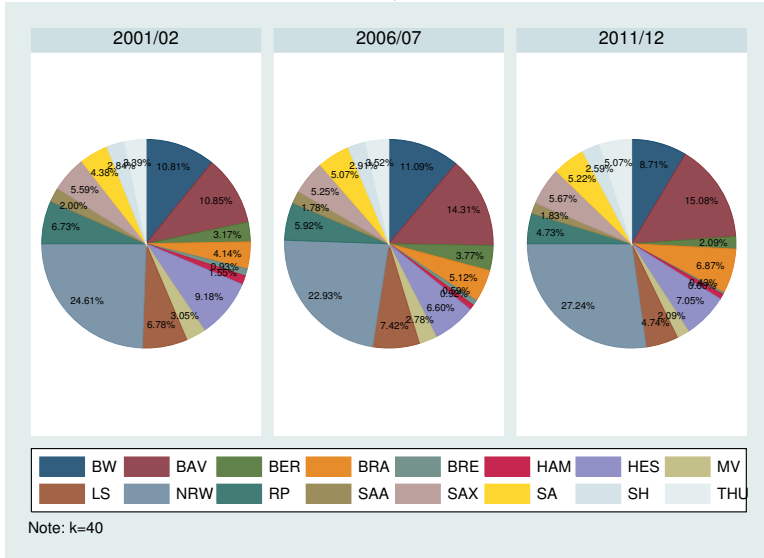
(b) contributions by migration background to overall M_0

Note: k=40
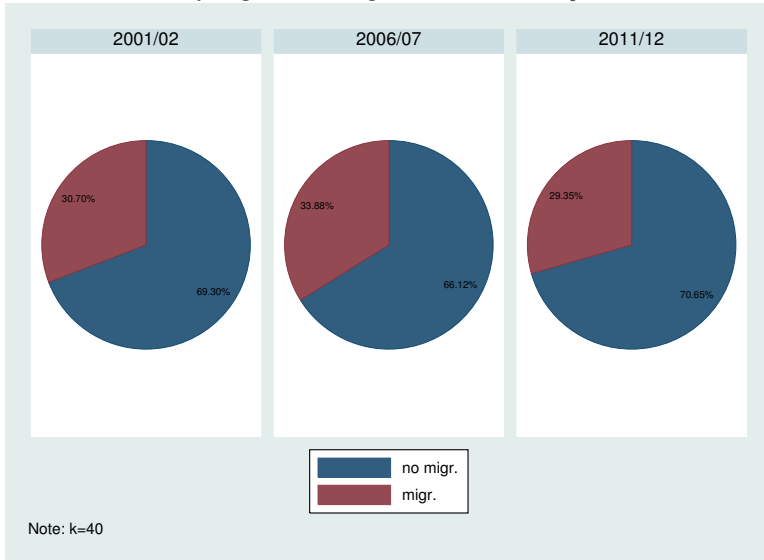
Notes: Data from SOEP v29.1. Poverty cutoff $k = 40$. Share of population with migration background: 2002: 16%; 2006: 17%; 2012: 19%

Figure 8: Contributions by Subpopulations II

(a) contributions by type of household to overall M_0

single	couple w. kids
couple, no kids	other
single–parent	

Note: k=40
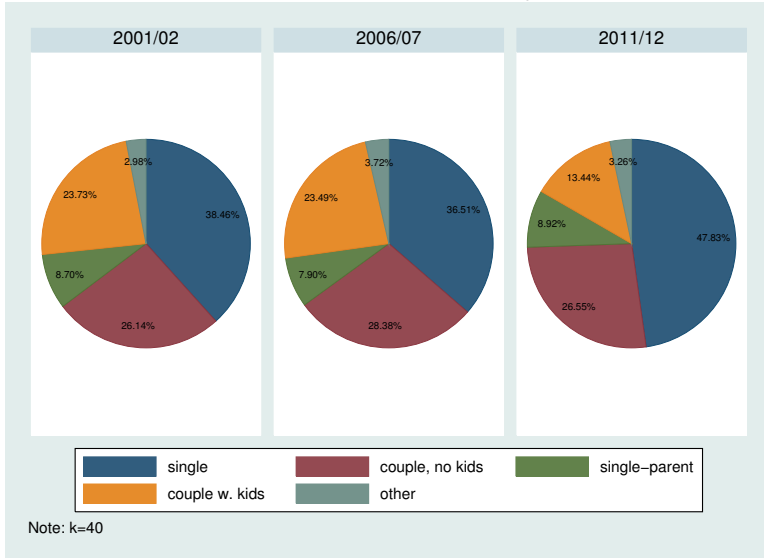
(b) contributions by education of father to overall M_0

d.k.	other
Hauptschule	not completed
Realschule	none
Abitur +	

Note: k=40
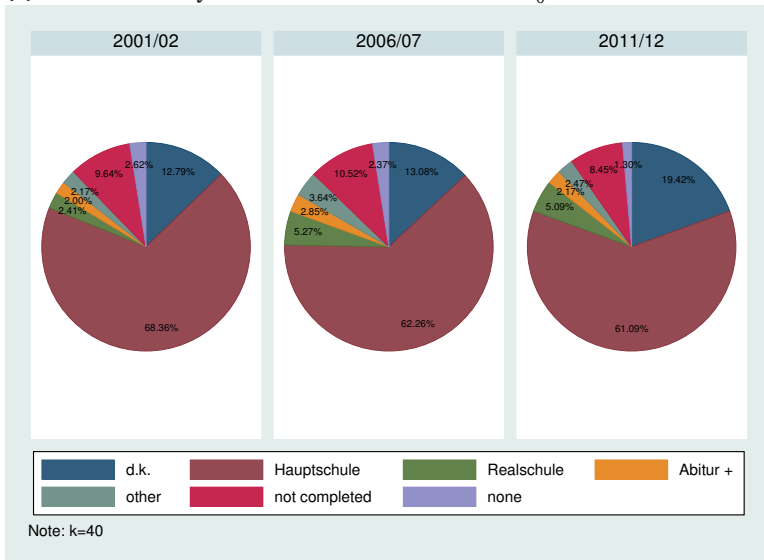
Notes: Data from SOEP v29.1. Poverty cutoff $k = 40$.

