Equity and Efficiency of Childcare Subsidies: A Structural Approach

David Koll[1] Dominik Sachs[2] Fabian Stürmer-Heiber[3] Hélène Turon[4]

Conference on Dynamic Structural Estimation, Bonn
August 19, 2021

[1]University of Mannheim & European University Institute [2]University of St. Gallen [3]LMU Munich
[4]University of Bristol

Childcare policies

Evaluating childcare policies

- high self-financing rates for targeted programs
  [García, Heckman, Leaf, and Prados (2020), Hendren and Sprung-Keyser (2020)]
- mixed evidence for fiscal cost of universal programs
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⇒ Fiscal return to expansion: creating subsidised slots in a rationed environment

⇒ Fiscal return to increasing subsidy: making slots cheaper in a non-rationed environment

⇒ How should subsidies vary with income? Equity-efficiency trade-off of childcare fees vs. taxes

Research strategy

Key challenge:

→ Which mothers respond to changes in childcare policies and how?

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→ Structural life cycle model of female labour supply and domestic childcare provision

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↳ heterogeneity in wages, family composition, and education

↳ quantification of the model for Germany (current policies)

→ rich unobserved heterogeneity:

↳ (i) taste for domestic childcare, (ii) taste for leisure, (iii) access to informal childcare

↳ joint distribution estimated by ML using German panel data

Preview of results

Expansion of access to public market childcare:

→ 103% of the costs are recovered through increased tax revenue

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Evaluation of childcare fee system versus tax system:

→ marginal redistribution through childcare fee schedule implies lower efficiency cost than through tax system

→ childcare fee schedule should be more progressive if groups are valued equally

Model

Model outline

◂ Institutional setup in Germany

Core setup:

- life cycle model (ages 20-80), three-year model period
- households: two adults with up to 3 children
- choices: female labour supply *lm* and domestic childcare *dcc*

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State variables:

- observed state space $s = (t, w_t^M, w_t^W, K_t, ed) \in \boldsymbol{S}$
  - age of both partners t
  - male and female wage (w_t^M,w_t^W)
    $\rightarrow$ Markov processes cond. on not working/part-time/full-time
  - family composition K_t: age & number of children
    $\rightarrow$ exog. stochastic process cond. on maternal age & education
- unobserved heterogeneity $h = (g, oth, \alpha) \in \boldsymbol{H}$
  - domestic childcare preferences g
  - availability of (informal) other childcare oth
  - leisure preferences α

Childcare setup

Time requirements:

Children's age bracket i	0 - 2	3 - 5	6 - 8	$\geqslant 9$
Hours of childcare needed per week ($\bar{t}_i$)	40	40†	15	0

Provision & cost:

▸ details on *mcc*

- domestic childcare (*dcc*) → free
- (informal) other childcare (*oth*) → free
- market childcare (*mcc*) → priced dependent on income, family size, and child age

Instantaneous utility

$$u(c, L, dcc) =$$

$$(1 - \mathcal{G}(g, K)) \left((1 - \alpha) \frac{c^{1-\gamma_c} - 1}{1 - \gamma_c} + \alpha \frac{\left(L + \bar{L}\right)^{1-\gamma_L} - 1}{1 - \gamma_L} \right) + \mathcal{G}(g, K) \left(\frac{\left(dcc + \overline{dcc}\right)^{1-\gamma_{dcc}} - 1}{1 - \gamma_{dcc}} \right)$$

- α: relative preference for leisure vs. consumption
- g: relative preference for domestic childcare vs. consumption-leisure component
  $\rightarrow$ households explicitly value *dcc*, but not *mcc* and *oth*

$$\mathcal{G}(g, K) = \begin{cases} g & \text{if youngest child's age} \in [0, 3) \\ g \cdot \kappa & \text{if youngest child's age} \in [3, 9) \end{cases}$$

Dynamic optimization problem

$$V(s_t, h) = \max_{lm_t, dcc_t} u(c_t, L_t, dcc_t | s_t, h) + \beta \mathbb{E}[V(s_{t+1}, h | s_t, h, lm_t)]$$

s.t.

time constraint: $40 = lm_t + L_t + dcc_t, \text{ with } lm_t \in \{0, 20, 40\}$

budget constraint: $y_t^{net} = c_t + Ecc(K_t, y_t^{gross})$

HH gross income: $y_t^{gross} = 40 \cdot w_t^M(w_{t-1}^M) + lm_t \cdot w_t^W \left(w_{t-1}^W, lm_{t-1}\right)$

HH net income: $y_t^{net} = y_t^{gross} - \mathcal{T}\left(y_t^{gross}, K_t\right)$

childcare expenditure: $Ecc(K_t, y_t^{gross}) = \sum_{i=1}^{3} p(i, K_t, y_t^{gross}) \cdot mcc_t(i)$

market childcare takeup: $mcc_t(i) = \max\left\{0, \bar{t}_i - dcc_t - oth\right\}, \quad \text{if i = 1, 3}$

$mcc_t(2) = \max\left\{20, \bar{t}_i - dcc_t - oth\right\}$

Quantification

Quantification

Auxiliary regressions & government policies

1. Wage process: log-normal estimation ◂ details
2. Fertility process: non-parametric estimation ◂ details
3. Government policies

Structural estimation

1. Calibration of utility function parameters
2. Maximum likelihood estimation of unobserved heterogeneity

Government policies

Government policies:

- *Childcare price schedule* estimated separately by child age
  → covariates: household income, household income × siblings
  ▸ Childcare fee schedules
- *Taxes and transfers:* implementation from Bick, Brüggemann, Fuchs-Schündeln, and Paule-Paludkiewicz (2019)
- *Childcare costs:* annual cost per full-time slot from federal statistics
  → 0-2: 10.900 EUR, 3-5: 7.300 EUR, 6-8: 6.200 EUR (2012 prices)

Calibrated parameters

Calibrated model parameters:

parameter	β	γ_c	γ_L	$\bar{L}$	γ_{dcc}	$\overline{dcc}$	κ
value	0.94	1	2	1	1.125	4	0.075

Targets:

- *Labour supply elasticities*
  - → participation elasticity and aggregate hours elasticity
- *Labour market outcomes by age of the youngest child*
  - → Share of NP, PT, and FT for child age brackets (0 – 2), (3 – 5), (6 – 8), and (9+)
- *Total market childcare shares by age of the youngest child*
  - → 3 moments for each child age brackets (0 – 2), (3 – 5), and (6 – 8)

Estimation of the distribution of unobserved heterogeneity

Object of interest:

$\ell(h|\boldsymbol{x})$, joint distribution of unobserved heterogeneity h

$\rightarrow$ conditional on constant characteristics $\boldsymbol{x}$

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Approach: Maximum Likelihood Estimation with panel data

- lm_1, lm_2, mcc_1, mcc_2: observed individual choices
- *mcc* and wages are observed with *measurement error*

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Approach: Maximum Likelihood Estimation with panel data

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- mcc and wages are observed with *measurement error*
- marginal distributions: $\ell(h|\boldsymbol{x}) = l^g(g|\boldsymbol{x}^g) \cdot l^{oth}(oth|\boldsymbol{x}^{oth}) \cdot l^{\alpha}(\alpha|\boldsymbol{x}^{\alpha})$
  $\rightarrow$ overlap in $\boldsymbol{x}$ creates correlations
- data-generating process of, e.g., domestic childcare preferences:
  $\mathcal{N}\left(\gamma^g + \boldsymbol{\beta}^g \boldsymbol{x}^g, (\sigma^g)^2\right)$

$\Rightarrow$ jointly estimate parameters γ, $\boldsymbol{\beta}$, and σ for each heterogeneity

Data and constant characteristics

Data:

- panel data from SOEP waves 2012 - 2017
- mapped into two model periods
- Sample includes women with at least one child and at most three

$\Rightarrow$ 2,178 individuals of which 1,073 have a child < 9

Constant characteristics *x*:

- domestic childcare preference *g*: *east*, *skilled occupation*, *catholic*
- availability of other childcare *oth* in West: *education*, *urban*
- leisure preference α: *education*, *skilled occupation*

▸ estimation results ▸ marginal distributions ▸ sensitivity plots

Identification of the unobserved heterogeneity

(Set) Identification is based on:

1. use of panel data and assumptions on the structure
   → allows to disentangle wage shocks from the permanent unobserved heterogeneity
   → changes in family composition over time affect which dimension of heterogeneity matters in which observed period
   → panel data also contains households with older children (9+)

2. cross-sectional variation in choices within period
   → conditional on the same observed states & constant characteristics

Model Fit

Model Fit - Labour supply

Labour supply shares by age of the youngest child

	Children 0 — 2			Children 3 — 5		
	NP	PT	FT	NP	PT	FT
Model	0.50	0.40	0.10	0.16	0.61	0.23
Data	0.55	0.40	0.05	0.17	0.65	0.18

	Children 6 — 8			Children 9+		
	NP	PT	FT	NP	PT	FT
Model	0.15	0.62	0.23	0.13	0.63	0.24
Data	0.13	0.68	0.19	0.16	0.54	0.30

Model Fit - Market childcare

Total market childcare take-up shares by age of the youngest child

	Children 0 — 2		
	$Tcc \leqslant \overline{m}_1$	$\overline{m}_1 < Tcc \leqslant \overline{m}_2$	$\overline{m}_2 < Tcc$
Model	0.48	0.32	0.20
Data	0.44	0.40	0.16
	Children 3 — 5		
	$Tcc \leqslant \overline{m}_1$	$\overline{m}_1 < Tcc \leqslant \overline{m}_2$	$\overline{m}_2 < Tcc$
Model	0.00	0.53	0.47
Data	0.02	0.52	0.46
	Children 6 — 8		
	$Tcc \leqslant \overline{m}_1$	$\overline{m}_1 < Tcc \leqslant \overline{m}_2$	$\overline{m}_2 < Tcc$
Model	0.33	0.17	0.50
Data	0.29	0.23	0.48

Notes: Tcc denotes total market childcare of the household. $\overline{m}_1$, respectively $\overline{m}_2$, indicates that the household would cover a share of 0.33, respectively 0.75, of its total need for childcare through market childcare.

Implied labour supply elasticities

1. Compensated intensive margin elasticity: 0.17

2. Compensated extensive margin elasticity: 0.15

Work in Progress: Relation to other quasi-experimental estimates such as childcare price elasticity

Policy Evaluations

Policy evaluation I: Expansion of access to public childcare

What is the fiscal return of a permanent lifting of rationing?

- Expansion of public childcare for 0-2 year olds between 2005 and 2012 in West Germany

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$\Rightarrow$ comparison of *rationing scenario* with *non-rationing baseline scenario*

- Rationing implementation in a modified framework:
  - 85% rationing probability, matching the pre-expansion take-up share of market childcare for 0-2 year olds
  - fallback option of informal childcare of 17.5h/week to match the employment share of mothers with 0-2 year olds in 2005 (30%)

$\Rightarrow$ 45% of mothers who start using public childcare also start working
[in line with reduced form evidence from Bauernschuster and Schlotter (2015)]

Policy evaluation I: Expansion of access to public childcare

Self-financing degree of public childcare expansion: $SFD = \frac{\Delta T}{\Delta S}$

- simulate sample in the rationing and non-rationing scenario
  - → ΔT (ΔS): difference in discounted tax revenue (subsidy expenses)
- time horizons: (i) impact period and (ii) all periods
  - → in (ii): evolution of wages (plus age and fertility) are taken into account

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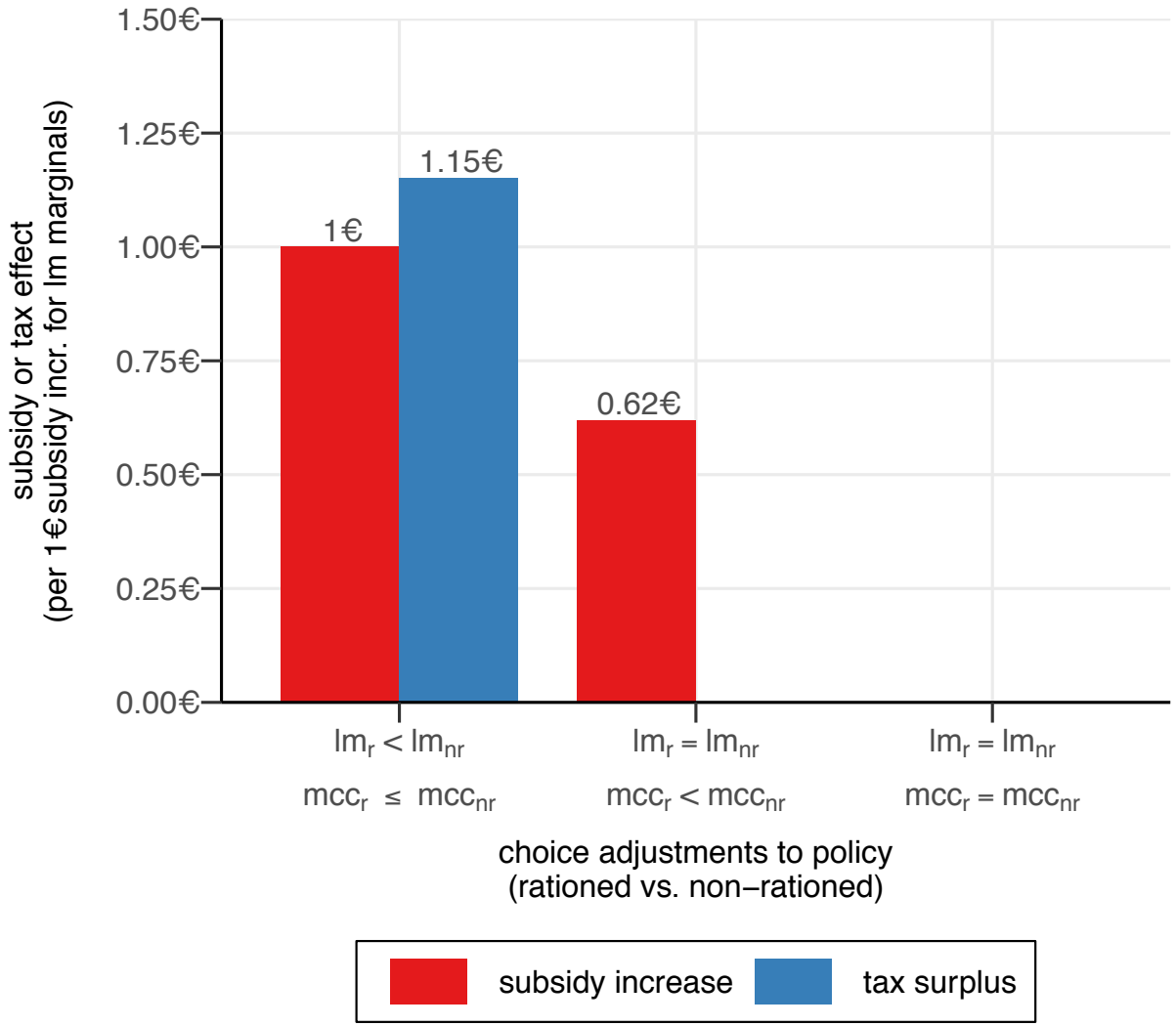
Resulting self-financing degrees:

