

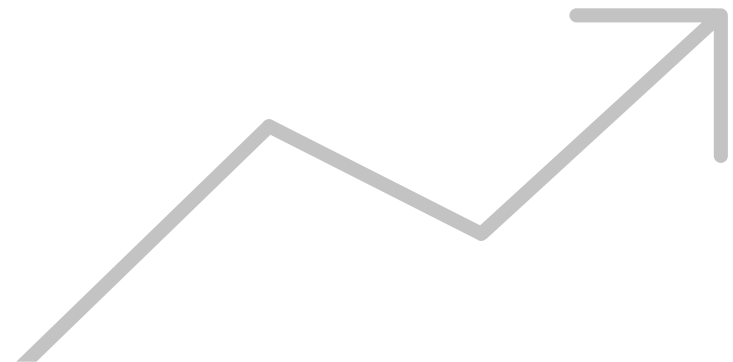
The 'German job miracle' and income inequality: a decomposition study

Work in progress

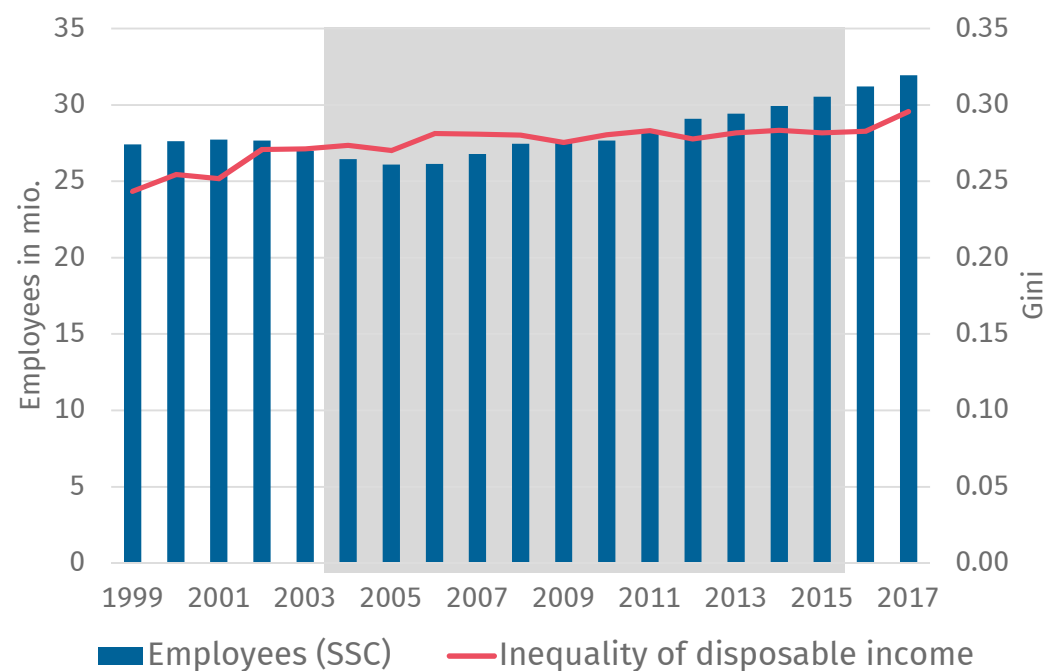
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Inequality and Employment trends



Sources: Bundesagentur für Arbeit – Statistik; SOEP – Own calculations

Subject of Analysis

- How did employment boom affected income inequality between 2004 and 2015?
- What drives employment boom in Germany?
- Which role play policy, wage and population changes for income inequality?

Decomposition strategy I

- Decomposition builds upon Bargain and Callan (2010), Bargain (2011) and Jessen (2018)
- Difference in Inequality between base and final period

$$\Delta = \{I[d_1(p^1, y_{1111}^{11})] - I[d_0(p^0, y_{0000}^{00})]\}$$

- Matrix y_{kpmn}^{lo} : Population of year l earning wages of year o making LS choices as if living under the policy regime k and earning wages of year p with preferences of population m facing labor market restrictions of year n .
- d_i : 'tax benefit function' of year i (turns gross into net income) (MSM)
- p^i : 'monetary parameters' of the tax system in i (income brackets, benefit amounts)

