

# More Bad News for Mothers: The Child Penalty in Mental Health

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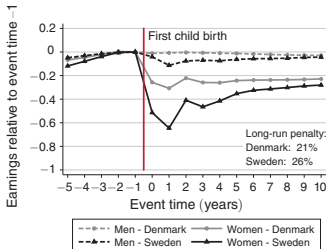
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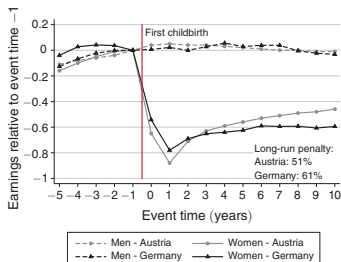
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EEA-ESEM Congress 2023, Barcelona — August 28, 2023

# 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

# Motivation

- ▶ Childbirth has large and persistent effects on the labor-market outcomes of women but not on those of men (Kleven et al., several papers)
- ▶ On average, men and women share the costs of parenthood unequally
- ▶ Descriptive work suggests that mothers spend more time on non-market activities than fathers:
  - ▶ Child-care (Guryan et al., JEP, 2008)
  - ▶ Other home-production (Borra et al., OEP, 2021)
- ▶ Literature documents child-related gender inequalities in important dimensions

How do these inequalities translate into differences in individual **well-being** across the sexes?

# Is there a child penalty in mental well-being?

- ▶ Combine quasi-experimental research designs with admin data to compare the impact of parenthood on mothers' vs. fathers' *mental well-being*.
- ▶ Measure of mental well-being with antidepressant prescriptions
  - ▶ More objective measure
  - ▶ Comparable across most countries (ATC code N06-A)
- ▶ Dual focus on AUT & DNK
  - ▶ Two rich countries with very good health-care systems
  - ▶ Comparable admin data
  - ▶ Different long-run gender gaps in earnings (AUT: 51% & DNK: 21%)  
Estimates by [Kleven et al. \(AER-P&P, 2019\)](#)
  - ▶ Differences in child-related gender inequality & gender conservatism  
Survey based evidence by [Bertrand et al. \(ReStud, 2021\)](#)

# Main findings

- ▶ **Overarching insight:** Across both countries, childbirth has much larger negative effects on mothers' than on fathers' mental health
- ▶ **Insight I:** Child penalty (CP) in mental health is more pronounced in Austria
- ▶ **Insight II:** CP explains a key part of the gender gap in mental health problems
- ▶ **Insight III:** Exogenously longer maternal leaves increase the CP for women, but not men

# Parenthood and mental health: What do we know?

- ▶ Literature on survey based measures of happiness / life satisfaction
  - ▶ Mixed findings with mostly neg. associations
    - ▶ Hardly gender-specific effects
    - ▶ Gender difference is not focus of this literature
- ▶ Medical and epidemiological literature
  1. Depression during and immediately after pregnancy

(Shorey et al., *Journal of Psychiatric Research*, 2018)
  2. Self-reported data on mental health
    - ▶ By and large neg. associations

(Evenson & Simon, *Journal of Health and Social Behavior*, 2005)
- ▶ Only few papers study the correlations in the medium- to long-run
  - ▶ Kravdal et al. (*Aging & Mental Health*, 2017) find based on Norwegian antidepressant prescriptions data that more children are generally associated with fewer prescriptions for men and women, but women with only one child are significantly more likely to require antidepressants compared to childless women.

# Structure of the reminder of the talk

- ▶ Institutional backgrounds (AUT vs. DNK)
- ▶ Data sources, samples, and descriptive statistics
- ▶ Estimation strategy
- ▶ Baseline estimates
- ▶ Decomposition the overall mental health gap
- ▶ If time: The role of family policies / mechanism
- ▶ If time: Heterogeneity

# Healthcare systems

Different financing & structure, but comparable services & outcomes

	<b>Austria</b> <i>(Bismarck Model)</i>	<b>Denmark</b> <i>(Beveridge Model)</i>
<i>Health expenditures</i>		
Total expenditures as % of GDP <sup>†</sup>	9.9	9.6
Out-of-pocket expenditures as % of total <sup>†</sup>	18.9	14.3
<i>Doctors and hospital beds per 100,000 population</i>		
All physicians <sup>†</sup>	4.6	3.6
Hospital beds <sup>†</sup>	7.6	3.4
<i>Mortality &amp; Life expectancy<sup>†</sup></i>		
Infant mortality (per 1000 live births)	3.6	3.8
Life expectancy at birth (in years)	80.4	79.2
<i>Suicide rates (cases per 100,000 population)<sup>§</sup></i>		
Male	24.09	19.59
Female	7.04	7.55

Notes: <sup>†</sup> Average over the period from 2000 to 2019/20. Data is retrieved from the Database of the Worldbank. <sup>§</sup> Average over the period from 2000 to 2017. Rates are age standardized. Data is from (Ritchie et al., 2022).