- *Impact period*:
  - → 71.1% of increase in subsidy expenses recovered through increased tax revenues
- *All periods*:
  - → increases to 103.3%
  - → of which 35.8pp: positive effect of wage dynamics on future tax revenues

Policy evaluation I: Expansion of access to public childcare

Decomposition of subsidy or tax effect in the *Impact period*

- Recall: Self-financing degree in *Impact period*: $SFD = \frac{\Delta T}{\Delta S} = 71.1\%$



Policy evaluation II: Increasing childcare subsidies

Self-financing degree of increase in childcare subsidies by 50€/month

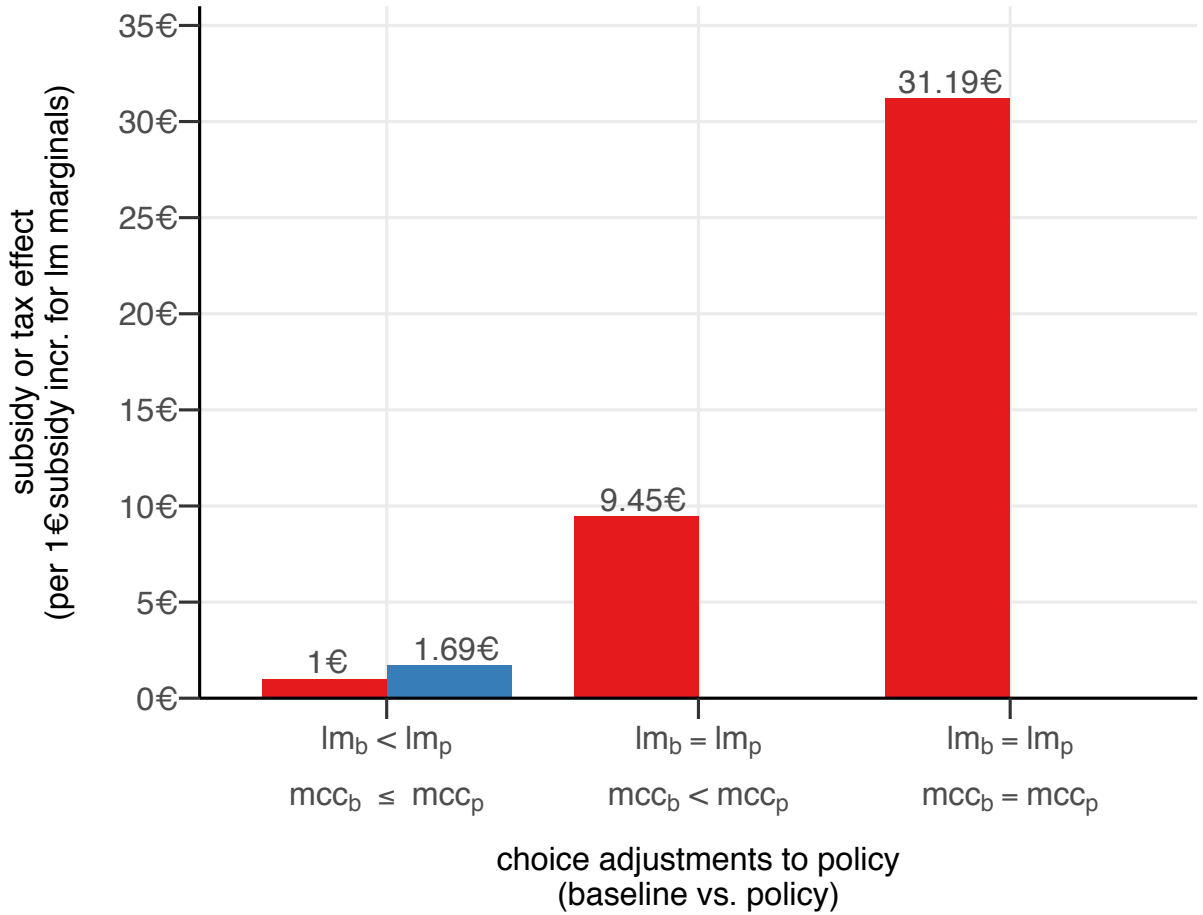
- in the non-rationed environment

	total
(i) *untargeted*	
Impact period	4.1%
All periods	5.9%
(ii) *full-time work contingent*	
Impact period	33.5%
All periods	50.1%

Policy evaluation II: Increasing childcare subsidies

Decomposition of fiscal effect of an untargeted increase

- Recall: Self-financing degree in *Impact period*: $SFD = \frac{\Delta T}{\Delta S} = 4.1\%$



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Decomposition of fiscal effect of full-time work contingent increase

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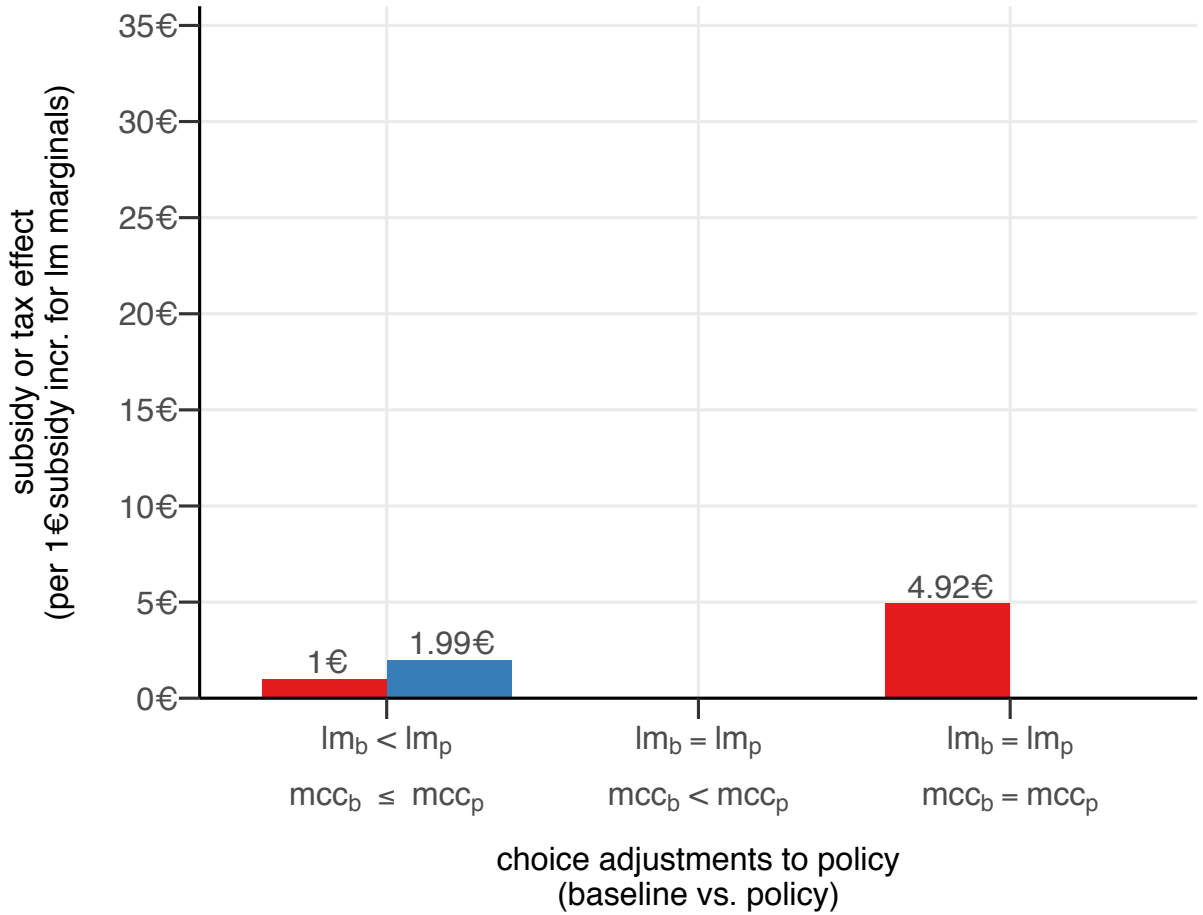

Policy evaluation III: Redistribution through childcare fees

→ current childcare fee schedule entails redistribution

→ What are the efficiency costs of redistribution associated with the existing progressive childcare fee schedule?

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Efficiency cost of redistribution:

- Marginal excess burden: For each dollar we take from those with above-median income, how much gets lost and does not reach those below median due to behavioral changes?

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Implementation:

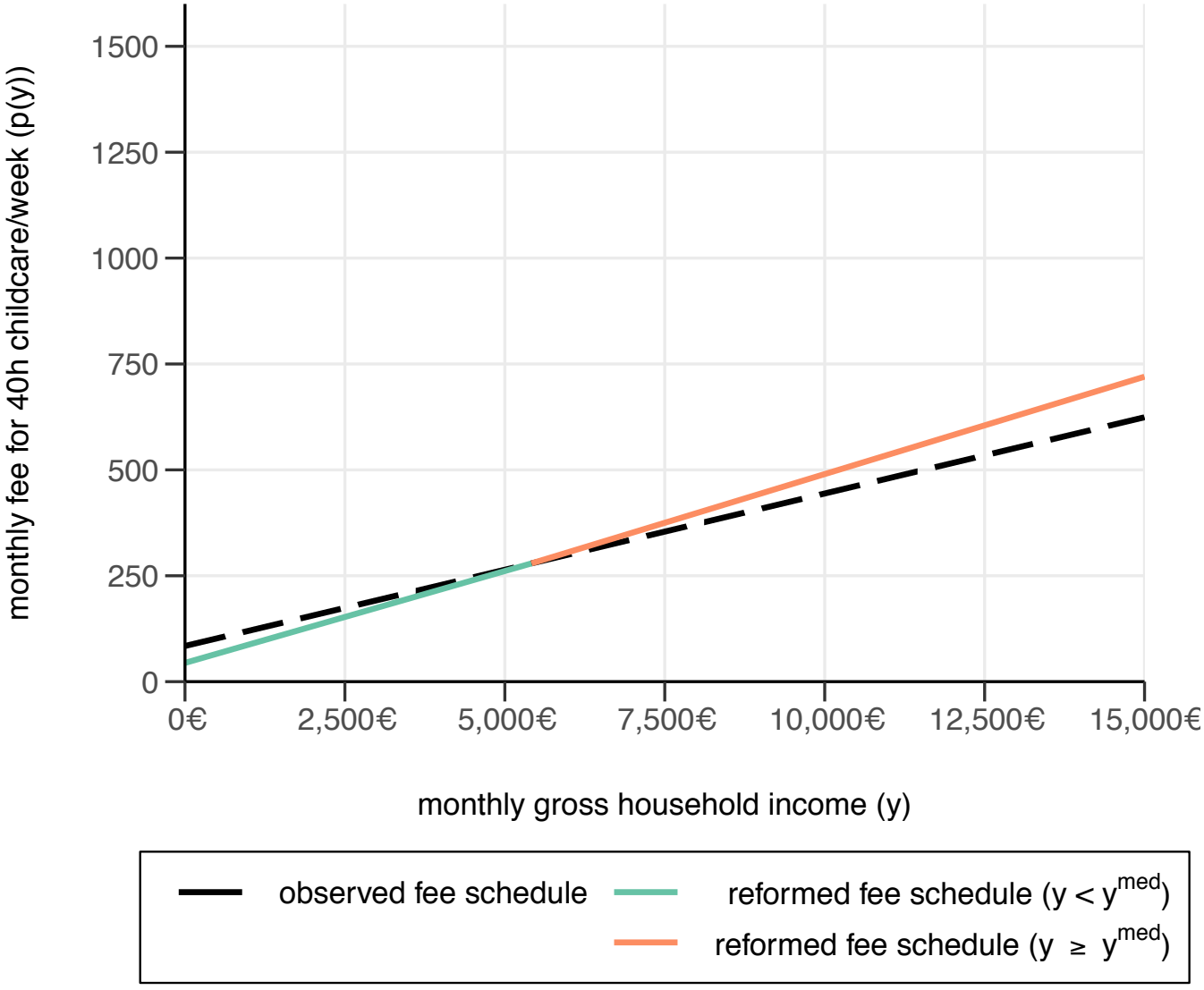
- Parametric reform of (i) tax schedule and (ii) childcare fees:

$$T^*(y) = \begin{cases} T(y) + \tau_1 \left(y - y^{med}\right) & \text{for } y \geqslant y^{med} \\ T(y) - \tau_2(\tau_1) \left(y^{med} - y\right) & \text{for } y < y^{med} \end{cases}$$

- Fix $\tau_1 = 0.01$ and choose τ_2 such that reform is budget-neutral taking behavioral changes into account

Policy evaluation III: Redistribution through childcare fees

Parametric reform of the childcare fee schedule



Policy evaluation III: Redistribution through childcare fees

Resulting marginal excess burdens:

- … for the tax schedule = 0.289
- … for the childcare fee schedule = 0.182

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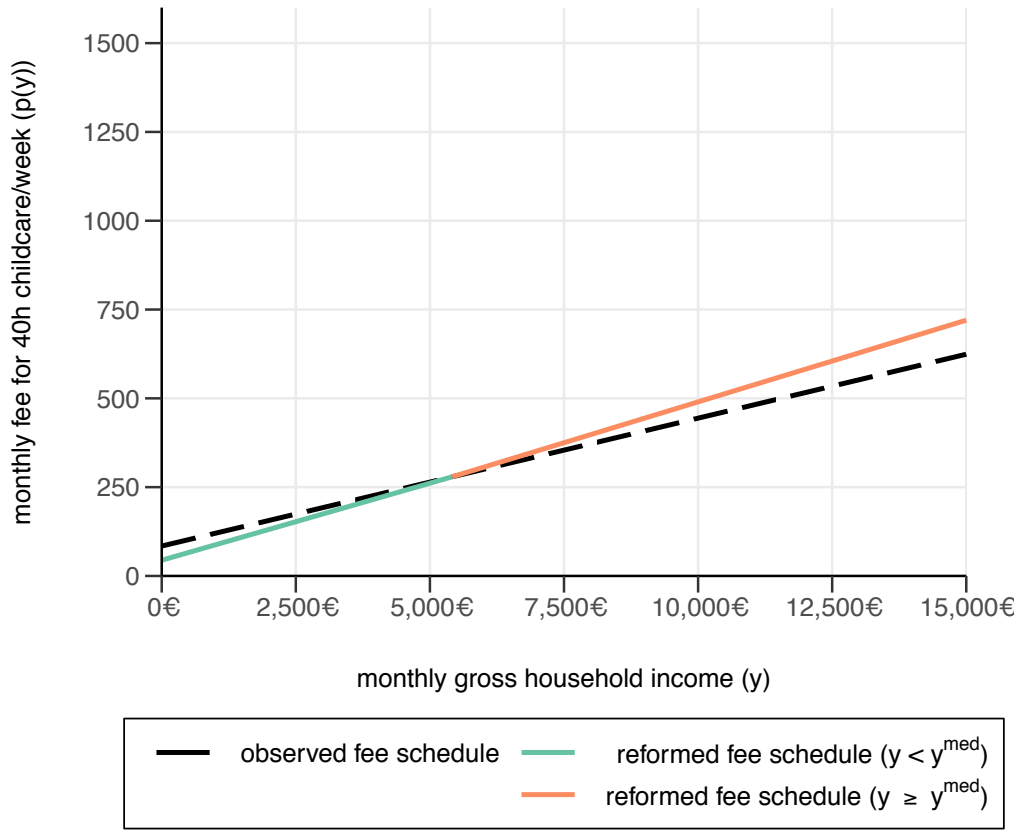
$\Rightarrow$ childcare fee schedule: lower efficiency cost of redistribution

