Gender of the first child and labour market outcomes in the UK

Sonia Bhalotra
University of Warwick, CEPR, IEA, IZA, IFS

Damian Clarke
University of Exeter, University of Chile, IZA

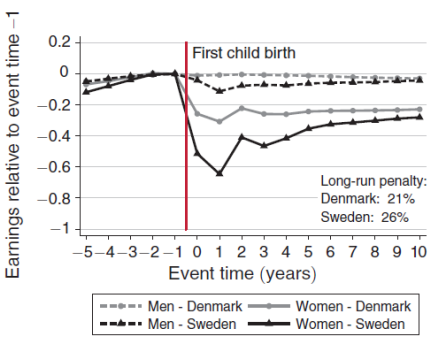
Dan Brown
Behavioural Insights Team, UK Government

Angelina Nazarova
Institute for Social and Economic Research, University of Essex, MiSoC, EEA, SIdE

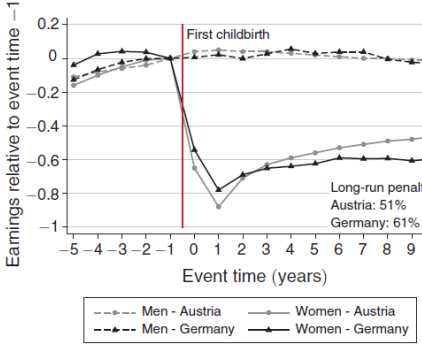
29 August 2023 EEA-ESEM Conference

Introduction

Recent evidence on child penalties in earnings



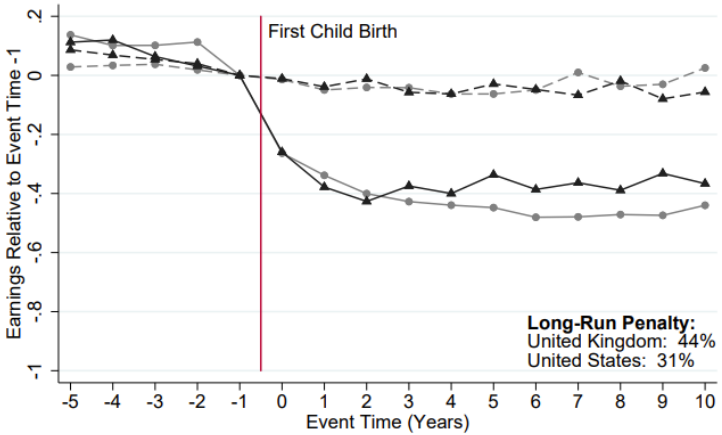
(a) Scandinavian countries



(b) German-speaking countries

Child Penalties across Countries: Evidence and Explanations, by Henrik Kleven, Camille Landais, Johanna Posch, Andreas Steinhauer, Josef Zweimüller, in AER-P&P, 2019

Recent evidence on child penalties in earnings: United Kingdom



The Importance of Child Penalties

- Childbirth has large and persistent effects on the labour market outcomes of women, but not on those of men (Kleven et al, 2009-2011)
- On average, men and women share the costs of parenthood unequally
- Mothers spend more time on non-market activities:
  - Child care (Guryan et al, 2008)
  - Other home production (Borra et al, 2021)
- Why is it important for the UK?
  - 48% of 18-24 old Brits say they definitely do want to have children one day (ONS, 2021)
  - Yet emotional & physical child care seldom shared evenly between men and women
  - UK gender pay gap progress slowed down as motherhood penalty persists (ONS, 2021)

Motivation

- We analyze whether the child penalty varies with the gender of the firstborn child
- This can illuminate the role of parental preferences in shaping the child penalty
- Revisit Kleven et al. event study research design for treatment effect estimation

How does a firstborn child's gender affect parental behaviour, and does child gender feed into parental gender gaps?

What we do

- Exploit high-quality panel structure of the UK Household Longitudinal Study (UKHLS)
- Focus on the recent time period 2009-2019

What do we know?

- Significant motherhood penalty across countries
  - Kleven et al, 2018, Artmann et al, 2021, Berniell et al, 2022
- The most talented women leave the labor market/uptake part-time jobs
- Motherhood serves as an information shock to women's beliefs
  - Fernandez-Kranz et al, 2013, Kuziemko et al, 2018, Berniell et al, 2021
- Preferences, gender norms, and discrimination are key
- High quality publicly provided child care is more effective than paternity leave
  - Andersen & Nix, 2020, Andersen & Nix, 2021

Main findings

- Labour market penalties for mothers of daughters relative to the fathers of daughters are **twice** as large as penalties for mothers of sons relative to the fathers of sons
  - Probability to be employed: firstborn son $\rightarrow$ 7% vs daughter $\rightarrow$ 21%
  - Real wage: firstborn son 10% vs daughter 27%
- Mothers of daughters are **more** involved with their kids
- Fathers of daughters are **less** involved in shared childcare responsibilities in the household
- Fathers of daughters are **less** likely to get married after the birth of a child
- Mothers of daughters tend to become **more** conservative, while fathers of daughters - **more** progressive
- Mothers of daughters spend 50% **more** time on household chores

UK: Data and Descriptives

Data

- UK Household Longitudinal Study - 2009-2019
- Sample $\rightarrow$ individuals aged 16-64 who have never had a biological child before the sample period begins
- Child gender is random conditional on the decision of having a child $\rightarrow$ firstborn
- Strongly balanced panel: 7048 parent x year excluding ethnic minorities
- We focus on labour market outcomes:
  - Employment
  - Total Working hours
  - Real wage
- Explore the following mechanisms:
  - Marriage and fertility
  - Parental involvement
  - Time spent on household chores and childcare responsibility
  - Progressiveness

Our sample is predominantly urban, UK born

	Fathers	Mothers	Total
Age	31.544	30.422	31.008
	(13.016)	(13.004)	(13.022)
Married	0.1881	0.209	0.198
	(0.3907)	(0.406)	(0.399)
Weekly Hours	23.40	22.311	22.868
	(21.66)	(20.061)	(20.904)
Employed	0.6427	0.651	0.647
	(0.4792)	(0.476)	(0.478)
Religious	0.445	0.492	0.467
	(0.497)	(0.499)	(0.499)
Urban	0.834	0.831	0.833
	(0.372)	(0.375)	(0.373)
Foreign Born	0.209	0.184	0.197
	(0.407)	(0.387)	(0.398)
Degree	0.281	0.313	0.296
	(0.449)	(0.464)	(0.457)
Observations	3,069	4,411	7,480

Notes. Fathers(mothers) are men(women) who became a parent during the observed period of 10 years.
90% of parents are living together with their partner.

Balance tests

	Fathers			Mothers		
	Daughter	Son	p-value (H0: Diff=0)	Daughter	Son	p-value (H0: Diff=0)
Age	29.42	29.44	0.959	27.04	27.01	0.938
Married	0.72	0.69	0.503	0.60	0.64	0.380
Weekly Hours	38.05	36.20	0.349	33.42	34.69	0.413
Employed	0.90	0.88	0.459	0.90	0.92	0.373
Religious	0.80	0.73	0.110	0.80	0.76	0.338
Urban	0.83	0.85	0.491	0.82	0.78	0.357
UK Born	0.83	0.87	0.241	0.80	0.85	0.110
Ethnic Minority	0.04	0.03	0.393	0.06	0.08	0.706
Degree	0.47	0.55	0.127	0.51	0.58	0.081*
Real Wages	2,621.79	2,717.78	0.603	2,008.51	1,995.80	0.917
Parent x Year	1490	1580	3070	2350	2060	4410

Notes. Characteristics are considered in the first wave of the dataset.

