Fertility and Family Labor Supply

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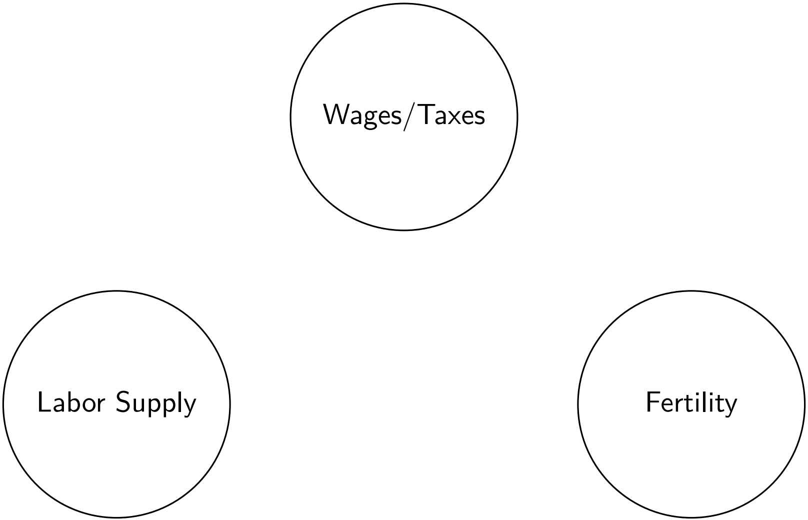
Motivation:

- Understanding labor supply is key for policy design.



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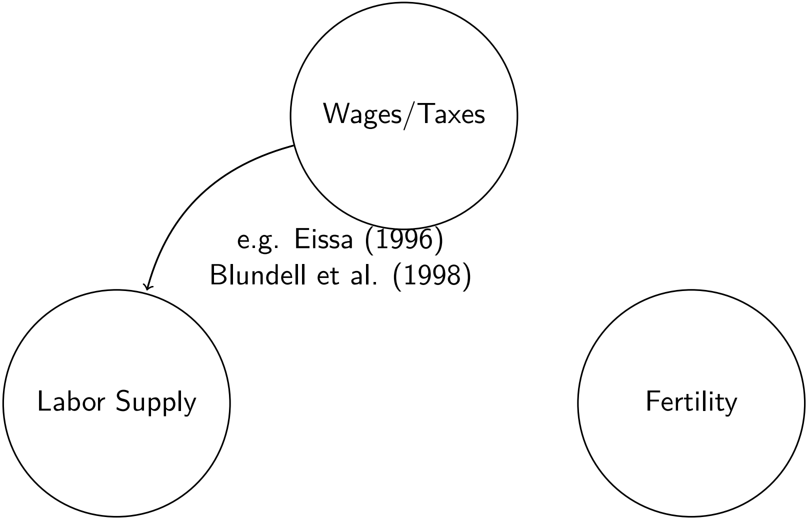

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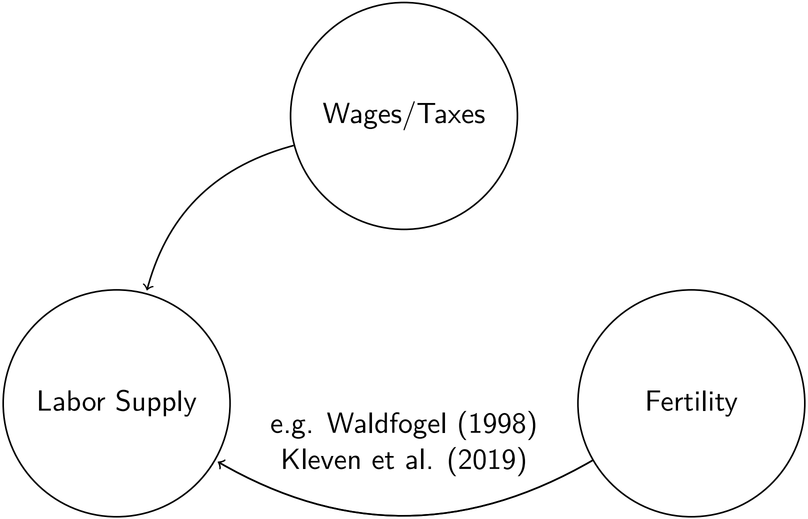

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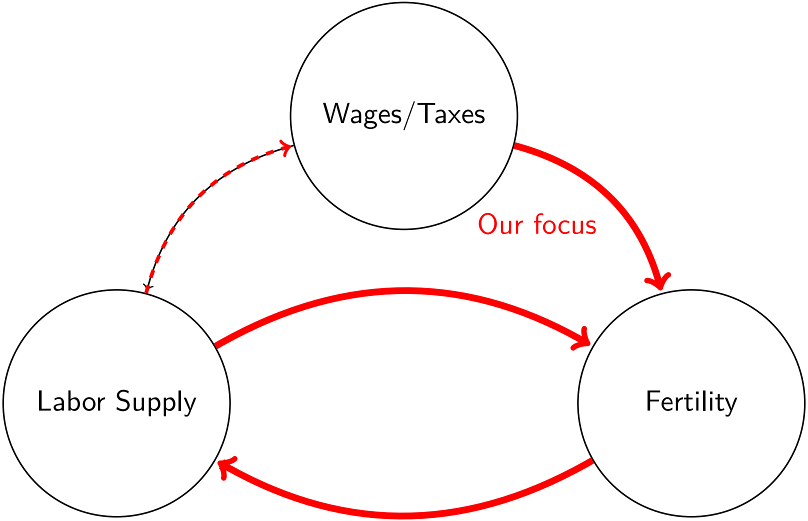