▶ Back



# Mental healthcare

Can be described well with module in the Eurobarometer (2005/06)

- ▶ Five-question Mental Health Inventory
  - ▶ Austria, men 68,7 women 67.8
  - ▶ Denmark, men 72.1 women 70.6
- ▶ *“In the last 12 months, did you seek help from a professional in respect of a psychological or emotional health problem?”*
  - ▶ Austria: 15%, Denmark 17%
- ▶ Follow-up question on care providers (multiple answers possible):
  - ▶ 80% of Austrians and Dans say “GP“
- ▶ Questions on mental healthcare utilization

Percent share of respondents who	Austria	Denmark
... has taken drugs	10	7
... has received psychotherapy	3	4
... has been admitted hospital	2	1

# Labor markets & family policies

## ▶ Labor markets

- ▶ Female employment rates in Austria have converged to Danish levels
  - ▶ Today (women between 25 to 54) AUT: 85.1%, DNK: 82.9%
- ▶ Female part-time share in AUT (33.1%) exceeds the Danish (23.1%)
  - ▶ Difference arises typically after maternity
- ▶ (Austrian men work more hours than Danish men)

## ▶ Family policies

- ▶ Parental leave
  - ▶ Austria: Long (up to 35 months)
  - ▶ Denmark: Short (32 weeks)
- ▶ Formal child-care
  - ▶ Austria: Incomplete for children < 3 years of age (esp. in rural areas)
  - ▶ Denmark: Guaranteed slot starting with 26 weeks

# Gender identity norms

## Austria is sexist, while Denmark is quite gender egalitarian

	Share of respondents which strongly agrees respective statement			
	Austria		Denmark	
	Women	Men	Women	Men
<i>Attitudes towards family and gender roles</i>				
(a) Working mother can have warm relation with child	0.47	0.35	0.61	0.61
(b) Pre-school child suffers through working mother	0.25	0.27	0.06	0.06
(c) Family life suffers through working mother	0.26	0.24	0.08	0.08
(d) Women's preference: home and children	0.09	0.10	0.07	0.07
(e) Being housewife is satisfying	0.16	0.15	0.17	0.17

Notes: The exact survey question in the *International Social Survey Programme* read as follows: "To begin, we have some questions about women. To what extent do you agree or disagree.]" (a) "A working mother can establish just as warm and secure a relationship with her children as a mother who does not work.", (b) "A pre-school child is likely to suffer if his or her mother works.", (c) "All in all, family life suffers when the woman has a full-time job.", (d) "A job is all right, but what most women really want is a home and children.", and (e) "Being a housewife is just as fulfilling as working for pay.". In each case, survey respondents must select one of the following response alternatives: "strongly agree, agree, neither agree nor disagree, disagree, strongly disagree". Figures show the share of survey respondents, who answered "strongly agree".

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# Parenthood & mental health: Potential mechanism

This slide is for childless participants!

- ▶ Life-changing event w/ significant changes during a short period
- ▶ Transition may have theoretically pos. or neg. effects on mental health
- ▶ Adjustment of labor-supply or carrying a double burden of work and child-rearing
- ▶ Being the primary childcarer is typically associated with cognitive load & mental stress
- ▶ Women: physical burden plus (in most cases) majority of child-rearing

**HOW IT  
FEELS**



**HOW IT  
LOOKS**



# Data sources

## ▶ (Upper) Austria

1. *Austrian Social Security Database (ASSD)*: Administrative records to verify pension claims with info on employment and childbirths for the universe of Austrian women.
2. *Upper Austrian Health Insurance Fund (UAHIF)*: Healthcare utilization and prescriptions for all private sector employees, their dependents, and all non-employed residents in the federal state of Upper Austria.

## ▶ Denmark

1. Population register by *Statistics Denmark*: All births with links to legal mothers and fathers. Merged info on the place of living, earnings, labor market attachment, and civil status.
2. *Danish Health Data Authority*: Healthcare utilization in prescription drugs

# Analysis sample

- ▶ First-born children between 2002 and 2007
- ▶ Link mothers and fathers to children
  - ▶ Drop parents outside the age range of [18,55]
- ▶ Gather info on health (and labor market) outcomes from 1998 to 2016
  - ▶ Fully-balanced panel from 4 years prior to birth to 9 post birth
- ▶ **Restrictions** in Austrian data:
  - ▶ Parents have to be insured with UAHIF
  - ▶ We cannot find all unmarried father.

# Summary statistics

	Austria		Denmark	
	Women	Men	Women	Men
<i>(a) Socioeconomic variables</i>				
Age at birth	28.16	30.86	29.37	31.05
Married at birth	0.41	0.65	0.44	0.43
Employed two years before birth	0.97	0.99	0.94	0.92
Annual wage (1,000 EUR) two years before birth	19.46	25.97	24.26	32.14
<i>(b) Outcome</i>				
Any antidepressant prescription (%) two years before birth	6.62	5.31	3.27	1.68
<i>(c) Physician visits</i>				
No. of GP visits two years before birth	4.12	3.19		
No. of psychiatrist visits two years before birth	0.13	0.07		
No. of gynaecologist and urologist visits two years before birth	2.25	0.18		
No. of other specialist visits two years before birth	2.65	1.76		
No. of health contacts excl. hospitals two years before birth	9.72	5.40	20.53	10.40

Notes: This table shows descriptive statistics for our Austrian and Danish estimation samples. It considers men and women separately. Moreover, it presents arithmetic means for (a) a selection of socioeconomic variables, (b) our main outcome variable, and (c) the number of physician visits. All the birth-related variables refer to the birth of the first child. <sup>a</sup> ATC code N06A. <sup>b</sup> Includes also neurologist and psychotherapy visits.

