

Wealth distribution and household economies of scale: Does family structure matter for inequality?

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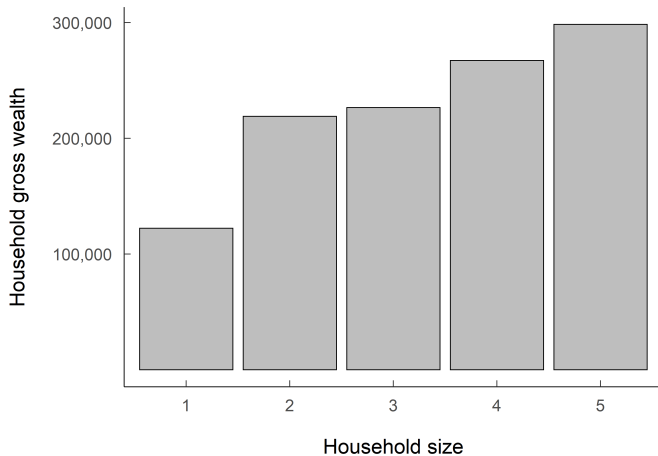
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Wealth and household size



Research question and argument

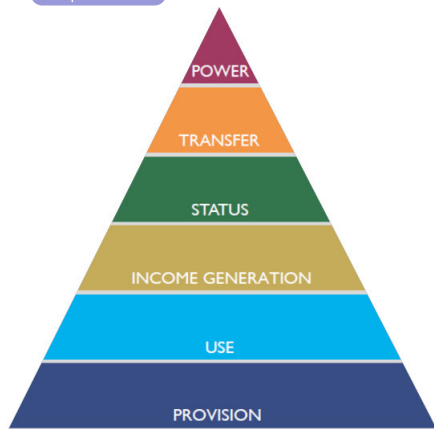
Aim of project/RQ:

- Are there household wealth economies of scale?
- Application: Does scale-effects adjustment for household wealth affect inequality?

Argument:

- Wealth can serve multiple purposes, which are more or less important depending on whether somebody is rich or not → Model to identify accumulation motive
- Scale effects are $\uparrow\uparrow$ for wealth functions primarily relevant to the rich → Estimate economies of scale by purpose
- Ignoring scale effects make the rich appear poorer → Adjust household wealth by purpose

► Equalizandum



Functions of wealth (Fessler and Schürz 2018)

Formalisation: While less affluent households derive wellbeing from supporting consumption with assets, wealthy people unlock direct utility from wealth (nonhomothetic preferences)

- Capitalist spirit model
- Decision on how much wealth to hold for consumption (well known scale effect e) versus capitalist spirit purposes ($\tau=?$)

Theory

► Full model

Use capitalist spirit model (Bakshi and Chen 1996; Carroll 1998) to estimate scale effects τ and the optimal level of consumption-wealth $c_{t,k}^*$ given total household wealth $w_{t,k}$.

Basic period-utility (agent lives 1 period) function with $h_{t,k}$ referring to household size, γ a minimum wealth parameter and $e = 0.5$ known:

$$U_{i,k}(c_{t,k}, w_{t+1,k}) = \left(\frac{c_{t,k}}{h_{t,k}^e} \right)^{\frac{1}{\rho}} \left(\frac{w_{t,k} - c_{t,k}}{h_{t,k}^\tau} + \gamma \right)^{\frac{1}{\alpha}} \quad (1)$$

Then, optimal consumption given by:

$$c_{t,k}^* = \frac{\alpha}{\alpha + \rho} (w_{t,k} + h_{t,k}^\tau \gamma) \quad (2)$$

Application

Then, adjustment of household wealth for scale effects follows:

$$w_{t,k} = \frac{(w_{t,k} - c_{t,k}^*)}{h_{t,k}^T} + \frac{c_{t,k}^*}{h_{t,k}^e} \quad (3)$$

Necessary assumptions:

- Assumption 1: Given total wealth level, households optimally allocate wealth between consumption and accumulation components
- Assumption 2: Shape of utility function and γ
- Assumption 3: Households make decisions jointly, though the share of personal wealth may shift the level of utility from household wealth (along with age and debt).