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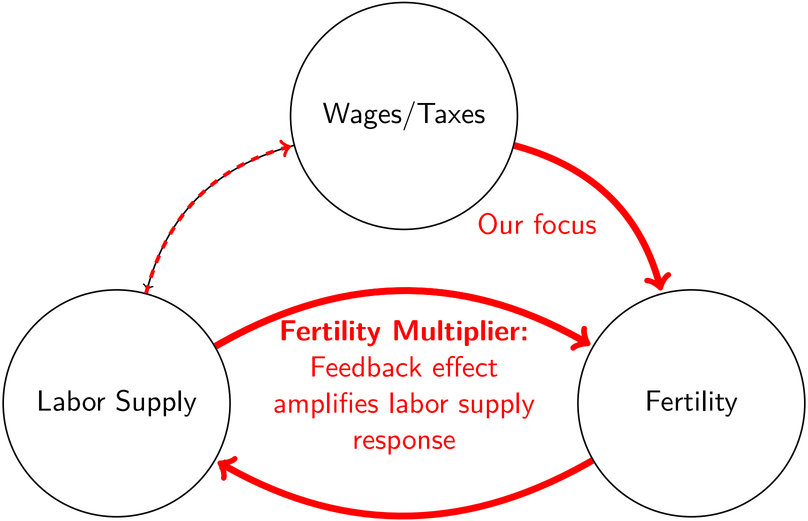

Contribution and Results

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    - labor supply and human capital accumulation of both household members
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   - marginal net-of-tax wage of **men** $\uparrow \implies$ fertility $\uparrow$
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   - labor supply and human capital accumulation of both household members
   - Fertility (endogenous number and timing)
   - Wealth accumulation
   - Replicates empirical findings above
   - Fertility and human capital depreciation can exacerbate long run gender inequality
   - $>$10% higher Marshallian labor supply elasticity of women when fertility can respond

Related Literature

- **Fertility responses to financial incentives:**
  - **Child subsidies and tax reliefs** (see e.g. Rosenzweig, 1999; Milligan, 2005; Brewer, Ratcliffe and Smith, 2012; Cohen, Dehejia and Romanov, 2013; Laroque and Salanié, 2014)
  - **Child care costs** (Blau and Robins, 1989; Del Boca, 2002; Mörk, Sjögren and Svaleryd, 2013)
  - **Wealth** (housing) (Lovenheim and Mumford, 2013; Dettling and Kearney, 2014; Mizutani, 2015; Atalay, Li and Whelan, 2017; Clark and Ferrer, 2019; Daysal, Lovenheim, Siersbæk and Wasser, 2021).
- **Female labor supply and fertility:** Hotz and Miller (1988); Francesconi (2002); Keane and Wolpin (2010); Adda, Dustmann and Stevens (2017); Eckstein, Keane and Lifshitz (2019)
- **Long-run labor supply elasticities:** see e.g. Attanasio, Levell, Low and Sánchez-Marcos (2018) and Keane (2011, forthcoming)
- **Gender gaps and child penalties:** Goldin (2014), Goldin and Katz (2002a), Kleven et al. (2019).

Outline

1. Empirical Motivation
   - Data
   - Identification Strategy
   - Results

2. Life-Cycle Model
   - Model framework
   - Estimation
   - Simulations
   - Quantifying the Importance of Fertility

Data and Sample Selection

- **Use several Danish registers for 2004–2018**
  - Linking household members (married and cohabitating) details
  - Information on income, fertility, wealth etc.
  - Monthly pay-slip information (BFL, from 2010)
    - Aggregate to annual freq.
    - Center around calendar year or childbirth

- **Common sample selection:**
  - Aged 25–60
  - Has a partner (of opposite sex)
  - Discard people who are mainly
    self-employed, student, retired or on disability insurance

- **Two samples:**
  1. tax sample (women aged 25–40)
  2. estimation sample (2010–2018, max. 5 years age difference)
     Split by educational attainment of woman

Identification Strategy: Tax Variation

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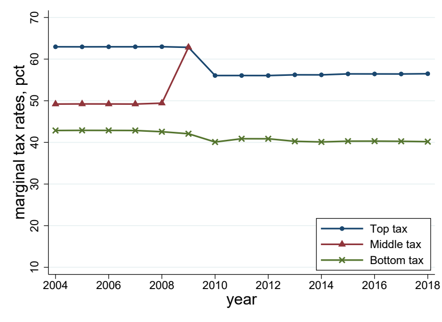
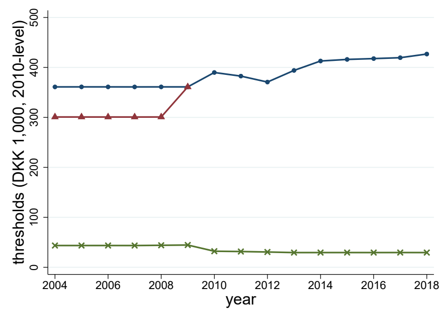
Figure: Danish Tax Variation, 2004–2018 (avg.).



(a) Marginal tax rates.



(b) Thresholds.

Notes: This Figure illustrates the main tax variation in the tax thresholds and marginal tax rates from 2004 through 2018 (averages). Source: Jakobsen and Søgaard (2019).

Identification Strategy: Household Regressions

- Estimate equations of the form (ETI, Gruber and Saez, 2002)

$$\Delta_4 N_{i,t} = \eta_w \Delta_4 \log(1-\tau_{i,t}) + \eta_m \Delta_4 \log(1-\tau_{partner(i,t)}) + \beta X_{i,t} + g(z_{i,t}) + \varepsilon_{i,t}$$

  where
  - $N_{i,t}$: number of children of woman i at time t
  - $\Delta_4 x_{i,t}$: four-year forward differences
  - $\tau_{i,t}$: marginal tax rate
  - $X_{i,t}$: year- and age dummies and human capital
  - $g(z_{i,t})$ detailed income controls for both partners

- η_w: Elasticity w.r.t **women's** marginal net-of-tax wage
- η_m: Elasticity w.r.t **men's** marginal net-of-tax wage

Identification Strategy: 2SLS

- **Endogenous** marginal tax rates
- **Instrument** $\Delta_4 \log(1 - \tau_{i,t})$ and $\Delta_4 \log(1 - \tau_{partner(i,t)})$ with 4-year *mechanical* net-of-tax wage changes of each partner

$$\log(1 - \tau_{i,t}^{t+4}) - \log(1 - \tau_{i,t})$$
$$\log(1 - \tau_{partner(i,t)}^{t+4}) - \log(1 - \tau_{partner(i,t)})$$

details

2SLS Estimation Results

	all	less skilled	high skilled
	(1)	(2)	(3)
$\Delta_4 \log(1-\tau_{i,t})$, women	-0.018*	-0.047***	-0.015
	(0.010)	(0.014)	(0.013)
$\Delta_4 \log(1-\tau_{i,t})$, men	0.010	0.038***	-0.020
	(0.009)	(0.012)	(0.013)
Income dummies	Yes	Yes	Yes
Children dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Age dummies	Yes	Yes	Yes
Hum. cap. controls	Yes	Yes	Yes
Male partner controls	Yes	Yes	Yes
Avg. dep. var. (y, level)	1.522	1.664	1.372
Obs.	2,531,181	1,299,908	1,231,273
First stage F-stat.	47,359.7	17,621.2	28,805.6