## Estimation strategy (1/2)

Follow Kleven et al. using an event study approach around the birth of the first child.

$$Y_{ist}^m = \sum_{event \neq -2} \alpha_{event}^m \cdot \mathbb{1}[event = t] + \sum_y \beta_{year}^m \cdot \mathbb{1}[year = s] + \sum_{age} \gamma_{age}^m \cdot \mathbb{1}[age = a_{is}] + u_{ist}^m \quad (1)$$

- $Y_{ist}^m$  ... binary indicator for a prescription of mother  $i$  gets in calendar year  $s$  at event time  $t$  (relative to the year of the first child's birth).
- **Event dummies to identify the effects of parenthood**
- **Year dummies to control for business-cycle effects**
- **Age dummies to factor out life-cycle effects**  
(Event time  $t = -2$  serves as reference period.)

Identifying assumptions: parallel outcome trends for males and females over the event time, conditional on life-cycle and business-cycle effects.



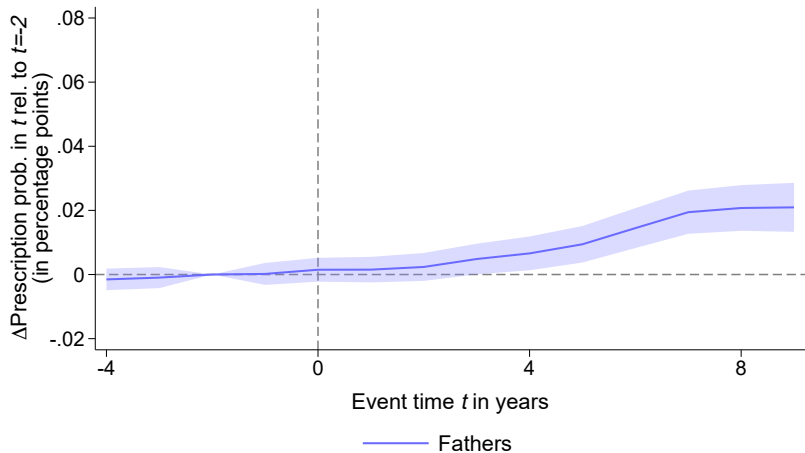
## Estimation strategy (2/2)

1. Estimate the model in (1) for mothers  $m$  and obtain  $\hat{\alpha}_t^m, \hat{\beta}_s^m, \hat{\gamma}_{ais}^m$ 
  - ▶ Rescale the estimated level effects at event time  $t$  into percentages:

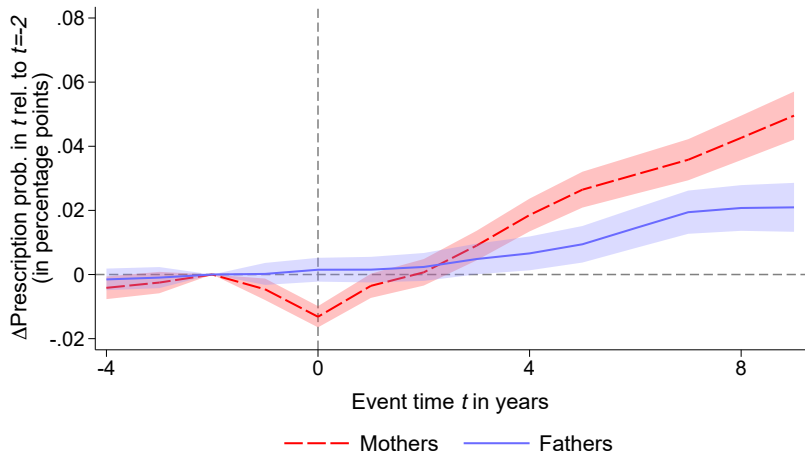
$$\hat{\alpha}_t^m / E[\tilde{Y}_{ist}^m | t]$$

- ▶  $\tilde{Y}_{ist}^m$  is the prediction when setting the event-dummy effects to zero.
  - ▶ This prediction measures the outcome mother  $i$  would have had without children.
2. Repeat 1.) for fathers  $f$
  3. Estimate the child penalty in mental health at event time  $t$ 
    - ▶ in levels as  $P_t^l = \hat{\alpha}_t^m - \hat{\alpha}_t^f$
    - ▶ in percentages as  $P_t = \frac{\hat{\alpha}_t^m - \hat{\alpha}_t^f}{E[\tilde{Y}_{ist}^f | t]}$
    - ▶  $P_t$  is the percentage by which women's' antidepressant use exceeds that of men due to children