Data

► Descriptives I

► Descriptives II

► Descriptives III

Data from the German Socio-Economic Panel (2002, 2007, 2012, 2017)

- Dependent variable: Individual satisfaction outcomes - Likert-scale (0-10), collapsed into binary → "utility"
- Right-hand side:
 - Demographic data
 - Household assets: Self reported, by different asset types, multiple imputations
 - Widely used for economies of scale measurement drawing on subjective wellbeing
 - Baseline model control variables: year fixed effects, age, personal wealth share, debt

Estimation at individual level (individual level satisfaction data) with matched household information

Estimation strategy

Taking logs gives non-linear (in parameters) regression with Logit link function

Specification:

$$U_{i,t,k} = \delta + \lambda \log(w_{t,k} + h_{t,k}^{\tau} \gamma) + \zeta \log(h_{t,l}) \quad (4)$$

$$+ \sum_{n=1}^N \beta_n(Z_{t,i,k,n}) + \eta_{t,i}$$

where

$$\lambda = \frac{1}{\rho} + \frac{1}{\alpha} \quad \text{and} \quad \zeta = \left(\frac{e}{\rho} + \frac{\tau}{\alpha} \right) (-1) \quad (5)$$

Children

Split up the parameter τ into different components, changing the second term of empirical model

σ captures that

- additional resource requirements differ between adults and children
- additional utility that individuals derive from choosing to have children

such that τ depends on the age composition of the household

$$\lambda \log(w_{t,k} + h_{t,k}^{(\tau - \sigma c_{t,k})} \gamma) \quad (6)$$

Parameter estimates

► Sensitivity I

► Sensitivity II

► Wealth definitions

► Kids

Table: Main results: Income Satisfaction

Coefficient	Baseline	Numeric dependent (ihs)	Fixed Effects	Children
λ	3.34 (0.268)***	0.624 (0.013)***	2.52 (0.324)***	3.353 (0.307)***
ζ	-0.24 (0.135)	-0.024 (0.014)	0.16 (0.298)	-0.265 (0.154)
τ	-0.01 (0.043)	-0.019 (0.025)	-0.071 (0.139)	-0.012 (0.047)
σ				-0.004 (0.002)
Ψ	0.161	0.112	0.013	0.177
γ	750k	750k	750k	750k

Note:

Each specification controls for wave fixed effects, age, debt and the personal wealth share. Standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Source: SOEP v.35, own calculations.

Non-consumption savings

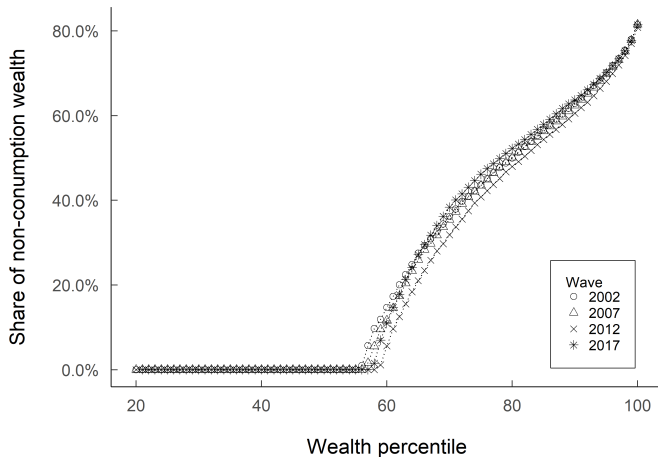


Table: Scale effects and inequality

	Gini		Palma	
	unadjusted	adjusted	unadjusted	adjusted
2002	0.72	0.74	60.88	70.92
2007	0.72	0.74	58.07	67.25
2012	0.70	0.72	50.21	58.78
2017	0.71	0.72	62.42	71.97

Note:

Data from SOEP 2002, 2007, 2012, 2017. $\tau = 0$, $\alpha * (\alpha + \rho)^{-1} = 0.15$