Empirical Strategy

Empirical strategy

- **First** we estimate Kleven et al event study style regression of:

$$Y_{ist}^{g} = \sum_{j \neq 1} \alpha_j^g \cdot \mathbb{1}[j = t] + \sum_k \beta_k^g \cdot \mathbb{1}[k = age_{is}] + \sum_j \gamma_y^g \cdot \mathbb{1}[y = s] + \delta_{is}^g \cdot \mathbb{1}[Degree_{is}] + \varepsilon_{ist}^g$$

  - for individual i in year s and event time (time to birth) t, stratified by gender g. Coefficients α capture time to birth effects, β capture age fixed effects, and γ capture year fixed effects. All coefficients are separately identified given variation in age at birth in each year. Also control for education before birth.
  - Individual i has his/her first child at time $t = 0$
  - Balanced sample of parents observed every year relative to $t = -1$, it runs from $t = -3$ to $t = +5$
  - Set of age dummies $\rightarrow$ underlying life cycle trends
  - Set of year dummies $\rightarrow$ time trends like wage inflation and business cycle

Empirical strategy

- **Second** we calculate approximate proportional changes in parental outcomes, e.g. real wage, owing to child birth as:

$$P_t^g \equiv \frac{\widehat{\alpha}_t^g}{E[\tilde{Y}_{ist}^g | t]}$$

where

$$\tilde{Y}_{ist}^g = \sum_k \widehat{\beta}_k^g \cdot \mathbb{1}[k = age_{is}] + \sum_y \widehat{\gamma}_y^g \cdot \mathbb{1}[y = s].$$

  - $\tilde{Y}_{ist}^g$ is the predicted salary for a woman of age k and calendar year y, omitting the contribution of time to birth dummies, and hence P_t^g is the event year t effect of children as a percentage of the counterfactual outcome absent children. The counterfactual is estimated off all other mothers from the data who at one point were aged k, and whose salary is also observed in calendar year y.
  - We also estimate child penalty for parents of boys and parents of girls separately

Empirical strategy

- **Third** we wish to examine whether labour market responses to girls and boys are different. Estimate:

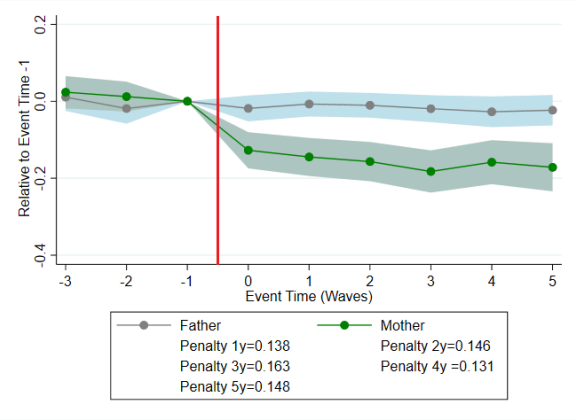
$$Y_{ist}^{g} = \sum_{j \neq 1} \alpha_j^g \cdot \mathbb{1}[j = t] \cdot \mathbb{1}[Girl_{is}^{g}] + \sum_{k} \beta_k^g \cdot \mathbb{1}[k = age_{is}] \cdot \mathbb{1}[Girl_{is}^{g}] +$$

$$+ \sum_{j} \gamma_y^g \cdot \mathbb{1}[y = s] \cdot \mathbb{1}[Girl_{is}^{g}] + \delta_{is}^g \cdot \mathbb{1}[Degree_{is}] \cdot \mathbb{1}[Girl_{is}^{g}] + \varepsilon_{ist}^g$$

Results

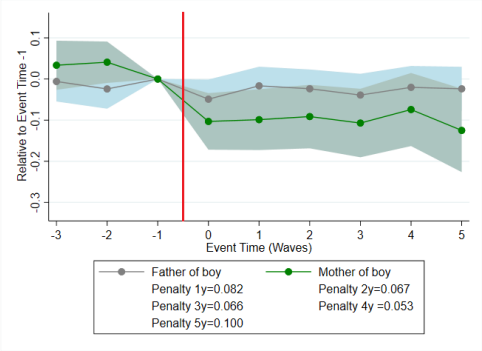
Child penalty

Employment

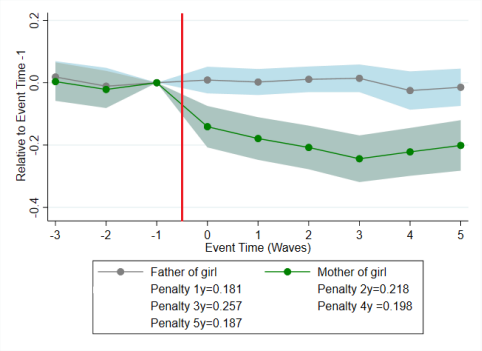


- Average Penalty: Employment $\rightarrow$ 14.5%

Employment by child gender



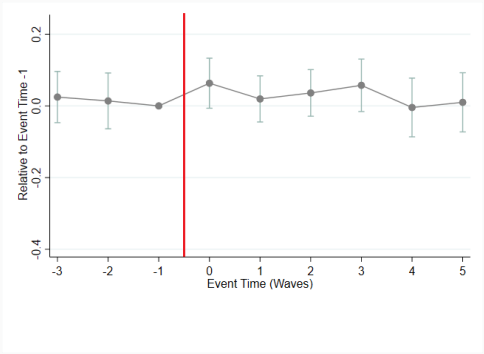
(a) Boy



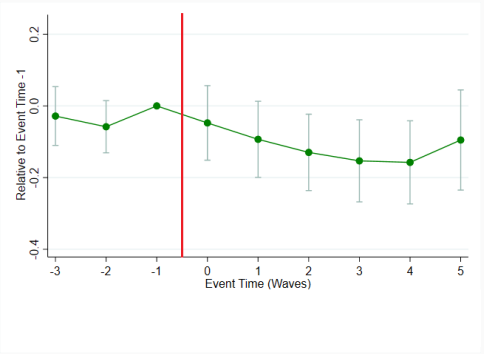
(b) Girl

- Average Penalty: Boy vs Girl $\rightarrow$ 7.4% vs 20.8%

Employment by child being a girl: full interaction



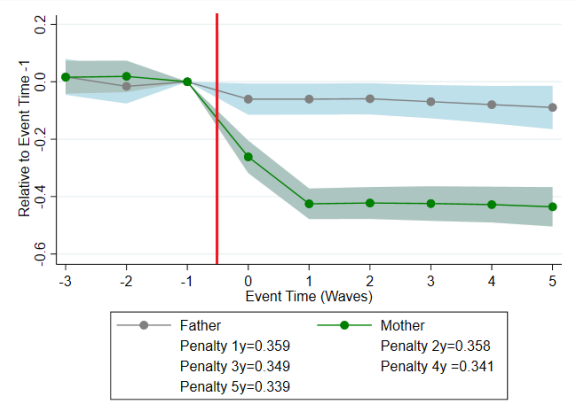
(a) Fathers



(b) Mothers

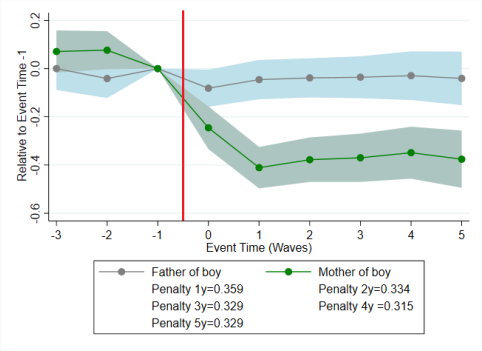
- Mothers of daughters face lower probability to be employed than if they'd had a son