- Elasticities (less skilled):
  $-0.047/1.664 = -0.028$ wrt. wages of women
  $0.038/1.664 = 0.023$ wrt. wages of men

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Model Overview

- Households maximize the expected discounted sum of future utility

- Choose
  - C_t: Consumption
  - $l_{w,t}$: Labor supply, woman
  - $l_{m,t}$: Labor supply, mam
  - e_t : Fertility effort

- Given states
  - $K_{w,t}$: Human capital, woman
  - $K_{m,t}$: Human capital, mam
  - A_{t-1}: Wealth (no net-borrowing)
  - n_t: Number of children
  - o_t : Age of youngest child
  - f_t: Infertility state
  - e: Educational attainment of woman

Labor Supply

- Endogenous labor supply of men and women, $j \in \{m, w\}$:
  - Not working, $l_{j,t} = 0$
  - Part time, $l_{j,t} = 0.75$
  - Full time, $l_{j,t} = 1$

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- Human capital accumulation

$$K_{j,t+1} = [(1-\delta)K_{j,t} + l_{j,t}]\epsilon_{j,t+1}$$

where $\epsilon_{j,t+1}$ is an *iid* log-normal mean-one shock.

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where $\epsilon_{j,t+1}$ is an *iid* log-normal mean-one shock.

- Labor income is

$$Y_{j,t} = w_{j,t} l_{j,t}$$

where wages are

$$\log w_{j,t} = \gamma_{j,0} + \gamma_{j,1} K_{j,t}$$

details

Fertility

- If fertile, $f_t = 1$ (with probability $p_f(t)$)
  - Couples chose **fertility effort**, $e_t \in \{0, 1\}$ each period
  - Imperfect fertility control

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- If fertile, $f_t = 1$ (with probability $p_f(t)$)
  - Couples chose **fertility effort**, $e_t \in \{0, 1\}$ each period
  - Imperfect fertility control
  - Childbirth next period with probability

$$\wp_t(e_t) = \begin{cases} \overline{\wp}_t & \text{if } e_t = 1 \\ \overline{\wp}_t \underline{\wp} & \text{if } e_t = 0 \end{cases}$$

$\overline{\wp}_t < 1$: biological fecundity (declining in age) details
$\underline{\wp} > 0$: unintended pregnancies

- The age of the youngest, o_t, evolves deterministically details
- Children move out stochastically details

Preferences

- Household preferences are

$$U(C_t, n_t, o_t, l_{w,t}, l_{m,t}, e_t) = \lambda u_w(\cdot) + (1-\lambda) u_m(\cdot)$$

- Individual preferences are

$$\begin{aligned} u_j(C_t, n_t, o_t, l_{j,t}, e_t) = & \frac{(C_t/\nu(n_t))^{1-\rho}}{1-\rho} \\ & + \sum_{i=1}^{3} \omega_i \mathbf{1}(n_t \geq i) \\ & + \sum_{i=0}^{2} \eta_i e_t \mathbf{1}(o_t = i) \\ & + g_j(l_{j,t}, age_{j,t}) \\ & + q_j(l_{w,t}, l_{m,t}, n_t, o_t) \mathbf{1}(n_t > 0) \end{aligned}$$

- **Flexible interaction between labor supply and children** in $q_j()$.

details

Institutional environment

- Partnership dissolution is random and absorbing details
- Retirement is exogenous and absorbing
- Involuntary unemployment risk each year

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- Partnership dissolution is random and absorbing details
- Retirement is exogenous and absorbing
- Involuntary unemployment risk each year
- Parsimonious versions of the Danish institutions (2010 rules)
  - Labor income tax system
  - Unemployment transfers [fixed amount in model]
  - Parental leave details
  - Child care costs
  - Child benefits details

Estimation: Two steps

1. **Calibrate** a set of parameters, $\boldsymbol{\phi}$.
   E.g. $\lambda = 0.5$.
   - Investigate the **sensitivity** to calibrated parameters (Jørgensen, 2023) details

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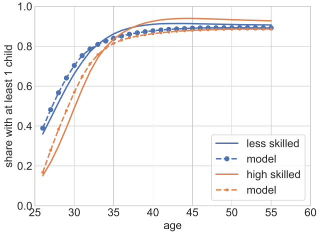
1. **Calibrate** a set of parameters, $\boldsymbol{\phi}$.
   E.g. $\lambda = 0.5$.
   - Investigate the **sensitivity** to calibrated parameters (Jørgensen, 2023) details

2. **Estimate** the remaining 2×45 parameters, $\boldsymbol{\theta}$.
   E.g. value of children, $\omega_1, \omega_2, \omega_3$ and dis-utility of work, $q(\cdot)$
   - **Simulated Method of Moments**

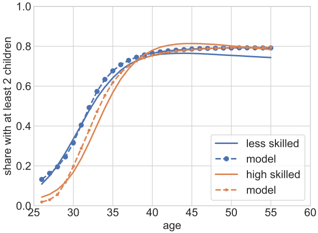
$$\hat{\boldsymbol{\theta}} = \arg\min_{\boldsymbol{\theta}} g(\boldsymbol{\theta}|\boldsymbol{\phi})' W g(\boldsymbol{\theta}|\boldsymbol{\phi})$$

   - Using estimation sample from 2010 (post-reform)
   - Investigate the "**informativeness**" of estimation moments (Honoré, Jørgensen and de Paula, 2020) details

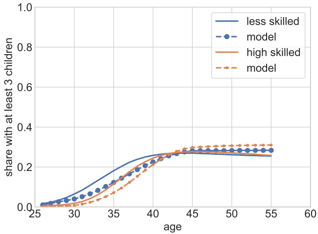
Moments and Model Fit: Fertility

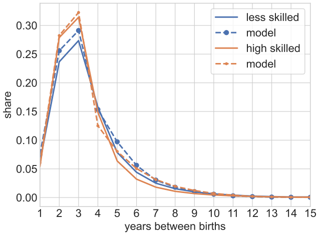


(a) Share with at least one child.