Figure 9: Dimensional Breakdown
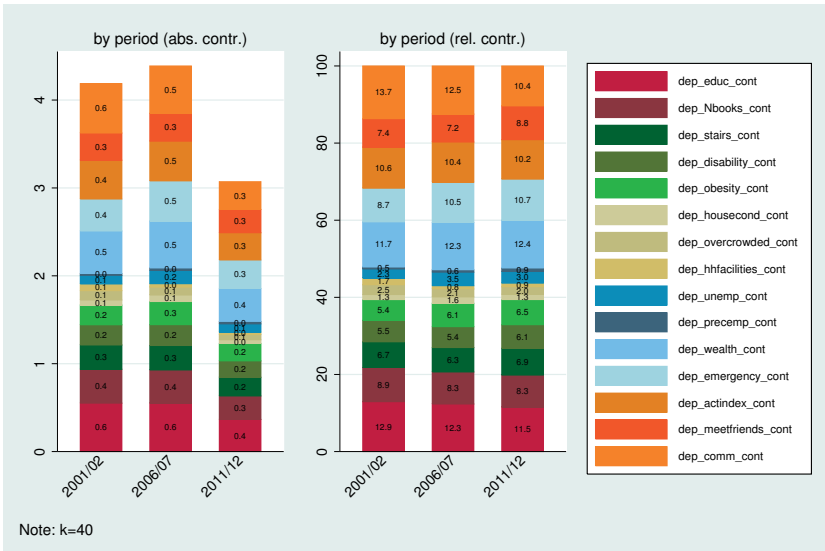
Note: Data from SOEP v29.1. Poverty cutoff $k = 40$. For better readability all (weighted) contributions are multiplied by 100. Thus, relative contributions are percentage points, whereas absolute contribution sum to $M_0 \times 100$.

Figure 10: Dimensional Breakdown by Subpopulations I

(a) relative contribution M_0

period: 2011/12

period: 2011/12

Note: k=40

(b) absolute contribution M_0

period: 2011/12

period: 2011/12

Note: k=40

Note: Data from SOEP v29.1. Poverty cutoff $k = 40$. For better readability all (weighted) contributions are multiplied by 100. Thus, relative contributions are percentage points, whereas absolute contribution sum to $M_0 \times 100$.

Figure 11: Dimensional Breakdown by Subpopulations II

(a) relative contribution M_0
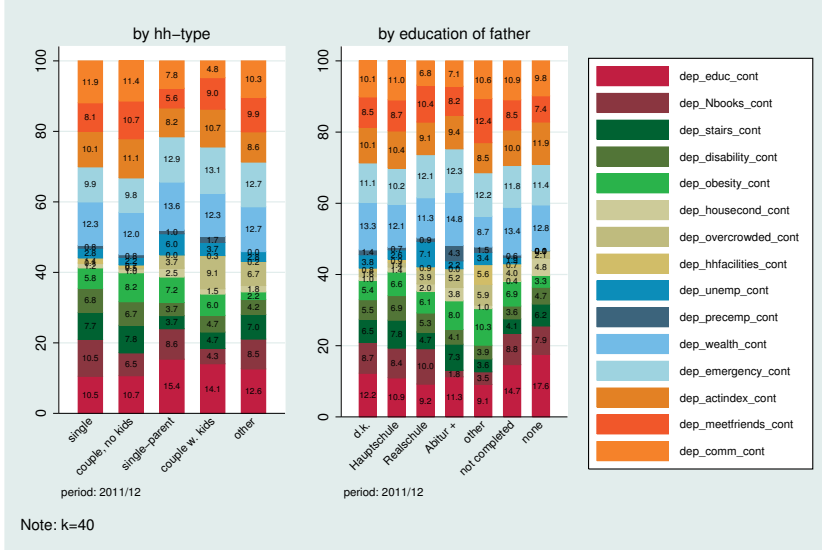
(b) absolute contribution M_0
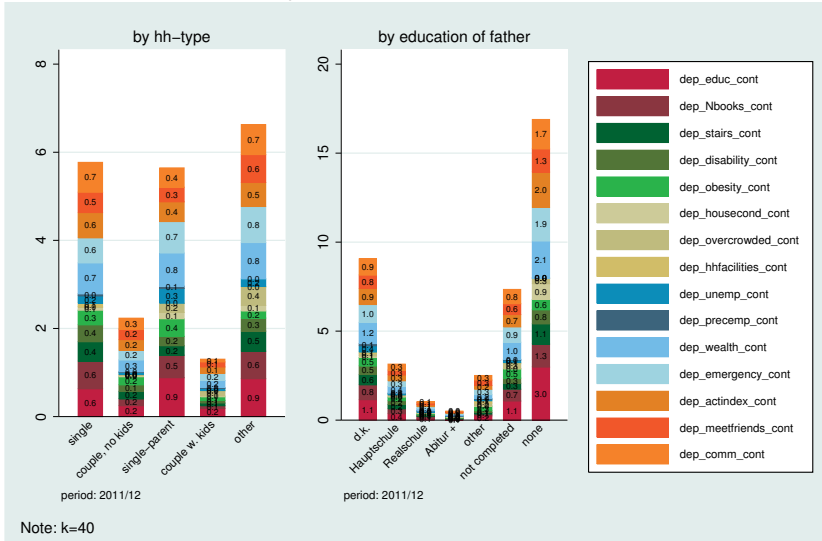
Note: Data from SOEP v29.1. Poverty cutoff $k = 40$. For better readability all (weighted) contributions are multiplied by 100. Thus, relative contributions are percentage points, whereas absolute contribution sum to $M_0 \times 100$.

