



Subjective Well-Being, Parental Child Care and Income—A Multidimensional Polarization Attempt

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Abstract

Neither market income nor consumption expenditure provide a complete picture of individual standard of living. It is non-market time use which is a further brick to a more comprehensive picture of individual well-being. In our study we focus on a prominent part of non-market services: it is parental child care which contributes not only to individual but also to societal well-being.

Within a novel approach we ask for multidimensional polarization effects on parental child care where compensation of time for parental child care and income is interdependently evaluated by panel estimates of society's subjective well-being. The new interdependent 2DGAP measure thereby provides multidimensional polarization (for the poor and the rich) intensity information and disentangles the single time and income contributions ensuring at the same time the interdependence of the polarization dimensions. Socio-economic influences on the polarization pole risk and intensity are quantified by two stage Heckman estimates.

The analyses are based on the German Socio-Economic Panel and the German Time Use Surveys 1991/92 and the just released actual 2012/13. The empirical results discover the interdependent relations between parental child care and income under a common evaluation frame and contributes to the question of dimension specific targeted policies in a multidimensional polarization approach.

Prominent result: compensation between parental child care time and income proved to be significant. Interdependent multidimensional polarization increased significantly over the twenty years under investigation with remarkable risk and intensity differences between the polarization poles and different disentangled time and income contributions.

JEL keywords: I31, I32, J22, D10, D31

Key words: Parental child care, multidimensional polarization of time and income, poverty and affluence, minimum multidimensional 2DGAP risk and intensity, subjective well-being, German Socio-Economic Panel (SOEP), German Time Use Study (GTUS 1991/92 and 2012/13)

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Subjective well-being, parental child care and income – A multidimensional polarization approach

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1 Introduction

Neither market income nor consumption expenditure alone provides a complete picture of individual standard of living and its distribution. It is non-market time use which is a further brick to a more comprehensive picture of individual well-being. In our study we focus on a prominent part of non-market services including market activities: it is parental child care time which contributes not only to individual child as well as parental but also to societal well-being.

Parental time for child caring is an important factor for the child's emotional, social and intellectual development. More time spent for children can improve their health, diminish risks of social misbehavior, support higher education and improve in general human capital in a broad sense (Cooksey and Fondell 1996, Barnard 2004, Carlson 2006 or Österbacka, Merz und Zick 2009). And, parental child care time is an important well-being factor for parents as well: every third father and every fifth mother desire more child care time in Germany (Statistisches Bundesamt 2015).

Beyond time spent on parental child care, individual living conditions require time to achieve income resources. The contest for desirable individual living conditions faces a growing polarization of society accompanied by an erosion of the middle class. This drifting apart of the poor and the rich has many far reaching individual consequences but also for the economy, society and for the quality of life in general (OECD 2015a,b, 2008, Stiglitz 2015a,b, 2014, 2012, Thewissen 2014, Berg and Ostry 2011, Wolfson 1997).

Our study on parental child care time combines subjective well-being, child care and income by a multidimensional polarization approach. We explicitly ask for a possible compensation/substitution between income and parental child care time and quantify its substitution by a Constant Elasticity Substitution (CES) well-being function, estimated by German individual panel data over almost 30 years.¹ This empirical based evaluation by German society in a second step then allows the analysis of multidimensional polarization of being poor and affluent under the parental child care perspective.

With our new 2DGAP approach therein we quantify the multidimensional polarization intensity – revealing its dimensional impacts for targeted policies - with reference to both poles of the multidimensional child care time and income distribution. The third step then quantifies socio-economic influences on the 2DGAP risk and intensity of being interdependent multidimensional poor and rich by a two stage Heckman approach. The data bases will be the German Socio-economic Panel and the just released actual German Time Use Study GTUS 2012/13 with comparisons to the twenty years ago GTUS 1991/92.

Thus our study contributes empirically based to the parental child care discussion first: by a new multidimensional compensation approach with multidimensional polarization well-being measures, second: by a new 2DGAP inspection of the multidimensional pole intensities, and third: by quantifying socio-economic influences on the multidimensional pole 2DGAP risk and intensity.

¹ The concept and its subsequent methodology follows our interdependent multidimensional analyses of genuine personal leisure time and income in Merz and Rathjen 2014 a,b for poverty and Merz and Scherg 2014 for the poor and the rich by an interdependent multidimensional polarization approach.

By asking for the relationship between parental child care time, a rather immaterial dimension, and income, a rather material dimension and resource, the question arise, why should there be any compensation? Isn't parental child care pre-dominant to any other (input) resource, regardless any income situation? Well, the fighting for living condition might restrict this time input either by demanding working hours or other obligations. Circumstances might or not might allow alternative non-parental child care which might influence the individual parental time allocation. Thus, a closer look is required asking for the actual tension between parental child care time and other time consuming activities like working for income in particular; detecting the empirical importance of this tension is the concern of our study.

The reminder of the study is organized as follows: After discussing the background of subjective well-being, parental child care and income (chapter 2), then our analyzing methodology and tools with multidimensional polarization identification, multidimensional CES well-being function and new multidimensional well-being measures are treated (chapter 3). The new multidimensional polarization 2DGAP methodology follows (chapter 4). Data and empirical multidimensional polarization thresholds are provided in chapter 5. Our parental child care results follow with well-being and 2DGAP intensity measures over twenty years for German society at all (chapter 6) as well as for 2DGAP risk and intensity results for socio-economic groups (chapter 7). Chapter 8 concludes.

2 Background

Parental child care time is of long-standing interest in the scientific debate and obviously a continuing topic in the daily life of families. In traditional microeconomics individual time is allocated between labor (with its income/consumption) and leisure. The maximization of the connected utility under time and income constraints result in the respective time allocation equations with either total leisure activities or with subsequent activities like child care. Within the well-known approach of the new home economics by Gary Becker, commodities are decisive parts of the utility function which are produced in the household with time and market goods inputs. Again, maximization of utility under time and income constraints delivers the optimal allocation of time and good. The commodities might be defined in a general sense and might encompass the product of child care time. Within this microeconomic frame the opportunity costs of achieving income (the market wage rate) is the income leisure (child care) link for the final time use allocation.²

Many studies found a negative relation between opportunity costs/ labor participation and time for child care, where higher opportunity costs pull to the market to the burden of non-market child care time (Kapteyn and Kooreman 1987, Hill and Stafford 1985, Baydar, Greek and Gritz 1999, Hallberg and Klevmarken 2003, Kalenkoski, Ribar and Stratton 2005, Kimmel and Conelly 2006, Aguiar and Hurst 2006 or Bloemen and Stancaelli 2008).

Other studies are less distinct regarding a negative relation. Ishii-Kuntz and Coltrane 1992, for example, found a positive correlation between labor market involvement and parental engagement for children-oriented activities. Bryant, Zick and Österbacka 2001 proved that there is more time spent with children on reading or doing homework if the mother is employed rather staying at home. Guryan, Hurst and Kearney 2008 analyze the impacts of socio-economic factors on parental time use and found almost in every of the 14 countries regarded a positive correlation between income, education and parental time used with their children. With focus on the education impact on child care Craig (2006) found for Australia that mothers with university education do spend more time than others to child care *and* to paid work. Remember, from an economic perspective the positive influence of higher education in child care is not expected given that the opportunity cost of time is higher for higher-educated with higher wages.

² Robbins 1930, Becker 1965, Lancaster 1966, Linder 1970, de Serpa 1971, Evans 1972, Gronau 1977, Hill and Stafford 1985 or Kapteyn and Kooreman 1987, for instance, extend Becker's model in regard to different activities the time is spent for.

Still other scholars do not find any significant impact of opportunity costs on child care. There cultural impacts and individual attitudes are more important. They emphasize behavioral reasons and amplify other aspects (Sayer, Bianchi and Robinson 2004). Bargaining theories, for instance, address the negotiation within the family resulting in the division of domestic tasks including child care (Manser and Brown 1980, McElroy and Horney 1981 or Apps and Rees 1996, Blundell, Chiappori, Magnac and Meghir 1998 or Brett 1998). Further broad discussion of care and child care within family time are provided by Folbre and Bittman 2004.

So, the question about the kind of relationship between child care and income is still open and expect empirical based appropriate answers. In empirical investigations, in general and so far, time use for child caring is analyzed in a single equation or multiple equation time use allocation regression frame to detect the influence of income and other resources to parental child care. Though often not discussed or uncovered, under the microeconomic rational choice perspective – traditional or in Beckerian modelling - behind any allocation modelling with single regression equations there still a utility maximization problem under time and income constraints is underlying.

With our approach we explicitly do not intend to estimate an allocation model under a rational choice perspective. We rather try to disentangle the well-being compensation between parental child care time and income and its consequences in an interdependent multidimensional polarization approach for the child care time and income poor and affluent.