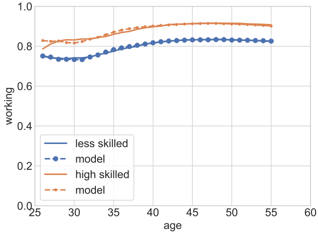


(b) Share with at least two children.

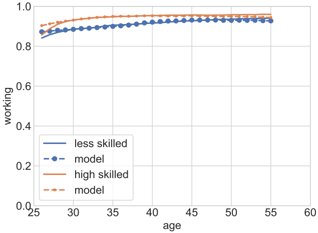




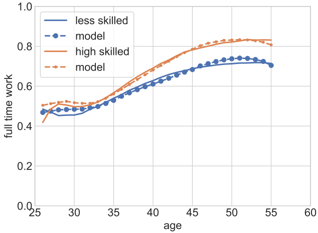
Moments and Model Fit: Selected age profiles



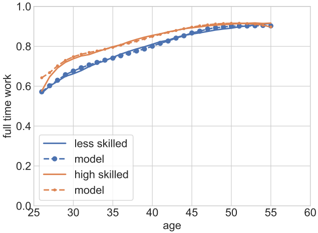
(a) Share Working, Women.



(b) Share Working, Men.

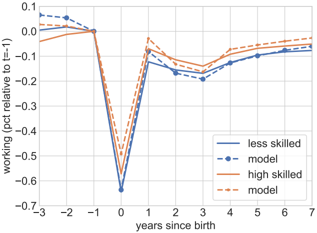


(c) Full time when working,

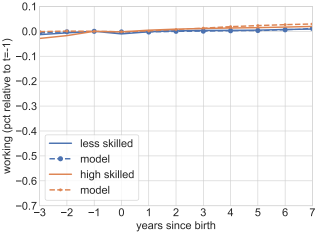


(d) Full time when working, Men.

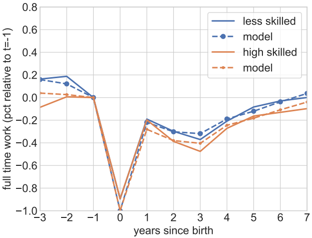
Moments and Model Fit: 1. Child Arrival



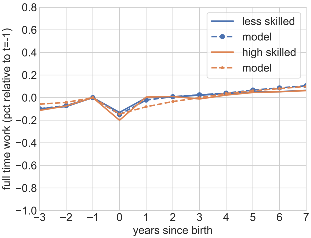
(a) Share Working, Women.



(b) Share Working, Men.



(c) Full time, Women.



(d) Full time, Men.

Simulations: Wage Elasticities (Validation)

	Less skilled		High skilled	
	data	model	data	model
Women's wages	-0.028 [-0.045,-0.012]	-0.031	-0.011 [-0.030, 0.008]	-0.047
Men's wages	0.023 [0.009, 0.037]	0.008	-0.015 [-0.033, 0.004]	0.006

- **Data:** Based on reduced-form regressions
- **Model:** 5% unanticipated permanent wage increase at age 35, measured 4 periods later

Model-Implications

1. How much do fertility responses amplify labor supply responses?
2. What are the family-related policy responses in our framework?
3. What are the long run implications of fertility and human capital accumulation for gender inequality?

1. Quantifying the Importance of Fertility for Labor Supply

- How important are **fertility adjustments for labor supply responses**?

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- How important are **fertility adjustments for labor supply responses**?

- We quantify this through counterfactual simulations
  - How different are labor supply elasticities **if fertility cannot adjust**?

1. Quantifying the Importance of Fertility for Labor Supply

We simulate effect of wage increase from 2 models:

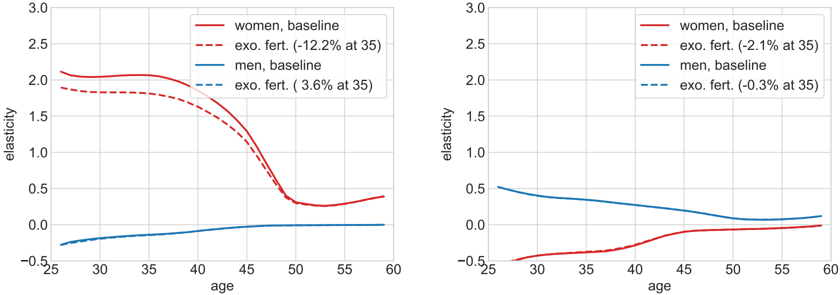
1. **baseline model**, with endogenous fertility

2. **exogenous fertility**, where couples cannot choose fertility
   - **Expect children to arrive *probabilistically***
     based on realized fertility from the baseline model details

- **5% permanent (unanticipated) increase in wage rate**
  - life-cycle Marshallian elasticity

1. Quantifying the Importance of Fertility for Labor Supply

Figure: Quantifying the Role of Fertility Responses. Less Skilled.



(a) Increased wage of women. (b) Increased wage of men.

- **Women:** Wages $\uparrow \implies$ Fertility $\downarrow \implies$ labor supply responsiveness $\uparrow$
  >10% larger long-run Marshall elasticity when fertility can adjust
- **Men:** No difference...

2. Counterfactual Policy Simulations

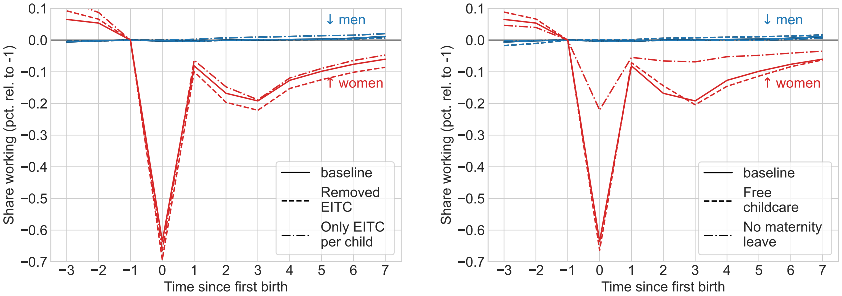
We evaluate several policies:

1. Removal of the EITC
2. Max EITC = baseline*number of children
3. Free childcare (remove $\approx$ 25% co-payment)
4. No maternity leave

$\rightarrow$ **Clear trade-off** between labor supply (of women) and fertility.