Figure 12: Relative change in M_0
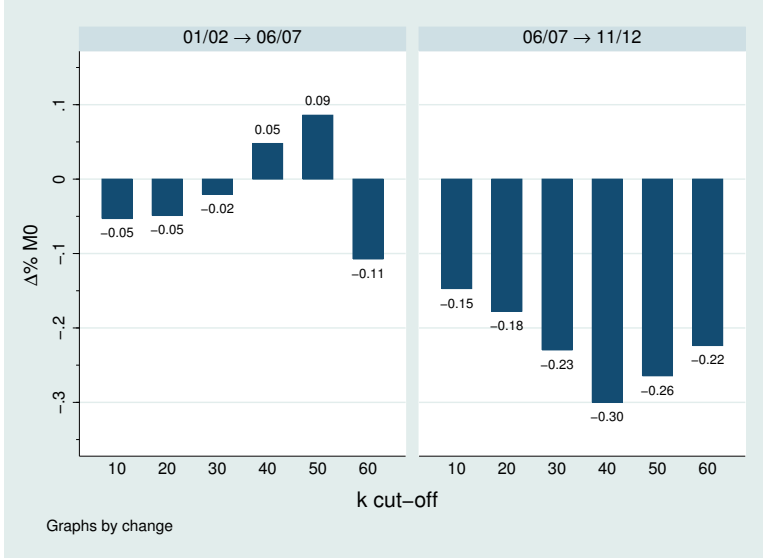
Notes: Data from SOEP v29.1.

Figure 13: Percentage Changes in Censored Headcounts of Indicators
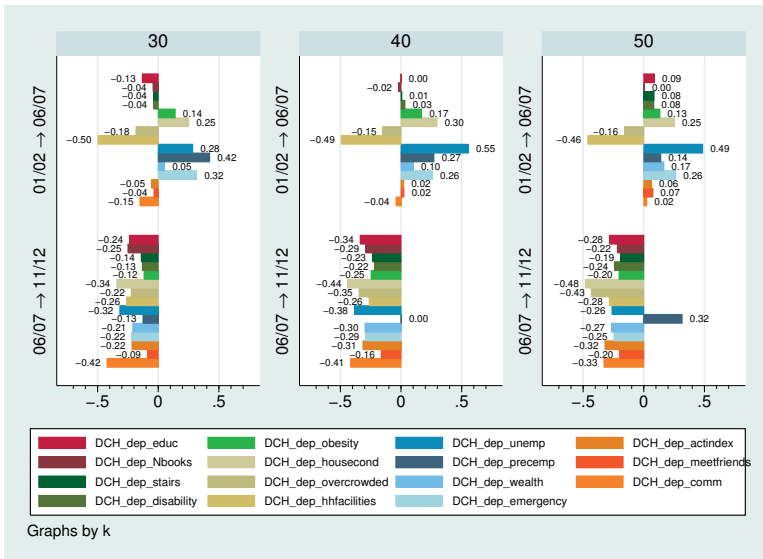
Notes: Data from SOEP v29.1.

Figure 14: Relative Changes

(a) Relative changes of indicators by year

Graphs by change
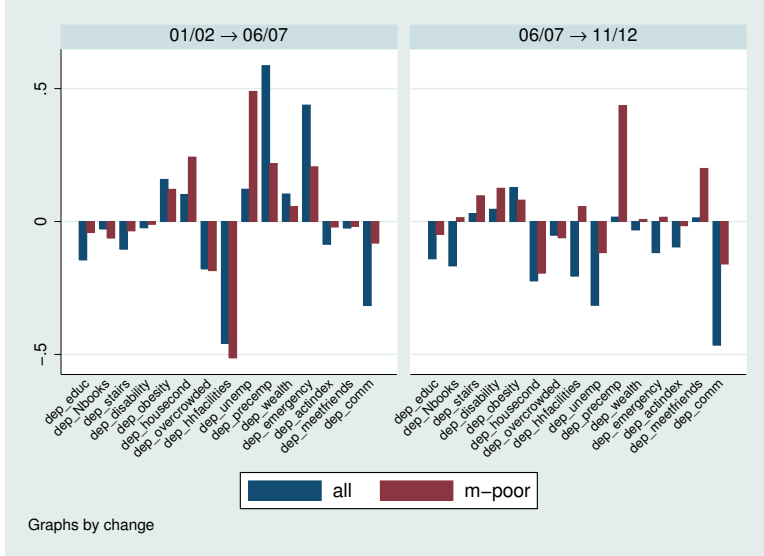
(b) Relative-change ratio of indicators by year and general trend