3 Multidimensional Polarization: Identification, Multidimensional CES Well-Being Function and New Well-Being Measures

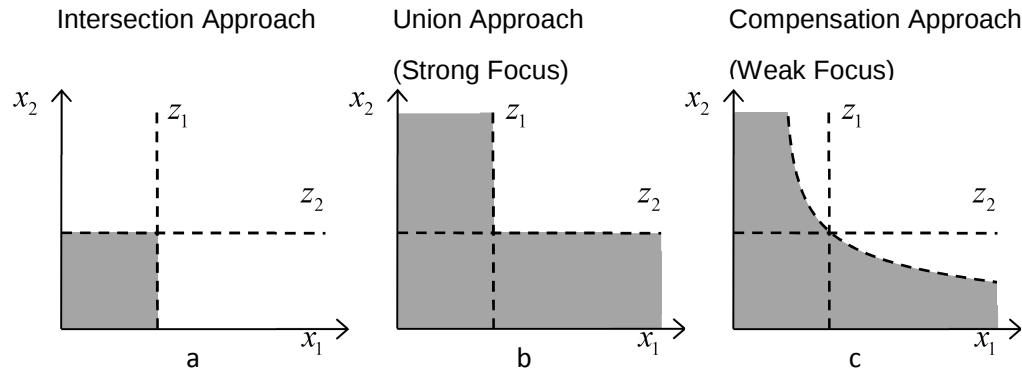
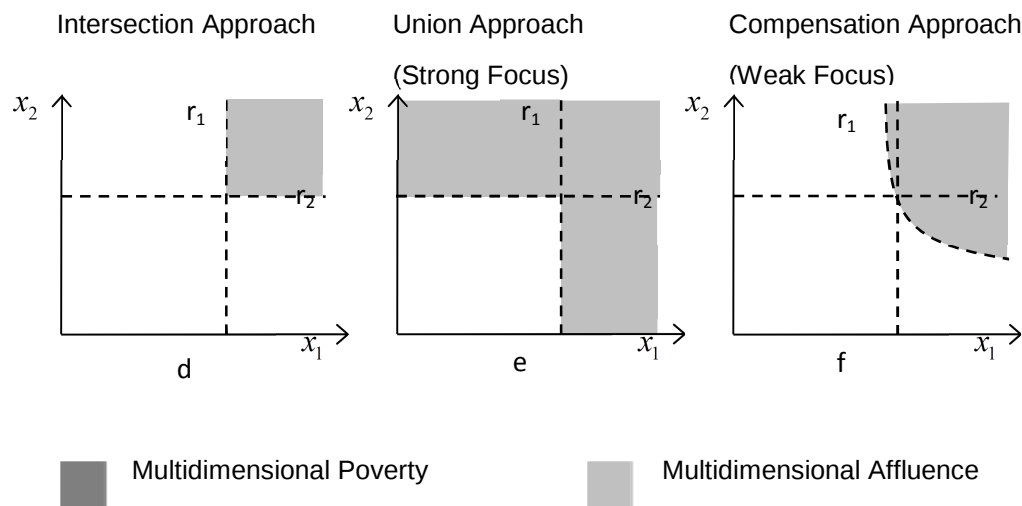
The multidimensional polarization analysis of a possible compensation/substitution between parental child and income requires the identification of its interdependence followed by an appropriate well-being function, which - with subsequent well-being multidimensional polarization measures - is the concern of the following chapter.³

3.1 Interdependent Multidimensional Polarization – Identification

In ***multidimensional poverty identification*** (Kakwani and Silber 2008, Deutsch and Silber 2005, Bourguignon and Chakravarty 2003), there are two identification approaches. In the so-called *union approach (strong focus axiom)* a person is judged to be multidimensional poor as soon she or he is deprived in at least one dimension (see Figure 1b for the two-dimension case, the shaded area with the corresponding poverty thresholds z_1 and z_2). The *intersection approach*, by contrast, judges an individual to be multidimensional poor when she is deprived in all dimensions (Figure 1a). Intermediate concepts are conceivable as well.

Since the union and intersection approaches seem to be too rigid as identification strategies for most cases, an intermediate approach allows compensation (weak focus axiom) for all ranges in one dimension given poverty in the other (Figure 1c). In the compensation approach thus, besides being poor in both dimensions (intersection), a person is multidimensional poor when she cannot compensate poverty in one dimension by the other non-poverty dimension.

³ As mentioned, this study's methodology follows Merz and Rathjen 2014 a,b and Merz and Scherg 2014. We use respective paragraphs without further single citation.

Figure 1: Identification of Multidimensional Polarization**Multidimensional Poverty****Multidimensional Affluence**

Note: x_1 and x_2 are the quantities of the first and second dimension, z_1 and z_2 are the corresponding poverty and r_1 and r_2 the corresponding affluence dimension thresholds.

Source: Own figure.

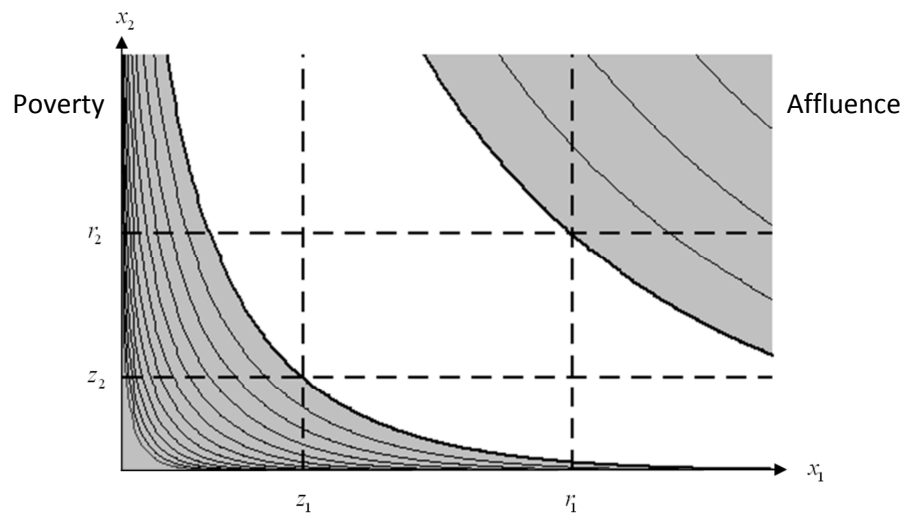
The empirical question is whether and to which extent a poverty gap in one dimension might be compensated for by higher quantities in the other one. If a gap in one dimension can be compensated by another's dimension quantity above the dimension threshold, then a person is off poverty (Figure 1c, unshaded area). Thus, the multidimensional poverty curve in the two dimensional case runs through the intersection of the dimension thresholds $z = (z_1, z_2)$ dividing the poor (shaded areas in Figure 1a,b,c) and the non-poor (unshaded areas in Figure 1a,b,c).

We extend multidimensional poverty identification to ***multidimensional polarization identification*** in a similar though not identical way and identify the other pole of the distribution, the ***affluent***, by mirroring the poverty areas along the single affluence thresholds $r = (r_1, r_2)$ (Figure 1d,e,f). The kind of relationships then between dimensions does not change with respect to the intermediate, union and compensation ranges. Figure 1 also allows the identification of unidimensional polarization

with regard to the x_1 dimension (poor to the left of z_1 , affluent to the right of r_1) and to the x_2 dimension (poor below z_2 , affluent above r_2).

In the following we focus on the compensation approach (weak focus axiom), where the grade of compensation will be evaluated empirically by the German population. For the compensation approach, Figure 2 illustrates the poverty and the affluence situation (two-dimensional case). Again, the shaded areas in Figure 2 describe the poor under the poverty curve and the affluent above the affluence curve.

Figure 2: Multidimensional Isopolarization Contours – Compensation Approach (Weak Focus Axiom) in the Two-Dimension Case



Source: Merz and Scherg 2014

Take for example the affluence compensation above the income threshold (shaded area right of r_1 in Figure 2). The time deficit (shaded area and being below the time affluence line r_2) is considered to be compensated by a high income above the multidimensional affluence curve to be assigned IMD affluent. The time deficit, however, is considered to be not compensated by high income below the multidimensional affluence curve; there is no more multidimensional affluence.

The poverty and affluence curves (in the two-dimension case) can be interpreted as *multidimensional isopolarization contours*, which are isoquants (well-being indifferent curves) of an underlying well-being function, a function which comprises all polarization attributes and evaluates their interdependent relation. This multidimensional well-being function is specified next.