$\Rightarrow$ if the government has the same desire to redistribute within the population that uses market childcare, childcare fees should be made *more progressive*

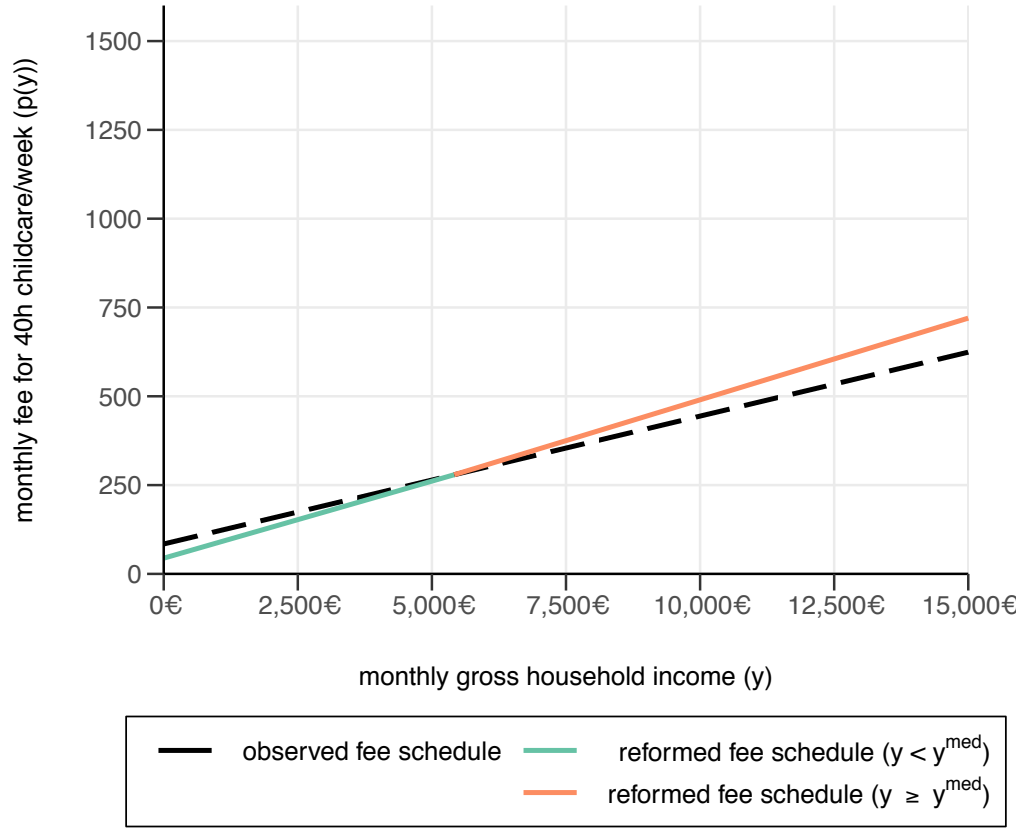
But where does the difference in efficiency costs come from?

Policy evaluation III: Redistribution through childcare fees



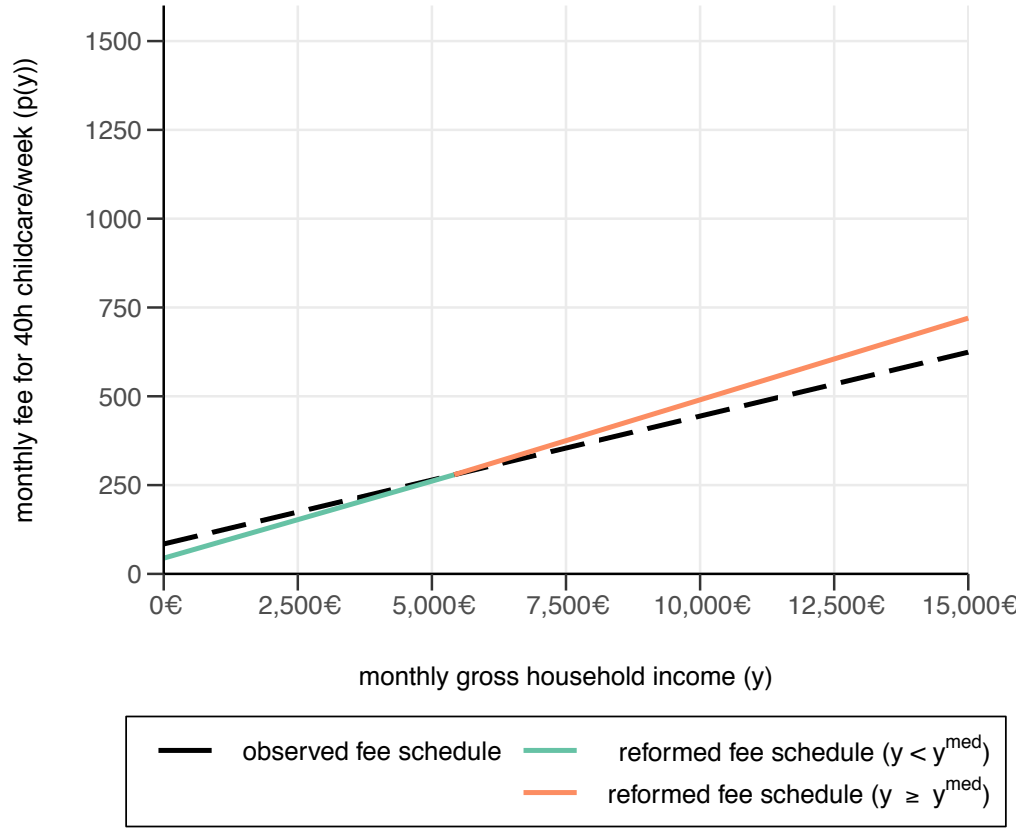
1. Increase in effective marginal tax rates for all income levels
   → applies to tax schedule and childcare fee schedule
   ⇒ labor supply ↓

Policy evaluation III: Redistribution through childcare fees



2. Change in the level of the monthly childcare fee
   → applies only to the childcare fee schedule
   → adjusts the return to working versus not-working
   ⇒ labor supply ↑ if $y < y^{med}$
   ⇒ labor supply ↓ if $y \geqslant y^{med}$

Policy evaluation III: Redistribution through childcare fees



2. (ctd.)
   → adjusts the relative price of leisure versus domestic childcare (for constant labor supply)
   ⇒ use of public childcare ↑ if $y < y^{med}$
   ⇒ use of public childcare ↓ if $y \geqslant y^{med}$

Policy evaluation III: Redistribution through childcare fees

Table: Decomposition of the marginal excess burden (MEB)

	tax schedule (MEB = 0.289)		childcare fee schedule (MEB = 0.182)	
	lm ↓	*lm* ↑	*lm* ↓	*lm* ↑
$y < y^{med}$	0.111 [38.5%]	0.000 [0.0%]	0.016 [8.7%]	-0.003 [-1.7%]
$y \geqslant y^{med}$	0.178 [61.6%]	0.000 [0.0%]	0.125 [69.1%]	0.000 [0.0%]

	unchanged *lm* & changed *Tcc*	unchanged *lm* & changed *Tcc*
	0.000 [0.1%]	0.044 [24.1%]

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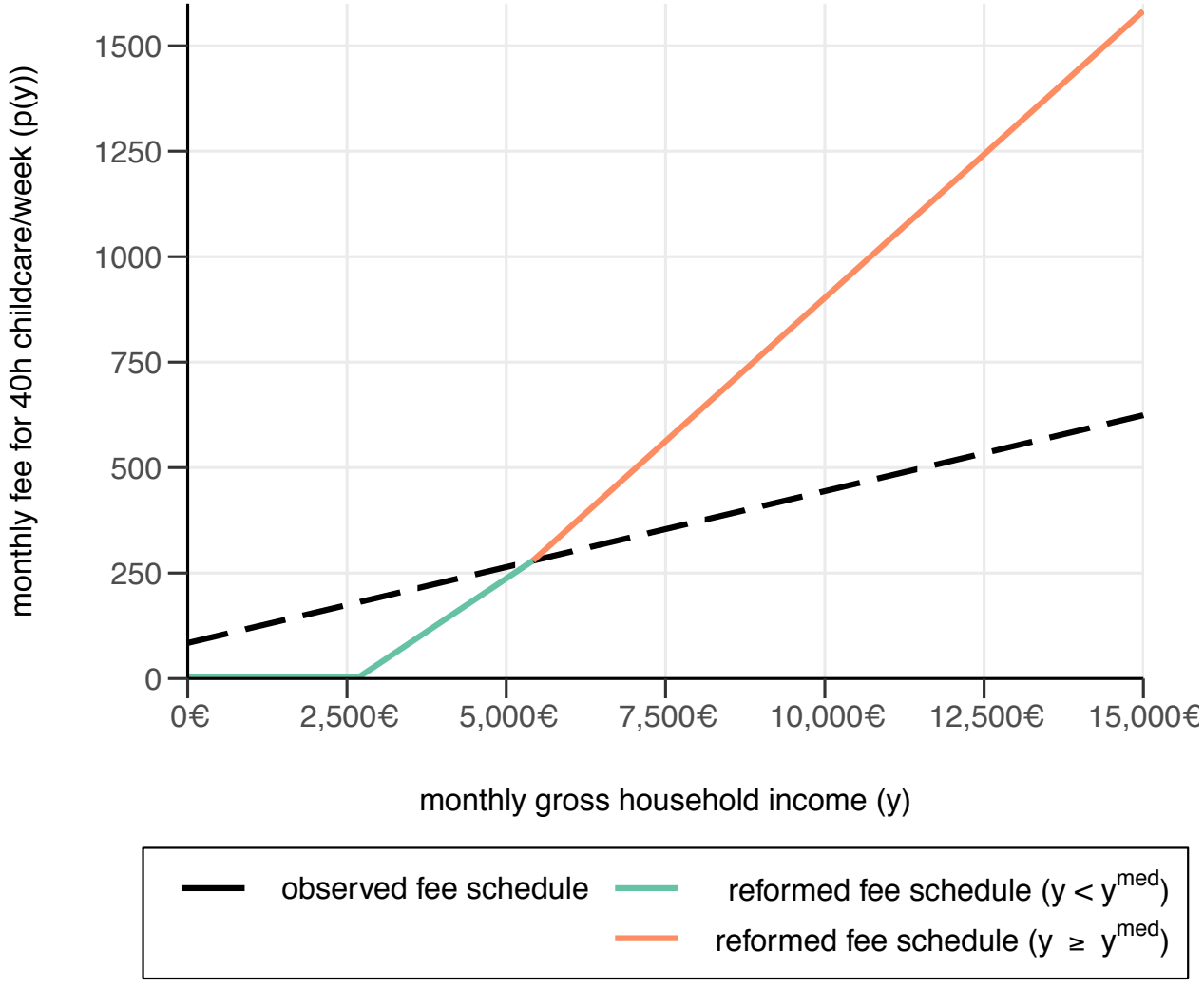
Policy evaluation III: Childcare fee reform

Reform: adjusting childcare fee schedule to imply same efficiency costs as the tax system



Conclusion

This paper: rich structural model to investigate the dynamic fiscal implications of childcare policies

1. *What are the effective fiscal costs of expanding access to public childcare?*

↳ A large public childcare expansion fully paid for itself through the dynamic effects on maternal earnings.

2. *Given the current level of subsidization, to what extend are additional childcare subsidies self-financing?*

↳ Further (untargeted) increases from the current generous level would only be 6% self-financing.

3. *How does the efficiency of redistribution via childcare fees compare to taxes?*

↳ The current childcare fee schedule implies substantially lower efficiency cost of redistribution.

Thank you for your attention!

koll@uni-mannheim.de or david.koll@eui.eu

Backup

Rationing in Germany?

- it seems that the “hard rationing” is smaller than what it is usually thought of (see table below)
- we identify the distribution of g conditional on current policy
- “rationing” is partly expressing preferences as visible from the table below: the distribution of g will capture this in a reduced form way, e.g., rationing related to location-dependency (distance, neighbourhood), quality ...

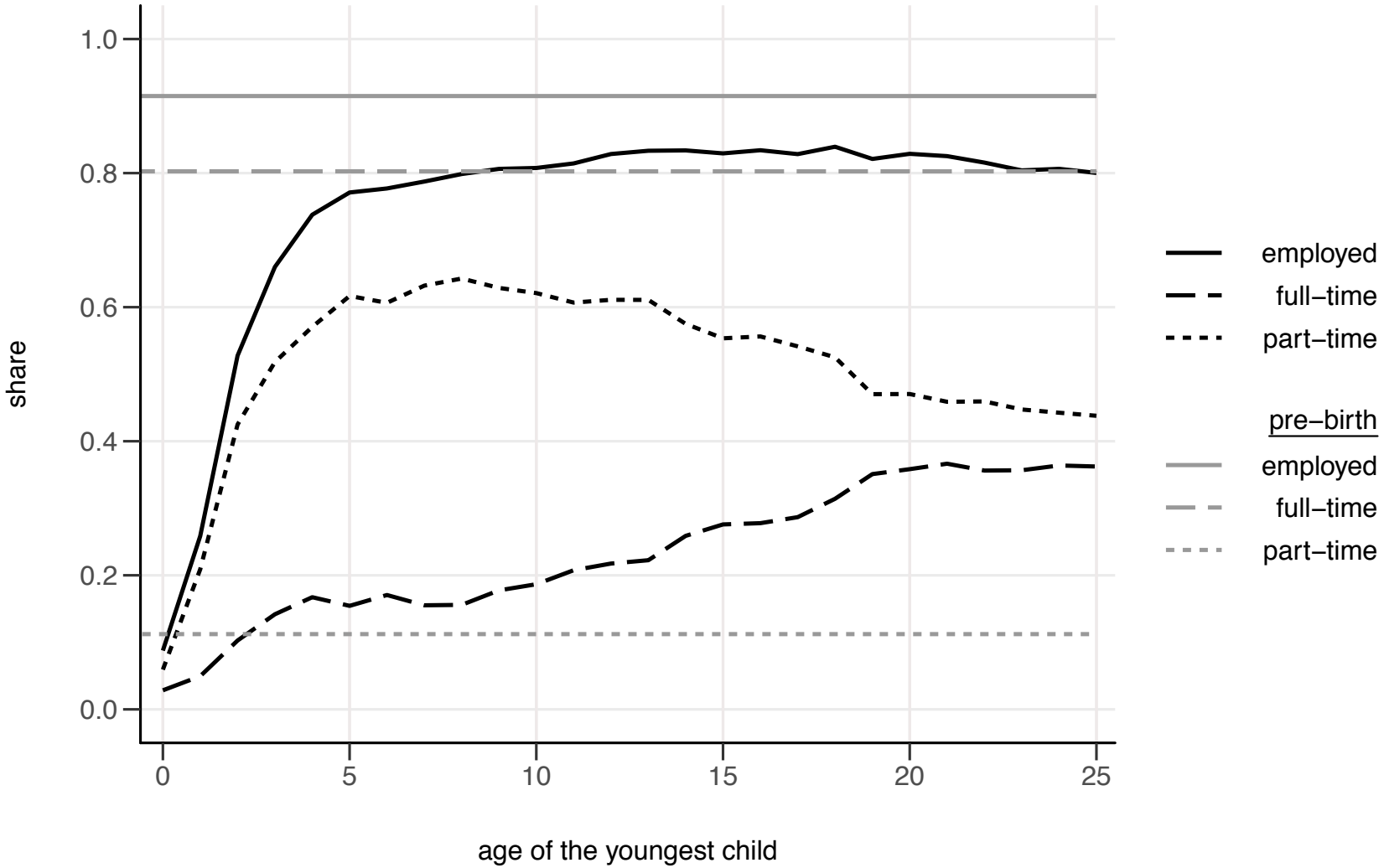
Excess demand for public childcare - children aged below 3:

desired hours per week $\leqslant 20$		desired hours per week > 20	
slot offered, but not used	no slot offered	slot offered, but not used	no slot offered
3.14%	1.09%	3.07%	2.09%

Notes: Source: DJI-Kinderbetreuungsstudie (waves 3 & 4, 2014 & 2015). Sample: children below 3, weighted to achieve representativeness at the national level.