Decomposition strategy II

- Decomposition of total change in inequality between 2004 and 2015 into 8 partial effects:

$$\begin{aligned}
 \Delta = & \{I[d_1(p^1, y_{1111}^{11})] - I[d_0(\alpha^1 p^0, y_{1111}^{11})]\} && \text{policy effect} \\
 & + \{I[d_0(\alpha^1 p^0, \alpha^1 y_{1111}^{11})] - I[d_0(\alpha^1 p^0, \alpha^1 y_{1111}^{10})]\} && \text{wage effect} \\
 & + \{I[d_0(\alpha^1 p^0, \alpha^1 y_{1111}^{10})] - I[d_0(\alpha^1 p^0, \alpha^1 y_{0111}^{10})]\} && \text{indirect policy effect} \\
 & + \{I[d_0(\alpha^1 p^0, \alpha^1 y_{0111}^{10})] - I[d_0(\alpha^1 p^0, \alpha^1 y_{0011}^{10})]\} && \text{indirect wage effect} \\
 & + \{I[d_0(\alpha^1 p^0, \alpha^1 y_{0011}^{10})] - I[d_0(\alpha^1 p^0, \alpha^1 y_{0001}^{10})]\} && \text{preference effect} \\
 & + \{I[d_0(\alpha^1 p^0, \alpha^1 y_{0001}^{10})] - I[d_0(\alpha^1 p^0, \alpha^1 y_{0000}^{10})]\} && \text{restriction effect} \\
 & + \{I[d_0(\alpha^1 p^0, y_{0000}^{10})] - I[d_0(\alpha^1 p^0, \alpha^1 y_{0000}^{00})]\} && \text{other effects} \\
 & + \{I[d_0(\alpha^1 p^0, \alpha^1 y_{0000}^{00})] - I[d_0(p^0, y_{0000}^{00})]\} && \text{income growth}
 \end{aligned}$$

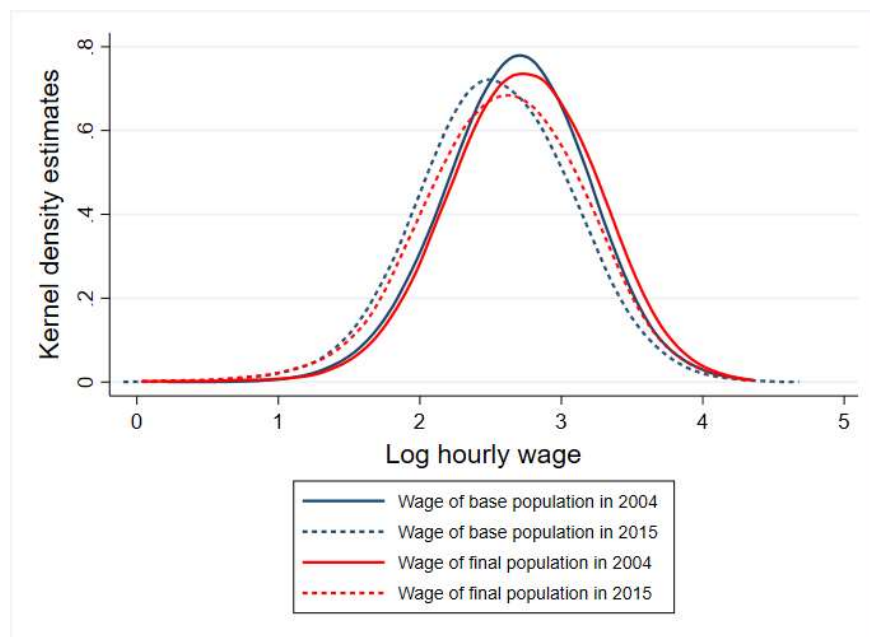
Microsimulation and labor supply model

- Static tax and benefit microsimulation model of the IAB (IAB-MSM)
- Uses data from German SOEP
- Heckman type wage estimation
- Double hurdle model of labor supply to account for behavioral adjustments (Bargain et al. 2010)
 - Discrete choice labor supply model using desired working hours for involuntary unemployed (**Preference model**)
 - Corrected with estimated probability of involuntary unemployment (**Restriction model**)
 - Assuming independent error terms, allows to estimate both equations separately