2. Counterfactual Policy Simulations (less skilled)

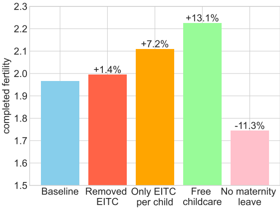
Figure: Event Studies: EITC and Child-Related Policies. Less Skilled.



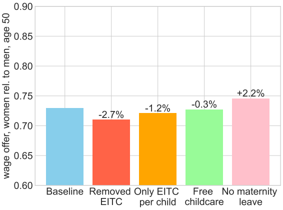
(a) EITC. (b) Child-related.

- **Short run:** large effects of removing maternity leave

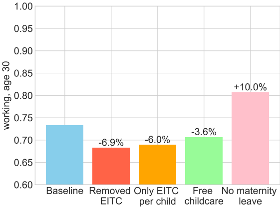
2. Counterfactual Policy Simulations (less skilled)



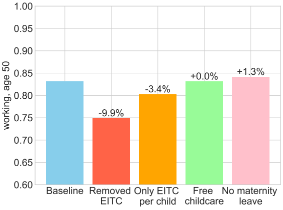
(c) Completed fertility.



(d) Offer wage gap, age 50.



(e) Share working, age 30.



(f) Share working, age 50.

- **Long run:** Only minor effects on the offer wage gap at age 50

3. Gender Inequality: Mechanisms

What are the long run implications of fertility and human capital accumulation for gender inequality?

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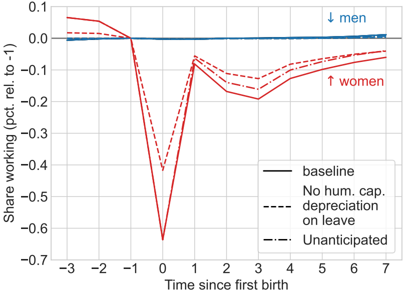
What are the long run implications of fertility and human capital accumulation for gender inequality?

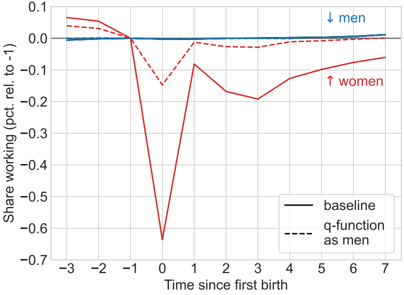
- Investigate these mechanisms through alternative models:

    1. No human capital depreciation when on maternity leave ($\delta = 0$ for women when $o_t = 0$)
    2. No human capital depreciation when on maternity leave but unanticipated
    3. Remove estimated gender differences in the the dis-utility from work when children are present (q-function for women set to that of men).

3. Gender Inequality: Mechanisms (less skilled)



(g) Human capital.



(h) Dis-utility from work.

- **Short run:** Significant short run effect from dis-utility differences

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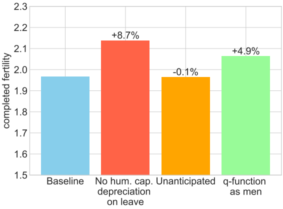

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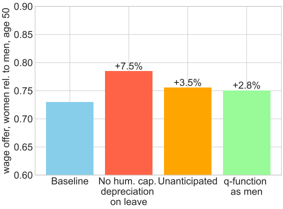

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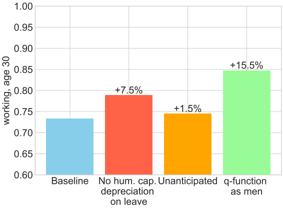

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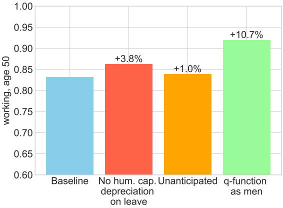

(l) Share working, age 50.

- **Long run:** Substantial effect from human capital depreciation

Conclusions

- **Fertility reacts to financial incentives**
  - Asymmetric response to wages of women and men

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- **Fertility reacts to financial incentives**
  - Asymmetric response to wages of women and men
- **Labor Supply Responses**
  - Family labor supply important
  - Labor supply for women responds more to wage changes when fertility can also adjust: $>10\%$ higher
- **Welfare reforms** have permanent effects through fertility even if wage shocks are transitory
  - "Fertility Multiplier"
- **Human capital depreciation** while on leave
  seems important for long run gender inequality

Conclusions

- **Fertility reacts to financial incentives**
  - Asymmetric response to wages of women and men
- **Labor Supply Responses**
  - Family labor supply important
  - Labor supply for women responds more to wage changes when fertility can also adjust: $>10\%$ higher
- **Welfare reforms** have permanent effects through fertility even if wage shocks are transitory
  - "Fertility Multiplier"
- **Human capital depreciation** while on leave seems important for long run gender inequality
- **Our future research:** Take the household even more seriously
  - Limited commitment (Mazzocco, 2007)
  - Likely important for asymmetric fertility effects between women and men

Extra Slides

Definition of partnership

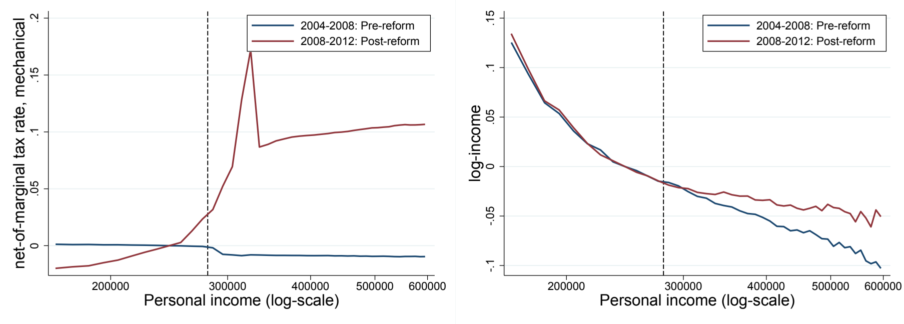
- Official definition of Statistics Denmark.
  https://www.dst.dk/da/Statistik/dokumentation/Times/cpr-oplysninger/familier-og-husstande/familie-type

- Either
  1. Legally married
  2. Living with a person with shared custody over a child
     (share legal address)
  3. Living with one other person of opposite sex with an age difference less than 15.
     (share legal address and both at least 16 years old)

back

Details on Instrument

Figure: Verification: 4-year differences across the income distribution.



