

Subjective Well-Being, Parental Child Care and Income – A Multidimensional Polarization Approach

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Motivation

- A growing polarization in society accompanied with an erosion of the middle class experiences more and more attention, at least in Germany, on recent economic and social policy discussion
- A strong polarization endangers social cohesion because the stabilizing effect of the middle class is diminishing

Question Addressed

So far uni-dimensional: Is there a growing disperse of the “**income scissor**” in Germany which describes that “**the poor are going to be poorer and the rich to be richer?**” (Grabka and Frick 2008)?

Here: Is there a growing **multidimensional polarization**?

Novel Approach

Multidimensional polarization effects on parent child care where

- compensation of time for parental child care and
- income interdependently
- evaluated by panel estimates of society's subjective well-being

Details of Approach

- Compensation/substitution between income and child care time, quantify substitution by Constant Elasticity Substitution (CES) well-being function, estimated with German individual panel data over time (2DGAP)
- Quantify multidimensional polarization intensity and reveal dimensional impacts for targets policies with reference to poles of child care time and income distribution
- Data: German SOEP and Time Use surveys

Results

- Compensation between parent child care time and income significant
- Interdependent multidimensional polarization headcount ratios and multidimensional well-being increased over 20 years studied (1991/91, 2012/2013)
- Minimum 2DGAP—stresses importance of polarization growth (intensity) of parental child care time and income
- Micro 2-stage Heckman estimates of risk to be in respective poles and the amount of 2DGAP intensity revealed different explanations



Plan of Paper

Multidimensional Polarization Well-Being

- Identification
- Aggregation, CES Well-Being Function
- New Compensation Based Well-Being Indices

New Minimum Multidimensional Polarization Gap (2DGAP)

Application:

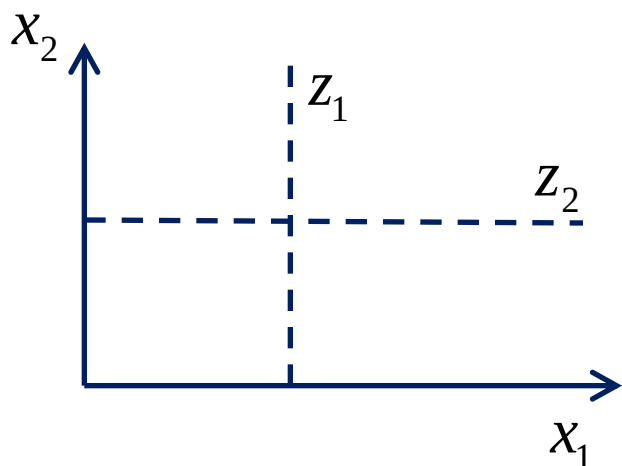
Subjective well-being, parental child care and income –
A multidimensional approach

Multidimensional Polarization – Identification

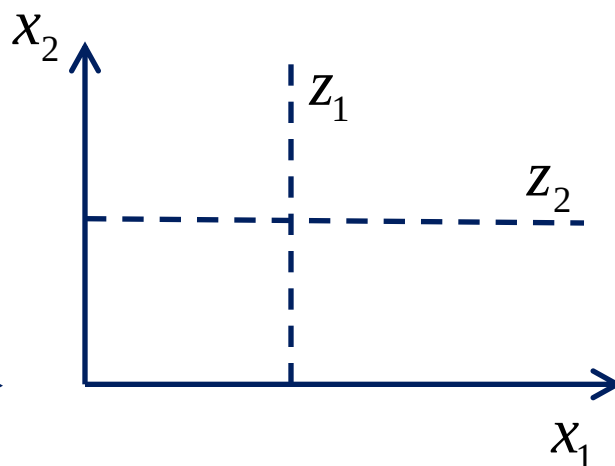


Measuring Multidimensional POVERTY - Identification

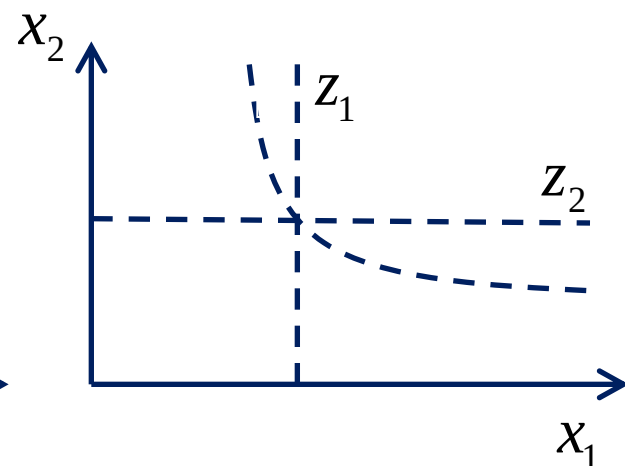
Intersection Approach



Union Approach
(Strong Focus)