Total working hours

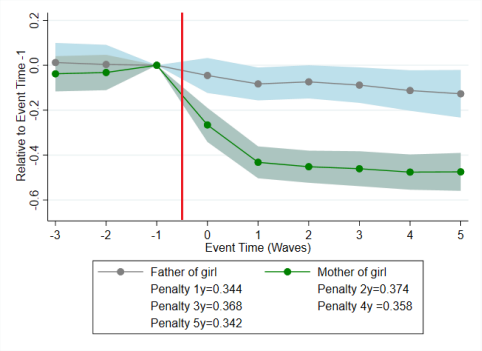


- Average Penalty: Total working hours $\rightarrow$ 34.9%

Total working hours by child gender



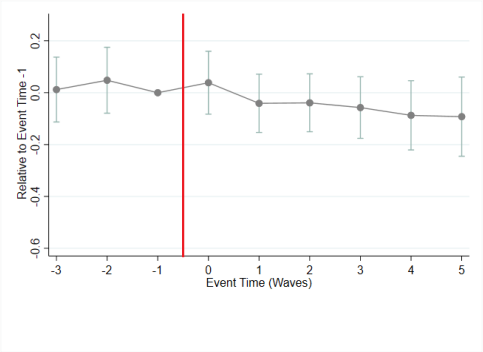
(a) Boy



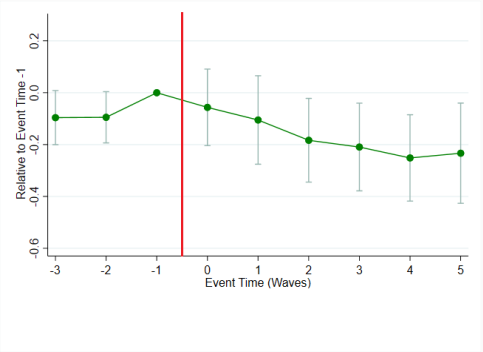
(b) Girl

- Average Penalty: Boy vs Girl $\rightarrow$ 33% vs 36%

Total working hours by child being a girl: full interaction



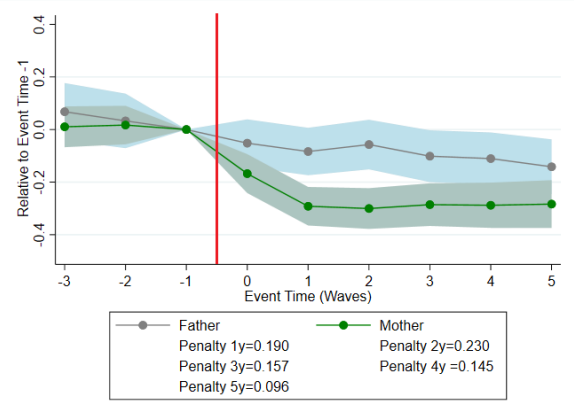
(a) Fathers



(b) Mothers

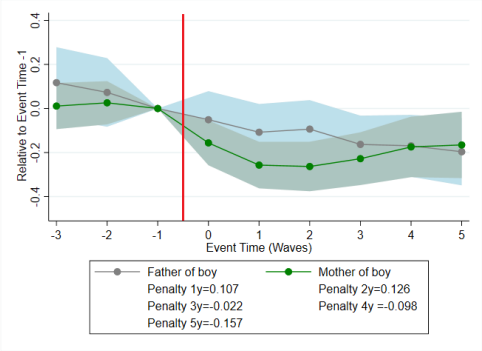
- Mothers of daughters work significantly less from 2 years post-birth and beyond

Real wage

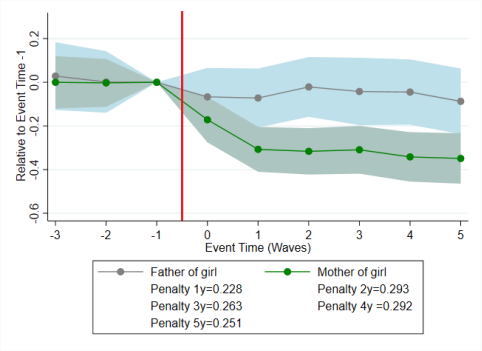


- Average Penalty: Real wage $\rightarrow$ 17%

Real wage by child gender



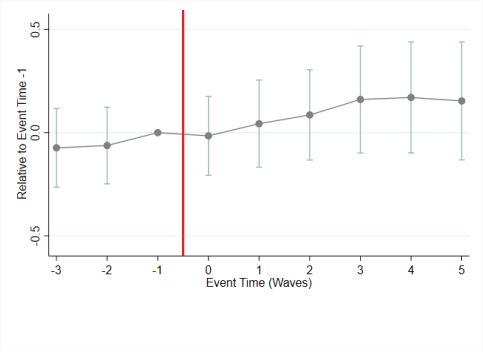
(a) Boy



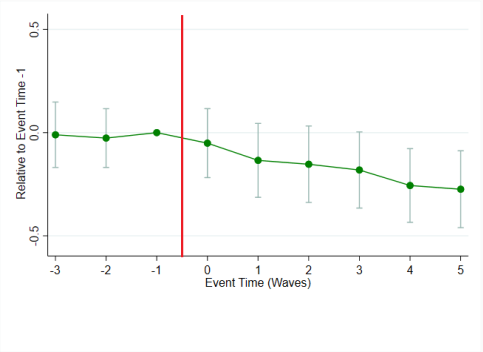
(b) Girl

- Average Penalty: Boy vs Girl $\rightarrow$ 10% vs 27%

Real wage by child being a girl: full interaction



(a) Fathers



(b) Mothers

- The wage penalty is larger for mothers of daughters than mothers of sons

Mechanisms

Child gender affects various outcomes

- Families with first-born daughters have more children
- Fathers of boys are less likely to get divorced
- Fathers of boys are convicted of significantly fewer crimes
- First-born daughter instead of son increases fathers' extraversion
- Having daughters makes people more likely to vote for left-wing political parties

(Dahl & Moretti, 2007, Oswald & Powdthavee, 2008, Dustmann & Landerso, 2018, van Lent, 2022)

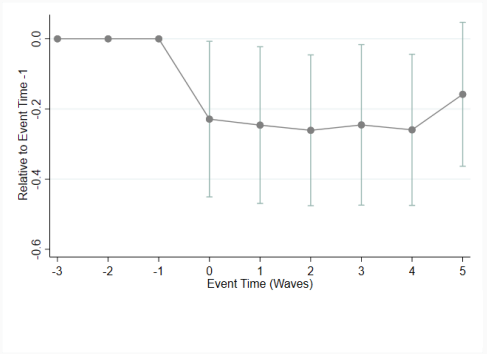
Mechanisms

- Parental involvement indexparent
- Fertility fertility
- Progressiveness prog
- Gender attitudes indexgen
- Time spent on household chores timechores
- Care responsibility hcare
- Marriage married