3.2 Multidimensional Polarization - Multidimensional CES Well-Being Function

Following the compensation approach, this section specifies a particular multidimensional well-being function, a Constant Elasticity of Substitution (CES) function, whose multidimensional isopolarization contours, as described above, identifies the individuals in the polarization poles, both the poor and the affluent. The CES well-being function accounts for the interdependence of the polarization attributes and will be the key element in the following new multidimensional polarization indices and the foundation for the new minimum 2DGAP polarization approach.

Our CES-type well-being function with its individual well-being indicator V_i (weak focus axiom) evaluates the interdependence of dimensions by

$$(1) \quad V_i = \gamma \left[w_1 (x_{1i})^{-\rho} + w_2 (x_{2i})^{-\rho} \right]^{-\frac{\nu}{\rho}}$$

with the substitution elasticity $\sigma = 1/(1 + \rho)$ measuring the curvature of the isoquants, ρ as a substitution parameter of the isopolarization contours with $\rho \neq 0$, γ as a constant, ν as returns to scale, x_{1i} and x_{2i} as the polarization attribute quantities, and the coefficients w_1 and $w_2 = 1 - w_1$ as distribution and weighting parameters describing the skewness of the isopolarization contours.⁴

Compared to other specifications the CES function has the virtue that the elasticity of substitution/compensation can be estimated empirically and is not restricted to a certain value, like a value of one as with the Cobb-Douglas function (a special case of the more general CES function). Since in our empirical application we estimate the CES by a log-Taylor approximation, the results can even be interpreted as being a more flexible specification like a translog one.⁵

The CES indifference curves, which are the contours of the CES well-being function describing the situation in the two-dimensional spaces here for parental child care time as x_{2i} , say, and income as x_{1i} , say, are derived by

$$(2) \quad x_{i2} = \left[\left[(V / \gamma)^{(-\rho/\nu)} - w_1 x_{i1}^{(-\rho)} \right] / w_2 \right]^{(-1/\rho)}.$$

Following the CES well-being compensation approach to quantifying the interdependence of the polarization attributes, the aggregated *multidimensional poverty curve* and the aggregated *multidimensional affluence curve* will be defined at their respective thresholds by

$$(3) \quad V_z = \gamma \left[w_1 (z_1)^{-\rho} + w_2 (z_2)^{-\rho} \right]^{-\frac{\nu}{\rho}} \quad \text{and} \quad V_r = \gamma \left[w_1 (r_1)^{-\rho} + w_2 (r_2)^{-\rho} \right]^{-\frac{\nu}{\rho}}$$

resulting in the two isopolarization contours, the isopoverty and the isoaffluence contours, which cross the poverty threshold intersection at $z = (z_1, z_2)$, or respectively the affluence threshold intersection at $r = (r_1, r_2)$. All individuals with their calculated multidimensional well-being $V_x = V(x_{1i}, x_{i2})$ below the isopoverty curve are assigned to be poor, above the isoaffluence curve to be affluent, and together assigned to be polarized (see again Figure 2).

⁴ The degree of substitution between child care time and income is measured by the Hicks' elasticity of substitution as the relative change in the proportion of the two attributes dependent on the relative change of the corresponding marginal rate of substitution. With the CES function, the intersections of all isoquants with a ray from the origin have the same marginal rate of substitution. Substitution/compensation, however, is different between different rays from the origin, which allows different degrees of substitution with different time and income ratios.

⁵ For a further discussion, reasoning and justification of the CES well-being function with multidimensional poverty application, the reader is referred to Merz and Rathjen 2014a.

3.3 Multidimensional Polarization - Well-Being Measures

We propose a new straightforward measurement approach to multidimensional polarization based on individual well-beings. We distinguish between two distances to measure the importance of the multidimensional distribution poles: the first one includes the distance from the individual situation to the median. The second one relies on defined poverty and affluence thresholds and measures the distance from the individual situation to the pole thresholds.

Multidimensional Well-Being Polarization (Median)

The first multidimensional polarization measure is the multidimensional well-being extension of the Wang and Tsui 2000 unidimensional polarization measure which considers polarization poles below and above the respective medians. Our *multidimensional well-being polarization index (median)* (weak focus axiom) measures the well-being polarization intensity as a mean relative well-being gap with respect to the median, and is defined (for the two dimensional case) by

$$(4) \quad P_{median} = \frac{1}{n} \sum_{i=1}^n \left[\left| \frac{V(x_{i1}, x_{i2}) - V(m_1, m_2)}{V(m_1, m_2)} \right| \right]^\alpha$$

where $V(\cdot)$ is a (CES) well-being function as in Equation 1, m_i is the median value of the polarization attributes, and n is the population size. The greater the distance from the median well-being to the individual well-being, the greater is this index. In contrast to Wang and Tsui 2000, who relate α to the interval $[0,1]$, we follow the Foster-Greer-Thorbecke (FGT) 1984 idea of α describing here a polarization aversion index, with $\alpha = 1$ as the relative well-being distance to the median, and $\alpha = 2$ (or $\alpha \geq 1$) for a greater polarization sensitivity with greater weights for larger gaps.

Multidimensional Well-Being Polarization (Poverty and Affluence Thresholds)

Whereas the last index comprises all gaps below and above the well-being median, *multidimensional well-being polarization index (poverty and affluence thresholds)* P_{all} considers the individual gaps with respect to explicit poverty and affluence thresholds:⁶

$$(5) \quad P_{all} = \frac{1}{n} \sum_{i=1}^n \left[\max \left(\frac{V(z_1, z_2) - V(x_{i1}, x_{i2})}{V(z_1, z_2)}, 0 \right) \right]^\alpha + \frac{1}{n} \sum_{i=1}^n \left[\max \left(\frac{V(x_{i1}, x_{i2}) - V(r_1, r_2)}{V(x_{i1}, x_{i2})}, 0 \right) \right]^\beta$$

The exponents α and β serve as polarization aversion coefficients, with $\alpha = 0$ and $\beta = 0$ delivering the multidimensional polarization headcount ratios. With $\alpha = 1$ and $\beta = 1$ an average relative polarization gap in well-being units is measured, and with $\alpha > 1$ and $\beta > 1$ a higher aversion against strong polarization (which may be different for the poor and the affluent) is reflected. The proposed polarization index (5) has its origins in a multidimensional Foster-Greer-Thorbecke 1984 poverty index under the weak focus axiom according to well-being.

The construction principle of this index – which transfers gap measures from poverty analysis to the analysis of the affluent – reveals a general problem of measuring any gap for the affluent. Whereas a poverty gap is restricted to the maximum interval z , the affluence gap would be unbounded. If the affluence part were specified in the same manner as the poverty part, then a reference to the affluence threshold $V(r_1, r_2)$ might deliver values greater than one (further implications are discussed e.g. in Peichl et al. 2010). Thus the second part of our multidimensional polarization index refers to the individual situation $V(x_{i1}, x_{i2})$ ensuring affluence percentage ratios in the interval $[0, 1]$.

⁶ It is an extension of the Scheicher 2010 index, which for each individual gap only sums up attribute values without any compensation possibilities.

Though both parts have a different reference, for both parts a larger index characterizes an increasing polarization as increasing mean relative gaps within the multidimensional poles.

Since in both parts of the multidimensional polarization index (Equation 5), the average is related to the whole population (n), relatively small values have to be expected in an empirical application. A more intuitively appropriate average would be related to only the poor or affluent population numbers. The *multidimensional well-being polarization index (poverty and affluence thresholds)* P_{poles} then is defined by

$$(5) \quad P_{poles} = \frac{1}{n_{poor}} \sum_{i \in poor}^{n_{poor}} \left[\frac{V(z_1, z_2) - V(x_{i1}, x_{i2})}{V(z_1, z_2)} \right]^{\alpha} + \frac{1}{n_{rich}} \sum_{i \in rich}^{n_{rich}} \left[\frac{V(x_{i1}, x_{i2}) - V(r_1, r_2)}{V(x_{i1}, x_{i2})} \right]^{\beta}$$

with exponents α and β greater or equal one. Our polarization index (Equation 5) respects well-being units, whereas the unidimensional Scheicher 2010 polarization index refers to income units.