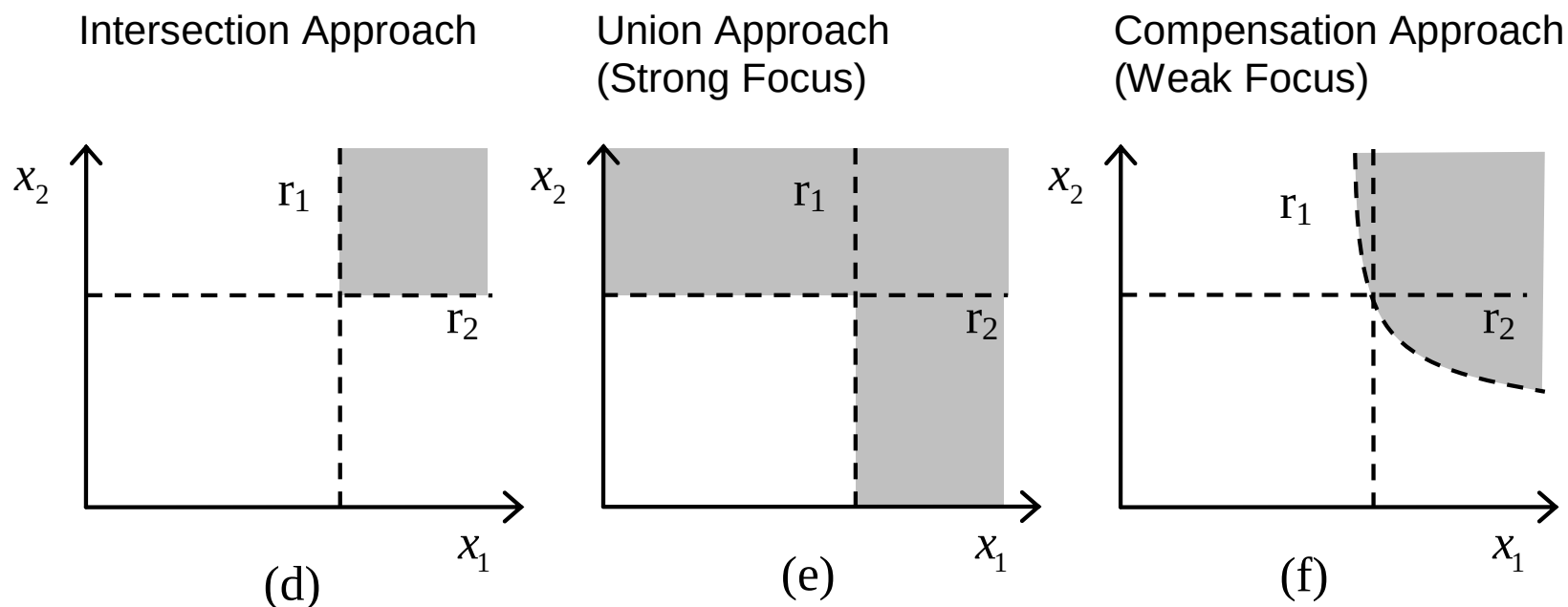
Compensation Approach
(Weak Focus)



Multidimensional Poverty

z_j unidimensional poverty lines ($j=1,2$)