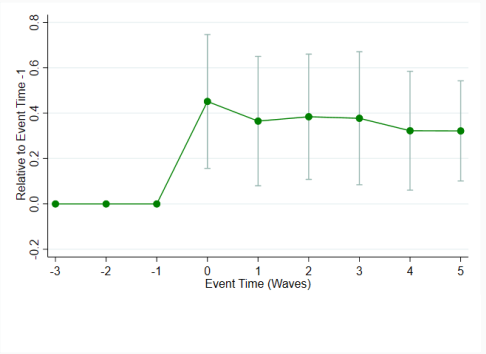
next

Parental involvement: higher index = more involved in different activities with a kid

Parental involvement by child being a girl: full interaction



(a) Fathers

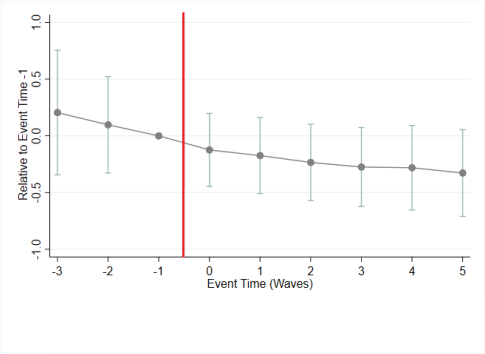


(b) Mothers

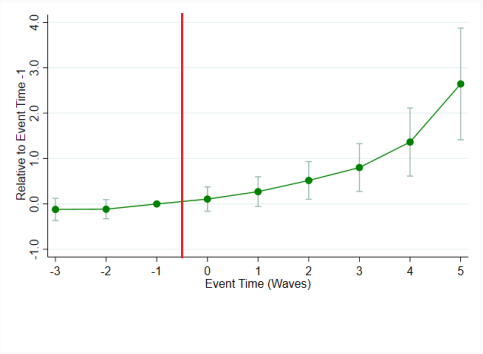
- Mothers of daughters are more involved in parenting than mothers of sons (40%), while fathers are 20% less involved mechanisms

Time spent on household chores

Time chores by child being a girl: full interaction



(a) Fathers

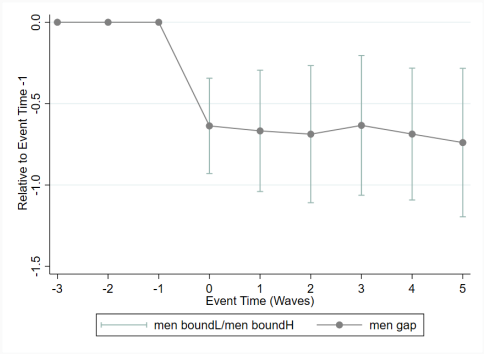


(b) Mothers

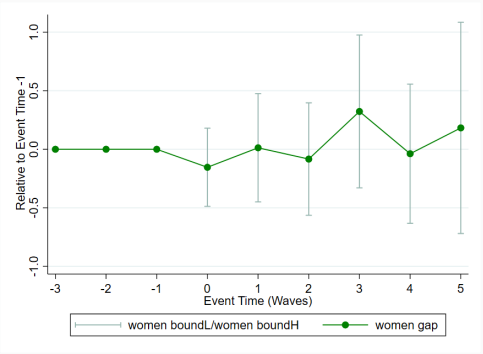
- Women increase time spent on household chores when they have a daughter
- There is around 50% increase during the first 2 years and almost 3 times 5 years later

Childcare Responsibilities: higher index = higher self responsibility

Childcare responsibility by having a girl: full interaction



(a) Fathers

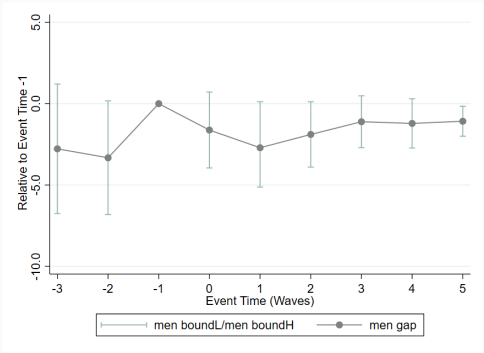


(b) Mothers

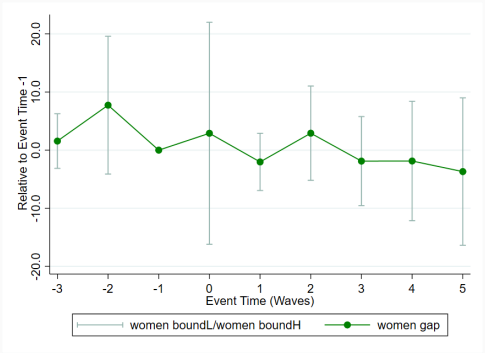
- Men tend to have less care responsibilities when they have a daughter
- The burden of the childcare is 50% more likely to be on their partners

Marriage: getting married after childbirth

Getting married by having a girl: full interaction



(a) Fathers



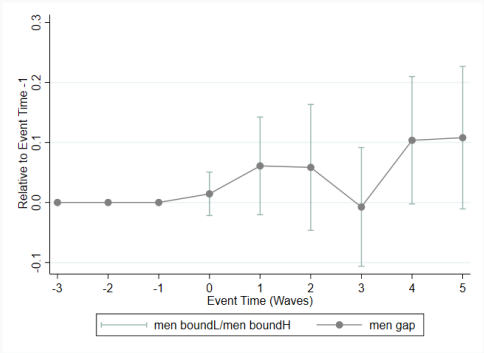
(b) Mothers

- Men are less likely to get married after having a daughter

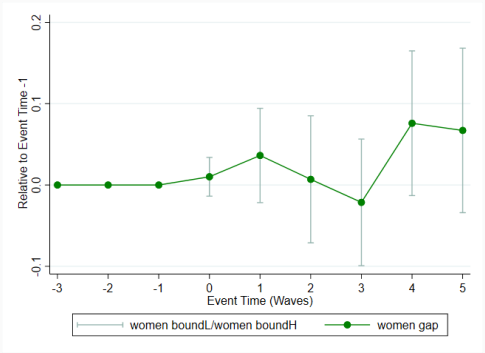
mechanisms

Fertility:

Fertility by child being a girl: full interaction



(a) Fathers

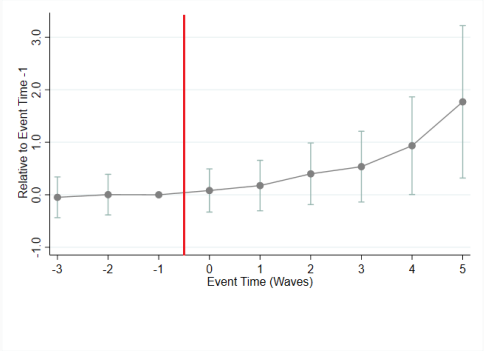


(b) Mothers

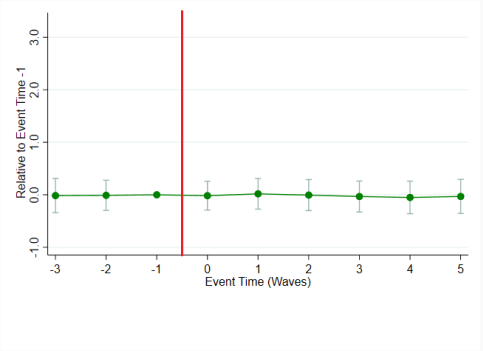
- Inconclusive, but points in the direction of greater likelihood of birth following girls mechanisms