Policy changes

- Social benefits:
 - Unemployment benefit II replaced unemployment assistance and social assistance
 - Financial losers (former UA recipients) and winners (former SA recipients)
 - Monetary parameters updated regularly with income changes of low incomes
- Tax:
 - 2005: decrease of top marginal tax rate from 45% to 42%.
 - 2004-2009: Initial tax rate decreased from 16% to 14%.
 - 2007: Introduction of so-called 'rich tax': income exceeding 250.000 taxed with 45%
 - Basic tax allowance raised regularly, but tax threshold only raised by 400€ and 330€
- Minimum wage of 8.5 € per hour introduced in 2015

Estimated wage changes



**Wage distributions include predicted wages for employed and non-working individuals in working age. Wages of base population are uprated with price Inflation.*

- Comparing lines of same color: Payment structure (wage effect) increases wage inequality and decreases real wages.
- Comparing lines of same type: Population changes increase wage inequality and increases real wages (in particular when measured on final population).

Simulated employment changes

Employment change in 1000		Working hour category						
Marginal effect		0	10	15	20	30	40	50
Indirect policy	Men	-175	-18	-1	-5	-3	+127	+75
	Women	-187	-57	-19	-6	+34	+203	+32
	Total	-363	-75	-20	-11	+32	+331	+107
Indirect wages	Men	+73	+13	+9	+12	+3	-50	-59
	Women	+183	+33	+9	-27	-70	-98	-31
	Total	+256	+46	+18	-15	-67	-147	-90
Preferences	Men	+105	+35	+30	+49	+115	-446	+111
	Women	-460	-5	+12	+138	+714	-679	+281
	Total	-355	+30	+43	+187	+829	-1125	+392
Restrictions	Men	-738	+20	+19	+31	+60	+540	+68
	Women	-461	+35	+37	+108	+161	+106	+14
	Total	-1198	+55	+56	+139	+221	+646	+82
Population	Men	+24	-23	-14	-44	-89	-281	+114
	Women	-703	-289	+24	-406	+186	+939	+108
	Total	-679	-311	+9	-449	+97	+658	+222

Results: Decomposition of pre-tax labor income

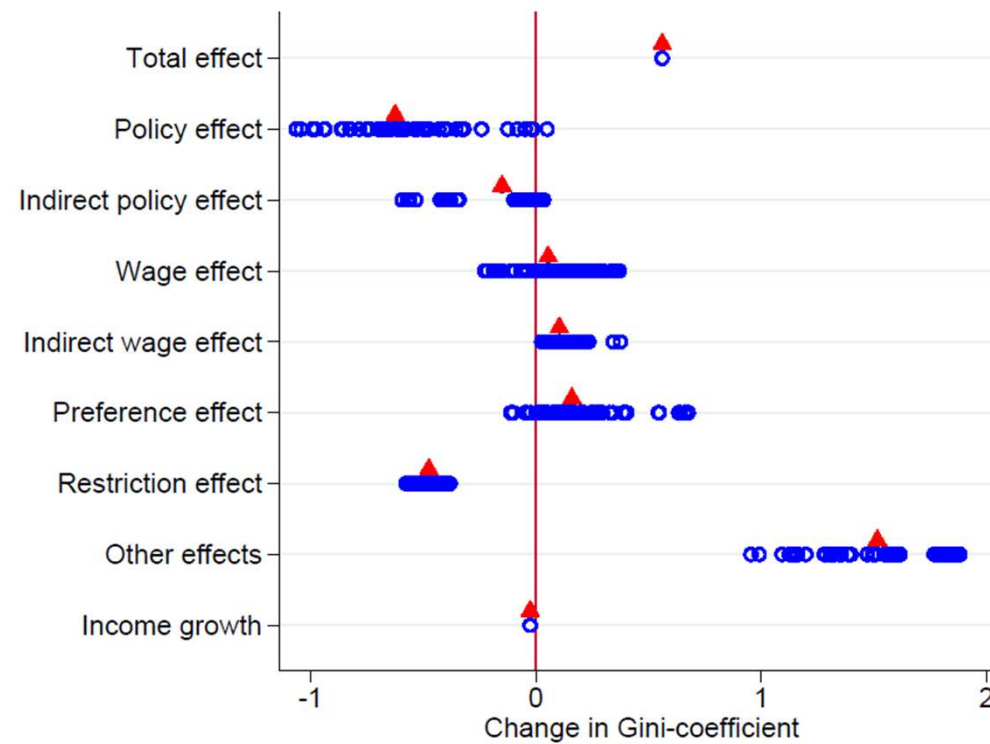
Marginal effect \ Inequality change			
	Gini	Atkinson $\varepsilon = 0.5$	Atkinson $\varepsilon = 1$
Policy	-0.75	-0.51	-1.17
Indirect policy	-0.10	-0.07	-0.16
Wage	0.86	0.43	0.64
Indirect Wage	0.09	0.06	0.12
Preference	0.57	0.32	0.64
Restriction	0.14	0.05	0.05
Population	1.35	0.84	2.09
Total	2.16	1.12	2.35