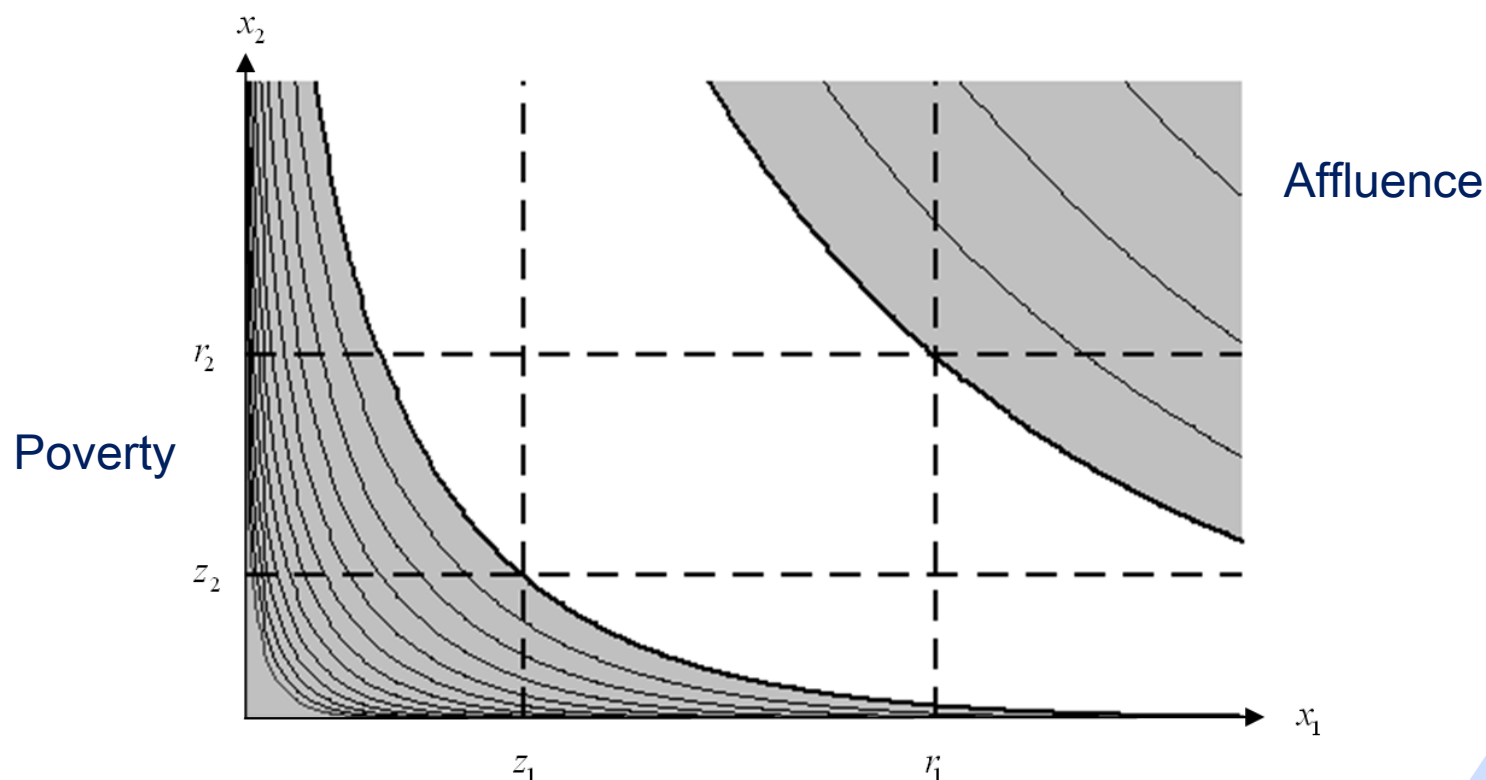
Measuring Multidimensional AFFLUENCE Identification



 Multidimensional Affluence
 r_j unidimensional affluence lines ($j=1,2$)

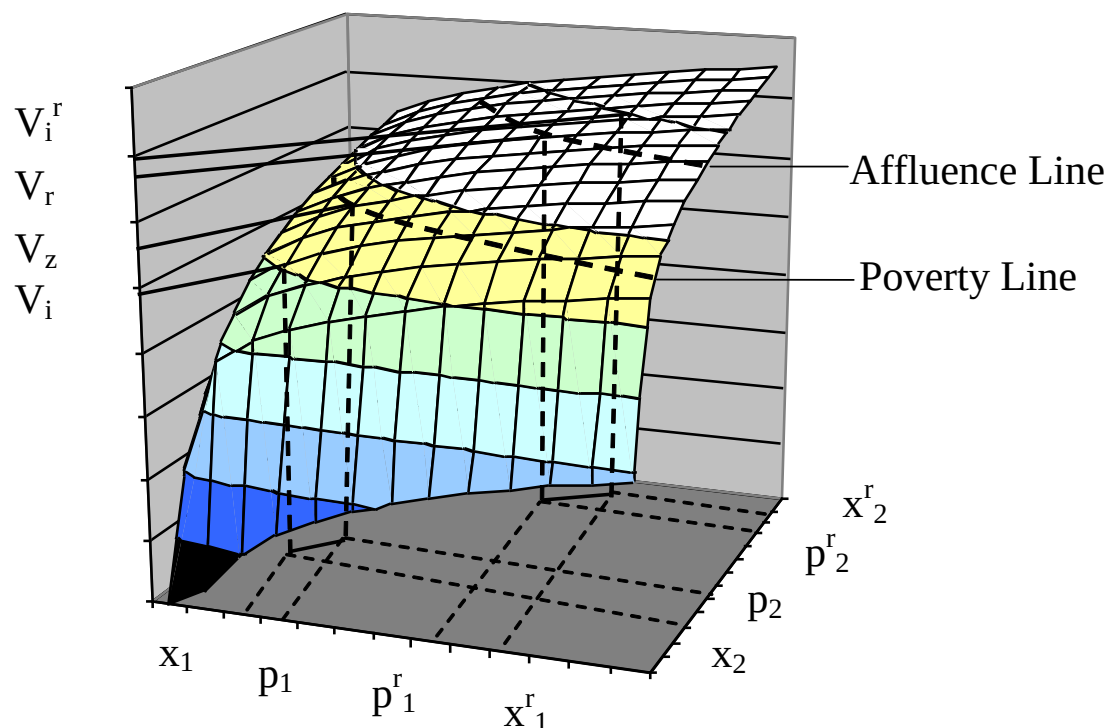
Extension: Multidimensional POLARIZATION - Identification