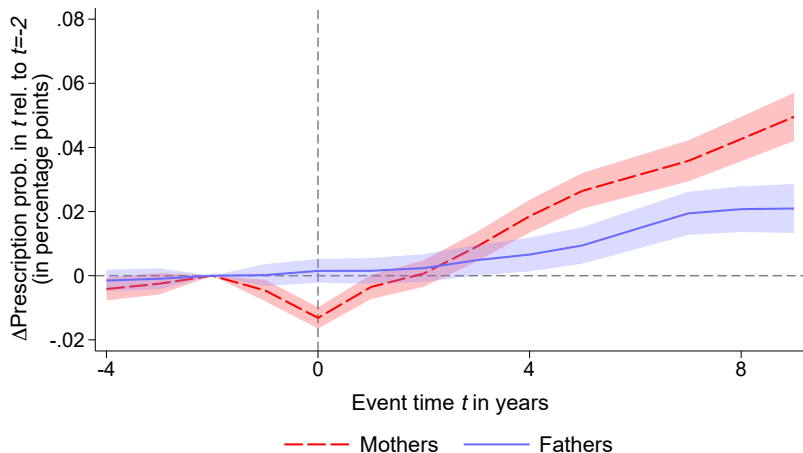
# Parenthood in Austria



# Parenthood in Austria

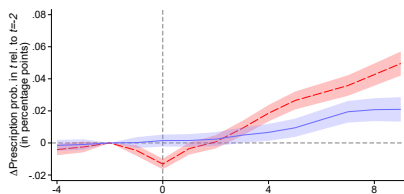


# Parenthood in Austria

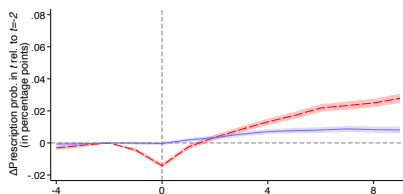


- ▶ Prescriptions in  $t = 9$  are higher than in the counterfactual w/o children by
  - ▶ Women: 4.96pp
  - ▶ Men: 2.10pp

# Impacts of parenthood on antidepressant prescriptions



(c) Austria



(d) Denmark

Notes: These figures show the estimated percentage point change in antidepressant prescriptions before and after having a child for mothers and fathers.

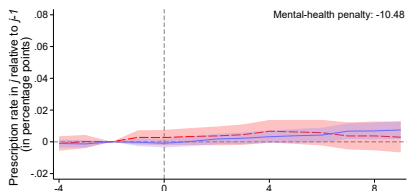
► **Child penalty in mental health**  $P_t = \frac{\hat{\alpha}_t^m - \hat{\alpha}_t^f}{E[Y_{ist}^f | t]}$

- Austria ( $t = 9$ ): 93.2%
- Denmark ( $t = 9$ ): 63.2%

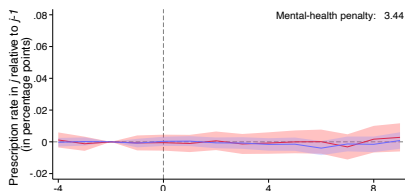
► Percentage by which women's' antidepressant use exceeds that of men due to children.

# Placebo check using childless individuals

- Randomly assign childbirths to non-parents
- Approximate the factual distribution of age at first birth by a sex and birth-cohort specific log-normal distribution  $\mathcal{LN}(\mu_c, \sigma_c^2)$ , conditional on partnership status
- The mean  $\mu_c$  and variance  $\sigma_c^2$  are obtained from the actual birth-cohort-specific distributions of age at first birth.
- For each childless individual, we then draw an artificial age at birth from this distribution.



(e) Austrian placebo parents



(f) Danish placebo parents

Notes: These figures show the estimated percentage point change in antidepressant prescriptions before and after having a placebo child for non-parents. All estimates control for age and year dummies and rely on robust standard errors.

## Discussion of main result

- ▶ Parenthood increases antidepressant prescriptions for both sexes
- ▶ In both countries, the effect is more pronounced for women
  - ▶ Consistent with (on average) unequally shared costs of parenthood
- ▶ Accepting antidepressants as a valid\* proxy for mental health:
  - ▶ Results demonstrate a significant child penalty in mental health for women
- ▶ The effect and the gender gap are more pronounced in AUT
  - ▶ Consistent with the hypothesis that gender norms matter

# Actual Differences in Mental Health

- ▶ Result 1: Women with a low MHI-5 score do not seek more help than comparable men Survey-based evidence
- ▶ Result 2: Women do not see **GPs/other specialists**\* more frequently in relevant period after childbirth
  - ▶ Not in line with idea that women see doctors more often who then have more chances to prescribe Austria Denmark
  - ▶ \* Excluding psychiatrists, psychologists, and neurologists
- ▶ Result 3: Women more frequently see **psychiatrists, psychologists, and neurologists**
  - ▶ In line with real mental health problems Austria
- ▶ Result 4: No equivalent pattern for **other ATC-N** nervous sys. drugs
  - ▶ Except some effects on analgesics (painkillers migraine); which makes sense Austria Denmark
  - ▶ Penalty is not simply an artifact measured in antidepressants
- ▶ Result 4: No evidence that males more often suffer from **drug-related conditions** post birth Penalty is not simply an artifact measured in antidepressants
  - ▶ No evidence in line with idea that men self-medicate



# Variations in the baseline estimates of child penalty in mental health

Additional interesting — but potentially endogenous — extensions and sample splits