NOTE. — Households without income from dependent employment are excluded from this decomposition.

Results: Decomposition of disposable income

Marginal effect \ Inequality change			
	Gini	Atkinson $\varepsilon = 0.5$	Atkinson $\varepsilon = 1$
Policy	-0.60	-0.18	-0.18
Indirect policy	-0.15	-0.09	-0.26
Wage	0.01	0.01	-0.06
Indirect Wage	0.10	0.04	0.09
Preference	0.17	0.02	-0.11
Restriction	-0.48	-0.23	-0.56
Population	1.65	0.40	-1.02
Growth	-0.09	-0.06	-0.18
Total	0.61	-0.09	-2.28

Results: Effect heterogeneity



Conclusion

- Employment boom is explained by both, labor supply and demand changes.
- Changes in labor supply increase income inequality slightly.
- Reduction of restrictions decreases disposable income inequality.
- Policy changes lead to stronger redistribution of income.
- Without the removal of restrictions and policy changes, inequality would have increased stronger due to population changes between 2004 and 2015.

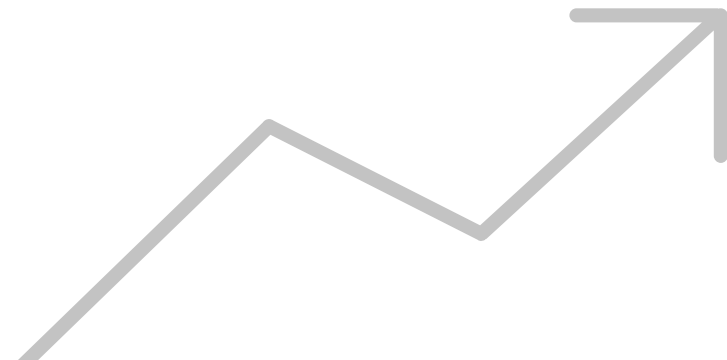
Thank you for your Attention!

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Literature Review: Decomposition for Germany

Author	Period	Method	Main results
Bargain et al., 2017	2008 - 2013	Static Microsim.	- No policy effect on overall inequality - Small poverty reducing effect of policy
Biewen & Juhasz, 2012	1999 - 2006	Reweighting of HH-Types & Microsim.	- Employment outcomes (job-types: part-time and mini and labor market returns at given job-type) are main driver of rising inequality - Inequality reducing effect of tax and benefit system - Less relevant: Changes in HH-structure and characteristics
Biewen et al. 2016	2005 - 2011	Reweighting of HH-Types & Microsim.	- No ineq. increase in disposable income but ineq. in individual monthly inc. decreased - Small ineq. reducing effect of changes in transfer system - Small ineq. increasing effect of changes in tax system - Small effect of capital returns and changes in population and HH-structure
Biewen & Sturm, 2021	2005 - 2016	Estimating employment probabilities	- Beneficiaries of employment changes across the whole income distribution, but lower part benefitting most - Moderate net income inequality reducing effect of employment changes, tax-benefit-system attenuates gross effect - Important other drivers: migration, changes in individual and household characteristics - Small effects of payment structure, capital incomes, changes in household types, tax and benefit system
Haupt & Nollmann, 2017	1992 - 2011	Uncond. Quantile Regressions	- Labor market is main driver of increasing poverty: Unemployment, part-time, low-wage (1999-2005). - Pensions and demographic changes reduced poverty (1990-2000) (Re-) distributional policy with small effects
Jessen, 2018	2002 - 2011	Behav. Microsim. w. wages	- Main driver of increasing ineq.: Unexplained population changes - Policy: small ineq. reducing effect - Behavioral effect: small ineq. increasing effect - Wages: small ineq. reducing effect
Peichl et al., 2012	1991 - 2007	Reweighting	Decreasing average hh size is associated with increase in ineq.