Inequality II

Table: Household size adjustment and inequality: Palma ratios

	2002	2007	2012	2017
Household wealth: $w_{t,k}$	60.88	58.07	50.21	62.42
Wealth scale: $\mathcal{W}_{t,k}$	70.92	67.25	58.78	71.97
Square root scale: $w_{t,k}/h^{0.5} = w_{t,k}/\sqrt{h}$	53.09	51.83	45.60	56.31
OECD Scale	52.10	51.14	45.01	55.67

Note:

Data from SOEP 2002, 2007, 2012, 2017

Relevance I

Wealth and welfare

- Monitoring of living conditions and inequality. Scale adjustments usually ad-hoc: analogous to income, per capita (Davies et al. 2009; Cowell et al. 2017; Marx and Nolan 2021; Rodems and Pfeffer 2021)
- Consumption economies of scale from income satisfaction data (Bradbury 1989; Schwarze 2003; Borah, Keldenich, and Knabe 2018)
- Literature on measuring the effect of wealth on subjective wellbeing (D'Ambrosio, Jäntti, and Lepinteur 2020; Brulé and Suter 2019; Headey and Wooden 2004)

Relevance II

- Horizontal equity in optimal taxation (Balcer and Sadka 1986; Muellbauer and Van De Ven 2004; Kindermann, Mayr, and Sachs 2020)
- Contribution to models of wealth accumulation and - distribution where wealth enters utility directly (Bakshi and Chen 1996; Kopczuk 2007; Michaillat and Saez 2021)

Conclusions

- Economies of scale for wealth provide a neat on household context moderate the relationship between wealth and wellbeing - analogous to what is common practice in the "income world"
- Household size adjustment for wealth differs along distribution: Consumption economies of scale dominate at lower tail, accumulation-wealth scale effects more important at the top
- Estimates for scale parameter τ imply high economies of scale for accumulation-wealth
- Family structure does matter for inequality - conditional on the indicators considered

References I

- [1] Gurdip S. Bakshi and Zhiwu Chen. “The Spirit of Capitalism and Stock-Market Prices”. In: *The American Economic Review* (1996), pp. 133–157.
- [2] Yves Balcer and Efraim Sadka. “Equivalence scales, horizontal equity and optimal taxation under utilitarianism”. en. In: *Journal of Public Economics* 29.1 (Feb. 1986), pp. 79–97.
- [3] Melanie Borah, Carina Keldenich, and Andreas Knabe. “Reference Income Effects in the Determination of Equivalence Scales Using Income Satisfaction Data”. In: *Review of Income and Wealth* 0.0 (2018).
- [4] Bruce Bradbury. “Family Size Equivalence Scales and Survey Evaluations of Income and Well-Being”. In: *Journal of Social Policy* 18.3 (1989), pp. 383–408.
- [5] Gaël Brulé and Christian Suter. *Wealth(s) and Subjective Well-Being*. New York, NY: Springer Berlin Heidelberg, 2019. ISBN: 978-3-030-05534-9.

References II

- [6] Christopher D. Carroll. *Why Do the Rich Save so Much?* Working Paper 6549. Cambridge Massachusetts: NBER, 1998.
- [7] Frank A. Cowell et al. “Wealth, Top Incomes, and Inequality”. In: *National Wealth: What Is Missing, Why It Matters*. Vol. 1. Oxford University Press, Oct. 19, 2017.
- [8] Conchita D’Ambrosio, Markus Jäntti, and Anthony Lepinteur. “Money and Happiness: Income, Wealth and Subjective Well-Being”. In: *Social Indicators Research* 148.1 (2020), pp. 47–66.
- [9] James B Davies et al. “The World Distribution of Household Wealth”. In: *Personal Wealth from a Global Perspective*. Ed. by James B Davies. Oxford, United Kingdom: Oxford University Press, 2009, pp. 1–72. ISBN: 978-0-19-954888-0.
- [10] Pirmin Fessler and Martin Schürz. “The Functions of Wealth: Renters, Owners and Capitalists across Europe and the United States”. In: *WP Österreichisch Nationalbank* 223 (2018).