4 Minimum Multidimensional Polarization Gap (2DGAP)

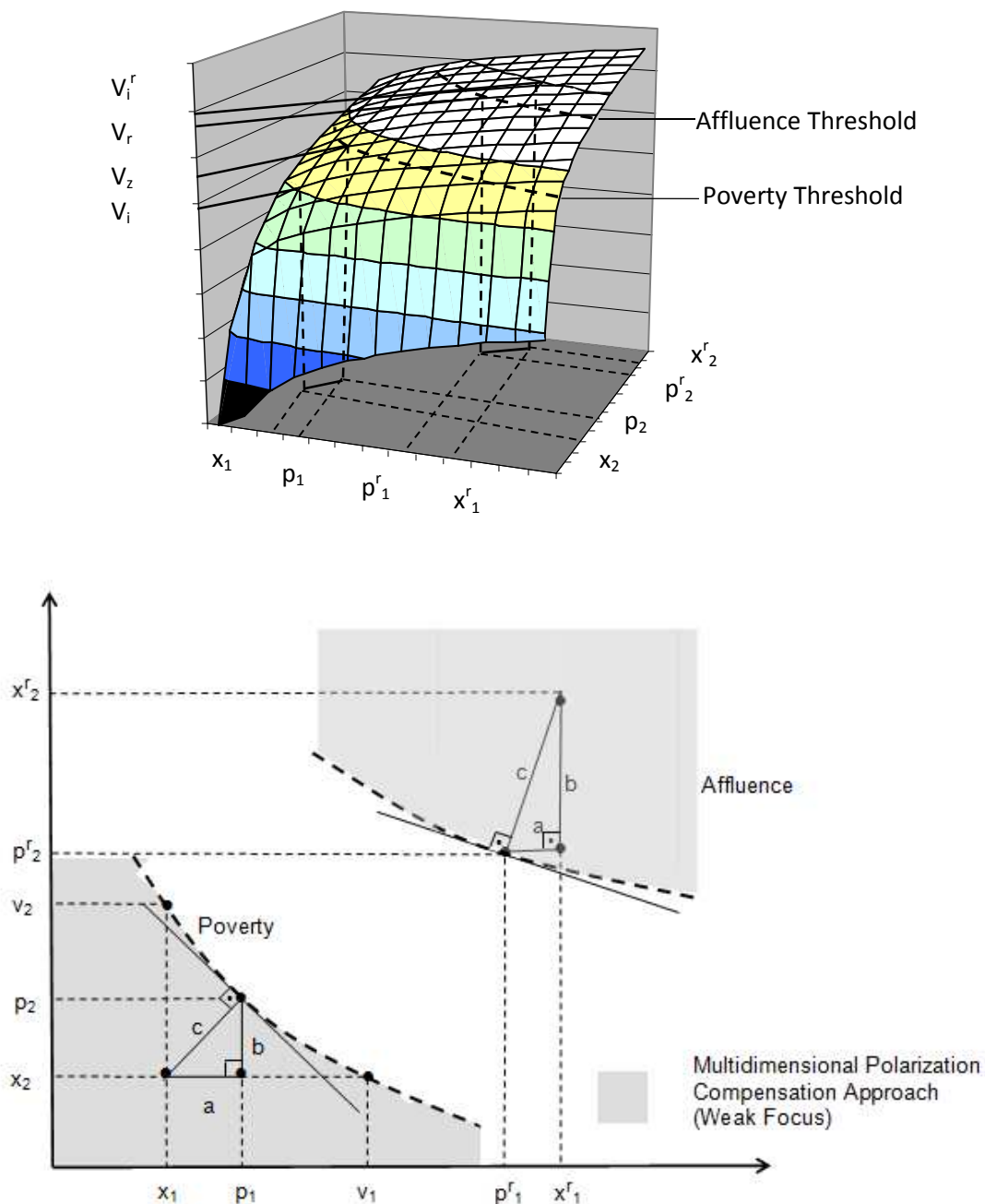
The virtue of measuring multidimensional well-being is that it respects and quantifies the interdependence of multiple well-being attributes by a one-value well-being index. However, such an aggregation of dimensions into a single well-being value is questionable if it is still measuring “multidimensional” poverty, affluence or polarization, since the single attributes are no longer transparent. Transparency for the single attributes in the multidimensional approach, however, is desirable in a manner which allows a targeted policy aimed at the transparent specific attributes of poverty, affluence or polarization.

The main motivation for developing the multidimensional polarization 2DGAP (introduced by Merz and Rathjen 2014b for poverty analyses) is thus to “disentangle” the single attributes of a well-being gap to obtain a unique multidimensional intensity measure with transparent single attributes. We follow the extended minimum poverty 2DGAP concept for the multidimensional polarization case as in Merz and Scherg 2014.

In the polarization case, both poles of a distribution with their respective poverty threshold and affluence threshold contours are of interest. Figure 3 (top) shows the CES well-being graph and describes the two-dimensional poverty and affluence case: $V_z = V(z_1, z_2)$ is the well-being contour at the poverty threshold $z = (z_1, z_2)$, $V_i = V(x_{i1}, x_{i2})$ is the individual well-being contour at $x_i = (x_{i1}, x_{i2})$. The difference $V_z - V_i$ is the multidimensional poverty well-being gap. In an analogous way $V_i^r - V_r$ defines the multidimensional affluence well-being gap for a rich person with $V_i^r = V(x_{i1}^r, x_{i2}^r)$ and $V_r = V(r_1, r_2)$ as the affluence threshold.

The mapping of the multidimensional well-being on its (two) single dimensional input space now allows for another attractive integrated approach for describing multidimensional polarization intensity while disentangling the single attribute contributions. It consists of a unique distance between an individual situation and the poverty or, respectively, the affluence threshold.

As an illustration, consider the two-dimensional case from the compensation approach and its attribute space as in Figure 3 (at the bottom) and regard first the poverty situation at $x = (x_1, x_2)$ for an individual. With respect to both dimensions there is a fan of distances from that point $x = (x_1, x_2)$ to the IMD isopoverty threshold. Indeed, each distance yields the same well-being difference $V_z - V_i$. However, each distance requires that different single attribute input mixtures need to be overcome in order to escape multidimensional poverty.

Figure 3: Multidimensional Polarization: Well-Being Gap and Minimum 2DGAP

Source: own illustration

The *shortest* path between $x = (x_1, x_2)$ and the corresponding point $p = (p_1, p_2)$ at the isopoverty threshold contour is shown in Figure 3. It requires a minimum input mixture in the sense of an optimized compensation intensity, a minimum combined input “length”, in order to escape multidimensional poverty. A natural measure for that length is the Euclidian distance of the single attributes $c = [a^2 + b^2]^{0.5}$ with their components a and b as the single poverty attribute gap intensities (for further details see Merz and Rathjen 2014b).

The same approach will be used for a shortest path from a multidimensional affluent individual situation to the isoaffluence curve. It is the minimum combined input length necessary to lose

multidimensional affluence. We call this shortest distance c the *minimum multidimensional poverty/affluence 2DGAP* (for two polarization dimensions).

The *minimum multidimensional poverty/affluence 2DGAP* c , again and summarized, delivers transparency of the single dimensions by the components a (say income) and b (say time). It will be transparent for each individual, how much time (b) and how much income (a), say, is minimally needed to overcome poverty respectively not to be affluent any more.

Aggregation and Mean Minimum Polarization 2DGAP

To retain the polarization single attribute contributions in the multidimensional approach, we propose a straightforward aggregation and measure by the sum of the respective minimum 2DGAP pole means, the *mean minimum polarization 2DGAP*:

$$(6) \quad C = \frac{1}{n_{poor}} \sum_{i \in poor}^n c_i + \frac{1}{n_{rich}} \sum_{i \in rich}^n c_i ,$$

and its single aggregated components⁷

$$(7) \quad A = \frac{1}{n_{poor}} \sum_{i \in poor}^n a_i + \frac{1}{n_{rich}} \sum_{i \in rich}^n a_i, \quad B = \frac{1}{n_{poor}} \sum_{i \in poor}^n b_i + \frac{1}{n_{rich}} \sum_{i \in rich}^n b_i .$$

5 Multidimensional Parental Child Care Time and Income Polarization in Germany – Data and Empirical Thresholds

This chapter characterizes our two data bases and discusses the threshold concept and its empirical implementation.

5.1 Data: GSOEP 2002 and GTUS 1991/92 and 2001/02

The German Socio-Economic Panel (GSOEP)

The German Socio-Economic Panel (GSOEP) provides representative individual longitudinal data for all persons older than 16 years living in German households. The representative panel study started in 1984 and encompasses annual subjective as well as objective information about individual living conditions in Germany (for details, see Wagner, Frick and Schupp 2007). In particular, the GSOEP asks about satisfaction with regard to different topics, such as income, as well as general questions about life satisfaction. The 11-point scale regarding general satisfaction information is used for our subjective well-being measure and the CES well-being estimation and refers to the recent happiness/satisfaction literature (Clark et al. 2008, Frey and Stutzer 2005).

Since appropriate well-being data are only available in the German Socio-Economic Panel, we use the GSOEP 2002 for the CES well-being estimation. Although in principle we could use the GSOEP for further analyses, we prefer to use time use diary data from the German Time Use Surveys (GTUS) from 1991/92 and 2012/13 (with no appropriate well-being information) since the time use diaries provide more in-depth information.