Appendix: (Standard) discrete choice LS model

–Individual n with hourly wage rate w_n and non-labor income I_n faces a discrete set of J categories with working hours h_j (50 ,40 ,30 ,20 ,15 ,10 ,0) and chooses alternative i that maximizes utility from consumption $C_{nj} = f\{w_n h_j | x_{nj}, I_n\}$ and leisure $L_j = T - h_j$

–Utility of individual n when choosing i : $U_{ni} = v(C_{ni}, L_j) + \varepsilon$

–EV type I distribution of ε , leads to choice probabilities of conditional logit:

$$P(U_{ni} > U_{nj}, \forall j \neq i) = \frac{\exp(v\{C_{ni}, L_i\})}{\sum_{j=1}^J \exp(v\{C_{nj}, L_j\})}$$

–Adaption of utility function to couple households is straightforward

–Freedom of choice: observed hours (incl. nonworking) are utility maximizing

Appendix: Double hurdle LS model

- Estimating probability of being involuntary unemployed: $I_i = \Phi(\beta X_i + v_i)$
- Using desired working hours for rationed individuals
- Estimating DC model with new hours distribution
- Probabilities for the three different possible states (for simplicity only singles):

- Voluntary non-participating: $P_i^{VOLUE} = Pr(d_i = 0) = \frac{\exp(U_{i1})}{\sum_{j=1}^J \exp(U_{ij})}$
- Involuntary unemployed: $P_i^{INVOLUE} = Pr(d_i > 0, p_i = 0) = \Phi(\beta X_i) \sum_{k=2}^J \left\{ \frac{\exp(U_{ik})}{\sum_{j=1}^J \exp(U_{ij})} \right\}$
- Employed: $P_i^{EMP} = Pr(d_i > 0, p_i > 0) = (1 - \Phi(\beta X_i)) \left\{ \frac{\exp(U_{ik})}{\sum_{j=1}^J \exp(U_{ij})} \right\}$

Appendix: Updating strategy and homogeneity property

- Updating of income is necessary to apply tax-transfer system of final period on base years data with base years income. Conversely, the monetary parameters of the tax-transfer system must be updated.
- Constant parameters and changes deviating from updating factor are considered as „policy“
- 'Updating factor' α^1 :updating according to price inflation 2004 – 2015
 - Robustness: updating according wage growth
- Homogeneity property:
 - In linearly homogenous tax-transfer systems, a simultaneous change in incomes and parameters should not affect the relative location of households in the distribution of disposable income.
 - Therefore, measures of inequality should not be affected by updating:

$$I[d_0(\alpha^1 p^0, \alpha^1 y^0)] - I[d_0(p^0, y^0)] \approx 0$$

Appendix

- We have seven different effects (others, policy, wage, indirect policy, indirect wage, preferences, restrictions)
 - Each effect differs with underlying distribution (e.g. base vs. final period data)
 - Each effect can be evaluated on 64 different distributions
 - In total 5040 permutations and 5040 different decompositions

$$I[d_1(p^1, y_{1111}^{11})] - I[d_0(\alpha^1 p^0, y_{1111}^{11})] \quad \text{policy effect}$$

$$I[d_1(p^1, \alpha^1 y_{1111}^{01})] - I[d_0(\alpha^1 p^0, \alpha^1 y_{1111}^{01})] \quad \text{policy effect}$$

$$\dots \quad \text{policy effect}$$

$$I[d_1(p^1, \alpha^1 y_{0000}^{00})] - I[d_0(\alpha^1 p^0, y_{0000}^{00})] \quad \text{policy effect}$$

- ‘Shapley value’: Averaging the effect over all decompositions

Other effects

- Everything not identified so far:
 - Change in individual and household characteristics
 - Household types and household sizes
 - Population ageing
 - Wages effects of population changes (expansion of education, ageing workforce)
 - Income of non-flexible household members (self employed, retired, children)
 - Changes in non-simulated income (capital income, pensions)

Appendix: Effect heterogeneity