References III

- [11] Bruce Headey and Mark Wooden. “The Effects of Wealth and Income on Subjective Well-Being and Ill-Being”. In: *Economic Record* 80.s1 (2004), S24–S33.
- [12] Caspar Kaiser and Andrew J. Oswald. “The Scientific Value of Numerical Measures of Human Feelings”. In: *Proceedings of the National Academy of Sciences* 119.42 (Oct. 18, 2022), e2210412119.
- [13] Fabian Kindermann, Lukas Mayr, and Dominik Sachs. “Inheritance taxation and wealth effects on the labor supply of heirs”. In: *Journal of Public Economics* 191 (2020), p. 104127.
- [14] Wojciech Kopczuk. “To Leave or Not to Leave: The Distribution of Bequest Motives”. In: *Review of Economic Studies* (2007), p. 29.
- [15] Ive Marx and Brian Nolan. “How Wealth Matters for Social Policy”. In: *Journal of European Social Policy* 31.5 (Dec. 1, 2021), pp. 489–495.
- [16] Pascal Michailat and Emmanuel Saez. “Resolving New Keynesian Anomalies with Wealth in the Utility Function”. In: *The Review of Economics and Statistics* 103.2 (May 14, 2021), pp. 197–215.

References IV

- [17] John Muellbauer and Justin Van De Ven. “Equivalence scales and taxation: a simulation analysis”. In: *Household behaviour, equivalence scales, welfare and poverty*. Springer, 2004, pp. 85–106. ISBN: 3-7908-0108-9.
- [18] Richard Rodems and Fabian T Pfeffer. “Avoiding Material Hardship: The Buffer Function of Wealth”. In: *Journal of European Social Policy* 31.5 (Dec. 1, 2021), pp. 517–532.
- [19] Johannes Schwarze. “Using Panel Data on Income Satisfaction to Estimate Equivalence Scale Elasticity”. In: *Review of Income and Wealth* 49.3 (2003), pp. 359–372.

Descriptive statistics: Core variables

◀ Data

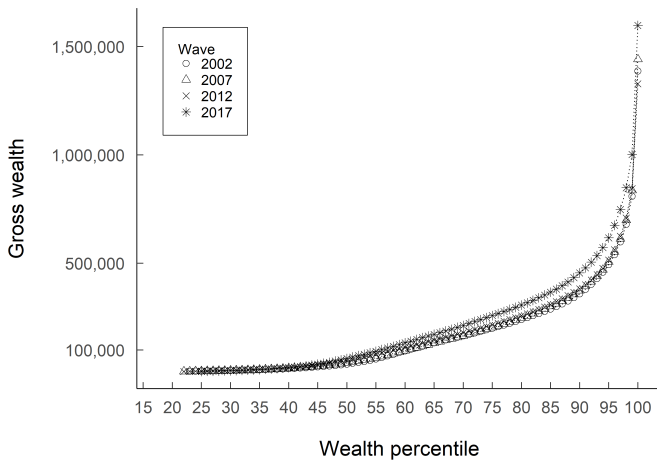
Table: Descriptive statistics

Variable	max	min	median	mean	sd
Household					
Debt (std)	54	-0.46	-0.33	-0.06	0.89
Gross wealth (k)	64443.2	0	49.09	199.05	660.75
Household size (count)	12	1	2	2.57	1.37
Individual					
Age (yrs)	102	17	47	48.27	17.13
Satisfaction (bi)	1	0	1	0.58	0.49
Satisfaction (Lik)	10	0	7	6.56	2.24
Wealth share (prct)	1	0	0.53	0.6	0.35

Note:

Data from SOEP 2002, 2007, 2012, 2017.

Descriptive statistics: Wealth distribution

[◀ Data](#)

◀ Data



Equalizandum

◀ Wealth and utility

Usually, equivalence scales do not allow for welfare comparisons, but only "situation comparisons" (unconditional/conditional scales)

Here: Equalisandum is welfare (utility)

- Normative approach
- Preference welfarism

Issues with preference welfarism (satisfaction with life plan)

- Expensive tastes: Test for scale effects between individuals with and without ideal number of children - does the approach capture utility from household composition?