Graphs by increase and change
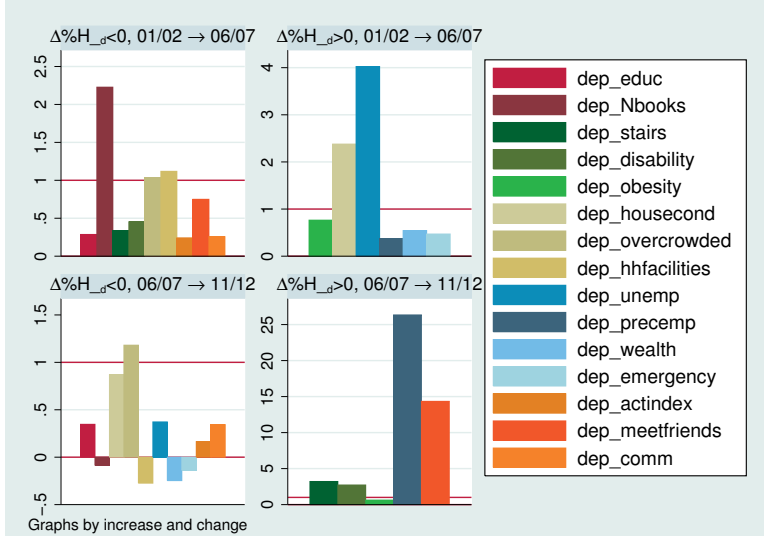
Note: Data from SOEP v29.1. Poverty cutoff $k = 40$. Trend refers to overall change in raw deprivation headcount, $\Delta\%H_d^{all}$. The ratio is calculated as $\frac{\Delta\%H_d^{poor}}{\Delta\%H_d^{all}}$.

Figure 15: Decomposing changes of M0 in changes of H and A
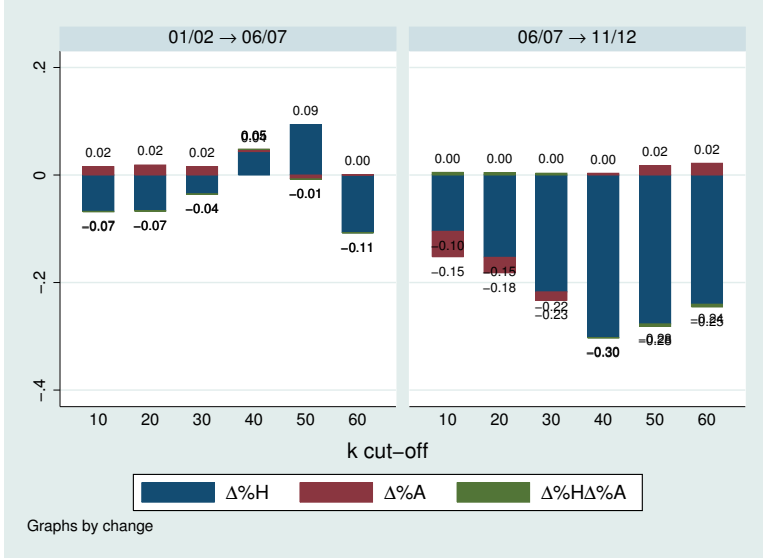
Figure 16: Decomposing $\Delta\%M_0$ in changes of censored headcount of dimensions
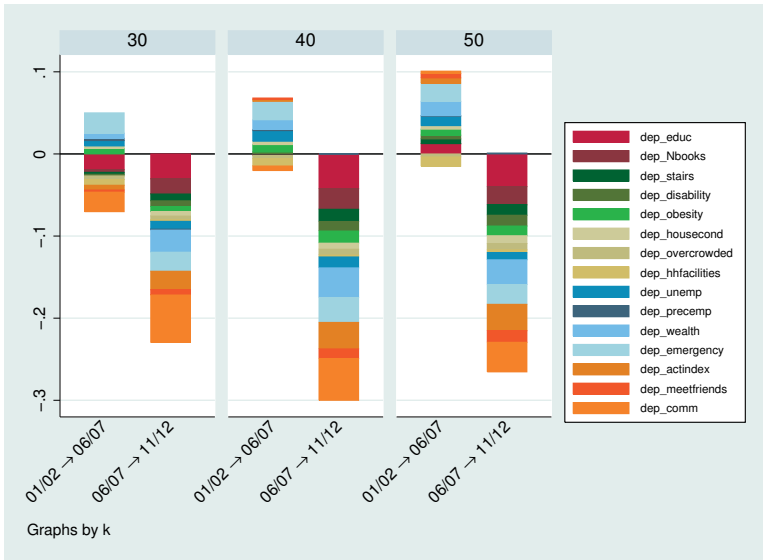
Figure 17: Decomposing Changes by Subgroups I