Political Progressiveness: Voting and Newspapers' Choice

Progressive Political Views by child being a girl: full interaction



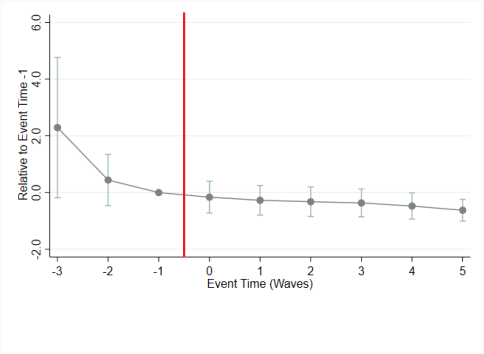
(a) Fathers



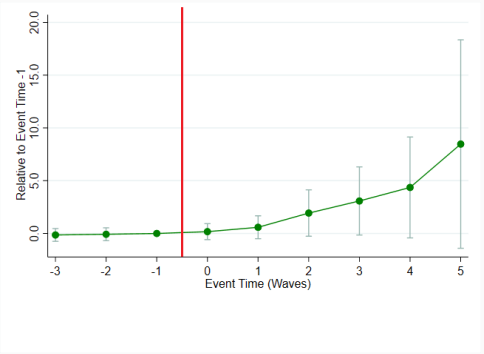
(b) Mothers

- Fathers of daughters tend to become *relatively* more progressive mechanisms

Conservative News by child being a girl: full interaction



(a) Fathers

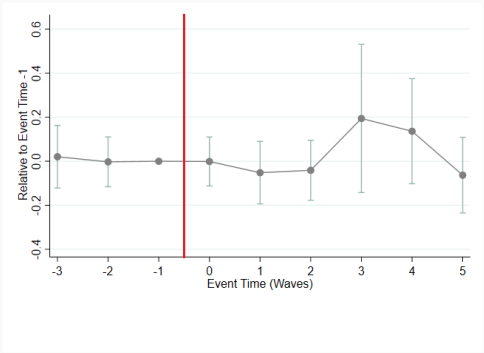


(b) Mothers

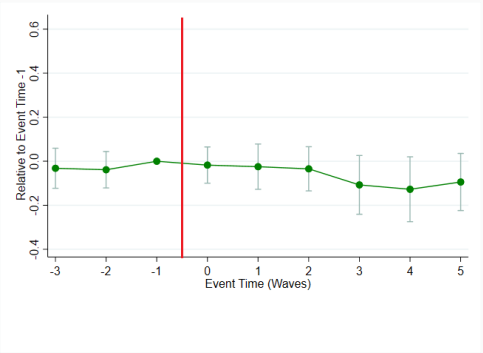
- Mothers of daughters tend to become more conservative, while fathers tend to become more progressive (in relative terms) mechanisms

Gender attitudes: higher gender index = more progressive/higher gender equality

Gender Index by child being a girl: full interaction



(a) Fathers



(b) Mothers

- Women tend to become more conservative while their firstborn daughter is growing up

Different Samples

Different samples

- Unbalanced UKHLS - 18,065 parent x year unbalUKHLS
- BHPS - 24,873 parent x year unbalBHPS

next

Discussion and Next Steps

Conclusion

- Childbirth has much larger negative effects on mothers' than on fathers' labour market outcomes
- Child penalty is larger when having a firstborn daughter:
  - **probability to be employed, total working hours, real wage**
- Fathers of daughters are less likely to get married after childbirth
- Mothers tend to spend more time with daughters and on household chores
- Fathers of daughters are less involved in child-rearing
- Mothers of daughters tend to become more conservative in their views, while fathers become more progressive

Thank you very much for your attention!
Gràcies! Gracias!

Angelina Nazarova

an21010@essex.ac.uk
https://angelina-nazarova.com

Appendix

Balance tests

	Fathers			Mothers		
	Son	Daughter	p-value (Ha: Diff!=0)	Son	Daughter	p-value (Ha: Diff!=0)
Parental involvement	0	0	NA	0	0	NA
Fertility	0	0	NA	0	0	NA
Mental health	49.83	50.03	0.553	47.82	47.80	0.942
Progressive Political Views	0.64	0.55	0.173	0.64	0.67	0.599
Conservative News	0.18	0.22	0.496	0.27	0.18	115
Index Gender Attitudes	18.11	18.12	0.989	18.93	18.74	0.245
Time spent on household chores	5.85	5.39	0.503	8.26	8.33	0.918
Poor Mental health	0.28	0.28	0.986	0.36	0.35	0.731

Explaining the gap

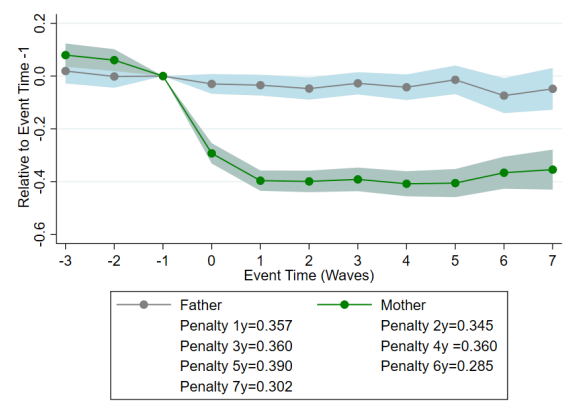
Explaining the gap

	(1)	(2)	(3)
	Being Employed	Working hours	Real wage
Parental Involvement	-0.01	-1.12***	-67.65***
Having another child	-0.09***	-5.67***	-0.75
Progressive Political Views	-0.05***	-3.43***	-272.20***
Conservative News	-0.02	-2.27***	-421.93***
Index Gender Attitudes	0.014***	0.78***	32.36***
Time spent on household chores	-0.006***	-0.58***	-50.36***
Poor Mental Health	-0.06***	-3.47***	-96.99**
Observations	3,780	3,404	3,104

Notes. Robust standard errors (in parentheses). Ethnic minorities are excluded. Balanced sample

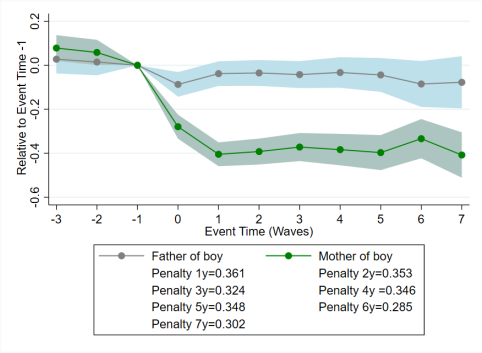
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Total working hours

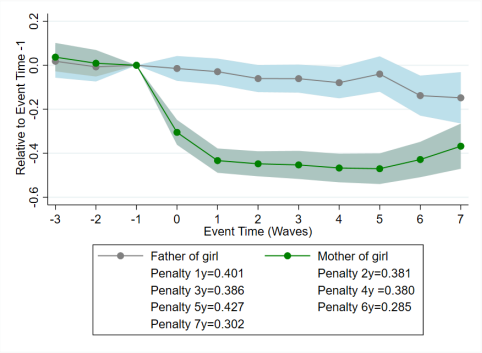


- 1st Year Penalty: Total working hours $\rightarrow$ 35%
- 1st Year Penalty (Balanced): Total working hours $\rightarrow$ 35%