Multidimensional Isopolarization Contours - Compensation Approach (Weak Focus) in the Two-Dimensional Case



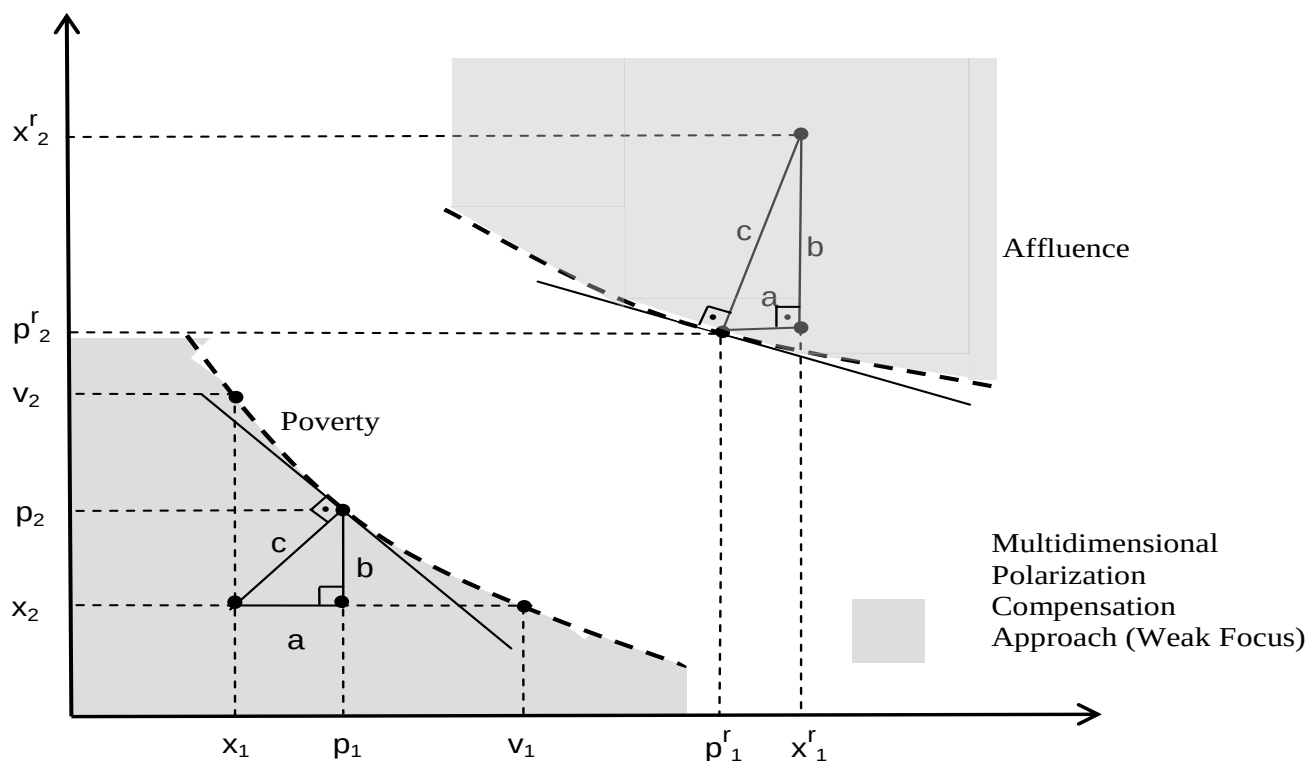
Source: own illustration, CES indifference curves of our application

Multidimensional Polarization: Well-Being Gap



Well-Being Gap ($V_z - V_i$) , ($V_r - V_i^r$)

Multidimensional Polarization: Minimum 2DGAP



Minimum 2DGAP:

c = Min. Distance (x_1, x_2) to IMD-Line, a = 2D x_1 contribution, b = 2D x_2 contribution

slope of c = orthogonal slope of IMD-Line

Databases

- German Socio-Economic Panel (GSOEP) 2002
CES estimates with subjective well-being data
- German Time Use Surveys (GTUS) 1991/92, 2001/02 and 2012/13
no satisfaction data,
but detailed time use diary data
- Integrated GSOEP onto German Time Use Study
 $V = f(\text{Income, Parental Child Care Time})$
 $V = \log$ of (0 to 10) responses to Satisfaction with standard of living
- Impute V (well-being) to Time Use Sample using estimated coefficients