⁷ The aggregation of the single poverty attributes a and b and of the 2DGAP c over all individuals might not result in the joint aggregate condition $c = (a^2 + b^2)^{0.5}$. With two degrees of freedom one remaining component (a , b or c) is computable from the other aggregates. In our application, alternative computations of the respective remaining components have shown close accordance with the orthogonal condition.

Within SOEP child care is one activity among others (paid and unpaid working hours, leisure etc.) for which time “normally” used in hours are available.⁸ Obviously this restricts a daily expressiveness but allows to capturing a more long termed time use importance. Other SOEP information characterize our further bricks: being a parent and defining an appropriate household income.

The German Time Use Surveys (GTUS) 1991/92 and 2001/02

The German Federal Statistical Office conducted three large representative time use surveys, the German Time Use Surveys 1991/92, 2001/02 and 2012/13 (Ehling, Holz and Kahle 2001, Ehling 2003, www.forschungsdatenzentrum.de). In these surveys all respondents in a household older than 11 years noted their everyday routines in diaries in their own words for two working days and a Saturday or Sunday. Personal and household questionnaires also provided socio-economic background information. We focus on the 1991/92 and 2012/13 GTUS data to characterize the begin and the end of an about twenty years long development.

Within GTUS coded activities for each time slot (1991/92 five minutes slots; 2012/13 ten minutes slots) over three time diary days are available. Child care for our study encompasses the code areas (GTUS 2012/13): “47 child care in the household” (with seven sub codes) and “947 Travel time child care” with comparable codes for GTUS 1991/92. Further personal and household information describe the parent and other household situation.

5.2 Income, Time, and Multidimensional Poverty and Affluence Threshold Concept

Single poverty thresholds z_i and single affluence lines r_i ($i = 1, 2$) identify the poor and the affluent respectively, the respective multidimensional well-being thresholds and the polarization individuals in our analysis. Yet, the empirical analysis requires concrete values.

Income: Poverty and Affluence Threshold Concept

Income poverty studies commonly use monthly household net equivalence income with equivalence scales like the OECD scale⁹. Conventional income-based poverty studies in the European Union identify a person as income poor if her net equivalence income is below 60% of the median income of all households (Bundesregierung 2005, XV). As a result, the 60% median line of the monthly household net equivalence income is adopted in this study as the *income poverty line*. For the sake of comparison, all subsequent income information for 1991/92 is adjusted to 2001/02 price levels.

Whereas there is common agreement about the income poverty line, there is a longstanding and still open discussion about a respective affluence line. The German government explicitly focused for the first time on affluence in addition to poverty in their first “Poverty and Affluence Report” (Bundesregierung 2002), which was followed by three further government reports (Bundesregierung 2004, 2011, 2013). During that period, top incomes gained increasing attention not only in Germany (Atkinson and Piketty 2007, Dell 2007 with German income tax microdata from 1891-1998, Merz, Hirschel and Zwick 2007 with German income tax microdata from 1992-2003). Several affluence lines were proposed in this literature, including an affluence line as a multiple of an income fraction, such as 200% or 150% of mean median income, or as a top income percentile.

As a pragmatic approach, we are choosing 150% as the cut-off for the median monthly household net equivalence income affluence threshold (this threshold is supported, for example, by the polarization threshold in Goebel et al. 2010 or Grabka and Frick 2008 from the German Economic Institute).

⁸ SOEP 2013: “What is a typical day like for you? How many hours do you spend on the following activities on a typical weekday, Saturday, and Sunday? • Please give only whole hours. Use zero if the activity does not apply!” one of 8 activities: child care

⁹ With a weight of 1 for a household head, a weight of 0.5 for additional household members aged 15 years or older, and a weight of 0.3 for all others.

Time: Poverty and Affluence Threshold Concept

Compared to income, the discussion about time poverty or even time affluence is still in its infancy. Bittman 1999 mentions a 50% time poverty line. To be consistent to our income poverty and affluence line, we chose 60% of the median parental child care leisure time as defining an individual which is time poor, and 150% of the median as the time affluence threshold. Admittedly, such thresholds are certainly debatable.

5.3 Empirical Multidimensional Poverty and Affluence Thresholds, Germany 1991/92 and 2012/13

The empirical based parental child care time and income poverty and affluence thresholds are summarized in Table 1. All income data are adjusted for price inflation.

CES well-being estimates: Fixed effects panel estimates 1992-2013

Concerning the empirical well-being and isopolarization thresholds an estimation of the CES well-being function is necessary. With the GSOEP-reported general life satisfaction data on an 11-point scale¹⁰, any estimation of individual well-being using this data requires a type of ordered response non-linear modelling. The Kmenta 1967 Taylor series approach, however, is a linear specification as a log-transformed non-linear CES well-being function (see Merz and Rathjen 2014a).

To capture a rather longstanding evaluation by the German society we then use the individual panel data from 1992 (after the German re-unification and the period of the first GTUS) to 2013 for estimating a fixed effect regression which results in the following CES well-being function

$$(8) \quad V = f(I, L) = 3.970 \cdot \left(0.912 \cdot I^{0.062} + 0.082 \cdot C^{0.062} \right)^{\frac{0.077}{0.062}}$$

with $I = x_{i1}$ for income and $C = x_{i2}$ for parental child care time. Significantly estimated coefficients together with the fulfilment of further consistency rules quantify the relevance of substitution/compensation between parental child care time and income. The population-based evaluation¹¹ of the substitution/compensation between parental child care time and income yields a substitution elasticity of $\sigma = 1.066$, which shows an easier substitution than in the Cobb-Douglas type ($\sigma = 1$) situation¹². Remarkably, given a significant substitution income is the dominant predictor of income and time influencing multidimensional well-being.

To provide an identical evaluation scheme this CES well-being estimates evaluates both the 1991/92 and 2012/13 situation.

Parental child care time and income

Median income, and as a result the income poverty and affluence thresholds, increased by 10.9% to 1.217.42 euros in the about twenty-year period between 1991/92 and 2012/13 (Table 1).

Median parental child care time, and in the same manner its time poverty and affluence thresholds, shows a stronger increase from 95 to 130 minutes per day, a remarkable increase by 36.8%.

¹⁰ GSOEP 2012/13 question in the personal questionnaire: “How satisfied are you today with the following areas of your life? • Please answer on a scale from 0 to 10, where 0 means completely dissatisfied and 10 means completely satisfied. How satisfied are you with your ... standard of living”.

¹¹ Our CES well-being function estimates are based on parents with children and therefore its judgment of the trade-off between the two dimensions is probably more appropriate than respecting a broader population.

¹² Perfect substitution: ($\rho = -1, \sigma = \infty$), Cobb-Douglas case with ($\rho = 0, \sigma = 1$), no substitution at all (complementary input factors, $\rho = \infty, \sigma = 0$).

Table 1: Child Care Time, Income and Well-Being Multidimensional Poverty and Affluence Lines, Germany 1991/92 and 2012/13

	1991/92	2012/13
Median Net Equivalence Income (in euros per month and 2002 prices)	1,097.45	1,217.42
Median Parental Child Care Time (in minutes per day)	95	130
Well-Being Median $V^{\text{median}} = f(I^{\text{median}}, L^{\text{median}})$	6.702	6.764
Income Poverty Line (=60% median net equivalence income)	658.47	730.45
Time Poverty Line (=60% median personal leisure time)	57	78
Well-Being Poor $V^{\text{poor}} = f(I^{\text{poor}}, L^{\text{poor}})$	6.443	6.503
Income Affluence Line (=150% of median)	1,646.18	1,826.13
Time Affluence Line (=150% of median)	142.50	195
Well-Being Rich $V^{\text{rich}} = f(I^{\text{rich}}, L^{\text{rich}})$	6.914	6.978
	1991/92	2012/13

Source: GTUS 1991/92 and 2012/13, own calculations.

Given the parental child care time and net equivalence income thresholds and the estimated CES-well-being function (Table 1), both, a respective assigned individual multidimensional well-being and the multidimensional threshold to be compared with are the empirical foundation for the following analysis.

6 Parental Child Care Time - Multidimensional Polarization in Germany – Headcount Ratios, Well-Being Indicators and Minimum 2DGAP Results

We provide results on the incidence and intensity of multidimensional parental child care by three sets of indicators: first, by headcount ratios, which shows how many parents are characterized by their poverty and affluence poles and both poles together; second, by multidimensional polarization CES-well-being indicators, and third, by the Minimum 2DGAP intensity results which describes unique poverty and affluence gaps together with their transparent child care time and income contributions.