Mothers on the labour market in Germany

back

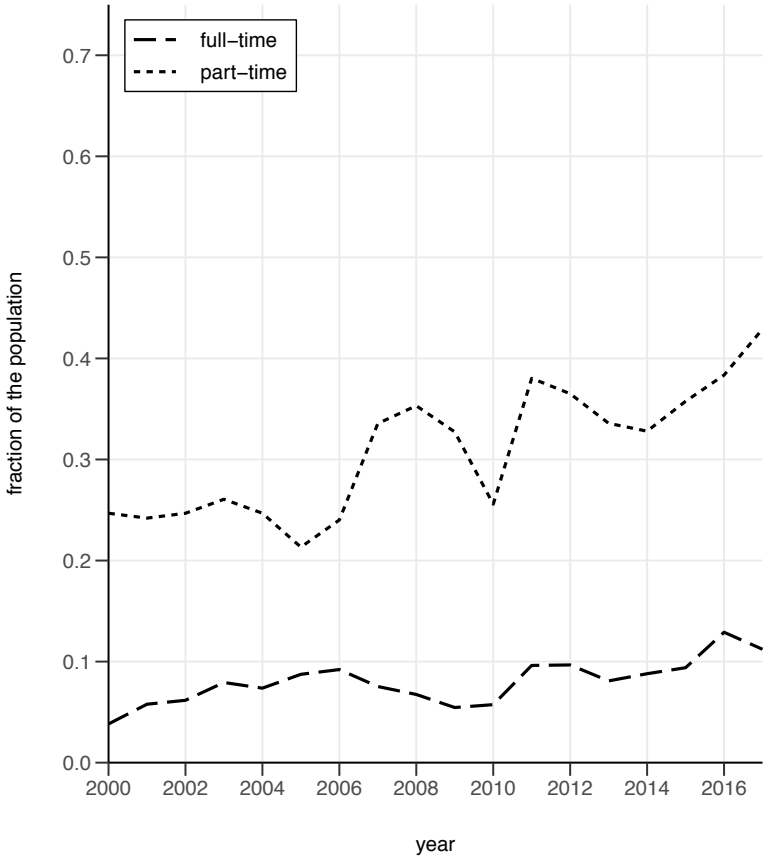


Sample: females aged 20 to 65 who are not in education and live with a full-time working partner, conditional on having at least one child. Source: 2000 to 2017 GSOEP.

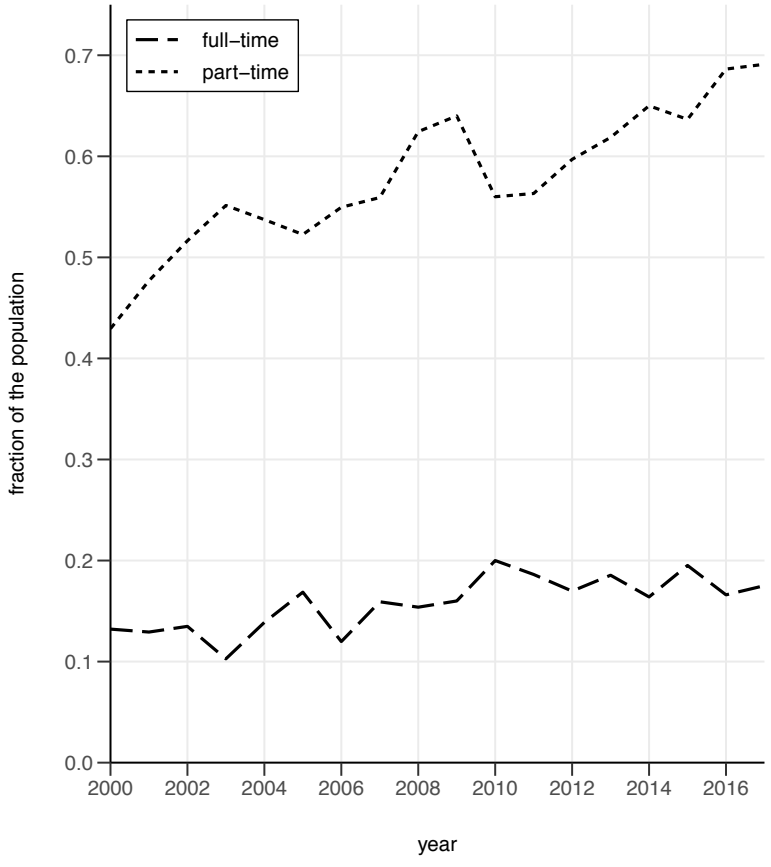
labour supply over time
childcare takeup over time

Employment of mothers across time

back



(a) Children aged 0-2

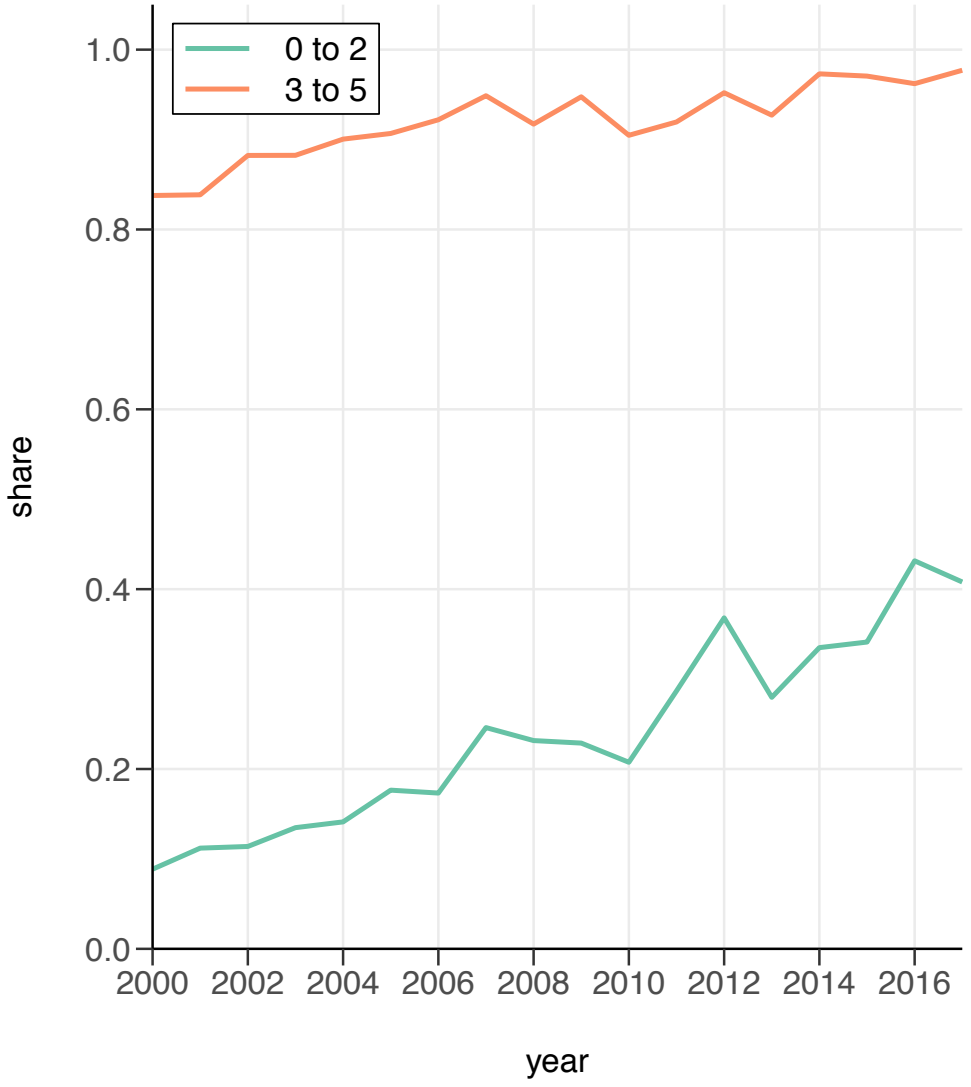


(b) Children aged 3-5

Sample: mothers aged 20 to 65 that are not in education and live with a full-time working partner, conditional on having a child aged 0 to 2 for panel (a) or 3 to 5 for panel (b). Source: 2000 to 2017 GSOEP.

Public market childcare enrolment across time

back



Notes: Enrolment is binary in the sense that it is not conditional on a minimum number of hours. Sample: mothers aged 20 to 65 that are not in education and live with a full-time working partner. Source: 2000 to 2017 GSOEP.

Institutional background in Germany

back to intro back to outline

Market childcare:

- largely provided by government or non-profit organizations (approx. $> 95\%$)
- quality is highly regulated

Taxes and transfers:

- child-dependent taxes and transfers

Parental leave:

- one-year paid parental leave
- job guarantee for three years

$\Rightarrow$ Market childcare and taxes and transfers realistically modelled

$\Rightarrow$ Parental leave policies are not modelled because:

i. dynamic effects of child birth related career breaks are well captured by the estimated wage process
ii. only small effect of a one-year paid parental leave on the three year budget
iii. state-dependent policy on previous labour market choice (complication of model)

Past childcare reforms in Germany

back

- 1996: Legal right to a slot in Kindergarten for all children aged $\geqslant 3$
- Before 2005: Only 5 public childcare slots per 100 children under age of 3
- 2005: A federal law (Tagesbetreuungsausbaugesetz): Commitment to 230,000 additional childcare slots $\rightarrow$ 17 slots per 100 children
- 2007: summit of federal, state and regional German governments agreed on an increase up to 35 slots per 100 children
- 2008: Kinderförderungsgesetz:
  - From October 2010: Legal right to subsidized child-care slot for all children below the age of 3 if both parents are working
  - From August 2013: Legal right to a subsidized childcare slot for all children aged 1 and above

Related literature and contribution

back

Structural work on female labour supply & child-related policies:

Bick (2016); Adda, Dustmann, and Stevens (2017); Turon (2019); Guner, Kaygusuz, and Ventura (2020); Hannusch (2020)

→ clear-cut public economics research question

→ modelling rich heterogeneity in family structures

→ estimating a joint distribution of three-dim. unobserved heterogeneity

Public Finance:

Domeij and Klein (2013); Ho and Pavoni (2019); Colas, Findeisen, and Sachs (2021)

→ introduction of universal childcare & marginal change in childcare subsidy, both including dynamic fiscal effects

→ evaluating the value of the implied redistribution

Reduced Form Empirical Evidence on Labour Supply Effects:

Bauernschuster and Schlotter (2015); Gathmann and Sass (2018)

→ long-run (fiscal) effects and counter-factual policy changes

→ effects of (targeted) subsidies

Market childcare setup

back

Exogenous price of one hour of market childcare:

$$p\left(i, K, y^{gross}\right)$$

where $i = 1, 2, 3$ indicates the child age and K the number & age structure of children.

Amount of market childcare for a child of age i:

$$mcc(i) = \max\left\{0, \bar{t}_i - dcc - oth\right\}, \qquad \text{if i = 1, 3}$$
$$mcc(2) = \max\left\{20, \bar{t}_i - dcc - oth\right\}$$

Household expenditure for market childcare:

$$Ecc(K, y^{gross}) = \sum_{i=1}^{3} p(i, K, y^{gross}) \cdot mcc(i)$$

where K indicates the number & age structure of children.