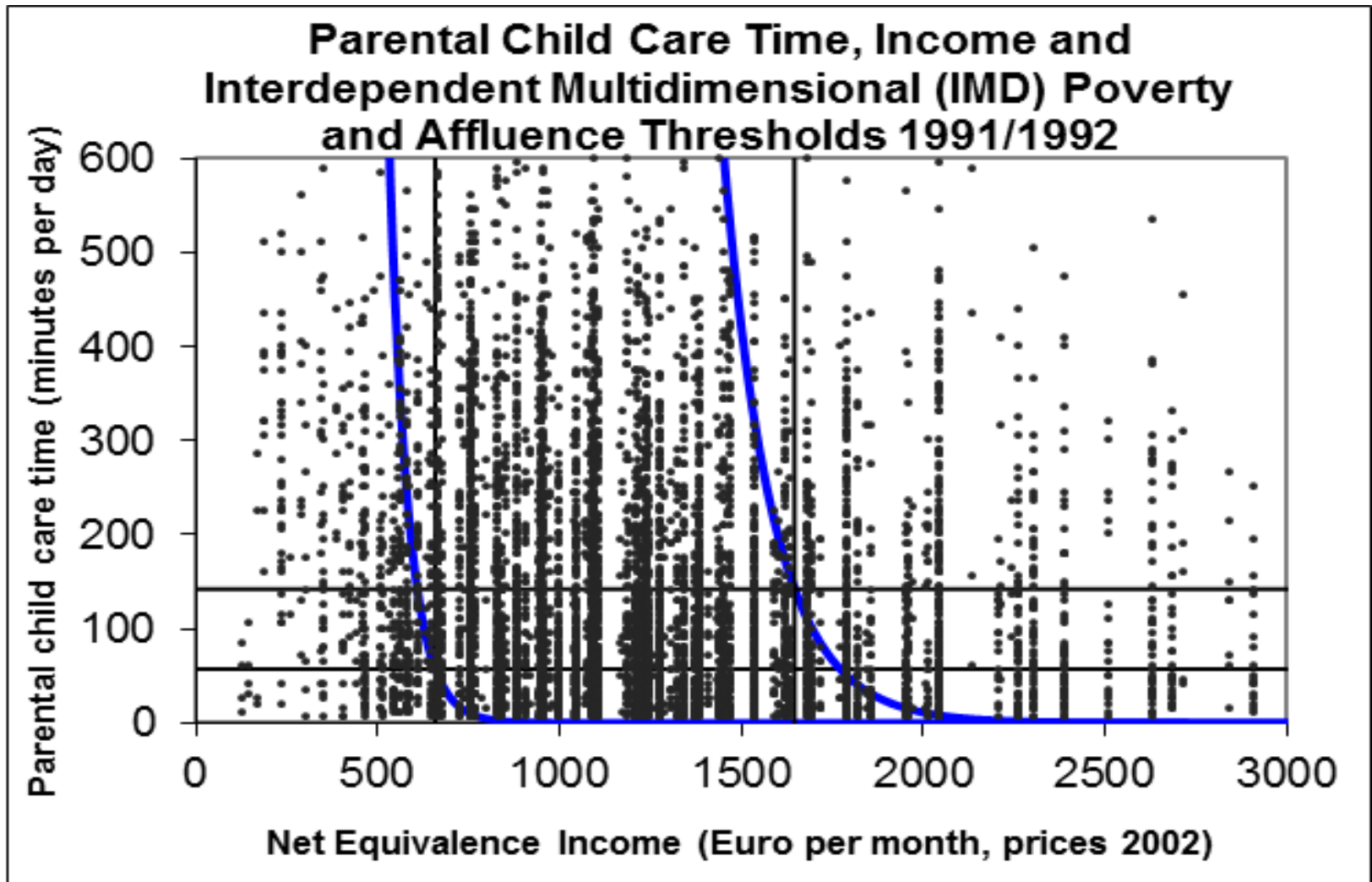
Child Care Time, Income and Well -Being Multidimensional Poverty and Affluence Lines, Germany 1991/92 and 20 12/13

	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 parental child care 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