## ► **Extensions** (only feasible for DNK)

1. Penalty is persistent & increases for women (but not for men) [Details](#)
2. Further children increase penalty for men, but not women [Details](#)

## ► **Heterogeneity**

1. Penalty is lower for highly educated parents [Details](#)
2. Penalty is somewhat higher if mother (in law) lives close [Details](#)

# Decomposition of the gender gap in mental health

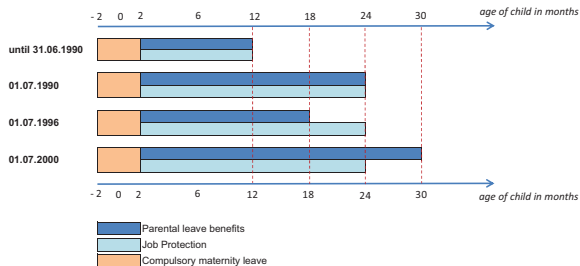
- ▶ General gender gap in mental health (Van de Veldet al., SSM, 2010)
  - ▶ Antidepressant use is about twice as common among women
- ▶ Decomposition in i.) child-related gap and ii.) residual gap

	Actual share using antidepressants	Predicted share using antidepressants without children
<b>Panel B: Austria</b>		
Women	6.30%	5.10%
Men	3.60%	3.40%
Overall gender gap		80.42%
Residual gender gap		49.94%
Child-related gender gap		30.48%
<b>Panel B: Denmark</b>		
Women	4.54%	3.19%
Men	2.54%	2.02%
Overall gender gap		78.91%
Residual gender gap		57.83%
Child-related gender gap		21.08%

- ▶ Thus, children are a substantial part of the gender gap in mental health

# The role of family policies: Parental leave

- ▶ Can family policies reduce the child penalty in mental health?
- ▶ Idea: Penalties with exogenously varying maternal leave durations
- ▶ Exploit 3 Austrian reforms with variation from 12 to 30 months

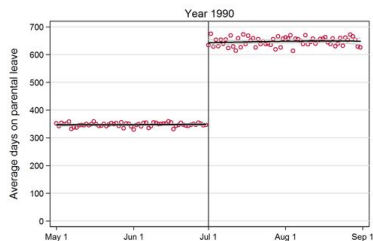
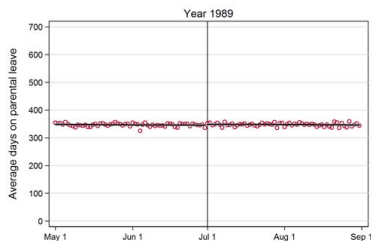


- ▶ Reform effects on labor market, fertility, & children are known (Lalive & Zweimüller, QJE, 2004; Lalive et al., ReStud, 2014; Danzer et al., JHR, 2022)
- ▶ Notably, Kleven et al., (AEJ, 2023) find no impact of these reform on the child penalty in earnings.
- ▶ Chuard (JHE, forthcoming) includes comparable reduced-form estimates for women(!) with a shorter sample

## Details of the 1990-reform in Austria

- ▶ Extension of paid and job-protected parental leave from 1 to 2 years
- ▶ Strict cut-off date: Mothers giving birth on July 1, 1990 or later
- ▶ First public discussion 7.5 months before reform came into effect
- ▶ No changes of eligibility criteria or level of benefits!
  - ▶ **Cash benefit:** 352 EUR (2015)  $\approx$  30-40% of female net median income
  - ▶ **Eligibility:** 52 (20) weeks of social security contributions in last two (one) years (for mothers below age 25)  $\Rightarrow$  “work requirement”
  - ▶ Automatic renewal of PL entitlement (no work requirement)
    - ▶ Before July 1990: if next child born within 15.5 months
    - ▶ Since July 1990: if next child born within 27.5 months

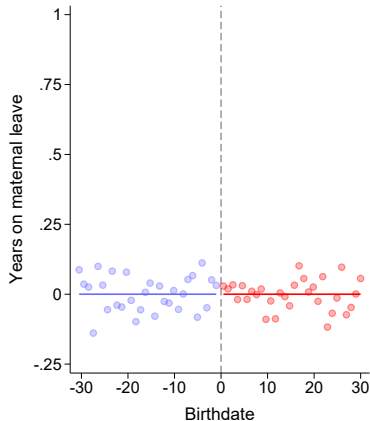
# Average maternal leave duration before & after the reform



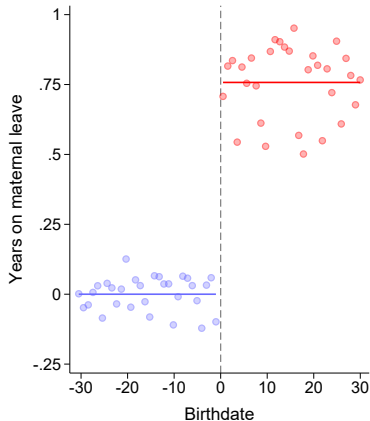
Notes: Daily averages with a second degree polynomial fit and 95% CI; eligible mothers. Data: Austrian Social Security Database

- ▶ Average PL duration jumps from about 350 to 650 days
- ▶  $\implies$  First stage (about 10 months)