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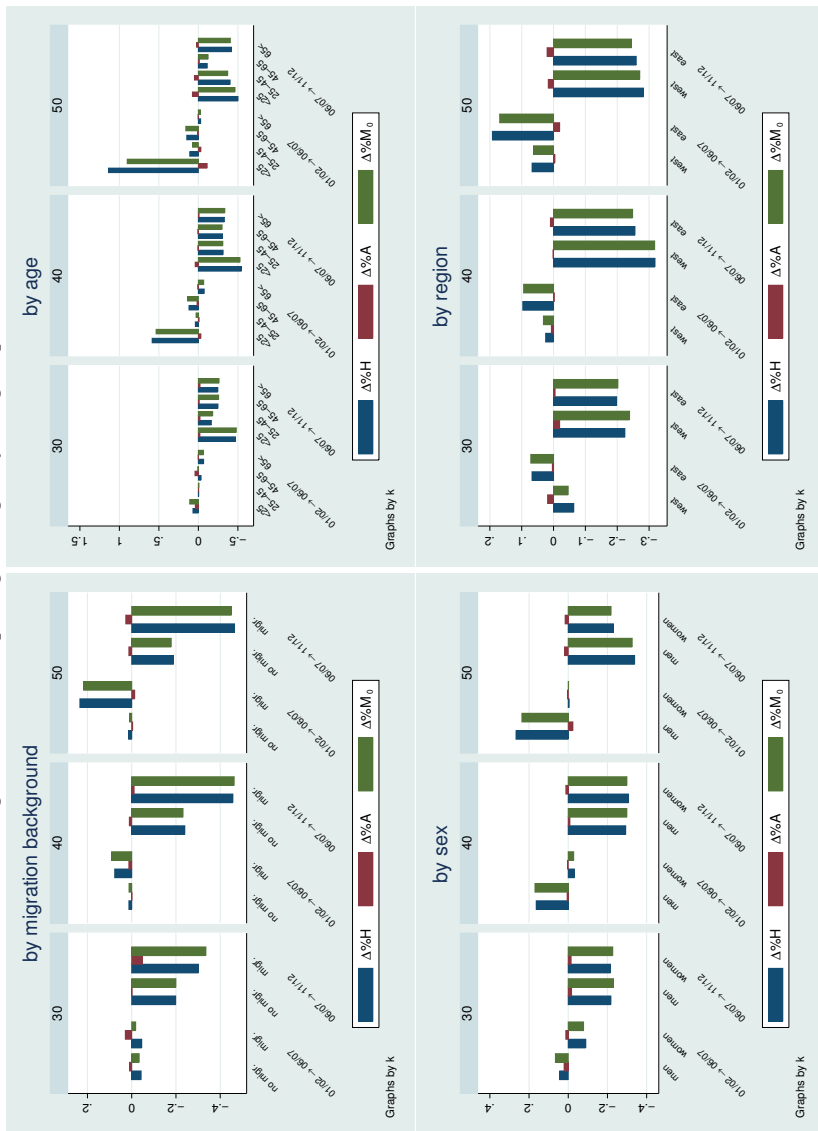
Figure 18: Decomposing Changes by Subgroups II
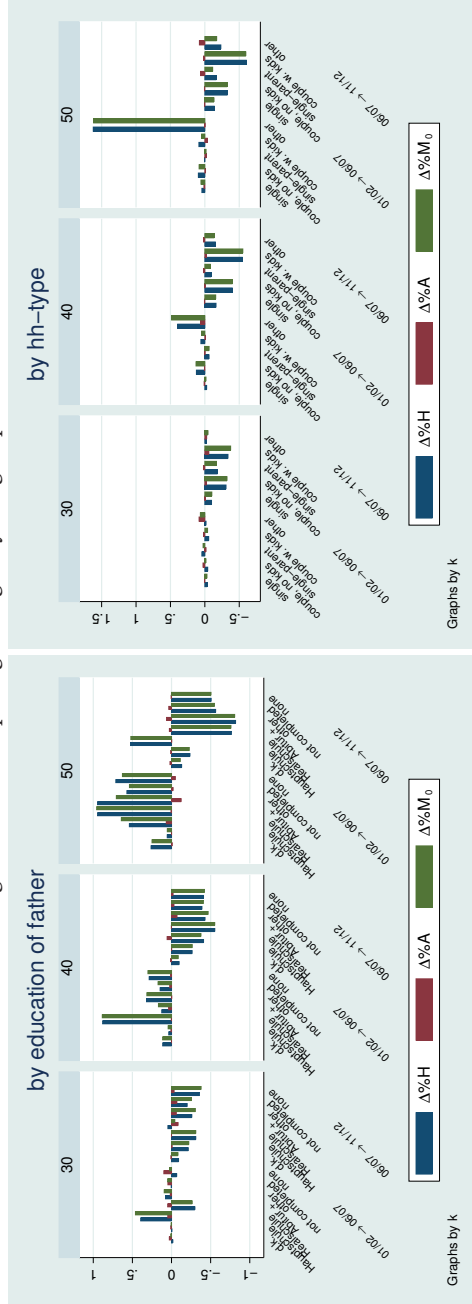
Table A.1: Questions

Activities:

Which of the following activities do you take part in during your free time? Please check off how often you do each activity: at least once a week, at least once a month, less often, never.

Going to the movies, pop music concerts, dancing, disco, sports events

Going to cultural events (such as concerts, theater, lectures, etc.)