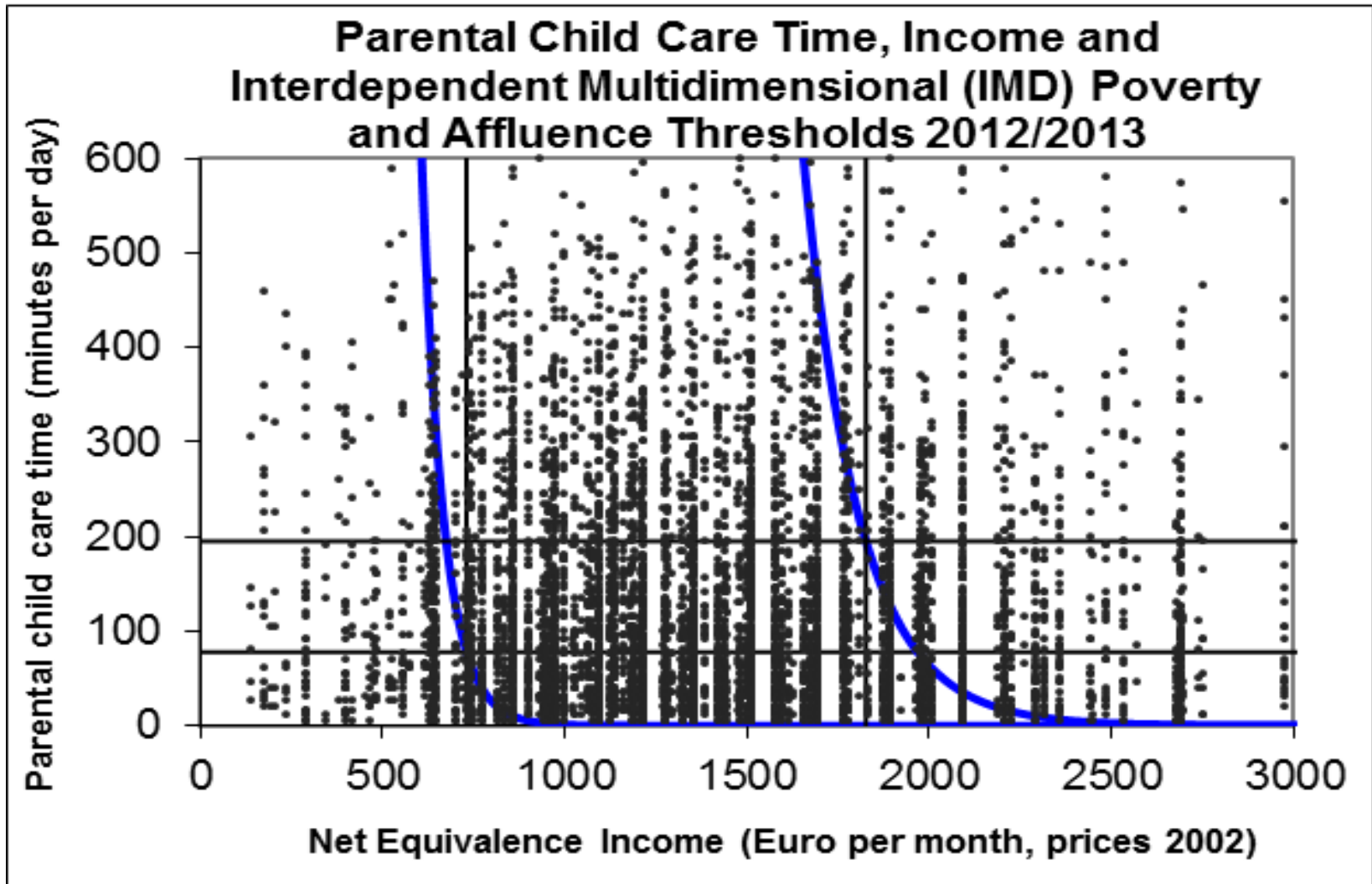
Source: GTUS 1991/92 and 2012/13, own calculations.



Parental Child Care Time and Income Observations – Germany 1991/92



Parental Child Care Time and Income Observations – Germany 2012/13

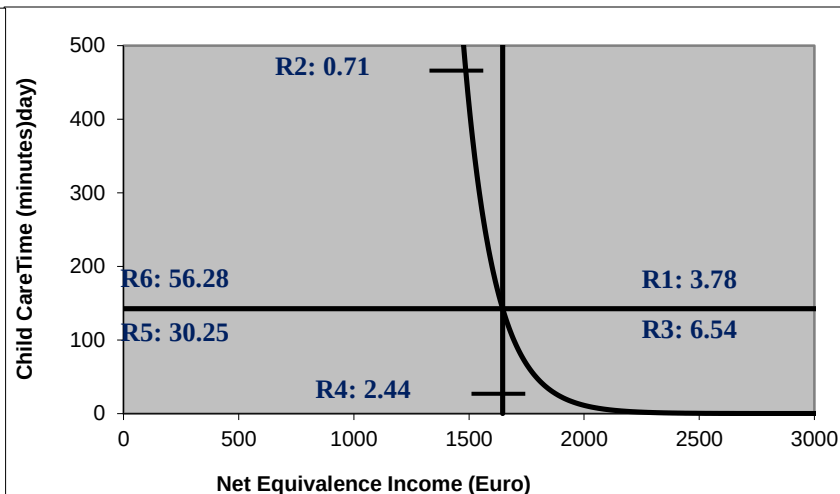
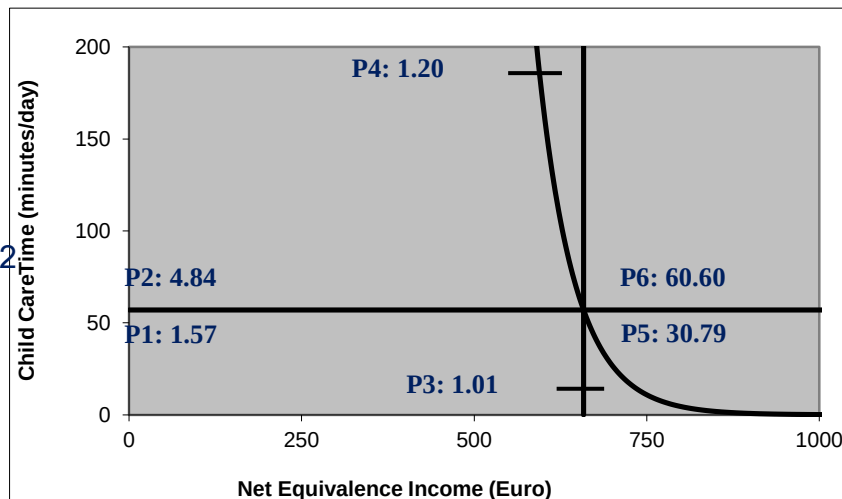