(a) Mechanical tax change. (b) Log income.

Notes: This figure illustrates the tax variation and the plausibility of the variation in generating exogeneous variation.

back

First-stage Results, $\Delta_4 \log(1 - \tau_{i,t})$, Women

	(1)	(2)	(3)
$\Delta_4 \tau^m_{i,t}$, women	0.428***	0.426***	0.426***
	(0.002)	(0.002)	(0.002)
$\Delta_4 \log(y^m_{i,t})$, women	0.010***	0.010***	0.010***
	(0.000)	(0.000)	(0.000)
$\Delta_4 \tau^m_{i,t}$, men	0.019***	0.019***	0.019***
	(0.001)	(0.001)	(0.001)
$\Delta_4 \log(y^m_{i,t})$, men	0.028***	0.027***	0.027***
	(0.001)	(0.001)	(0.001)
Income dummies	Yes	Yes	Yes
Children dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Age dummies	Yes	Yes	Yes
Hum. cap. controls	No	Yes	Yes
Male partner controls	No	No	Yes
Avg. dep. var. (y, level)			
Obs.	2531181	2531181	2531181
First stage F-stat.			

2SLS Results by Income back

	income $\in$ $[50, 350]$ (1)	income $\in$ $(350, 600]$ (2)	less skilled (3)	high skilled (4)
$\Delta_4 \log(1 - \tau_{i,t})$, women	-0.030***	-0.048	-0.048***	-0.019
	(0.010)	(0.038)	(0.015)	(0.013)
$\Delta_4 \log(y_{i,t})$, women	0.005*	0.009	0.002	0.003
	(0.003)	(0.016)	(0.003)	(0.004)
$\Delta_4 \log(1 - \tau_{i,t})$, men	0.007	0.004	0.038***	-0.026*
	(0.010)	(0.027)	(0.012)	(0.014)
$\Delta_4 \log(y_{i,t})$, men	0.048***	0.040***	0.000	0.025**
	(0.016)	(0.010)	(0.013)	(0.011)
Income dummies	Yes	Yes	Yes	Yes
Children dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Age dummies	Yes	Yes	Yes	Yes
Hum. cap. controls	Yes	Yes	Yes	Yes
Male partner controls	Yes	Yes	Yes	Yes
Avg. dep. var. (y, level)	1.526	1.496	1.664	1.372
Obs.	2205258	325923	1299908	1231273
First stage F-stat.	19869.3	1996.9	11197.1	15910.2

back

2SLS Results: Labor Supply

back

	Women (1)	Men (2)
$\Delta_4 \log(1-\tau_{i,t})$, women	0.213***	0.111***
	(0.015)	(0.013)
$\Delta_4 \log(y_{i,t})$, women	-0.016***	0.003
	(0.005)	(0.003)
$\Delta_4 \log(1-\tau_{i,t})$, men	-0.004	0.200***
	(0.015)	(0.014)
$\Delta_4 \log(y_{i,t})$, men	0.006	-0.019
	(0.011)	(0.016)
Income dummies	Yes	Yes
Children dummies	Yes	Yes
Year dummies	Yes	Yes
Age dummies	Yes	Yes
Hum. cap. controls	Yes	Yes
Male partner controls	Yes	Yes
Avg. dep. var. (y, level)	5.454	5.728
Obs.	2316021	2396584

Details on Part Time back

- The part time value of $l_{PT} = 0.75$ is motivated by
  - Statistics Denmark's definition of part time in work experience statistics
  - Close to typical hours in Denmark
    - ★ A normal full-time week is 37 hours in Denmark
    - ★ part time is typically 30 or 32 hours per week ($81\% - 87\%$ of the full-time hours)
- The value affects the human capital accumulation process and the wage/income process
- Utility function is independent of the exact value
- Results are not overly sensitive to this choice.

Details on the Age of Youngest back

- The age of the youngest child aged 0–6, o_t, evolves as

$$o_{t+1} = \begin{cases} 0 & \text{if } b_{t+1} = 1 \\ o_t + 1 & \text{if } b_{t+1} = 0 \text{ and } o_{t+1} \in \{0, 1, 2, 3, 4, 5\} \\ o_t & \text{if } b_{t+1} = 0 \text{ and } o_t \in \{6+\} \\ NC & \text{if } b_{t+1} = 0 \text{ and } o_t \in \{NC\}. \end{cases} \tag{1}$$

Details on the Fertility Process back

- The number of children evolves as

$$n_{t+1} = n_t + b_{t+1}(e_t) - x_{t+1} \tag{2}$$

where x_{t+1} refers to a child moving out, as is given by

$$x_{t+1} = \begin{cases} 1 & \text{with probability } q_t(n_t, o_t) \\ 0 & \text{with probability } 1 - q_t(n_t, o_t) \end{cases} \tag{3}$$

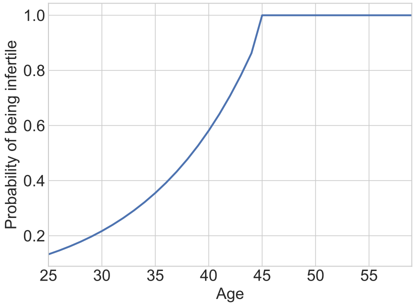
- Children can move out once the fertile period ends at T_f
- x_{t+1} is a realization of a Binomial distribution with

$$q_t(n_t, o_t) = \begin{cases} P_{bin}(1, p_x | n_t - o_t) & \text{if } n_t > 0,\ t > T_f \text{ and } o_t \in \{6+\} \\ 0 & \text{else} \end{cases}$$

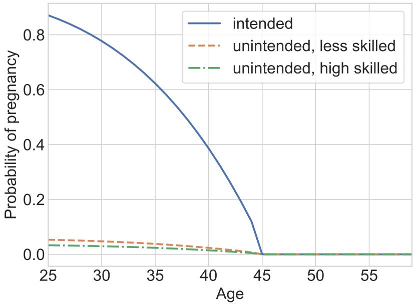
where

$$P_{bin}(1, p_x | n) = \frac{n!}{(n-1)!} p_x (1 - p_x)^{n-1}$$

Details on Fertility and Partnership Dissolution back



(c) Infertility Probability.