Doing sports yourself

Volunteer work in clubs or social services

Attending church, religious events

Meeting with friends, relatives or neighbors

Helping out friends, relatives or neighbors

Figure 19: Income and Multidimensional Poverty
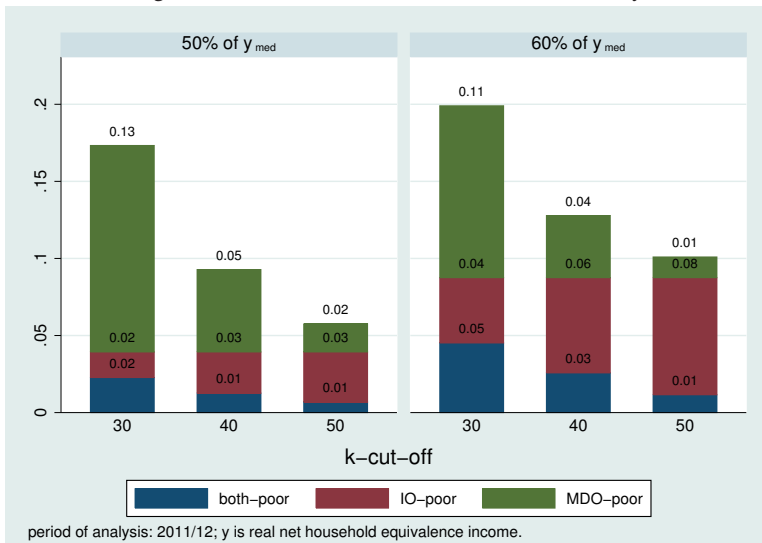
period of analysis: 2011/12; y is real net household equivalence income.

Notes: Data from SOEP v29.1. Underlying income concept is real net household equivalence income. Year of analysis is 2011–12.

Figure 20: Income and Multidimensional Poverty
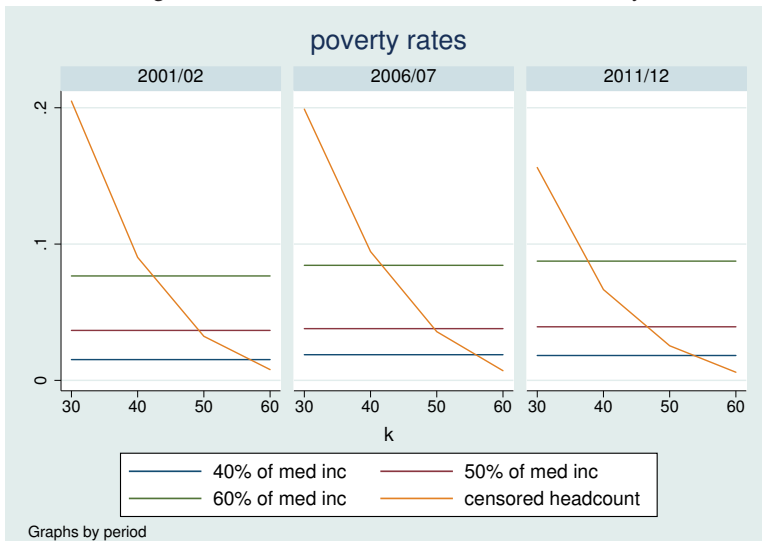
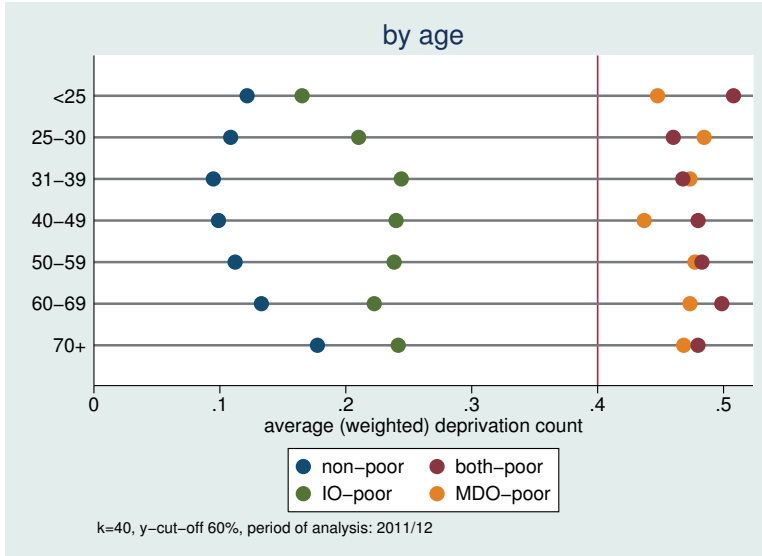**Notes:** Data from SOEP v29.1. Underlying income concept is real net household equivalence income.
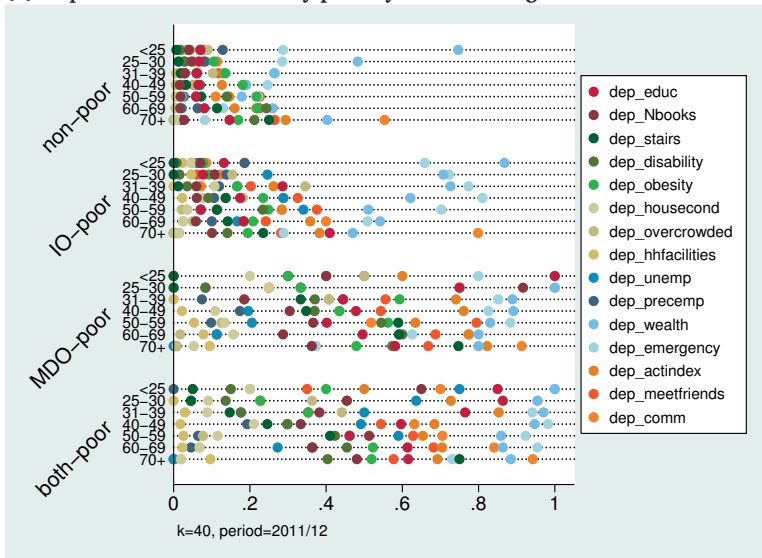
Figure 21: Age by poverty status
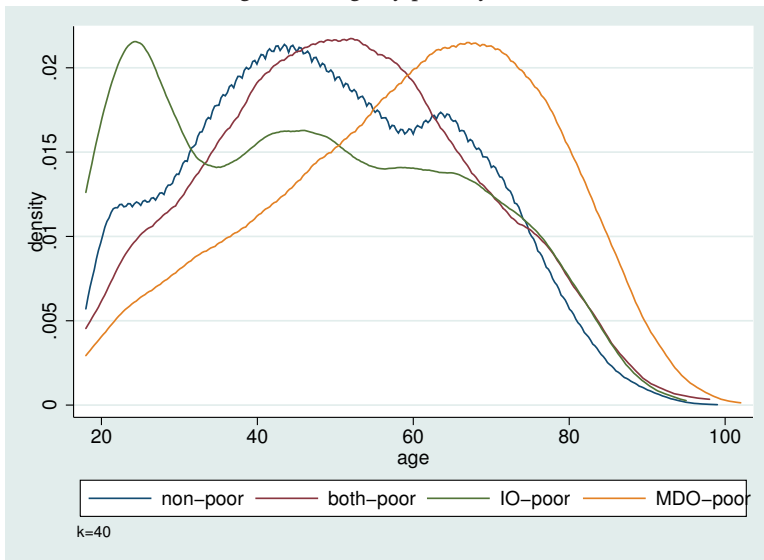
Notes: Data from SOEP v29.1. Poverty cutoff $k = 40$. Threshold for income-poverty is 60% of median income. Underlying income concept is real net household equivalence income.