# Effects of 2000-reform on yrs of maternal leave (first stage)



(g) Pre-reform year 1999



(h) Reform year 2000

The figures are covariate adjusted. For comparison, we plot the pre-reform year (left-hand side) and the reform year (right-hand side)

1990-reform

1996-reform

## 2 estimation approaches

1. **Reduced forms:** relate mental health to the assignment variable via covariate-adjusted graphs
  2. **LATE estimates:** Instrument actual maternal leave duration (i.e., endogenous treatment variable) with assignment variable. (Implemented as a fuzzy regression discontinuity design via 2SLS)
    - Advantage of 1.) simple graphical representation
    - Advantage of 2.) LATE can be interpreted comparably across reforms.
- ▶ In either approach we account for seasonality
    - ▶ We use control cohorts from the same calendar months in the respective pre-reform year (i.e., 1989, 1995, 1999)
  - ▶ Outcome variable:
    - ▶ No data before 1998
    - ▶ Use either i. fraction or ii. number of all post-birth years in which a women got a prescription

# 1. Reduced form estimation/plot

$$Y_i = \alpha_0 + \alpha_1 T_i + \alpha_2 A_i + \alpha_3 run_i + \alpha_4 run \times A_i + \alpha_5 B_i + \mathbf{X}_{i,t=0} \delta' + u_i, \quad (2)$$

$Y_i$  is a measure of the mental health of mother  $i$

$T_i$  is the binary assignment variable

$A_i$  is a binary indicator equal to one if child was born after the cutoff date

$run_i$  is the child's birth date (measured in days) centered at the cutoff

$B_i$  is a binary variable equal to one if the child is born in the reform year

$\mathbf{X}_{i,t=0}$  is a vector of control variables.

## ▶ Sample

- ▶ All eligible mothers in respective reform and pre-reform year
- ▶ Two alternative bandwidths (30 days and 61 days)

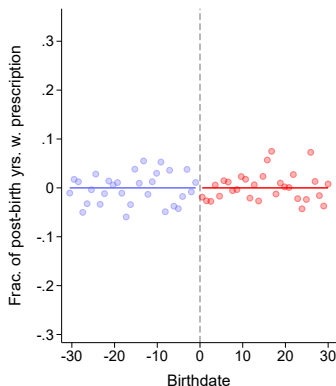
## ▶ Obtain covariate-adjusted reduced form plot:

- estimate (??)
- set  $\alpha_1$  to zero
- predict the outcome  $\hat{Y}_i$  for  $\alpha_1 = 0$
- calculate the residual as  $Y_i - \hat{Y}_i$
- plot the residuals

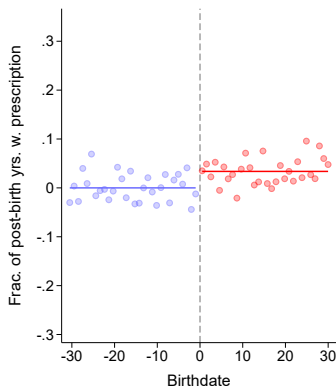


# Reduced-form plot of the 2000 reform, women

## A. Impact on fraction of post-birth years with prescriptions



(i) Pre-reform year 1999

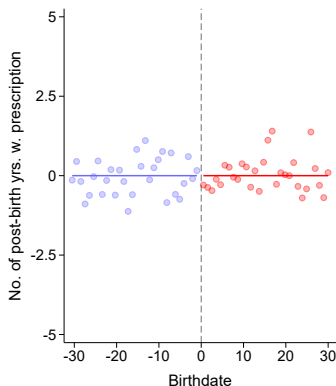


(j) Reform year 2000

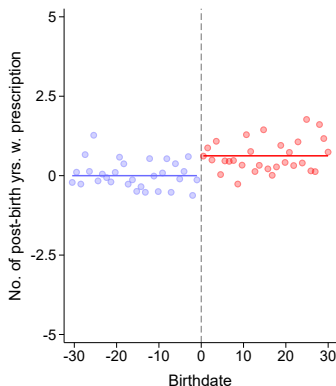
The figures are covariate adjusted. For comparison, we plot the pre-reform year (left-hand side) and the reform year (right-hand side).

# Reduced-form plot of the 2000 reform, women

## B. Impact on number of post-birth years with prescriptions



(k) Pre-reform year 1999



(l) Reform year 2000

The figures are covariate adjusted. For comparison, we plot the pre-reform year (left-hand side) and the reform year (right-hand side).

## Reduced-form estimates of the 2000-reform, women

	(1)	(2)	(3)
	Triangular	Unweighted	Covariates
<b>A. Impact on fraction of post-birth years with AD prescriptions</b>			
Assignment	0.0307** (2.5140)	0.0263** (2.1168)	0.0337*** (2.7465)
Mean of outcome		0.0455	
<b>B. Impact on number of post-birth years with AD prescriptions</b>			
Assignment	0.5802*** (2.8399)	0.4716** (2.2525)	0.6246*** (3.0400)
Mean of outcome		0.6819	
Observations		1901	