Total working hours by child gender



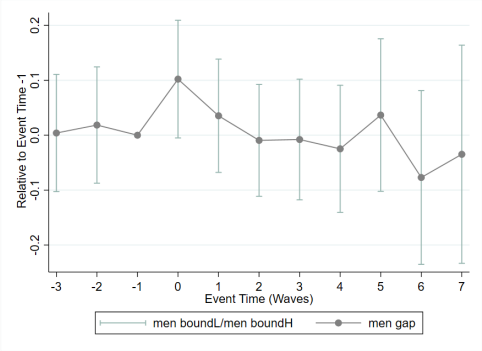
(a) Boy



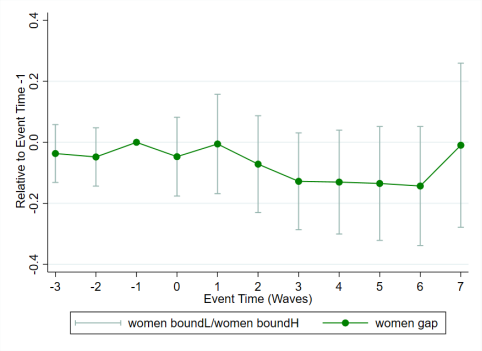
(b) Girl

- 1st Year Penalty: Boy vs Girl $\rightarrow$ 36% vs 40%
- 1st Year Penalty (Balanced): Boy vs Girl $\rightarrow$ 34% vs 37%

Total working hours by child being a girl: full interaction



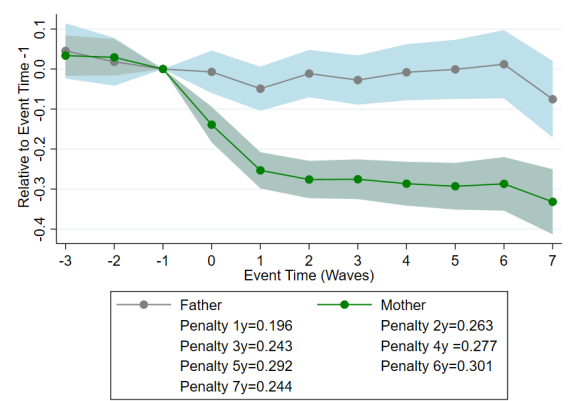
(a) Fathers



(b) Mothers

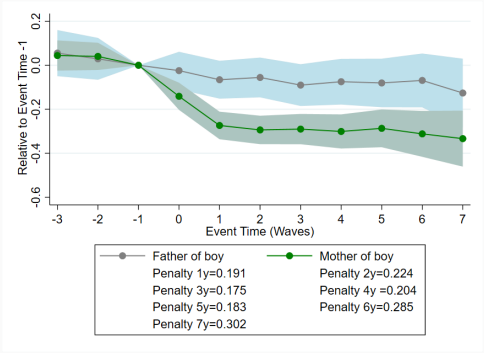
- Similar trend of mothers decreasing their working hours when they have a girl

Real wage

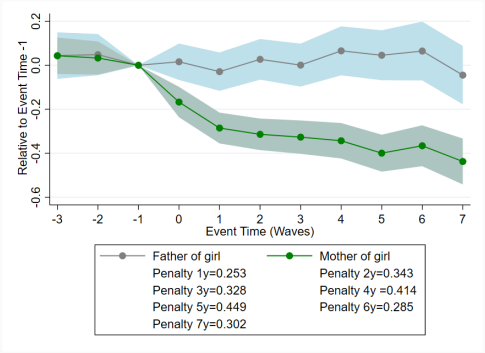


- 1st Year Penalty: Real wage $\rightarrow$ 19%
- 1st Year Penalty (Balanced): Real wage $\rightarrow$ 19%

Real wage by child gender



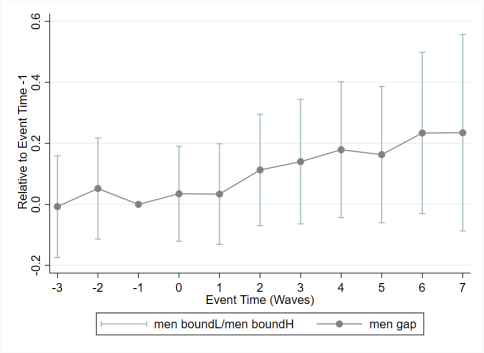
(a) Boy



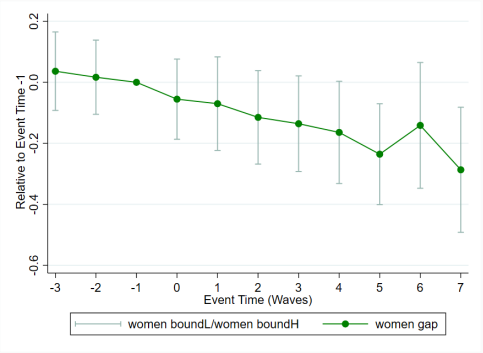
(b) Girl

- 1st Year Penalty: Boy vs Girl $\rightarrow$ 19% vs 25%
- 1st Year Penalty (Balanced): Boy vs Girl $\rightarrow$ 10% vs 23%

Real wage by child being a girl: full interaction



(a) Fathers

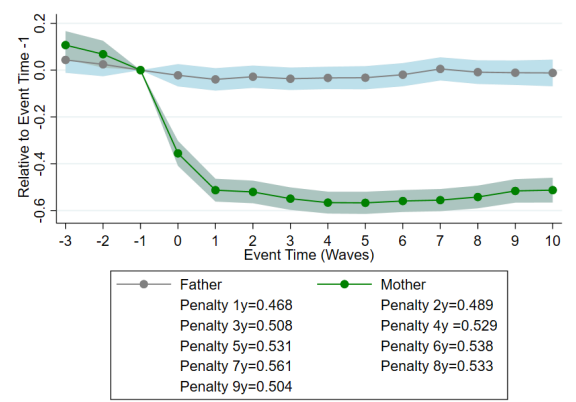


(b) Mothers

- Similar to the balanced sample, the real wage is decreasing more for the mothers of girls

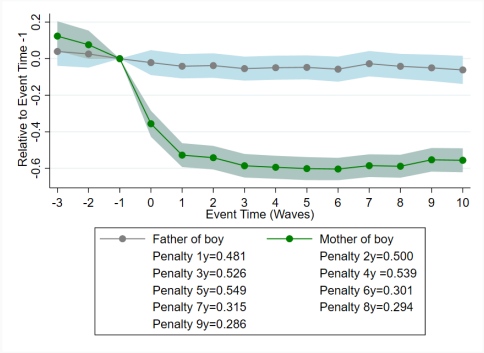
samples

Total working hours

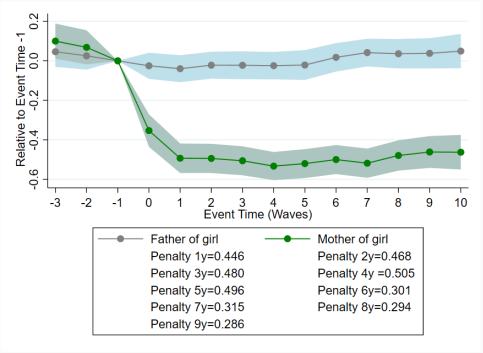


- 1st Year Penalty: Total working hours $\rightarrow$ 47%
- 1st Year Penalty (Unbalanced UKHLS): Total working hours $\rightarrow$ 35%
- 1st Year Penalty (Balanced UKHLS): Total working hours $\rightarrow$ 35%