Figure 22: Average and raw deprivation headcount by age

(a) Average deprivation by poverty status

(b) Deprivation headcounts by poverty status and age

Notes: Data from SOEP v29.1. Poverty cutoff $k = 40$. Threshold for income-poverty is 60% of median income. Underlying income concept is real net household equivalence income. Year of analysis is 2011–12.

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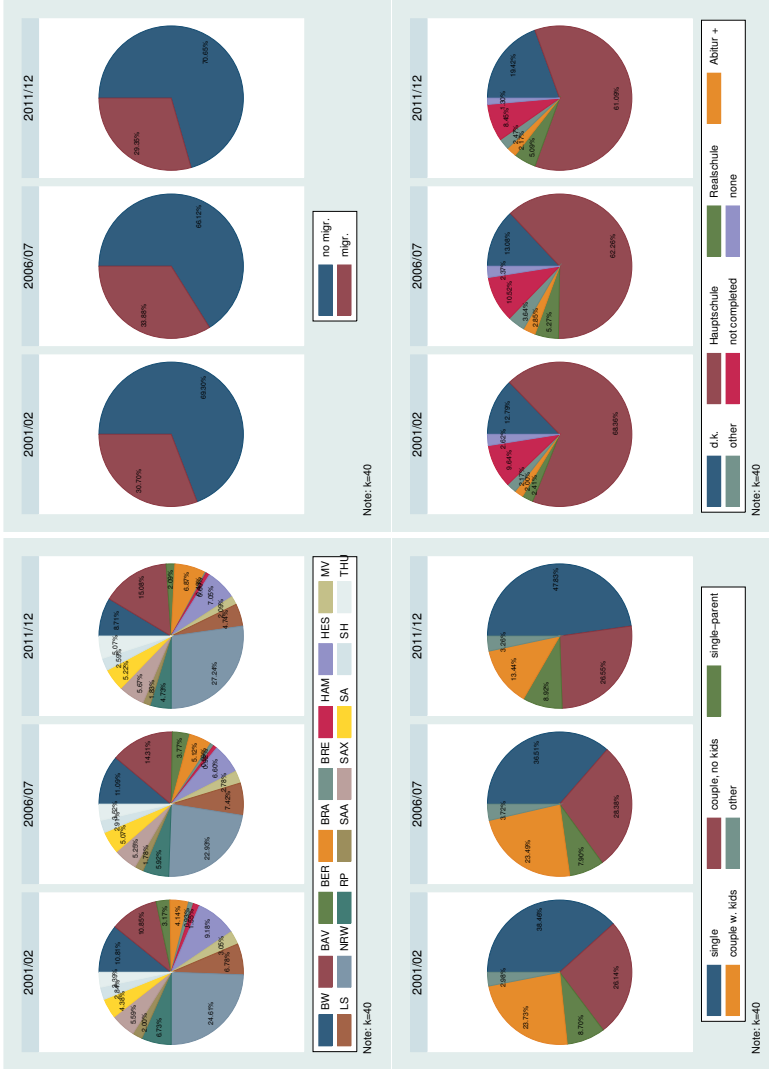Figure A.1: Censored Headcounts of Dimensions