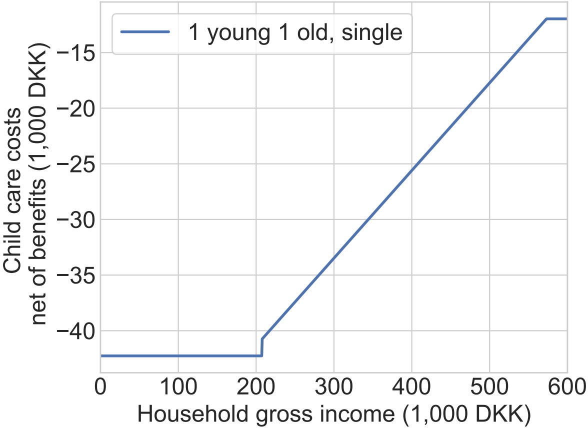
(d) Biological Fecundity, $\overline{\wp}_t$.

Figure: Biological Fecundity.

Notes: Figure 5 shows in panel (a) the probability of permanent infertility, $p_f(t)$, based on Sommer (2016). Panel (b) shows the probability of a pregnancy conditional on being fertile. The intended pregnancies are calibrated following the biological fecundity in Leridon (2004) and the likelihood of unintended pregnancies are based on Ejrnæs and Jørgensen (2020).

Details on Child Costs and Transfers back

Figure: Costs net of Benefits, $\mathcal{C}(n_t, o_t, Y_t, s_t)$.



Details on Parental Leave back

- Women take all parental leave in year of childbirth
- Income in the year of birth is

$$\tilde{Y}_{w,t}|_{b_t=1} = \begin{cases} \overline{w}_t \cdot \pi + \underline{w}_t \cdot (1-\pi) & \text{if } l_{w,t} = 0 \\ \overline{w}_t \cdot \pi + \tilde{w}_t \cdot (1-\pi) & \text{if } l_{w,t} = l_{PT} \\ \tilde{w}_t & \text{if } l_{w,t} = 1 \end{cases} \tag{4}$$

where $\tilde{w}_t$ is the wage-level associated with full-time work and

$$\overline{w}_t = \overline{\tau}\tilde{w}_t$$
$$\underline{w}_t = \underline{\tau}\tilde{w}_t$$

is the level of parental leave benefits in a period with high replacement rate, $\overline{\tau}$, and low replacement rate $\underline{\tau}$, respectively.

- We set $\pi = 25/52$, $\overline{\tau} = 1$ and estimate $\underline{\tau}$.

Details on Preferences back

- Dis-utility of work is linked to fertility through

$$q_j(\bullet) = \begin{cases} \tilde{\alpha}_{PT,child,j} + \tilde{\alpha}_{PT,more,j}(n_t - 1) + \tilde{\alpha}_{PT,young,j}\mathbf{1}(o_t \leq 3) + \tilde{\alpha}_{PT,work}\mathbf{1}(l_{-j,t} > 0) & \text{if } l_j \\ \tilde{\alpha}_{FT,child,j} + \tilde{\alpha}_{FT,more,j}(n_t - 1) + \tilde{\alpha}_{FT,young,j}\mathbf{1}(o_t o_t \leq 3) + \tilde{\alpha}_{FT,work}\mathbf{1}(l_{-j,t} > 0) & \text{if } l_j \end{cases}$$

where $l_{j,t} = 0$ is the reference alternative.

- The baseline dis-utility of work also varies with age,

$$g_j(\bullet) = \begin{cases} \mu_{PT,j} + \tilde{\mu}_{PT,age,j}(age_{j,t} - 25) & \text{if } l_{j,t} > 0 \\ \mu_{FT,j} + \tilde{\mu}_{FT,age,j}(age_{j,t} - 25) + \tilde{\mu}_{FT,age2,j}(age_{j,t} - 25)^2 & \text{if } l_{j,t} = 1 \end{cases}$$