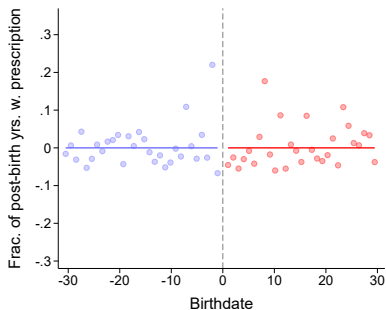
Notes: This table provides reduced-form estimates for the impact of the 2000 reform on the fraction of post-birth years with an antidepressant prescriptions (Panel A) and the number of post-birth years with an antidepressant prescriptions (Panel B). The estimates rely on a bandwidth of 30 days. Column (1) uses triangular weights, Column (2) does not use any weighting, and Column (3) combines triangular weights with covariates. It controls for mother's age, the child's sex, the child's legitimacy status, maternal education dummies, a dummy indicating whether the child is born preterm, a dummy indicating whether the mother was born abroad.  $t$  statistics in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , and \*\*\*  $p < 0.01$ .

## Reduced-form estimates of the 2000-reform, men

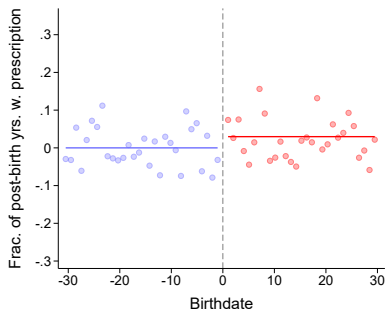
	(1)	(2)	(3)
	Triangular	Unweighted	Covariates
<b>A. Impact on fraction of post-birth years with AD prescriptions</b>			
Assignment	0.0049 (0.3497)	-0.0018 (-0.1260)	0.0098 (0.6813)
Mean of outcome		0.0378	
<b>B. Impact on number of post-birth years with AD prescriptions</b>			
Assignment	0.0376 (0.1621)	-0.0728 (-0.3080)	0.0859 (0.3655)
Mean of outcome		0.6375	
Observations		1025	

Notes: This table provides reduced-form estimates for the impact of the 2000 reform on men's fraction of post-birth years with an antidepressant prescriptions (Panel A) and men's number of post-birth years with an antidepressant prescriptions (Panel B). The estimates rely on a bandwidth of 30 days. Column (1) uses triangular weights, Column (2) does not use any weighting, and Column (3) combines triangular weights with covariates. It controls for mother's age, the child's sex, the child's legitimacy status, maternal education dummies, a dummy indicating whether the child is born preterm, a dummy indicating whether the mother was born abroad. *t* statistics in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , and \*\*\*  $p < 0.01$ .

# Covariate-adjusted reduced form plot for the 1990-reform



(m) Pre-reform year 1989



(n) Reform year 1990

*Notes:* The right figure shows the reduced form covariate-adjusted plots between being assigned to the respective new regulation and maternal mental health for the 1990 reform. This plot is obtained by (i) estimating the model in (??), (ii) setting  $\alpha_1$  to zero, (iii) predicting the outcome  $\hat{Y}_i$  for  $\alpha_1 = 0$ , (iv) calculating the residual as  $Y_i - \hat{Y}_i$ , and (v) plotting the residuals. For comparison, we show an equivalent plot for the pre-reform year reform (left-hand side). Maternal mental health is captured by the fraction of post-birth years with an antidepressant prescription.

Plot for 2000-reform

## 2. LATE estimation via Fuzzy RDD/2SLS

$$ML_i = \beta_0 + \beta_1 T_i + \beta_2 A_i + \beta_3 run_i + \beta_4 run_i \times A_i + \beta_5 B_i + \mathbf{X}_{i,t=0} \gamma' + \eta_i$$
$$Y_i = \gamma_0 + \gamma_1 \hat{M}L_i + \gamma_2 A_i + \gamma_3 run_i + \gamma_4 run_i \times A_i + \gamma_5 B_i + \mathbf{X}_{i,t=0} \delta' + \epsilon_i$$

$ML_i$  actual duration of maternal leave

$Y_i$  is a measure of the mental health of mother  $i$

$T_i$  is the binary assignment variable

$A_i$  is a binary indicator equal to one if child was born after the cutoff date

$run_i$  is the child's birth date (measured in days) centered at the cutoff

$B_i$  is a binary variable equal to one if the child is born in the reform year

$\mathbf{X}_{i,t=0}$  is a vector of control variables.

- ▶ Sample
  - ▶ All eligible mothers in respective reform and pre-reform year
  - ▶ Two alternative bandwidths (30 days and 61 days)
- ▶ **Identifying assumptions:** no sorting at reform date & parallel trends
  - ▶ Eligibility/take-up   Density   Balancing
- ▶ **Interpretation:**  $\hat{\gamma}_1$  is the causal effect of an additional year of maternal leave by being assigned to a new regulations.