Parental Child Care Time and Income and Interdependent Multidimensional (IMD) Poverty and Affluence Headcount Ratios – Germany 1991/92 and 2012/13

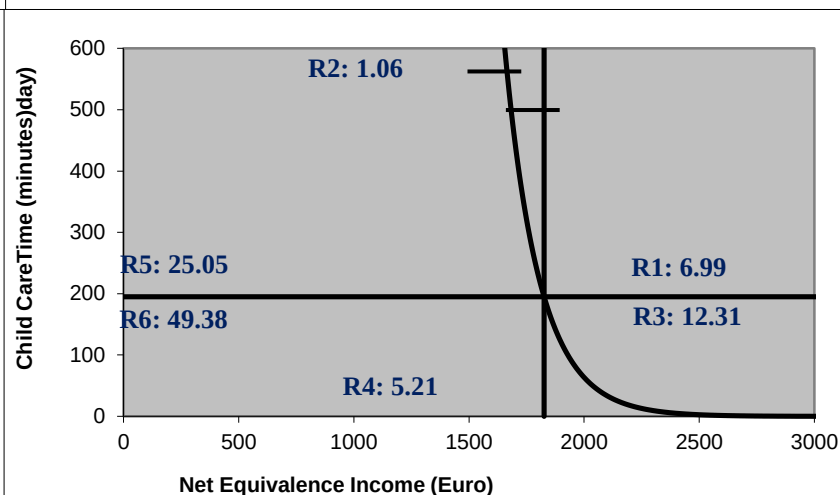
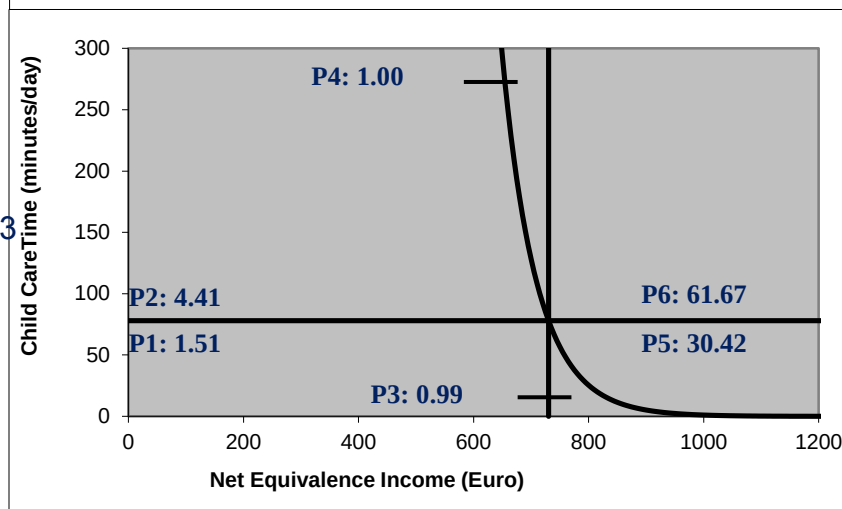
Poverty

Affluence

1991/92



2012/13



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



Parental Child Care Time and Income – Multidimensional Polarization Measures - Germany 1991/92 and 2012/13----- Head Count Ratio Percentages of All Parents

	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.



Parental Child Care Time and Income – Multidimensional Polarization Measures. Germany 1991/92 and 2012/13

	1991/92	2012/13	Index 1992=100	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	***

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Implication

- Interdependence of multidimensional attributes
- New 2DGAP provides attribute specific policies in time and income space
 - ▶ Allows for different policies for the poor and the affluent
 - ▶ Need relatively more income than time if you are poor
 - ▶ Need relatively more time than income in you are affluent

Comments

- Novel approach to use subjective evaluations of satisfaction with standard of living to estimate contours of isopoverty and isaffluence
- Time period of variables:
 - ▶ Parental child care minutes per day
 - ▶ Household adult equivalent (disposable?) income per month
 - ▶ Subjective standard of living - person
- Use of equivalence scales – income only
- Implications for policy
- Demographic distributions of samples (weights)