censored headcounts of dimensions

Graphs by k
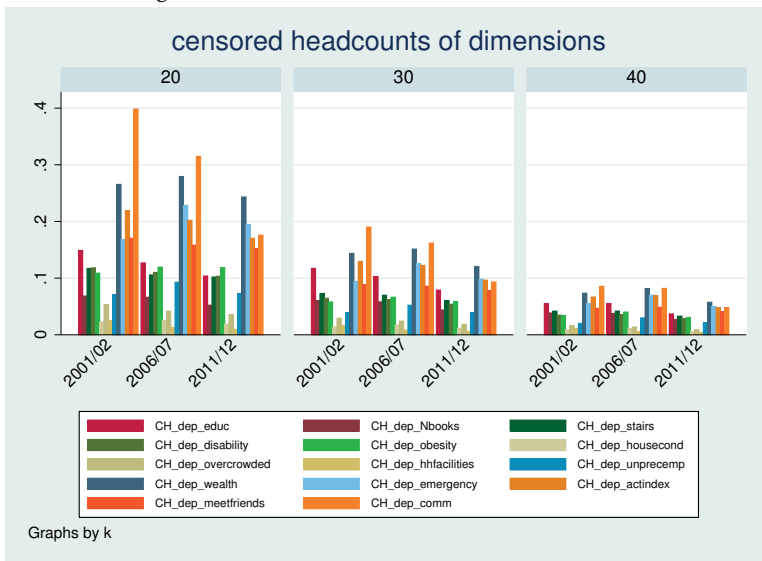
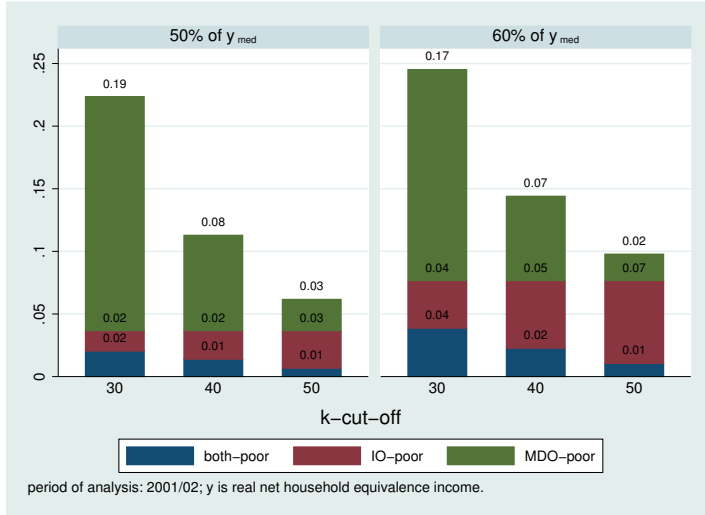Figure A.2: Average intensity by groups
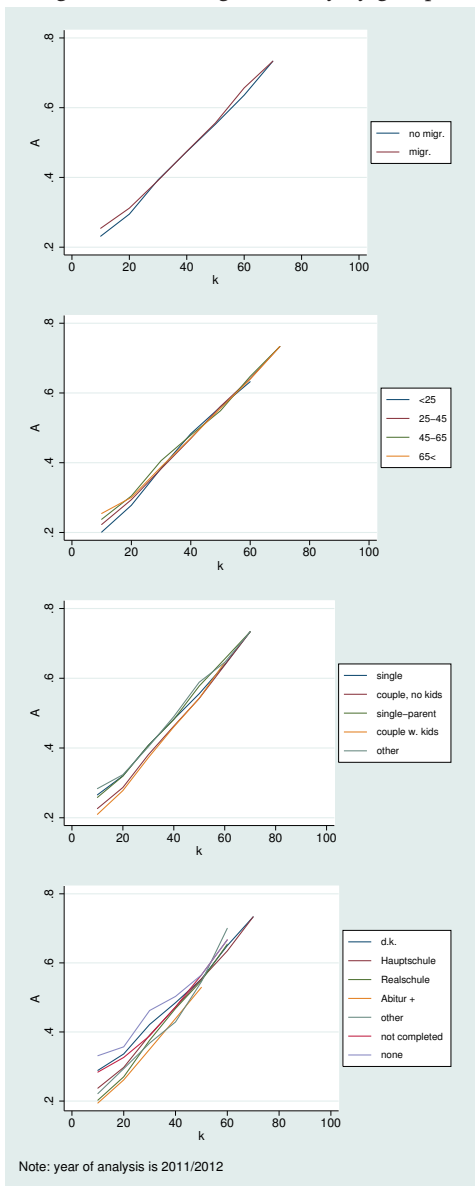
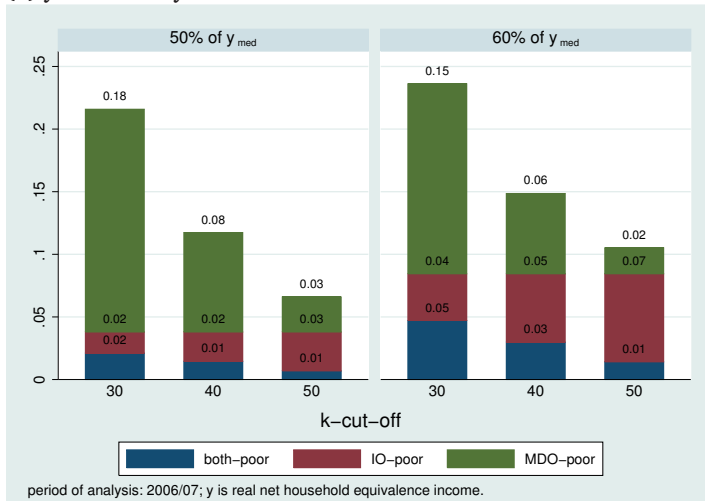Figure A.3: Contributions by Subpopulations I

Notes: Data from SOEP v29.1. Poverty cutoff $k = 40$.

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Figure A.4: Income and Multidimensional Poverty—other years

(a) years of analysis 2001–02

period of analysis: 2001/02; y is real net household equivalence income.

(b) years of analysis 2006–07

period of analysis: 2006/07; y is real net household equivalence income.

Notes: Data from SOEP v29.1. Poverty cutoff $k = 40$. Threshold for income-poverty is 60% of median income. Underlying income concept is real net household equivalence income.