Wage process

back to quantification overview

Estimation of wage process based on GSOEP 2000 - 2017:

→ imputing unobserved wages accounting for selection

- female wages are determined by $log(w_{it}^W) = \mathbf{X}_{it}\boldsymbol{\beta} + u_{it}$
  → Mincer-type covariates, number of children (+ below 5), urban, former East Germany, year dummies
- female wages are observed if: $\mathbf{Z}_{it}\boldsymbol{\zeta} + \nu_{it} > 0$
  → exclusion restrictions: dummies for presence of (0-2,3-5,6-8,9-17,18+) year old children, husband's wage quintile, net household income in case of not working

→ fit log-normal wage models

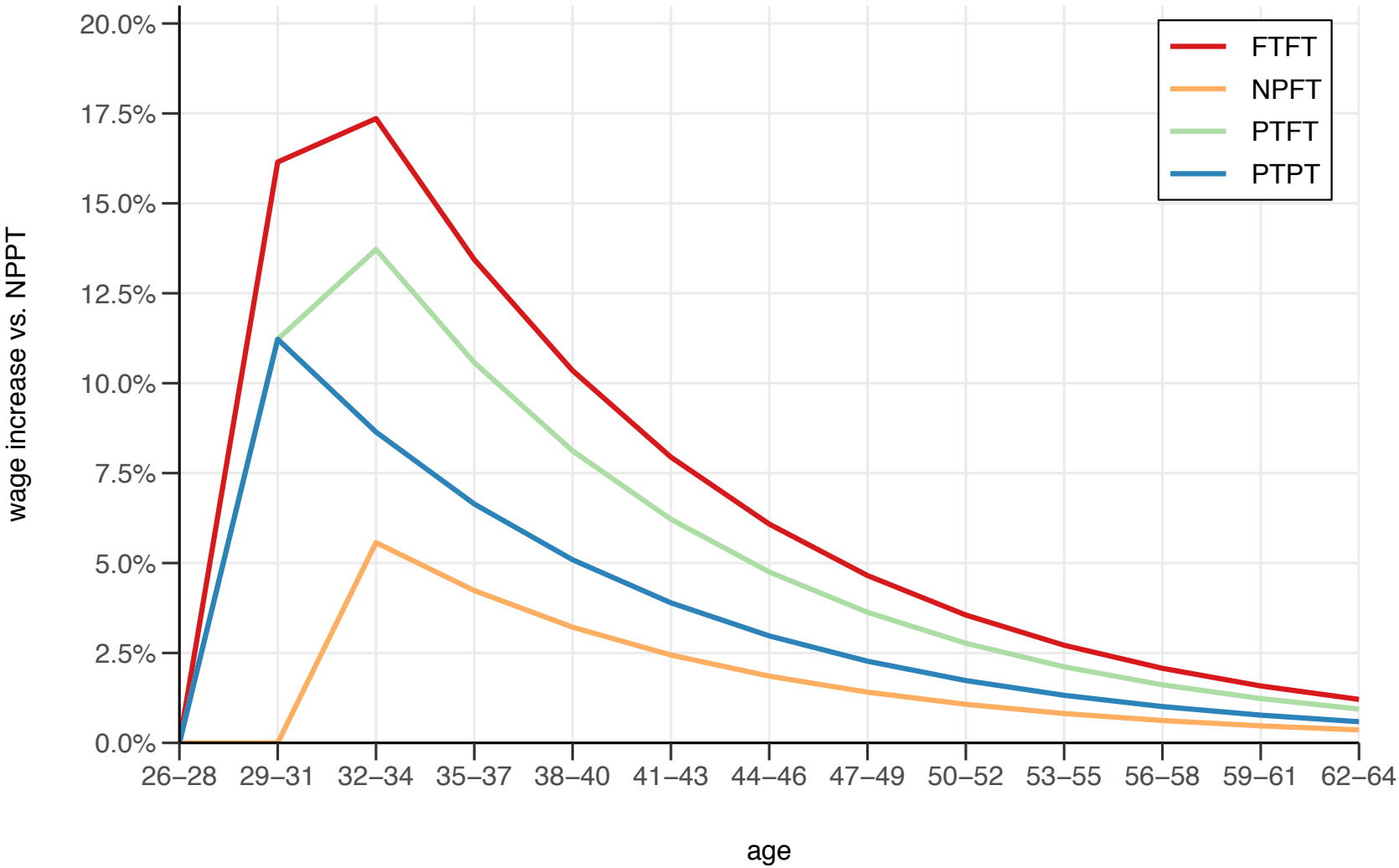
estimation results

$$log(w_{i,t}^W) = \alpha + \beta_1 log(w_{i,t-1}^W) + \beta_2 \mathbb{1}\{lm_{i,t-1} = NP\} + \beta_3 \mathbb{1}\{lm_{i,t-1} = PT\} + \beta_4 educ_i + f(t) + \varepsilon_{i,t}^W$$

→ compute gender- and age-specific transition probabilities between wage gridpoints conditional on labour supply choice

Wage dynamics across the life cycle

Illustration of Wage Process Dynamics



Notes: Relative increase in wages of different labour supply patterns, always compared to not working at age 26-28 and working part-time at age 29-31. NP, PT, and FT denote not working, part-time work, and full-time work respectively.

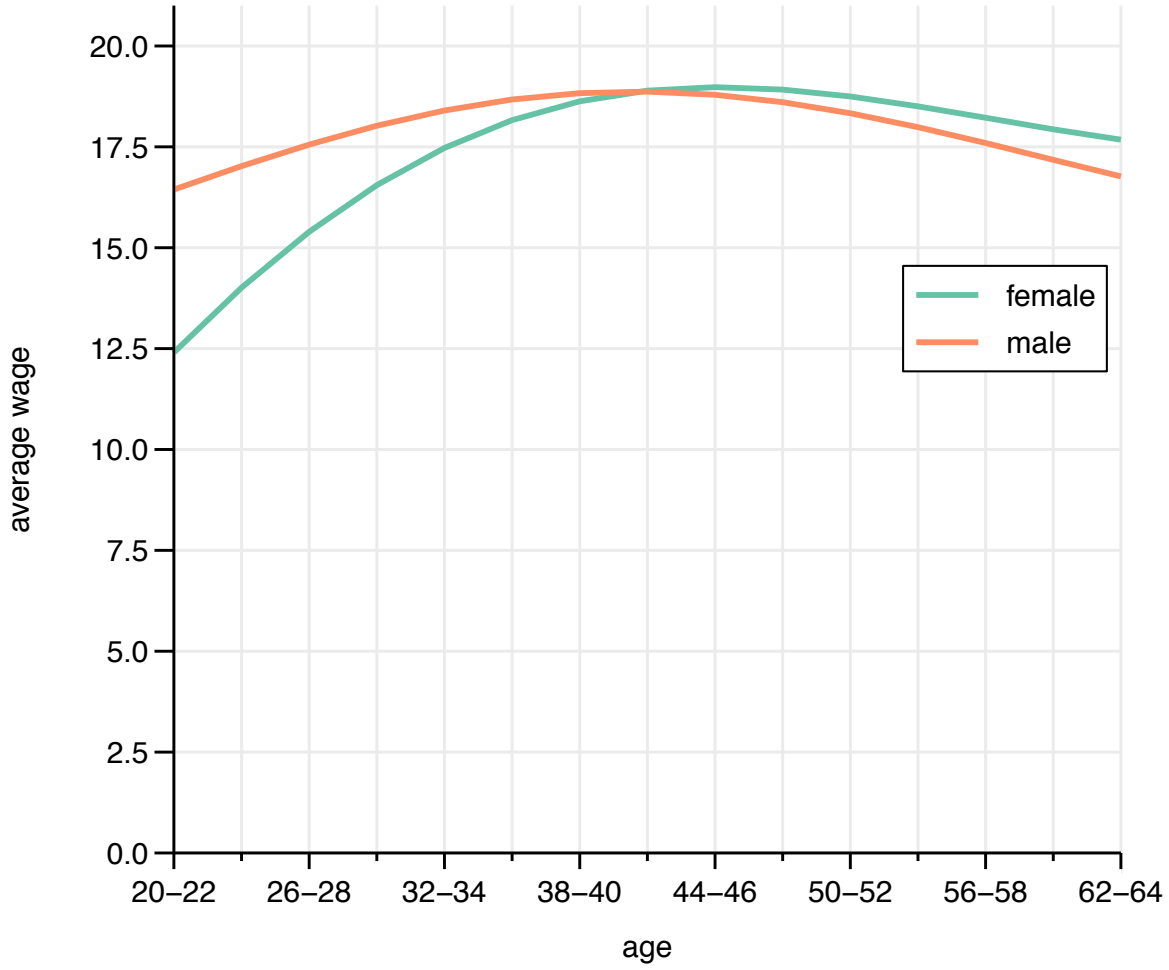
Estimation of female and male wage dynamics

back

	$log(w_t^{female})$	$log(w_t^{male})$
age_t	0.020 (0.013)	0.010 (0.0093)
age_t^2	-0.0026 (0.0017)	-0.0018 (0.0012)
age_t^3	0.000082 (0.000067)	0.000059 (0.000048)
educ	0.076 (0.0052)	0.027 (0.0036)
NP_{t-1}	-0.18 (0.0065)	
PT_{t-1}	-0.057 (0.0057)	
$log(w_{t-1}^{female})$	0.75 (0.0057)	
$log(w_t^{male})$		0.91 (0.0040)
constant	0.70 (0.032)	0.30 (0.023)
σ^2	0.28 (0.0017)	0.20 (0.0012)

Wage dynamics across the lifecycle

back



Notes: Simulated average wages starting with the observed wage distributions for individuals without A-Levels aged 20-22 and assuming continuous full-time work for the remaining lifecycle.

Fertility process details

back to quantification overview

Definition family composition type K:

- number of children aged $(0-2)$, $(3-5)$, $(6-8)$, $(9+)$
- 4-element vector K indicating the presence of a child in each bracket

Assumptions:

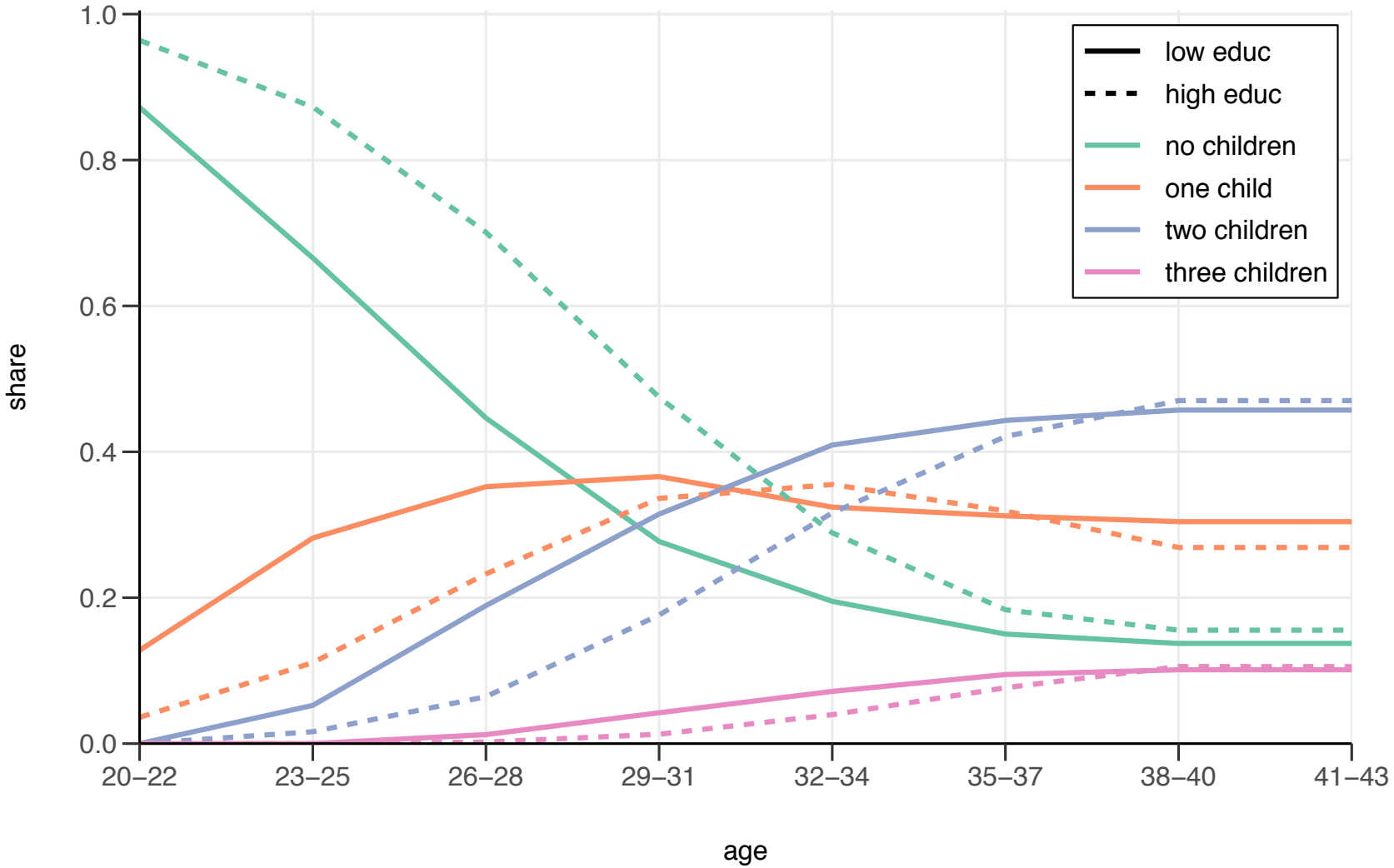
- one child per 3 year period
- subsequent siblings can only be born in one or two three-year intervals
- children's age difference is equal to the period length

Non-parametric estimation:

- observed age and education specific transition probabilities between consecutive types

Illustration of the fertility process

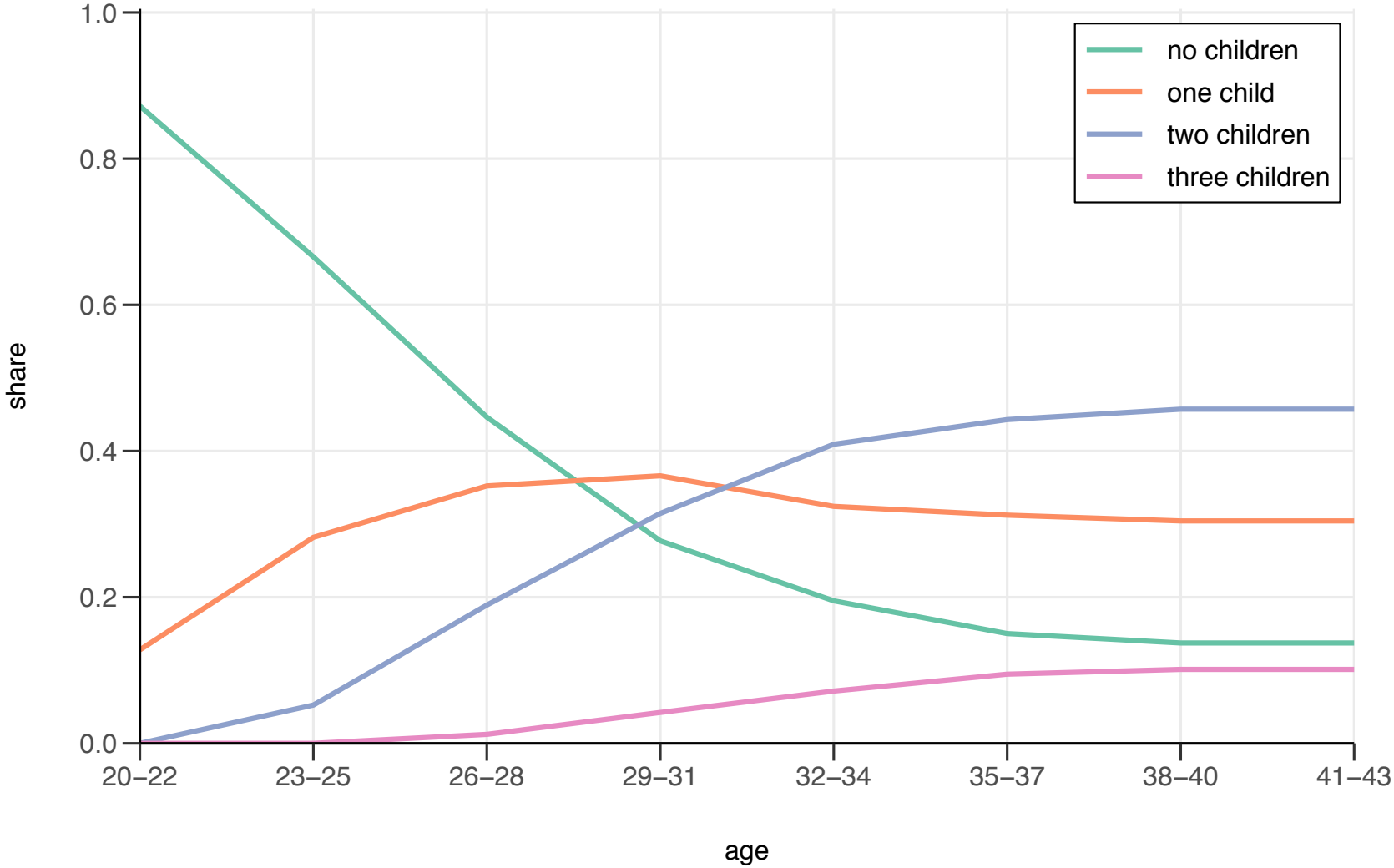
back to illustration for low educated



Notes: Population shares of family size, high educ: A-levels or college, childbirths between age 20 and 40. Sample: Females aged 20 and 65, not in education, and living with a full-time working husband, Microcensus 2014 & 2018.