6.1 Overall Multidimensional Polarization Results: Headcount Ratios and Well-Being Indicators

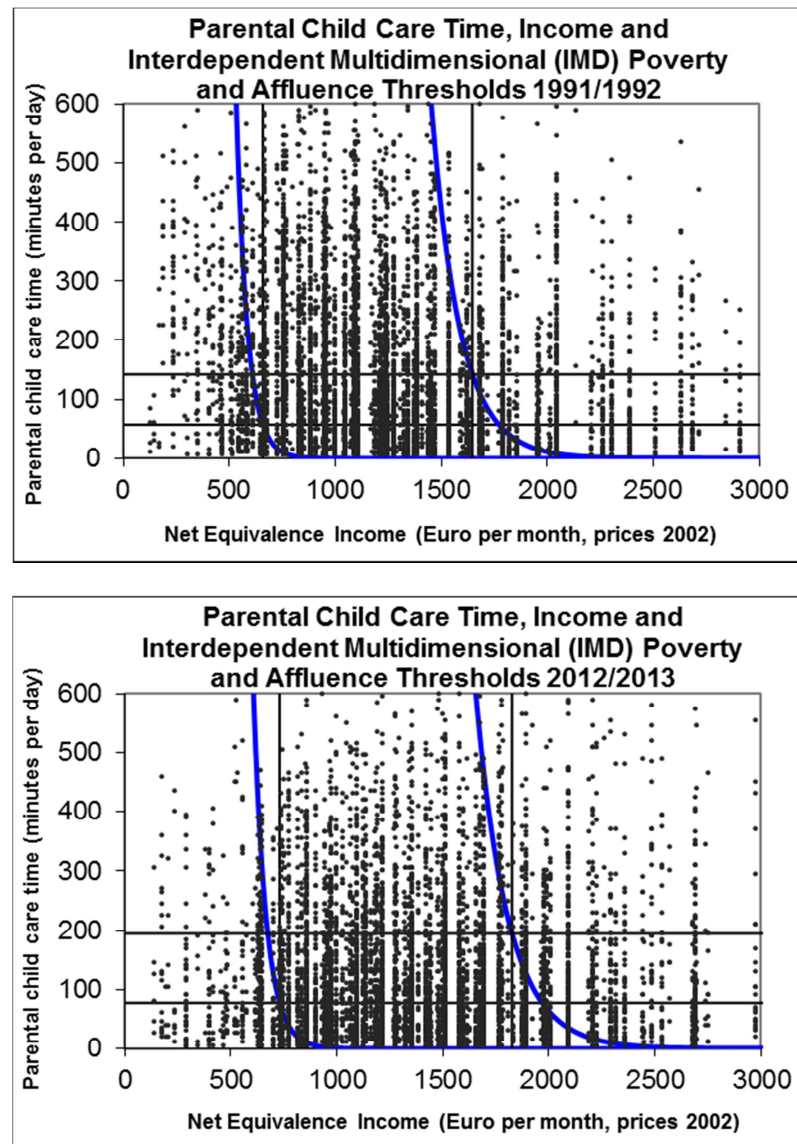
Let us start with the incidence of interdependent multidimensional polarization of parental child care time and income measured by headcount ratios.

Headcount Ratios

The mapping of multidimensional well-being on its time and income space provides meaningful and illustrative results of the multidimensional polarization incidence. Figure 1 shows all individual

observations (personal days) for both years under investigation together with its framing poverty and affluence thresholds. Figure 2 aggregates the information with its headcount ratios in dividing regions. Table 2 shows aggregated unidimensional child care time and income headcount ratios as well as the Interdependent Multidimensional (IMD) headcount ratio.

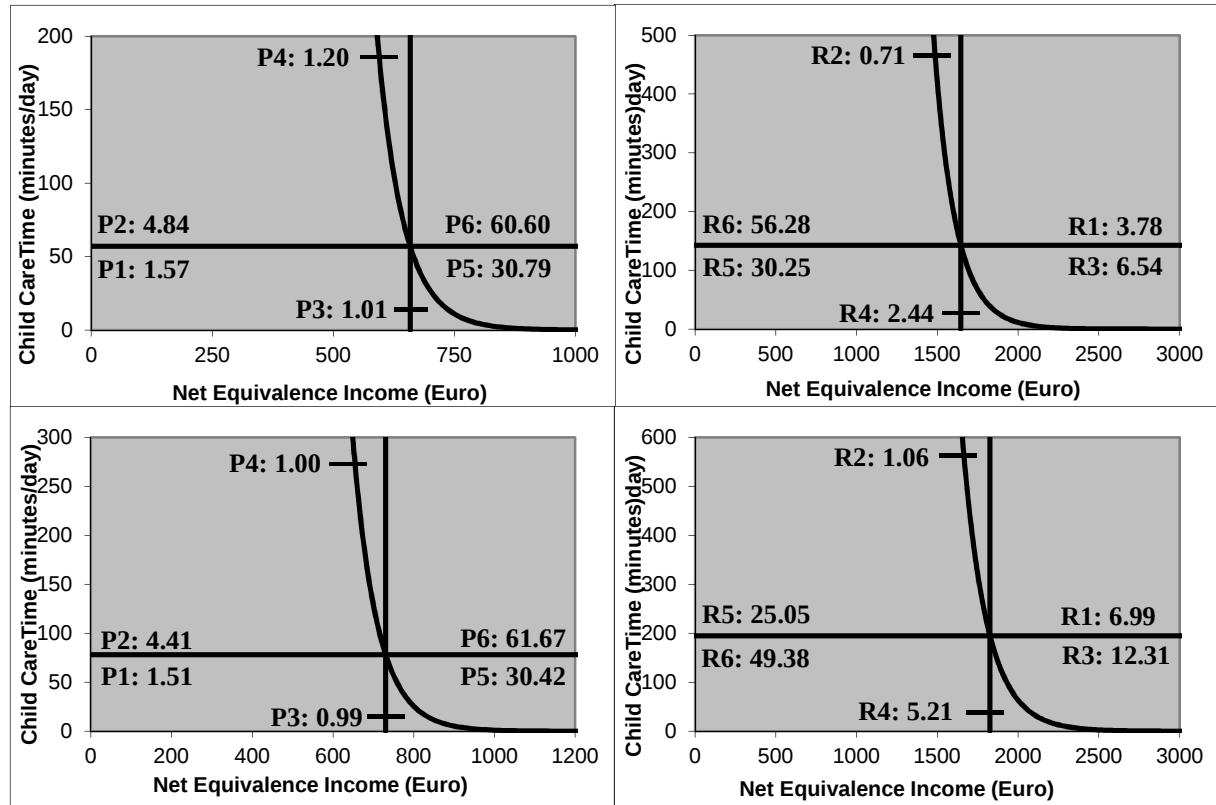
Figure 1: Parental Child Care Time and Income Observations – Germany 1991/92 and 2012/13



Source: GTUS 1991/92 and 2012/13, own calculation.

As to Figure 2, parents are assigned to be poor in both dimensions in region P1: with 1.51% (2012/13) of all parents this is fortunately a relative small group. Though income is the dominant factor in the estimated CES well-being function, there are still individuals where even above poverty income is not compensating their child care time deficit (roughly 1% in 2012/13). The above poverty income, however, is compensating the parents' child care time deficit by 30.42% (region P5). The regions P1, P2 and P3 are marking the poor interdependent multidimensional (IMD) child care time and income parents: 6.91% are assigned IMD poor. Though decreasing from 1991/92 from 7.42% to 6.91% the change is not significant (see also Table 3), the IMD headcount ratio remains around 7%.

Figure 2: Parental Child Care Time and Income and Interdependent Multidimensional (IMD) Poverty and Affluence Headcount Ratios – Germany 1991/92 and 2912/13



Source: GTUS 1991/92 and 2012/13, own calculation.

Table 2: Parental Child Care Time and Income – Multidimensional Polarization Measures - Germany 1991/92 and 2012/13

	Poverty			Affluence			Poverty and Affluence		
	1991/ 92	2012/ 13	Index 1991/92=100	1991/ 92	2012/ 13	Index 1991/92=100	1991/ 92	2012/ 13	Index 1991/92=100
Income (1,2, 4)	7.61	6.92	90.9	12.76	24.51	192.1	20.37	31.43	154.3
Child Care Time (1, 3, 5)	33.37	32.92	98.7	34.74	33.1	95.3	68.11	66.02	96.9
IMD (1, 2, 3)	7.42	6.91	93.1	11.03	20.36	184.6	18.45	27.27	147.8

Source: GTUS 1991/92 and 2012/13, own calculation.

Poverty Pole

Affluence Pole

12,31% IMD affluent are assigned to compensate their child care time deficit by high income (R3). Still 5,21 % are assigned not to be IMD affluent though income rich but child care time poor; their

child care time deficit is assigned not to be compensated even by high income (R4). Remarkably, almost every sixth rich parent (17.52%) faces a child care time deficit (R3, R4). Taking the IMD affluent regions together (R1, R2 and R3) then 20,36% parents could be assigned to be rich in child care time and income. Remarkably, whereas the IMD poor remain around 7% the IMD well-being incidence of the rich almost doubled from 11.03% to 20.36% over those twenty years (Table 2).