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CES well-being indicator (weak focus axiom) (Merz/Rathjen 2014a; poverty)

$$V_i = \gamma \left[w_1 (x_{i1})^{-\rho} + w_2 (x_{i2})^{-\rho} \right]^{\frac{\nu}{-\rho}}$$

CES Indifference curve

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

Aggregated CES multidimensional poverty line

$$V_z = \gamma \left[w_1 (z_1)^{-\rho} + w_2 (z_2)^{-\rho} \right]^{\frac{\nu}{-\rho}}$$

Aggregated CES multidimensional affluence line

$$V_r = \gamma \left[w_1 (r_1)^{-\rho} + w_2 (r_2)^{-\rho} \right]^{\frac{\nu}{-\rho}}$$

x_{ij} = quantity of person i in dimension j
 w_j = dimension parameter for dimension j
 ρ = substitution parameter
 ν = returns to scale
 γ = constant

Compensation Based Well-Being Indices (CES)

Median Line: Multidimensional Well-Being Polarization, Wang and Tsui 2000 extension

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

Poverty and Affluence Line: Multidimensional Well-being Polarization, Foster Greer Thorbecke type

$$P_{all} = \frac{1}{n} \sum_{i=1}^n \left[\max \left(\frac{V(z_1, z_2) - V(x_{1i}, x_{2i})}{V(z_1, z_2)}, 0 \right) \right]^\alpha + \frac{1}{n} \sum_{i=1}^n \left[\max \left(\frac{V(x_{i1}, x_{i2}) - V(r_1, r_2)}{V(x_{i1}, x_{i2})}, 0 \right) \right]^\beta$$

Compensation: Multidimensional Polarization by a CES Well-Being Function

Poverty and Affluence Line: Multidimensional Well-being Polarization, Scheicher 2010
extension

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

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

Minimum 2DGAP

Aggregation and Mean Minimum Polarization 2DGAP

Mean minimum polarization 2DGAP:

$$C = \frac{1}{n_{poor}} \sum_{i \in poor}^n c_i + \frac{1}{n_{rich}} \sum_{i \in rich}^n c_i$$

with its singular aggregated components

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

Minimum 2DGAP definition and property

Minimum multidimensional poverty/affluence 2DGAP c =
shortest length (Euclidean norm) to the respective isothreshold line.

Shortest length = linear path orthogonal to the slope at the respective point of the CES-type isothreshold line:

$$c = \|c\| = \left[a^2 + b^2 \right]^{0,5} = \left[(p_1 - x_1)^2 + (p_2 - x_2)^2 \right]^{0,5} \\ = \left[(p_1 - x_1)^2 + (f(p_1 | V_z) - x_2)^2 \right]^{0,5} = \min!$$

with

$$f(p_1 | V_z) = \left(\left(\left(\frac{V_z}{\gamma} \right)^{-\frac{\rho}{v}} - w_1 p_1^{-\rho} \right) / w_2 \right)^{-\frac{1}{\rho}}$$

The iterative solution of the non-linear equation for p_1 then allows to calculate p_2 and in the sequel the attribute lengths of x and p for a respective $x = (x_1, x_2)$.

Note, because of the quadratic distances the procedure for the poverty as well as for the affluence situation is similar.

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 I	ntensity				
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, da y		- 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	***
Age	- 0.088	***	0.000	0.134	***
Age ² /100	0.0981	***	0.000	- 0.130	***
German	- 0.575	** *	0.000	- 0.146	
Education					
Second. School	- 0.464	***	0.000	0.397	***
Abitur - Fachabitur	- 0.667	***	0.000	0.971	***
Occupation					
Self - employed	- 0.600	***	0.000	0.539	***
Blue Collar	- 0.998	***	0.000	- 0.0104	
White Collar	- 1.128	***	0.000	0.627	***
Civil Servant	- 1.517	***	0.000	1.117	***
Job					
Working minutes, day	0.000128		0.318	- 0.000340	***
Shift Work	-		0.992	- 0.139	*
Work at Home	- 0.180		0.070	0.155	**
Family and Household					
Household Size	- 0.567	***	0.000	0.462	***
No. Children 1 - 3	0.536	***	0.000	- 0.520	***
No. Children 4 - 5	0.469	***	0.000	- 0.554	***
No. Children 6 - 9	0.331	***	0.000	- 0.521	***
No. Children 10 - 18	0.431	***	0.000	- 0.632	***
Paid C. Care	0.0094	**	0.005	- 0.0048	
Support					
Unpaid C. Care	-		0.772	0.000784	
Supp.	0.00168				
Region					
Community type	0.125	***	0.000	- 0.0479	*
East Germany	0.286	***	0.000	- 0.193	***
Constant	3.204	***	0.000	- 5.847	***
Mills Lambda	48.55		0.396	49.18	
n	6853			6850	
Censored n	6309			5517	
Uncensored n	544			1333	
Wald Chi ²	125.27	***		247.34	***