Illustration of the fertility process [low educated]

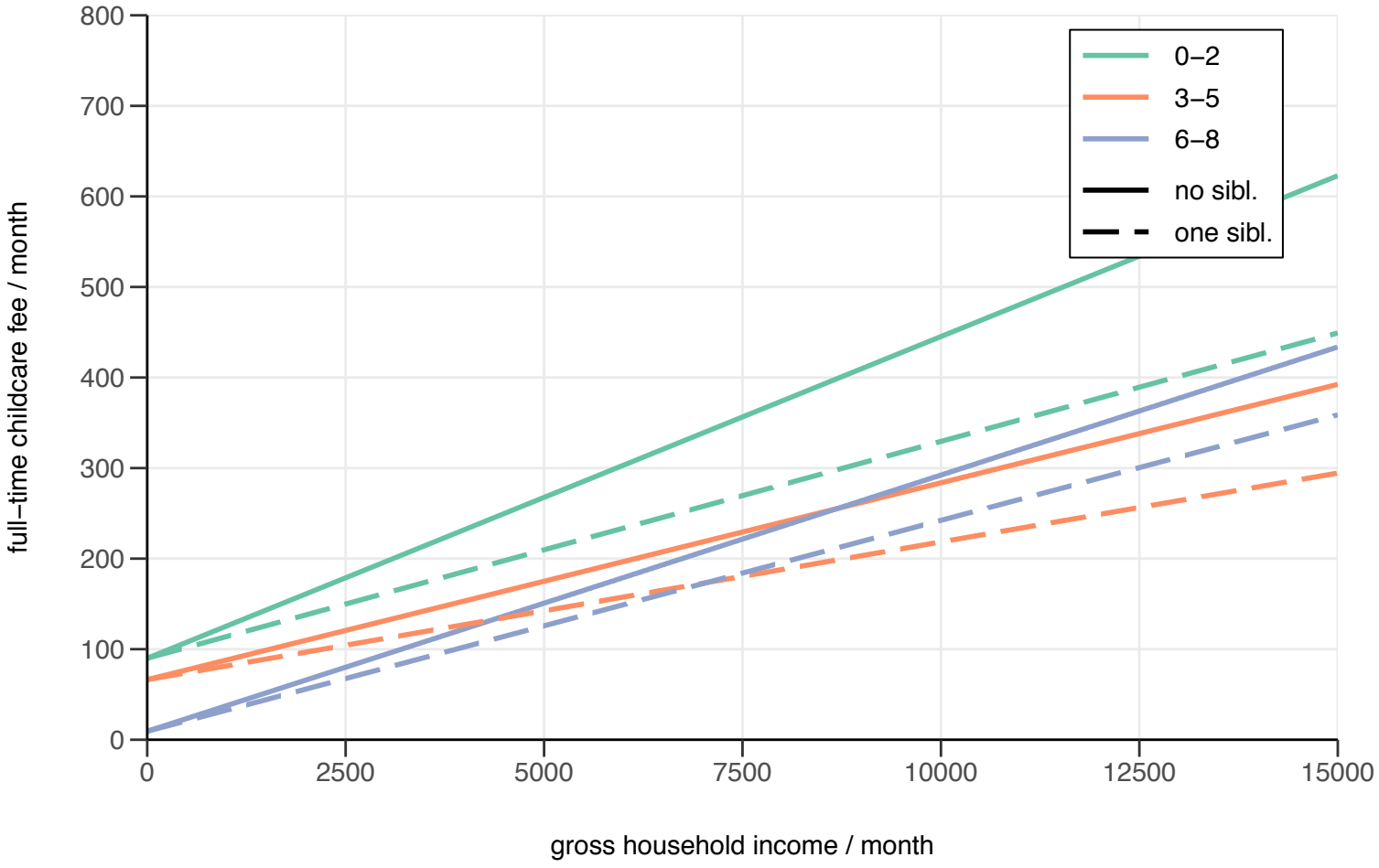
Figure: high & low educated



Notes: Population shares of family size, high educ: A-levels or college, childbirths between age 20 and 40. Sample: Females aged 20 and 65, not in education, and living with a full-time working husband, Microcensus 2014 & 2018.

Childcare fee schedule

back to Government policies



Full-time equivalent monthly childcare fees, based on estimates from Tobit models.

Calibrated parameters

back to quantification overview

Calibrated model parameters:

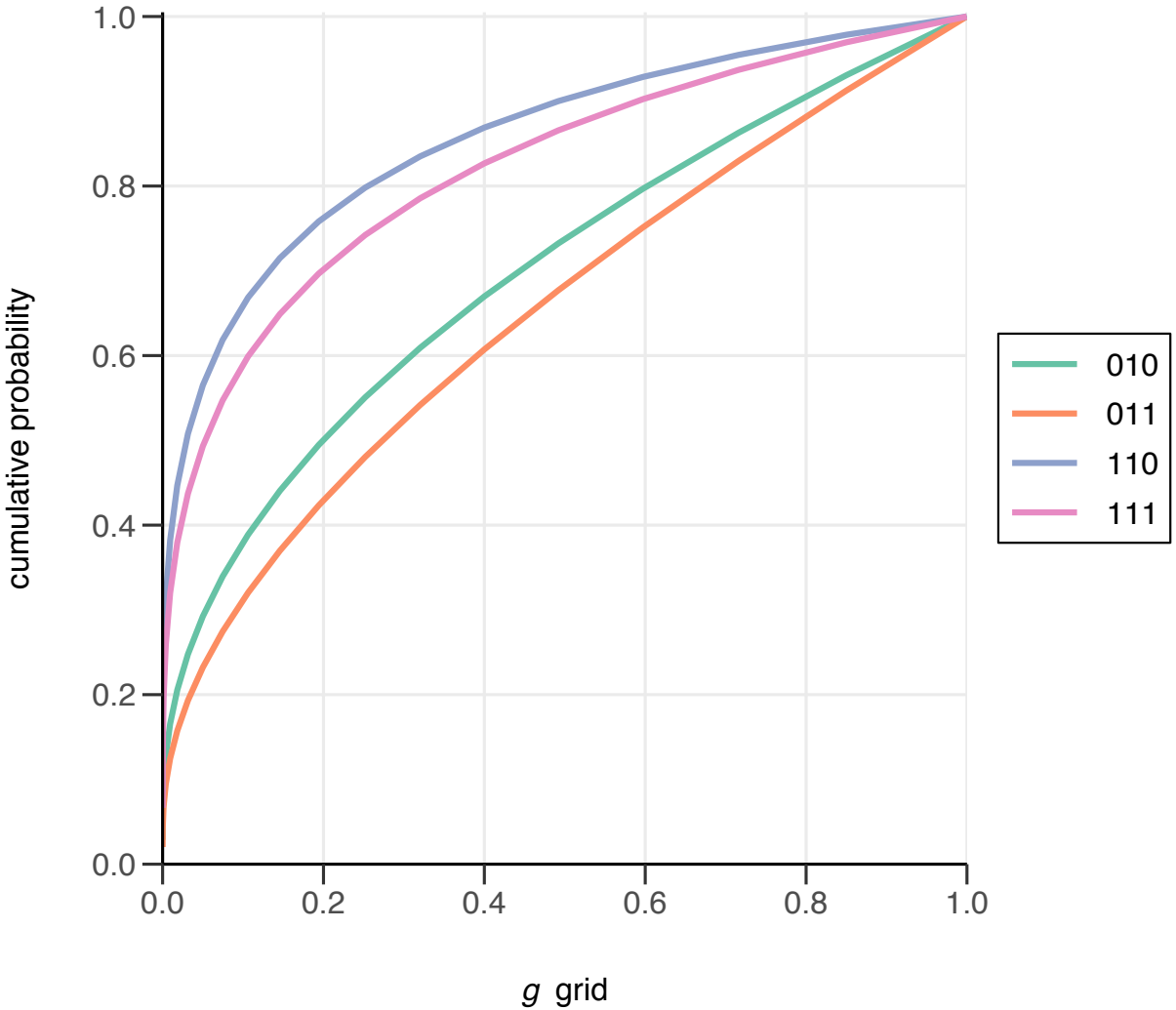
parameter	β	γ_c	γ_L	$\bar{L}$	γ_{dcc}	$\overline{dcc}$	κ
value	0.94	1	2	1	1.125	4	0.075

Targets:

- *Labour supply elasticities*
  → participation elasticity and aggregate hours elasticity
- *Labour market outcomes by age of the youngest child*
  → Share of NP, PT, and FT for child age brackets (0 – 2), (3 – 5), (6 – 8), and (9+)
- *Total market childcare shares by age of the youngest child*
  → 3 moments each for child age brackets (0 – 2), (3 – 5), and (6 – 8)

Estimated CDFs of home produced childcare preference g

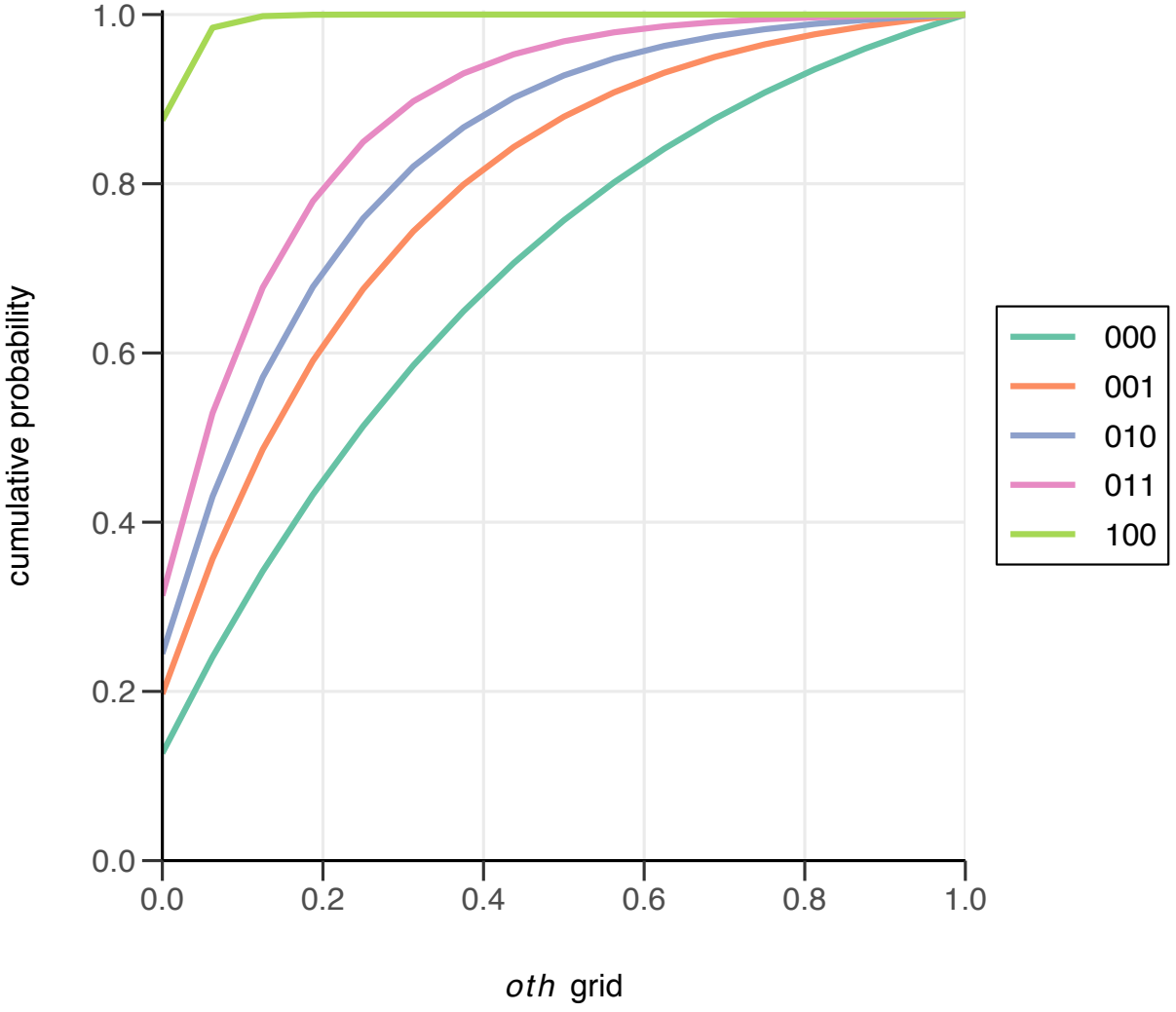
back



Notes: The legend indicates if the respective dummy of – in this order – **east, skilled occupation, catholic** is 0 or 1. We omit the plots for *no* skilled occupation because the implied difference by skilled occupation is small and would render the graph unreadable.