Total working hours by child gender



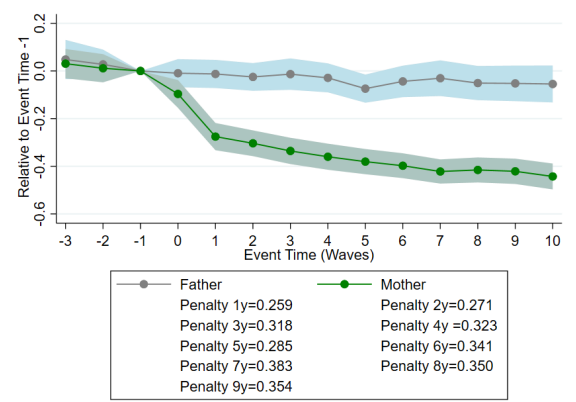
(a) Boy



(b) Girl

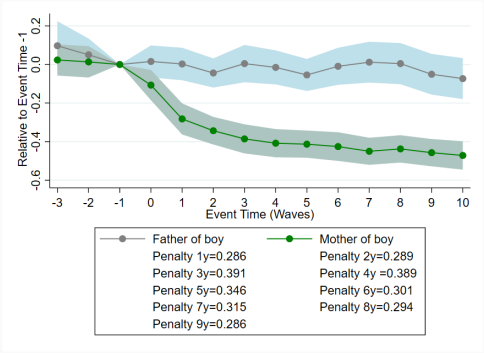
- 1st Year Penalty: Boy vs Girl $\rightarrow$ 48% vs 44%
- 1st Year Penalty (Unbalanced UKHLS): Boy vs Girl $\rightarrow$ 36% vs 40%
- 1st Year Penalty (Balanced UKHLS): Boy vs Girl $\rightarrow$ 34% vs 37%

Real wage

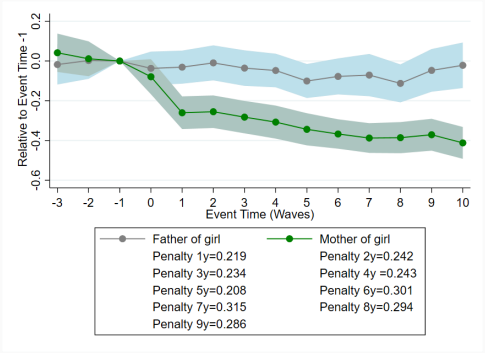


- 1st Year Penalty: Real wage $\rightarrow$ 26%
- 1st Year Penalty (Unbalanced UKHLS): Real wage $\rightarrow$ 19%
- 1st Year Penalty (Balanced UKHLS): Real wage $\rightarrow$ 19%

Real wage by child gender



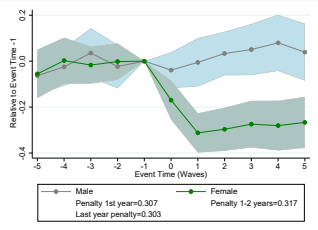
(a) Boy



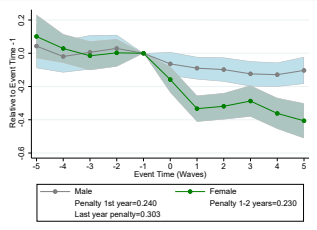
(b) Girl

- 1st Year Penalty: Boy vs Girl $\rightarrow$ 29% vs 22%
- 1st Year Penalty (Unbalanced UKHLS): Boy vs Girl $\rightarrow$ 19% vs 25%
- 1st Year Penalty (Balanced UKHLS): Boy vs Girl $\rightarrow$ 10% vs 23%

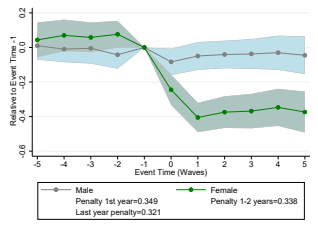
Total hours child penalty by STEM



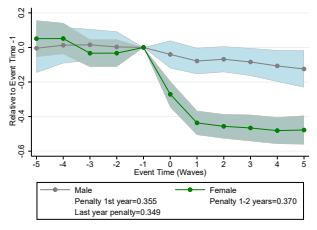
(a) STEM - boys



(b) STEM - girls

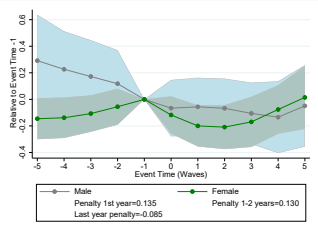


(c) No STEM - boys

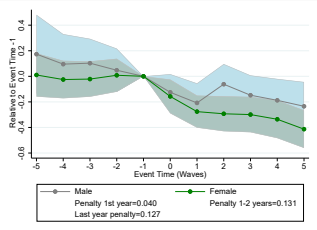


(d) No STEM - girls

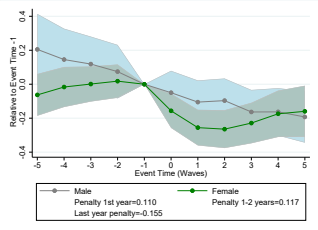
Real wage child penalty by STEM



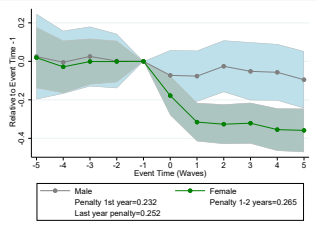
(a) STEM - boys



(b) STEM - girls

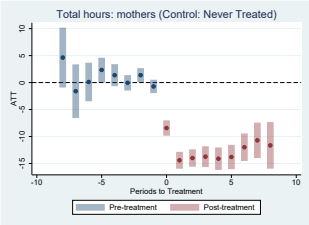


(c) No STEM - boys

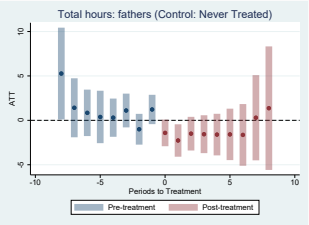


(d) No STEM - girls

Adopting Callaway & Sant'Anna estimation using working hours



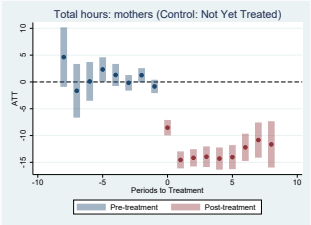
(a) Total hours - Mothers



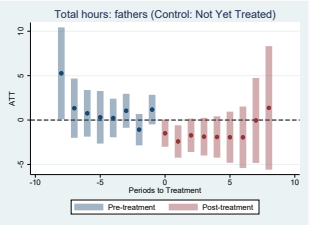
(b) Total hours - Fathers

- Preliminary comparison with two different control groups: never treated and not yet treated. Results are similar with stabilized inverse probability weighting and ordinary least squares.