Interdependent Multidimensional Poverty and Affluence: Polarization

The aggregated polarization measure results stress the asymmetric picture: with around 7% IMD poor in contrast to around 20% IMD rich the affluence pole is almost three times higher than the poverty pole (2012/13). And, it is only the affluence pole which increased significantly over those twenty years by 84%. Though this sounds like a nice picture of an increasing affluent pole importance, however, after twenty years and the proven well-being income dominance, there are still one third (32,92%) of all parents which show a remarkable child care time deficit (P1, P3, P5).

Interdependent Multidimensional Well-Being

The interdependence of multidimensional parental child care time and income polarization is represented by the CES well-being function and the polarization indicators upon. Table 3 provides the two discussed well-being gap measures: P_{median} which divides the poles by the overall median and P_{poles} , which relies on the poverty and affluence thresholds as pole markers. Both IMD polarization well-being measures show a slight but significant increase in IMD polarization. This increase is diminishing when the pole limits are closer to the pole ends. Whereas the headcount ratio of the affluent increased considerably the well-being gap in the contrary decreased. Thus, with a decreasing well-being gap the affluent pole is losing its polarization importance.

6.1 Multidimensional Polarization by the Minimum Multidimensional Polarization Gap (2DGAP)

At a first glance the picture from the results above seems to be complete and conclusive: incidence and well-being intensity of parental child care time and income is rising over the twenty years under investigation. However, and shortly discussed above, many different individuals might be on the same well-being curvature but are considered only by the same well-being value. Thus, the different situations might be blurred.

But, there is a solution for a more distinct picture: each individual situation is individually captured by a different 2DGAP value, which for each individual is a unique gap (shortest path to circumvent the respective pole). In addition, the gap components, income (a) and child care time (b), will be transparent for each individual multidimensional 2DGAP distance (c) (see equations 6 and 7).

The overall impressive 2DGAP result (Table 3): the aggregated 2DGAP C measure and its income (A) and child care time component (B) show a highly significant increase in multidimensional well-being polarization of parental child care time and income.

This result is in line with the well-being gap result above which stresses the importance and validity of our results; the more, since both approaches, the well-being gap and the 2DGAP one, do not necessarily show similar pictures in general. They might yield different results like in our multidimensional polarization analysis of genuine personal leisure time and income (Merz and Scherg 2014).

2DGAP Overall (C): the *mean multidimensional polarization 2DGAP* (C , Equations 6 and 7) increased significantly by $C = +29.5\%$ (Table 3). Thus, if the compensation evaluation by the German population is accepted, we face a remarkable growth of the interdependent multidimensional polarization of parental child care time and income over those twenty years. This increase is driven rather by the poor $C_{poor} = +42.3\%$ than the rich $C_{rich} = +19.6\%$ 2DGAP intensity.

Thus, increased multidimensional polarization of child care time and income is characterized by an expanded poverty gap, though the headcount ratio of the poor remained at about 7%.

Table 3: Parental Child Care Time and Income - Multidimensional Polarization Measures. Germany 1991/92 and 2012/13

	1991/92	2012/13	<i>Index</i> <i>1992=100</i>	Sig. ¹
IMD Headcount Ratio				
HCR _{poor} (%)	7.42	6.91	93	
HCR _{rich} (%)	11.03	20.36	185	***
HCR _{poles} (%)	18.45	27.27	148	***
IMD Inequality Well-Being				
Gini	0.016	0.017	106.3	***
90/10 Relation	1.104	1.110	100.5	²
95/5 Relation	1.120	1.132	101.1	²
IMD Polarization Well Being				
P _{median} (%)	2.15	2.52	117	***
P _{poles+poor} (%)	1.82	2.30	126	***
P _{poles.rich} (%)	1.69	1.44	85	***
P _{poles} (%)	3.51	3.74	107	***
2DGAP Income Component				
A _{poor,income} (€)	102.51	144.39	140.9	***
A _{rich,income} (€)	21.91	32.61	148.8	***
A (€)	124.42	177.00	142.3	***
Child Care Time Component				
B _{poor,time} (minutes)	30.91	40.70	131.7	***
B _{rich,time} (minutes)	96.29	111.46	115.8	***
B (minutes)	127.21	152.16	119.6	***
IMD Gap				
C _{poor}	109.07	152.50	142.3	***
C _{rich}	105.67	125.64	119.6	***
C	214.74	278.14	129.5	***

¹ Two sample difference in means test with variance inhomogeneity and unequal variances; Significance *** < 0.1%; ** < 1%; * < 5%. ² Without testing

Source: GTUS 1991/92 and 2012/13, own calculation.

The question now arises which of the 2DGAP components, income (A) or child care time (B) is most contributing to this result.

2DGAP Income component (A): The summarized mean minimum *income 2DGAP* component increased from €124.42 to €177.00 by +40.9%, a remarkable and highly significant increase. The poverty income component in both years is by far greater than the affluence income component (e.g. 2012/13: $A_{poor, income} = €144.39$ vs. $A_{rich, income} = €32.61$); i.e. the poverty income situation is farer away from their poverty threshold than the affluent income situation poverty from their affluence threshold. Thus, the poverty income contribution to multidimensional polarization of the poor is higher than the income contribution of the affluent. This might be an indication to focus rather an income oriented anti-polarization policy for the poor than for the affluent.

2DGAP Child Care Time component (B): The summarized mean minimum child care *time 2DGAP* component increased significantly highly significant from 127.21 minutes to 152.16 minutes per day (+19.6%). In contrast to the income component contribution, the parental child care contribution to multidimensional polarization is now higher for the affluent (2012/13: $B_{rich, time} = 111.46$ minutes vs. $B_{poor, time} = 40.70$ minutes). The affluent need relatively more time than the poor to leave their poles. In other words: the child care/income (b/a) contribution to multidimensional polarization is stronger for the affluent than for the poor.

To summarize: Though the income components grew faster than the respective time components over those twenty years, the stronger increase of the poor child care time component again stresses an increasing parental child care time deficit in particular of the multidimensional poor.

Multidimensional polarization is driven with respect to income by a relatively large poverty pole contribution, and with respect to parental child care time by a relatively large affluent pole contribution. Further single results are shown in Table 3.

Compensation: Valuing child care time

The 2DGAP components a and b allow a valuing of the parental child care time. The respective slope $-a/b$ at the IMD isopolarization curve characterizes the replacement relation between both dimensions, child care time and income. If we take the mean 2DGAP C as a center of all gaps to the multidimensional poverty and affluence threshold, then the belonging replacement ratio (input ratio) describes the shortest path from poverty or affluence. A replacement ration for instance of $a/b=0.5$ respectively $b/a=2$ then requires the double of time compared to income units to leave a pole.

The result for the poor in 2012/13 is $A_{poor} / B_{poor} = €144.39/40.70 \text{ minutes} = €3.55/\text{minute}$ (slope $-A/B$ at C and the isopoverty curve, the slope of C is $B/A=0.28 \text{ minutes/Euro}$). Thus, €3.55 per minute is required to leave multidimensional poverty. The replacement ratio of the affluent is $A_{rich} / B_{rich} = €32.61/111.46 \text{ minutes} = €0.29/\text{minute}$; already with 29 cents one minute can be “compensated”. Thus, time could be characterized as to be more valuable for the affluent than for the poor. Or in other words: the poor have to spend €3.55 whereas the affluent have to spend only 29 cents for one minute of parental child care time.

Thus, given the evaluated compensation between parental child care time and income by the German population child care time is more valuable for the affluent. Or: with a greater amount of income for one minute child care time of the poor could be called to be more expensive in contrast to the affluent.

This result, too, stresses the particular importance of the time component with regard to the interdependent multidimensional polarization of child care time and income.

7 Multidimensional Parental Child Care Time Polarization in Germany – 2DGAP Intensity Results for Socio-Economic Groups

Is multidimensional polarization different for different people? What kind of influences do have socio-economic characteristics? Do personal, job and household and even regional characteristics have not only influence but do they have different impacts on the poor and the affluent poles of multidimensional polarization of parental child care and income?

These are the questions we now want to answer for the 2DGAP intensities by a two stage Heckman 1976 approach. The first selection stage explains the risk to be multidimensional poor by probit estimates of all parents with children having positive child care time as well income values. The second stage explains the amount of the 2DGAPs (C) by a selectivity corrected linear OLS regression model for the poor respectively the affluent intensity gaps of the time and income poor or time and income affluent parents only.