Estimated CDFs of informal childcare *oth*

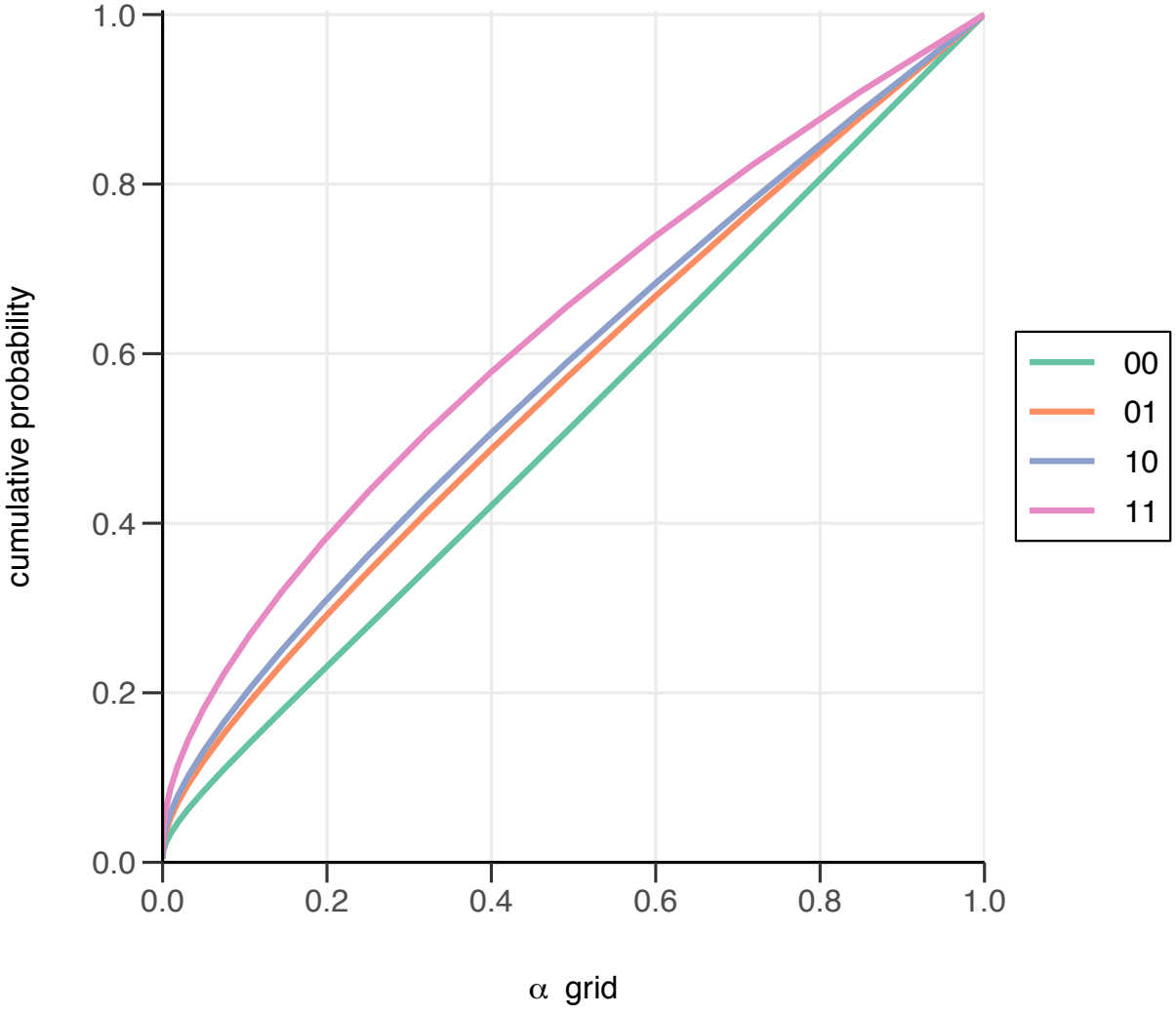
back



Notes: The legend indicates if the respective dummy of – in this order – **east, education, urban** is 0 or 1.

Estimated CDFs of leisure preferences *alpha*

back



Notes: The legend indicates if the respective dummy of – in this order – **high experience, education** is 0 or 1.

Maximum likelihood estimates

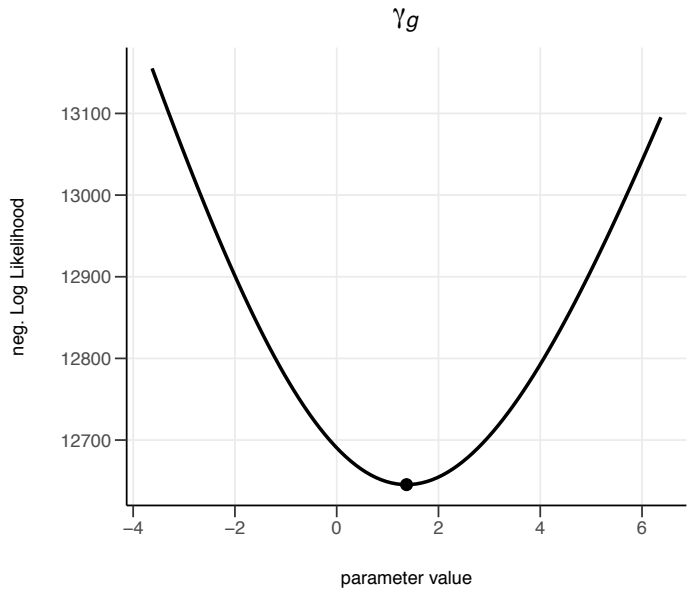
back

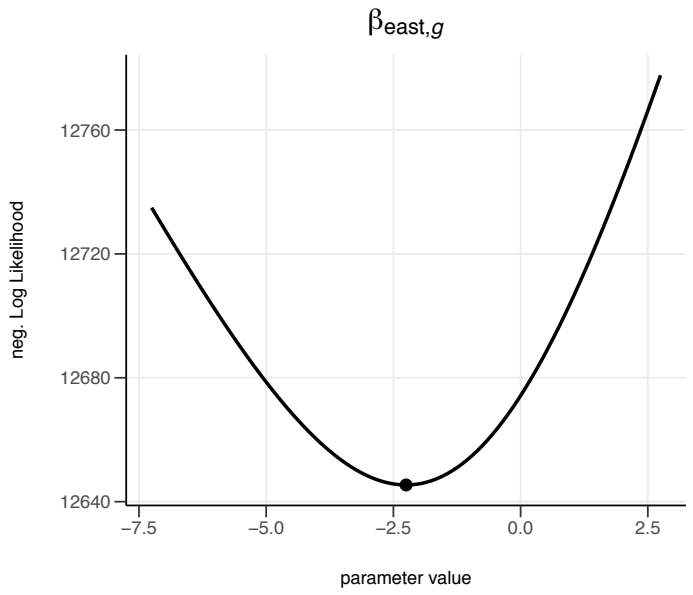
	home produced childcare (g)	avail. of other childcare (oth^{west})	avail. of other childcare (oth^{east})	leisure (α)
γ	1.37	-7.12	-33.25	1.63
β_{east}	-2.25			
$\beta_{skilled\ occupation}$	0.01			-0.22
$\beta_{catholic}$	0.58			
$\beta_{education}$		-10.44		-0.28
β_{urban}		-6.27		
σ	1.00	2.00	1.00	0.55

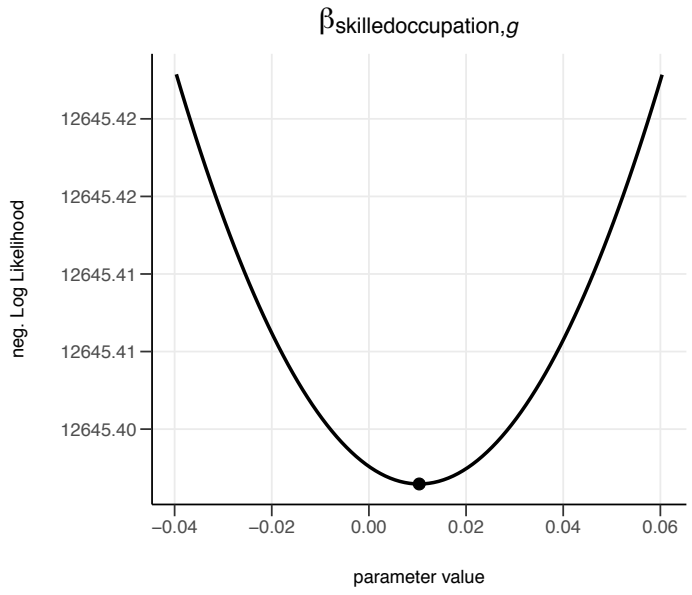
Notes: Estimation results for the distributional parameters of the unobserved heterogeneity. σ of oth^{east} is fixed to 1 for computational reasons.

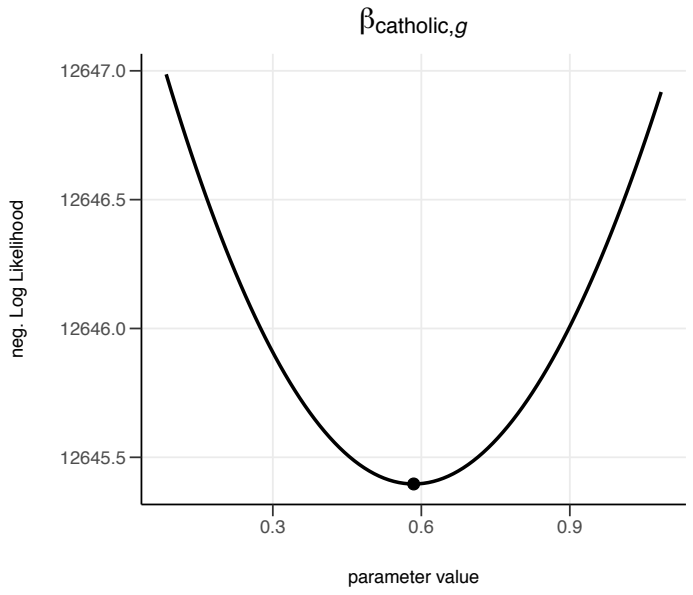
Sensitivity plots of the ML estimates of the means of g

back



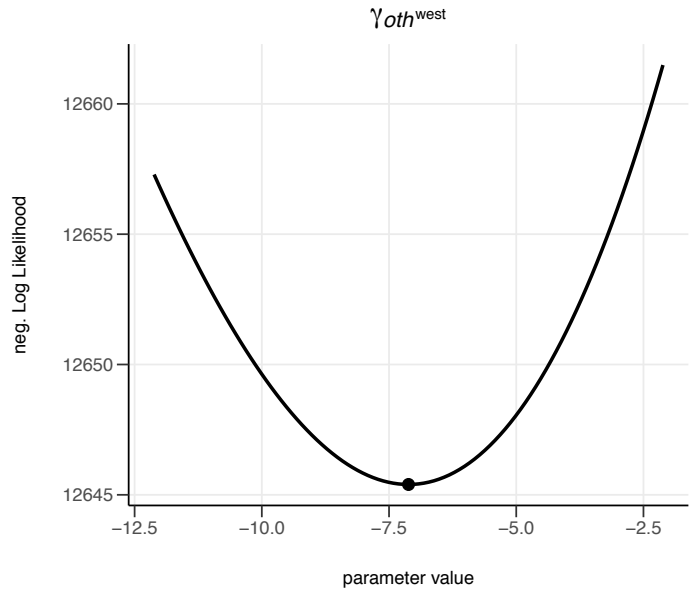


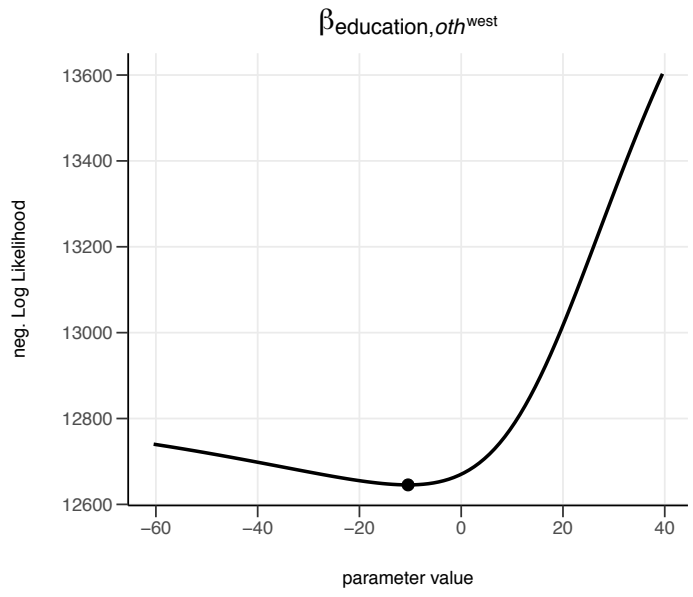


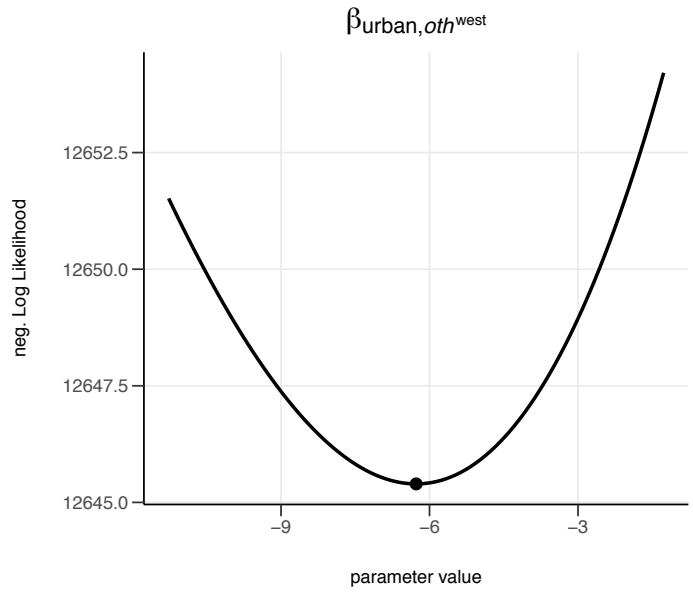


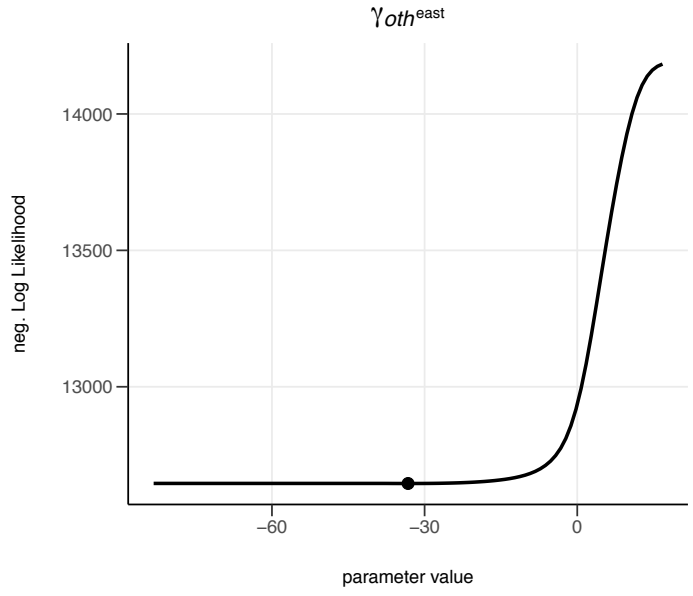
Sensitivity plots of the ML estimates of the means of *oth*