Adopting Callaway & Sant'Anna estimation using working hours



(a) Total hours - Mothers

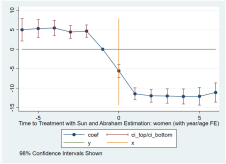


(b) Total hours - Fathers

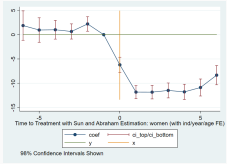
- Preliminary comparison with two different control groups: never treated and not yet treated. Results are similar with stabilized inverse probability weighting and ordinary least squares.

checks

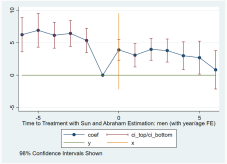
Adopting Sun & Abraham estimation using working hours



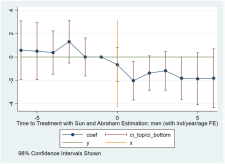
(a) Mothers - age & time FEs



(b) Mothers - ind & age & time FEs



(c) Fathers - age & time FEs



(d) Fathers - ind & age & time FEs

- Sun and Abraham approach uses never treated as a comparison group

checks

How would the model change if we are including mother fixed effects?

- We estimate the following equation with mother fixed effects:

$$Y_{ist}^{g} = \sum_{j \neq 1} \alpha_j^g \cdot \mathbb{1}[j = t] + \sum_k \beta_k^g \cdot \mathbb{1}[k = age_{is}] + \sum_j \gamma_y^g \cdot \mathbb{1}[y = s] + \mu_i + \varepsilon_{ist}^g, \quad (1)$$

- where the difference owes to the μ_i term requiring the estimation of a single parameter for each woman. At minimum, we must now have some multicolinearity as for each woman we cannot separately estimate a fixed effect and full set of dynamic coefficients to time to birth, as well as age, as well as her average salary.
- Resolving this $\rightarrow$ omitting two mother fixed effect terms.

How would the model change if we are including mother fixed effects?

- Then, to calculate the proportional change term, we would once again follow:

$$P_t^g \equiv \frac{\widehat{\alpha}_t^g}{E[\tilde{Y}_{ist}^g | t]}, \tag{2}$$

however here

$$\tilde{Y}_{ist}^g = \sum_k \widehat{\beta}_k^g \cdot \mathbb{1}[k = age_{is}] + \sum_y \widehat{\gamma}_y^g \cdot \mathbb{1}[y = s] + \widehat{\mu}_i. \tag{3}$$

- The first two terms are estimated off cohorts, while the final term is estimated off each individual.
- Our counterfactual to compare to each women is the woman's average salary over the entire period, plus the cohort level wage and calendar year fixed effects, omitting time to birth dummies.

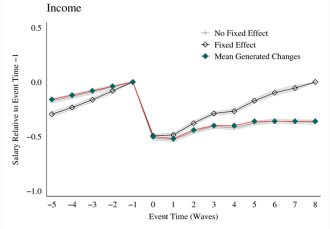
Problems with inclusion of mother FE

- As $\widehat{\mu}_i$ is estimated within woman, and each woman does have a birth in the sample period, then this μ_i term is partially contaminated by the effect of child birth.
- Many wage profiles will mean that this tends to lead to downward biases to coefficients in years leading up to child birth, and upward biases to coefficients in years following childbirth, and these biases will be worse as we move further away from the omitted baseline at year -1.

checks

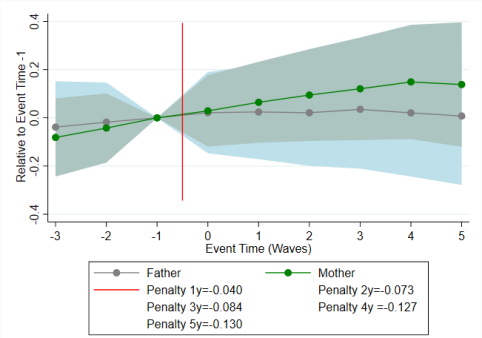
Simulation exercise

- We generate a simple wage path where mothers experience a decrease in their salaries by 50% in the year when they give birth.
- Salary at mean are set to be 2500 in year -1, then in year 0 falls by 1250.
- The simulations include mother-specific heterogeneity (mother FEs are relevant).



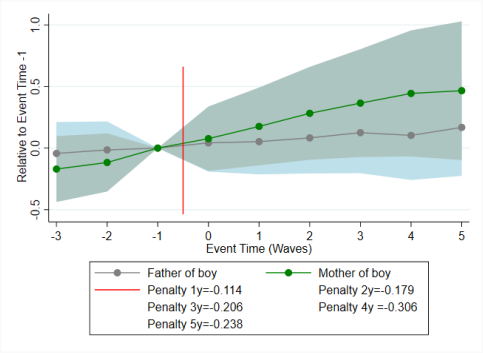
- No FE model $\rightarrow$ exactly -50% in salaries. The model follows exactly the change that we have in our synthetic data.
- FE model $\rightarrow$ -47%, which is less than "true" value. We face a multicollinearity issue in event time (omitted last wave) and in calendar year (omitted 2020).

Fraction of chores made self

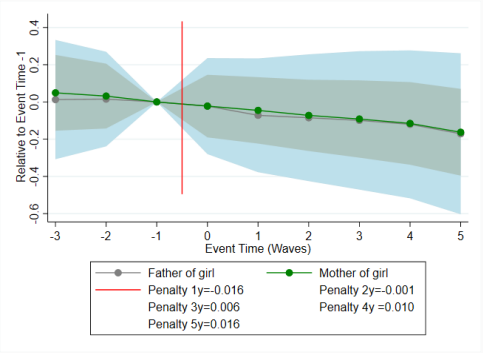


- 1st Year Penalty: Fraction of chores made self $\rightarrow$ -4%
- Last Year Penalty: Fraction of chores made self $\rightarrow$ -13%

Fraction of chores made self by child gender



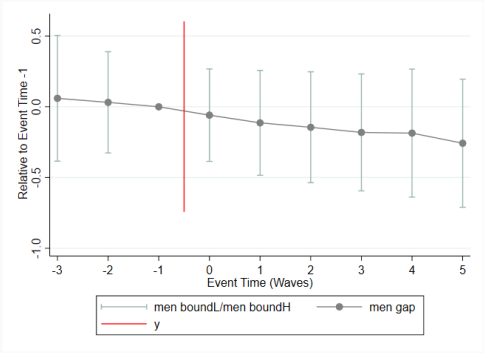
(a) Boy



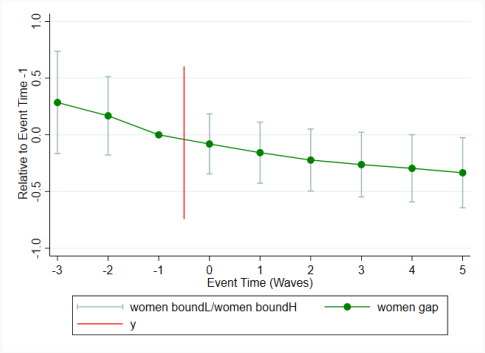
(b) Girl

- 1st Year Penalty: Boy vs Girl $\rightarrow$ -11% vs -2%
- Last Year Penalty: Boy vs Girl $\rightarrow$ -24% vs 2%

Fraction of chores made self by being a girl: full interaction



(a) Fathers



(b) Mothers

- Mothers of daughters start doing less chores by themselves

timechores