In general: the longer the C distance is the closer somebody is at the pole ends. Thus, a positive estimated coefficient of the 2DGAP gap amount is deepening poverty and affluence and strengths polarization. Note, the assignment to be multidimensional poor respectively affluent is based on the subjective well-being evaluation of German society (all parents based on twenty years panel econometric estimates with the German Socio-Economic Panel).

Table 4 presents the 2012/13 results with regard to the risk and the 2DGAP amount being multidimensional poor or affluent. The selection of socio-economic variables follows proven market and non-market variables but restricted by the variables at hand, of course.

Table 4: Multidimensional Polarization of Parental Child Care Time and Income – 2DGAP Polarization Risk and Intensity: Two Stage Heckman Estimation Results – Germany 2012/13

	IMD ¹ poor		IMD affluent	
	coeff.	p-value	coeff.	p-value
IMD Polarization Intensity				
Personal				
Female	-7.198	0.662	28.21*	0.022
Age	3.434	0.553	1.168	0.908
Age ²	-0.0497	0.434	-0.0260	0.799
Not enough time	28.22***	0.000	-1.223	0.665
Education				
Second. School	-59.02*	0.019	28.02	0.417
Abitur- Fachabitur	-61.99	0.072	64.90	0.358
Occupation				
Self-employed	-6.293	0.873	49.15	0.229
Blue Collar	-118.8*	0.019	36.11	0.122
White Collar	-115.1*	0.037	34.70	0.446
Civil Servant	-71.92	0.459	51.90	0.488
Job				
Working minutes, day	-0.110**	0.003	-0.120***	0.000
Shift Work	-23.23	0.351	-39.70**	0.003
Work at Home	16.54	0.607	-3.169	0.791
Family and Household				
Household Size	-53.86	0.058	18.02	0.547
No. Children 1-3	82.95**	0.009	-1.132	0.974
No. Children 4-5	136.7***	0.000	-6.154	0.864

No. Cchildren 6-9	18.44	0.416	5.057	0.883
No. Children 10-18	62.62*	0.013	-27.21	0.507
Paid C. Care Support	1.127	0.207	-0.529	0.328
Unpaid C. Care Supp.	-0.301	0.840	-0.307	0.677
Region				
Community type	9.309	0.248	-5.754	0.207
East Germany	-10.39	0.584	-20.68	0.181
Constant	105.9	0.393	-48.52	0.920
IMD Polarization Risk				
Personal				
Female	-0.0922	0.145	0.161***	0.000
Age	-0.088***	0.000	0.134***	0.000
Age ² /100	0.0981***	0.000	-0.130***	0.000
German	-0.575***	0.000	-0.146	0.274
Education				
Second. School	-0.464***	0.000	0.397***	0.000
Abitur- Fachabitur	-0.667***	0.000	0.971***	0.000
Occupation				
Self-employed	-0.600***	0.000	0.539***	0.000
Blue Collar	-0.998***	0.000	-0.0104	0.924
White Collar	-1.128***	0.000	0.627***	0.000
Civil Servant	-1.517***	0.000	1.117***	0.000
Job				
Working minutes, day	0.000128	0.318	-0.000340***	0.000
Shift Work	-0.00089	0.992	-0.139*	0.027
Work at Home	-0.180	0.070	0.155**	0.002
Family and Household				
Household Size	-0.567***	0.000	0.462***	0.000
No. Children 1-3	0.536***	0.000	-0.520***	0.000
No. Children 4-5	0.469***	0.000	-0.554***	0.000
No. Cchildren 6-9	0.331***	0.000	-0.521***	0.000
No. Children 10-18	0.431***	0.000	-0.632***	0.000
Paid C. Care Support	0.0094**	0.005	-0.0048	0.065
Unpaid C. Care Supp.	-0.00168	0.772	0.000784	0.853
Region				
Community type	0.125***	0.000	-0.0479*	0.021
East Germany	0.286***	0.000	-0.193***	0.000
Constant	3.204***	0.000	-5.847***	0.000
Mills Lambda	48.55	0.396	49.18	0.587
<i>n</i>	6853		6850	
<i>Censored n</i>	6309		5517	
<i>Uncensored n</i>	544		1333	
<i>Wald Chi²</i>	125.27***		247.34***	

[†] Interdependent Multidimensional; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: GTUS 2012/13, own calculation.

Overall result

The overall result: there are remarkable differences with respect to the significance and sign of the variables. And, this holds for the pole probabilities as well as for the pole intensities.

2DGAP polarization risk

Personal characteristics: Surprisingly gender is only significant and positive for the affluent pole. Thus, with the background of a high household income time for parental child care is rising. This is in some accordance with the above mentioned Guryan, Hurst and Kearney 2008 results of a positive correlation of child care time and income, which is in contrast to economic modelling. The age influence is just of opposite sign: the older a parent the higher income and child care time; valid vice versa for the young. Foreigners have a significant higher risk being multidimensional poor; no significance for the affluence pole. Higher education is in favor being on the rich pole.

Occupation: Occupation, different for different jobs, reduces significantly the risk for the poor pole position and rises the risk for the affluent pole. A positive correlation of being active and earning (more) money than being non-active in the labor force seems to be behind. Paid work at the day of measured individual child care time, surprisingly, do not influence multidimensional child care and income poverty but affluence. Though income is the pre-dominant predictor in the well-being function there seems to be daily time enough for child care time at the poor pole. Work at home has a positive significant influence for the high time and income pole, but as expected - plays no role at the lower end of the distribution.

Family and household situation: a larger household diminishes multidimensional poverty 2DGAP risk and increase significantly multidimensional affluent 2DGAP risk probably because of further financial and personal support of other household members. The time slot GTUS diary data about time use for an activity like child care, shows information regardless how many children are present that time. Nevertheless, the number of children in the household by age classes can be constructed and show with Table 4 a significant influence in rising multidimensional poverty.

As expected, the risk to be multidimensional poor is diminishing when children getting older with the exemption of children between 10 and 18 years old. It seems to be that higher material (consumption) needs but a less child care requirement is behind that picture for the older children. This picture is roughly conformed by the negative and significant coefficients of the affluent. Support for child caring by others (friends, neighbors or relatives) have no influence for both pole probabilities. A small contribution of paid nursing/child care is visible and needs further explanation.

Region: Even after more than twenty years after the German re-unification there are still West- and East German differences. Living in East German (Neue Länder) rise in general the risk to be multidimensional child care time and income poor and diminish that of the multidimensional affluent. The less regional dense the population is, say the more living in the country, the greater is the risk to be multidimensional poor respectively the lower is the risk for the affluent. Though commuting the children to outdoor activities is considered in the child care time definition, expected growing travelling activities might here be overcompensated by outdoor activities of the parents with diminishing child care time.

2DGAP polarization intensity

Compared to the above 2DGAP pole probabilities the explanation of the respective 2DGAP intensity by roughly the same variables is less successful, there are by far less significant single coefficients.

Personal characteristics: With no specific gender and age influence the individual assessment of having not enough time for the children is positive and significant for the poverty pole. Greater desire to have more time for the children is correlated with the severity of multidimensional poverty, where the question of causality remains open.

Occupation: Higher working hours the day is diminishing the 2DGAP intensity both for the poor and affluent pole.

Family and household situation: In particular young children till 3 years and in the Kita ("Kindertagesstätte", professional outdoor child care) age till 6 years deepen the multidimensional poverty intensity.

Education and the regional situation, though important for the risk explanation, play no significant role any further in the determination of multidimensional parental child care time and income 2DGAP intensity, an astonishing result.

8 Concluding Remarks

This study was about subjective well-being, parental child care and income in a multidimensional polarization perspective. Our novel approach combines these three components with the explicit evaluation of the compensation between child care time and income estimated by German society over twenty years. Besides multidimensional polarization well-being measures and results, the minimum multidimensional polarization 2DGAP approach disentangled the singular contributions ensuring their interdependence. With panel data from the German Socio-Economic Panel (SOEP) and German time use diary data from the German Federal Statistical Office from 1991/92 and brand-new available 2012/13, we provided new insights and quantified socio-economic relations concerning the risk and the 2DGAP intensity amount.

Prominent results: compensation between parental child care time and income proved to be significant. Interdependent multidimensional polarization headcount ratios as well multidimensional well-being increased significantly over the twenty years under investigation. Minimum 2DGAP stresses the polarization growth of parental child care time and income. In addition, the situation showed remarkable differences between the polarization poles with different disentangled time and income contributions to the 2DGAP pole intensities. The microeconomic two-stage Heckman estimates of the risk to be in the respective pole and then of the amount of the 2DGAP intensity gap detected interesting pole different explanation.

All the quantified results might support targeted policies; targeted in both ways: with respect to targeted policies to the poor and the affluent and with respect to targeted multidimensional parental child care and income policies and their disentangled time and income contributions which still ensures their evaluated interdependence.

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