◀ Parameter estimates: Children and welfare

- Adaption: Unlikely to affect results for relatively short panel (Kaiser and Oswald 2022).

Parameter estimates: Children and welfare

[◀ Main results](#)

Table: Fertility

Coefficient	Subsample	Optimal family	Excess kids
λ	3.294 (0.254)***	3.297 (0.263)***	4.471 (1.082)***
ζ	-0.04 (0.126)	-0.031 (0.131)	-1.439 (0.658)*
τ	-0.095 (0.047)*	-0.094 (0.049)	0.193 (0.115)
ψ	0.181	0.174	0.419
γ	750k	750k	750k

Note:

Each specification controls for wave fixed effects, age, debt and the personal wealth share. Standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Source: SOEP v.35, own calculations.

Full model

◀ Theory I

Structural model:

$$U(c_{t,k}, w_{t+1,k}) = \left(\frac{\alpha [w_{t,k} + h_{t,k}^{\tau} \gamma]}{[\alpha + \rho] h_{t,k}^e} \right)^{\frac{1}{\rho}} \left([w_{t,k} + h_{t,k}^{\tau} \gamma] \left[\frac{\rho}{\alpha + \rho} \right] h_{t,k}^{-\tau} \right)^{\frac{1}{\alpha}} \exp(\theta Z_{i,t,k}) \quad (7)$$

Linearised:

$$\log(U_{i,t,k}) = \delta + \lambda \log(w_{t,k} + h_{t,k}^{\tau} \gamma) + \zeta \log(h_{t,i}) + \sum_{n=1}^N \beta_n(Z_{t,i,k,n}) + \eta_{t,i} \quad (8)$$

Parameter estimates: Robustness I

[◀ Main results](#)

Table: Robustness analysis

Coefficient	Controls	Portfolio Composition	Credit constraints	50+	Net wealth
λ	3.299 (0.209)***	3.726 (0.078)***	2.671 (0.093)***	3.356 (0.227)***	2.778 (0.045)***
ζ	-0.248 (0.109)*	-0.092 (0.065)	0.038 (0.065)	0.111 (0.15)	-0.024 (0.022)
τ	-0.031 (0.036)	-0.049 (0.019)*	-0.096 (0.029)***	-0.108 (0.057)	-0.011 (0.006)
ψ	0.2	0.134	0.137	0.123	0.038
γ	750k	750k	750k	750k	750k

Note:

Each specification controls for wave fixed effects, age, debt and the personal wealth share. Standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Source: SOEP v.35, own calculations.

Parameter estimates: Robustness II

[◀ Main results](#)

Table: Robustness analysis

Coefficient	No Top Coding	High γ	Low γ
λ	0.229 (0.026)***	4.186 (0.082)***	2.461 (0.064)***
ζ	0.04 (0.034)	-0.266 (0.069)***	-0.203 (0.059)***
τ	-0.058 (0.165)	0 (0.017)	-0.033 (0.027)
ψ	-0.208	0.126	0.217
γ	750k	1000k	500k

Note:

Each specification controls for wave fixed effects, age, debt and the personal wealth share. Standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Source: SOEP v.35, own calculations.

◀ Main results

Coefficient	2017 wave	Wealth + Vehicles	Durables	Financial wealth
λ	3.278 (0.325)***	3.32 (0.344)***	3.221 (0.576)***	4.061 (0.577)***
ζ	-0.328 (0.192)	-0.316 (0.2)	0.054 (0.187)	-0.352 (2.772)
τ	0.029 (0.059)	0.021 (0.061)	-0.096 (0.073)	0.078 (0.677)
$\alpha * (\alpha + \rho)^{-1}$	0.151	0.155	0.133	0.02
γ	750k	750k	750k	750k

Data from SOEP 2017. Each specification controls for age, debt and the personal wealth share. Standard errors in parentheses. * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.



◀ Inequality I