back



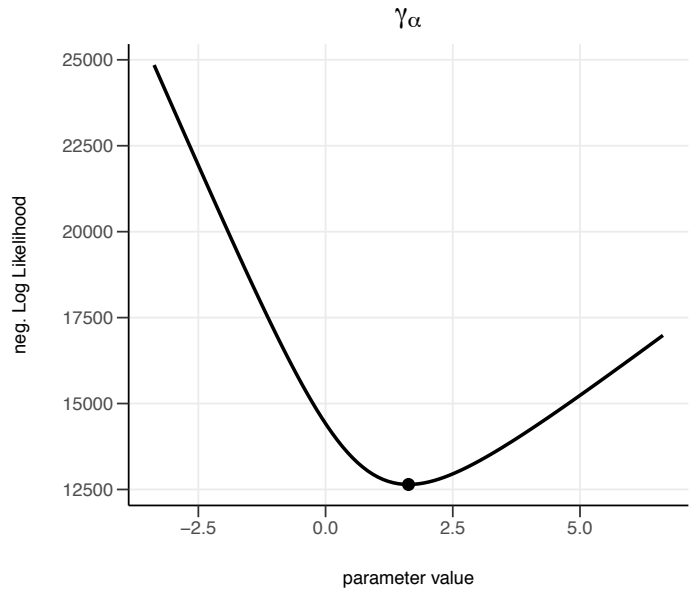


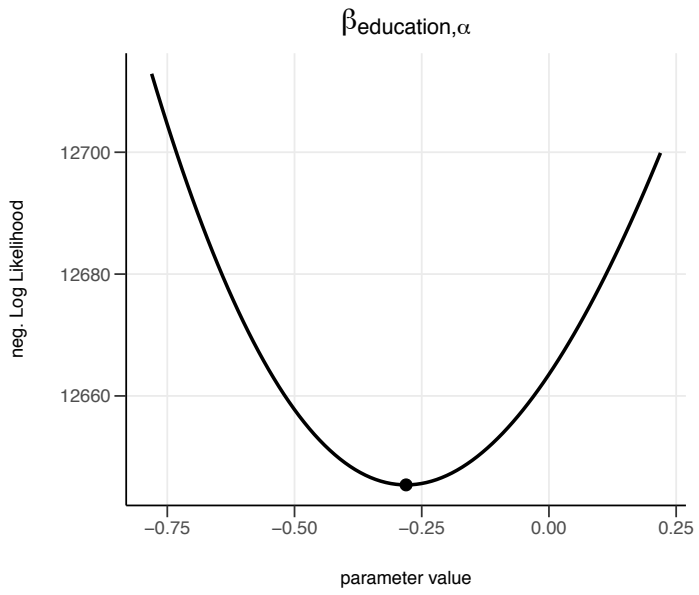


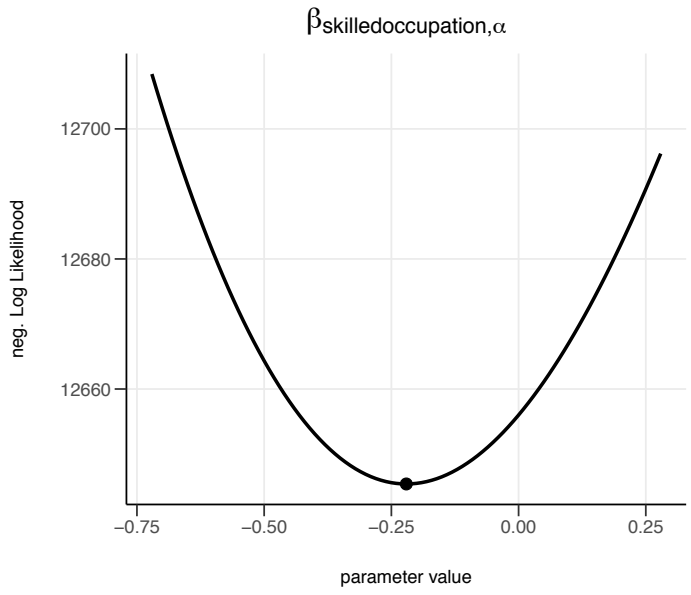


Sensitivity plots of the ML estimates of the means of α

back

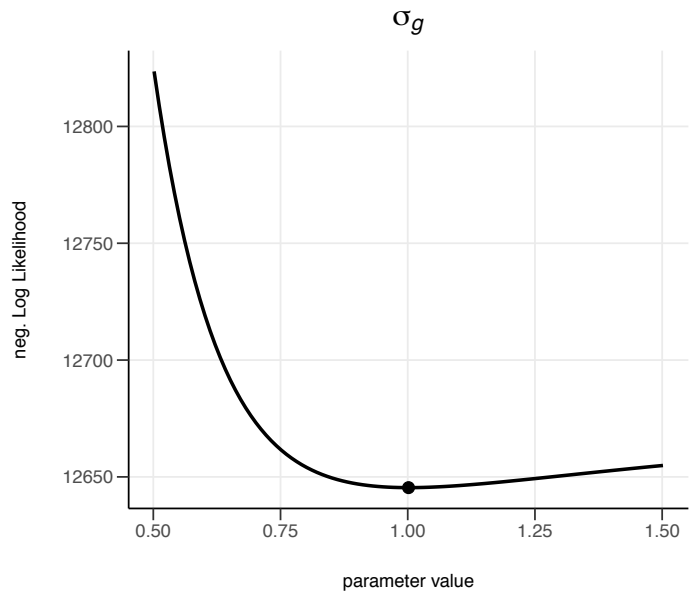


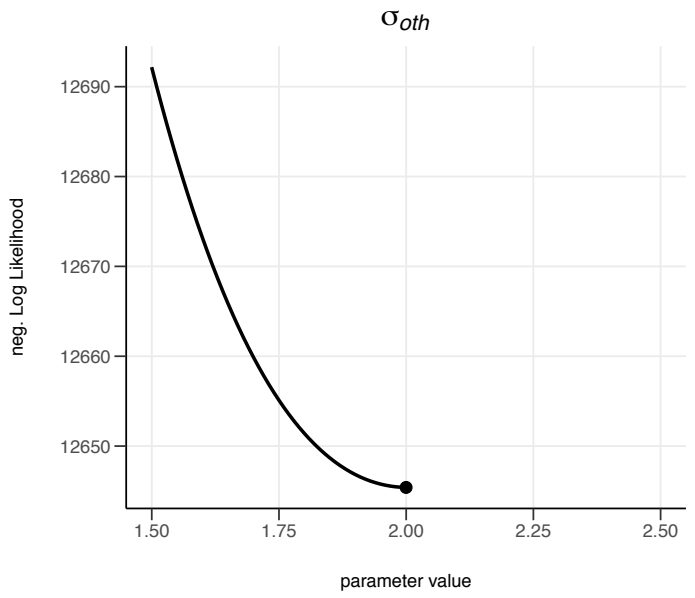


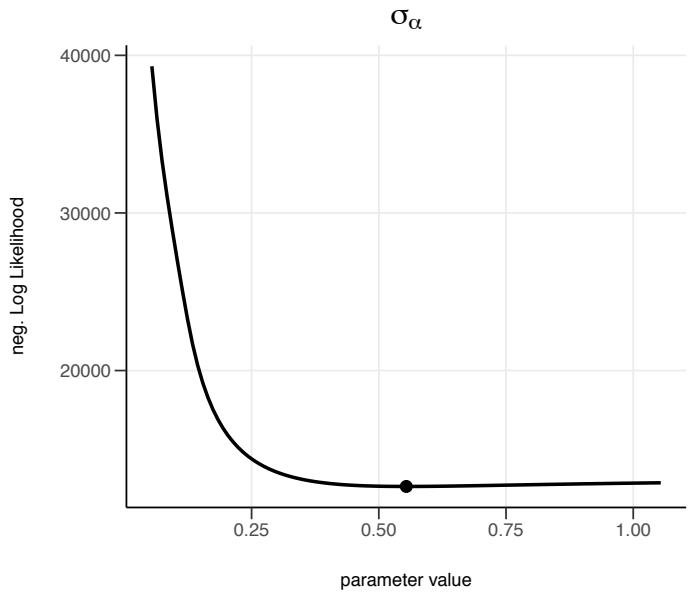


Sensitivity plots of the ML estimates of the variances

back







Labour supply elasticities

back

1. Simulation of a permanent increase in gross female wages by 1%:

$\Rightarrow$ (Marshallian) Participation elasticity in the model: 0.09

$\Rightarrow$ (Marshallian) Aggregate hours elasticity in the model: 0.18

Labour supply elasticities

back

1. Simulation of a permanent increase in gross female wages by 1%:

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2. Simulation of a permanent lump-sum net transfer of 1000 EUR:

$\Rightarrow$ Income effect (net of taxes): -0.135

Labour supply elasticities

back

1. Simulation of a permanent increase in gross female wages by 1%:

⇒ (Marshallian) Participation elasticity in the model: 0.09

⇒ (Marshallian) Aggregate hours elasticity in the model: 0.18

2. Simulation of a permanent lump-sum net transfer of 1000 EUR:

⇒ Income effect (net of taxes): -0.135

This yields by the Slutsky equation ...

⇒ (Hicksian) Participation elasticity: 0.1575

⇒ (Hicksian) Aggregate hours elasticity: 0.315

Fiscal calculations from main part

Permanent decrease in hourly childcare price schedule $p' < p$

$\Rightarrow$ We consider two time horizons

- Impact period
- All periods
  $\rightarrow$ here, we need to take the evolution of wages (plus age and fertility) into account

Fiscal calculations from main part

Permanent decrease in hourly childcare price schedule $p' < p$

$\Rightarrow$ Self-financing degree over all periods

$$SFD_{rem} = \frac{T_{rem}}{S_{rem}}$$

- we calculate for every combination of observed and unobserved heterogeneity (s_t, h) and price change $p' < p$
  - ... the change in the government tax revenue $\Delta T(s_t, h; p, p')$
- weighted by the distributions of observed and unobserved heterogeneity, $l_{3,t}(s_{t,n}, x_n)$ and $l_2(h|x_n)$
- discounted sum over all periods

$$T_{rem} = \sum_{n=1}^{N} \sum_{h \in \boldsymbol{H}} \sum_{t=imp}^{T(n)} \left(\frac{1}{1+r}\right)^{t-imp} \Delta T(s_{t,n}, h; p, p')\ l_2(h|x_n)\ l_{3,t}(s_{t,n}, x_n)$$

Fiscal calculations

▸ Details on the fiscal calculations

$\Rightarrow$ Permanent decrease in the childcare price schedule $p' < p$
[given hourly cost of market childcare for the government: C]

- for every state (s, h) and the price change $p' < p$, we calculate
  - ... the government subsidy $\Delta S(s, h; p, p')$
    $\rightarrow$ mechanical: price decrease for constant *mcc*
    $\rightarrow$ behavioral: adjustments in *mcc*
  - ... the government revenue $\Delta T(s, h; p, p')$
- weighting by $l_2(h|x_n) \cdot l_3(s_n, x_n)$ [households from the data]
- we consider two time horizons:
  - Impact period
  - All periods
    $\rightarrow$ here, we need to take the evolution of wages into account

Fiscal calculations I

$\Rightarrow$ Permanent decrease in the childcare price schedule $p' < p$

given hourly cost of market childcare for the government: C

Fiscal calculations I

$\Rightarrow$ Permanent decrease in the childcare price schedule $p' < p$
given hourly cost of market childcare for the government: C

Government expenses for subsidies for given (s, h):

$$\Delta S(s, h; p, p') = (C - p') \cdot mcc^*(s, h; p') - (C - p) \cdot mcc^*(s, h; p)$$

$\rightarrow$ mechanical: $\Delta S_m(s, h) = \big[(C - p') - (C - p)\big] \cdot mcc^*(s, h; p)$

$\rightarrow$ behavioural: $\Delta S_b(s, h) = (C - p') \cdot \big[mcc^*(s, h; p') - mcc^*(s, h; p)\big]$

Fiscal calculations I

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Government expenses for subsidies for given (s, h):

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$\rightarrow$ behavioural: $\Delta S_b(s, h) = (C - p') \cdot \big[mcc^*(s, h; p') - mcc^*(s, h; p)\big]$

Government revenues for given (s, h):

$$\Delta T(s, h; p, p') = T\big(y^{gross}(s, h; p')\big) - T\big(y^{gross}(s, h; p)\big)$$
$$= T\big(40 \cdot \big(w^M + lm^*(s, h; p') \cdot w^W\big)\big) - T\big(40 \cdot \big(w^M + lm^*(s, h; p) \cdot w^W\big)\big)$$

back

Fiscal calculations II

Population-wide self-financing degree in the *impact period*:

- Government revenues through taxes:

$$T_{imp} = \sum_{n=1}^{N} \sum_{h \in \boldsymbol{H}} \Delta T(s_n, h; p, p') \; l_2(h|x_n) \; l_3(s_n, x_n)$$

- Government expenses through subsidies:

$$S_{imp} = \sum_{n=1}^{N} \sum_{h \in \boldsymbol{H}} \Delta S(s_n, h; p, p') \; l_2(h|x_n) \; l_3(s_n, x_n)$$

$\Rightarrow$ Self-financing degree in the impact period

$$SFD_{imp} = \frac{T_{imp}}{S_{imp}}$$

▸ back

Fiscal calculations III

Population-wide self-financing degree over all periods:

- Government revenues through taxes:

$$T_{rem} = \sum_{n=1}^{N} \sum_{h \in \boldsymbol{H}} \sum_{t=imp}^{T(n)} \left(\frac{1}{1+r}\right)^{t-imp} \Delta T(s_{t,n}, h; p, p')\ l_2(h|x_n)\ l_{t,3}(s_{t,n}, x_n)$$

- Government expenses through subsidies:

$$S_{rem} = \sum_{n=1}^{N} \sum_{h \in \boldsymbol{H}} \sum_{t=imp}^{T(n)} \left(\frac{1}{1+r}\right)^{t-imp} \Delta S(s_{t,n}, h; p, p')\ l_2(h|x_n)\ l_{t,3}(s_{t,n}, x_n)$$

  where r corresponds to 1% per year.

$\Rightarrow$ **Self-financing degree over all periods**

$$SFD_{rem} = \frac{T_{rem}}{S_{rem}}$$

back

Policy evaluation II: Increasing childcare subsidies

Self-financing degree of increase in childcare subsidy by 50€/month

		female hourly wage		
	total	$\leqslant$ 15€	20€	$\geqslant$ 25€
(i) *untargeted +50 EUR*				
Impact period	4.1%	3.4%	5.4%	4.3%
All periods	5.9%	5.3%	7.1%	6.2%

Policy evaluation II: Increasing childcare subsidies

Self-financing degree of increase in childcare subsidy by 50€/month

		female hourly wage		
	total	⩽ 15€	20€	⩾ 25€
(i) *untargeted +50 EUR*				
Impact period	4.1%	3.4%	5.4%	4.3%
All periods	5.9%	5.3%	7.1%	6.2%
(ii) *work contingent +50 EUR*				
Impact period	8.7%	7.4%	11.9%	8.0%
All periods	12.4%	11.0%	15.4%	11.6%

Policy evaluation II: Increasing childcare subsidies

Self-financing degree of increase in childcare subsidy by 50€/month

		female hourly wage		
	total	⩽ 15€	20€	⩾ 25€
(i) *untargeted +50 EUR*				
Impact period	4.1%	3.4%	5.4%	4.3%
All periods	5.9%	5.3%	7.1%	6.2%
(ii) *work contingent +50 EUR*				
Impact period	8.7%	7.4%	11.9%	8.0%
All periods	12.4%	11.0%	15.4%	11.6%
(ii) *full-time contingent +50 EUR*				
Impact period	33.5%	29.6%	40.4%	33.6%
All periods	50.1%	48.3%	54.0%	47.2%

→ targeting creates work incentives ⇒ higher tax returns

→ targeting reduces share of inframarginal mothers ⇒ lower costs of subsidy

Approach: Okun's leaky bucket

back

1. increase taxes for above-median income households by 1% and reduce them for below-median households by τ, choosing τ to keep the budget balanced after behavioral adjustments
2. *excess burden* $= 1 - \frac{\textit{net income increase for below-median HH}}{\textit{net income decrease for above-median HH}}$, holding labour supply and domestic childcare choices fixed (as the indirect effects from the behavioral changes are second order [*envelope theorem*])

$\Rightarrow$ measure for the governments preference to redistribute from above- to below-median income households