Parameter Estimates back

Parameter		Less skilled estimate	Less skilled se	High skilled estimate	High skilled se
Utility from children					
ω_1	Value of having at least one child	8.691	(0.012)	-4.794	(0.006)
$\omega_{1,age}$	Value of having at least one child, age.	0.343	(0.001)	1.018	(0.001)
ω_2	Value of having at least two children	12.478	(0.009)	14.684	(0.008)
ω_3	Value of having at least three children	6.054	(0.028)	4.708	(0.032)
η_0	Value of fertility effort when 1st child aged 0	-0.292	(0.006)	-0.363	(0.002)
η_1	Value of fertility effort when 1st child aged 1	-0.034	(0.001)	0.001	(0.001)
η_2	Value of fertility effort when 1st child aged 2	0.025	(0.000)	0.100	(0.001)
Utility from market work, $g_w(\bullet)$ and $g_m(\bullet)$. Relative to not working.					
$\mu_{PT,w}$	Value of working, women	-0.229	(0.001)	-0.447	(0.001)
$\mu_{PT,age,w}$	Value of working wrt. age, women	-1.885	(0.004)	-1.840	(0.004)
$\mu_{FT,w}$	Additional value of full time work, women	-0.320	(0.000)	-0.376	(0.000)
$\mu_{FT,age^2,w}$	Additional value of full time work wrt. age squared, women	-0.680	(0.002)	-0.891	(0.001)
$\mu_{FT,age,w}$	Additional value of full time work wrt. age, women	-0.038	(0.003)	-1.129	(0.004)
$\mu_{PT,m}$	Value of working, men	-0.390	(0.001)	-0.557	(0.001)
$\mu_{PT,age,m}$	Value of working wrt. age, men	-1.399	(0.003)	-2.035	(0.003)
$\mu_{FT,m}$	Additional value of full time work, men	-0.373	(0.000)	-0.429	(0.000)
$\mu_{FT,age,m}$	Additional value of full time work wrt. age squared, men	-0.693	(0.002)	-0.405	(0.001)
$\mu_{FT,age^2,m}$	Additional value of full time work wrt. age, men	-3.339	(0.012)	-3.404	(0.007)
Utility from market work with children, $q_w(\bullet)$ and $q_m(\bullet)$. Relative to not working.					
$\alpha_{PT,child,w}$	Value of working with children, women	14.739	(0.032)	-0.847	(0.014)
$\alpha_{PT,young,w}$	Value of working with young children, women	3.615	(0.038)	0.179	(0.014)
$\alpha_{PT,more,w}$	Value of working with more children, women	-1.352	(0.025)	7.301	(0.012)
$\alpha_{PT,birth,w}$	Value of working at birth, women	45.830	(0.150)	18.396	(0.056)
$\alpha_{FT,child,w}$	Additional value of full time work with children, women	-0.373	(0.011)	3.409	(0.012)
$\alpha_{FT,young,w}$	Additional value of full time work with young children, women	0.667	(0.016)	0.884	(0.009)
$\alpha_{FT,more,w}$	Additional value of full time work with more children, women	-0.065	(0.014)	0.038	(0.005)
$\alpha_{PT,child,m}$	Value of working with children, men	3.892	(0.013)	2.771	(0.011)
$\alpha_{PT,young,m}$	Value of working with young children, men	0.200	(0.065)	-0.020	(0.014)
$\alpha_{PT,more,m}$	Value of working with more children, men	0.068	(0.010)	0.035	(0.009)
$\alpha_{PT,birth,m}$	Value of working at birth, men	-0.418	(0.070)	-0.030	(0.034)
$\alpha_{FT,child,m}$	Additional value of full time work with children, men	4.165	(0.010)	5.724	(0.016)
$\alpha_{FT,young,m}$	Additional value of full time work with young children, men	-1.693	(0.016)	0.294	(0.009)
$\alpha_{FT,more,m}$	Additional value of full time work with more children, men	3.768	(0.016)	0.257	(0.006)
$\alpha_{FT,birth,m}$	Additional value of full time work at birth, men	-1.322	(0.039)	-0.341	(0.013)
$\alpha_{PT,work}$	Value of working with children. Partner working.	0.413	(0.006)	-0.471	(0.004)
$\alpha_{FT,work}$	Value of working full time with children. Partner working.	0.751	(0.007)	-0.069	(0.005)
Wage and human capital process					
$\gamma_{0,w}$	Wage: constant, women	0.562	(0.001)	0.862	(0.001)
$\gamma_{1,w}$	Wage: human capital, women	0.091	(0.000)	0.082	(0.000)
$\gamma_{0,m}$	Wage: constant, men	0.653	(0.001)	0.725	(0.001)
$\gamma_{1,m}$	Wage: human capital, men	0.100	(0.000)	0.110	(0.000)
σ_w	Human capital: shock variance (std), women	0.140	(0.000)	0.192	(0.000)
σ_m	Human capital: shock variance (std), men	0.171	(0.000)	0.180	(0.000)
κ_w	Human capital: initial factor, women	0.292	(0.003)	0.494	(0.003)

Informativeness of Estimation Moments

back

- Based on M_4 in Honoré, Jørgensen and de Paula (2020)
- The percentage change in the asymptotic variance of elements of $\hat{\boldsymbol{\theta}}$ from removing groups of moments in $g(\boldsymbol{\theta})$

$$I_k = \text{diag}(\tilde{\Sigma}_k - \Sigma)/\text{diag}(\Sigma) \cdot 100 \tag{5}$$

where

$$\begin{aligned} \tilde{\Sigma}_k &= (G'\tilde{W}_k G)^{-1} G'\tilde{W}_k S \tilde{W}_k G (G'\tilde{W}_k G)^{-1} \\ \tilde{W}_k &= W \odot (\iota_k \iota_k') \end{aligned}$$

and $\odot$ is element-wise multiplication and ι_k is a $J \times 1$ vector with ones in all elements except the kth *group* of moments being zeros.

1. Share working and the share working full time conditional on working, split by age and gender.
2. Average labor income when working, split by age and gender.
3. Share with at least 1, 2 or 3 children, split by age.
4. Distribution of years between first and second childbirths.
5. Share working and share working full time after first and second childbirth, split by gender.
6. Average wealth split by age.

Sensitivity: Change in the Marginal Dis-Utility of Work

back

- Based on the approximation (Jørgensen, 2023)

$$\frac{\partial \hat{\boldsymbol{\theta}}}{\partial \boldsymbol{\phi}'} \approx -(G'WG)^{-1}G'D$$

in which
$G = \frac{\partial g(\hat{\boldsymbol{\theta}}|\boldsymbol{\phi})}{\partial \hat{\boldsymbol{\theta}}'}$
$D = \frac{\partial g(\hat{\boldsymbol{\theta}}|\boldsymbol{\phi})}{\partial \boldsymbol{\phi}'}$

- We calculate

$$\begin{aligned}\frac{d\Delta_j(l,n)}{d\boldsymbol{\phi}'} &= \frac{\partial \Delta_j(l,n)}{\partial \boldsymbol{\theta}'}\frac{\partial \boldsymbol{\theta}}{\partial \boldsymbol{\phi}'} \\ &\approx -\frac{\partial \Delta_j(l,n)}{\partial \boldsymbol{\theta}'}(G'WG)^{-1}G'D\end{aligned}$$

and report elasticities

Simulation Details back

- Simulate 500,000 synthetic households from age 25 through 60
- Initialize all households as couples with zero net wealth and the empirical joint distribution of number of children, age of youngest and human capital.
- The effect at age t of a wage increase is

$$\Delta y_t = y_t - \tilde{y}_t$$

where $y_t = n_t^{-1} \sum_i y_{i,t}$ is the average simulated optimal outcome under the baseline estimated model and $\tilde{y}_t^{(s_1:s_2)} = n_t^{-1} \sum_i \tilde{y}_{i,t}^{(s_1:s_2)}$ is the average simulated optimal outcome under the counterfactual setting in which wages are scaled by μ percent in periods s_1 through s_2.

- Formally, wages in the alternative model are given as

$$\tilde{w}_{i,t}^{(s_1:s_2)} = \begin{cases} (1+\mu) w_{i,t} & \text{if } s_1 \leq t \leq s_2 \\ w_{i,t} & \text{else.} \end{cases}$$

Unless otherwise explicitly stated, we use a five percent increase, $\mu = 0.05$.

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