# Impact of maternal leave duration on mental health (LATEs for 2000 reform)

	(1) Triangular	(2) Unweighted	(3) Covariates
<b>A. Impact on fraction of post-birth years with AD prescriptions</b>			
Years of maternal leave	0.0410** (2.5128)	0.0350** (2.1186)	0.0445*** (2.7735)
Mean of outcome		0.0455	
<b>B. Impact on number of post-birth years with AD prescriptions</b>			
Years of maternal leave	0.7736** (2.4578)	0.6271** (2.2430)	0.8245*** (2.6354)
Mean of outcome		0.6819	
Observations	1901		

Notes: This table provides LATE estimates (see  $\hat{\gamma}_1$  in equation ??) of an additional year of maternal leave on the fraction of post-birth years with an antidepressant prescriptions (Panel A) and the number of post-birth years with an antidepressant prescriptions (Panel B). The estimates rely on a bandwidth of 30 days. Column (1) uses triangular weights, Column (2) does not use any weighting, and Column (3) combines triangular weights with covariates. It controls for mother's age, the child's sex, the child's legitimacy status, maternal education dummies, a dummy indicating whether the child is born preterm, a dummy indicating whether the mother was born abroad. *t* statistics in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , and \*\*\*  $p < 0.01$ .

# LATE estimates for all reforms, outcome var 1

	(1)	(2)	(3)	(4)	(5)	(6)
	30 day bandwidth			60 day bandwidth		
	No covs	Some covs	More covs	No covs	Some covs	More covs
<b>1990 reform</b>						
Years of maternal leave	0.0484** (1.9836)	0.0498** (2.0464)	0.0478** (1.9743)	0.0314* (1.8482)	0.0321* (1.8993)	0.0309* (1.8402)
No. of observations		2,070			4,141	
Mean of dep var		0.0867				
<b>1996 reform</b>						
Years of maternal leave	0.0092 (0.2280)	0.0111 (0.2834)	0.0141 (0.3659)	-0.0076 (-0.2539)	-0.0105 (-0.3543)	-0.0076 (-0.2586)
No. of observations		2,140			4,160	
Mean of dep var		0.0759				
<b>2000 reform</b>						
Years of maternal leave	0.0402** (2.1190)	0.0433** (2.3137)	0.0441** (2.3821)	0.0375*** (2.7956)	0.0390*** (2.9456)	0.0410*** (3.0903)
No. of observations		1,861			3,756	
Mean of dep var		0.0472				

Notes: This table provides estimates of the LATE of an additional year of maternal leave (see  $\hat{\gamma}_1$  in equation ??) by being assigned to the respective new regulation on maternal mental health. The latter is captured by the fraction of post-birth years with an antidepressant prescription. Columns (1) to (3) use a bandwidth of 30 days and Columns (4) to (6) a bandwidth of 61 days. The specification "some covs" (columns 2 and 5) controls for mother's age and marital status, and for the child's sex. The specification "more covs" (columns 3 and 6) additionally controls for the child's legitimacy status, for whether the child is born preterm, for maternal education, and for whether the mother was born abroad.

An additional year of leave increases the fraction of post-birth years with prescription by 4 to 5 %-points. Equivalent to 56% (1990 reform) & 85% (2000 reform). We find comparable effect sizes for the other two outcomes.

Outcome-2

Outcome-3



## Summary and conclusions

- ▶ Childbirth has much larger negative effects on mothers' than on fathers' mental health
- ▶ Child penalty in mental health is more pronounced in Austria
- ▶ Child penalty explains a key part of the gender gap in mental health problems
- ▶ Exogenously longer maternal leaves increase the Child penalty for women, but not men
- ▶ Re-think parental leave (and formal child-care) policies?
- ▶ Next step: Study CP in different groups of immigrants to Denmark/Austria

# Appendix

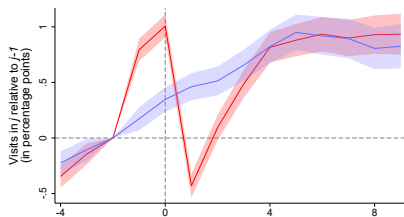
## Help seeking in Survey data

- ▶ Eurobarometer respondents from AT and DNK with an MHI-5 score below 73 points
- ▶ *“In the last 12 months, did you seek help from somebody in respect of a mental health problem” (yes/no)*

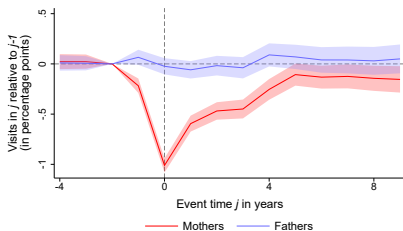
	Pooled sample		Austria		Denmark	
	(1)	(2)	(3)	(4)	(5)	(6)
Respondent is male	-0.018 (0.051)	-0.000 (0.050)	-0.012 (0.071)	0.020 (0.071)	-0.014 (0.073)	-0.009 (0.071)
MHI-5 score		-0.012*** (0.002)		-0.014*** (0.004)		-0.010*** (0.004)
Number of observations	345	345	193	193	152	152
Mean of dependent variable	0.304	0.304	0.332	0.332	0.270	0.270
Adjusted R <sup>2</sup>	-0.003	0.058	-0.005	0.065	-0.006	0.041

Notes: This tables summarizes estimation results from OLS regressions. The estimation sample includes Eurobarometer respondents from Austria and Denmark with an MHI-5 score below 52 points. The dependent variable is a binary variable equal to one if the respondent answers to the following question, and zero otherwise. Robust standard errors are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## Consultations of GPs and other specialists– Austria



(o) GPs

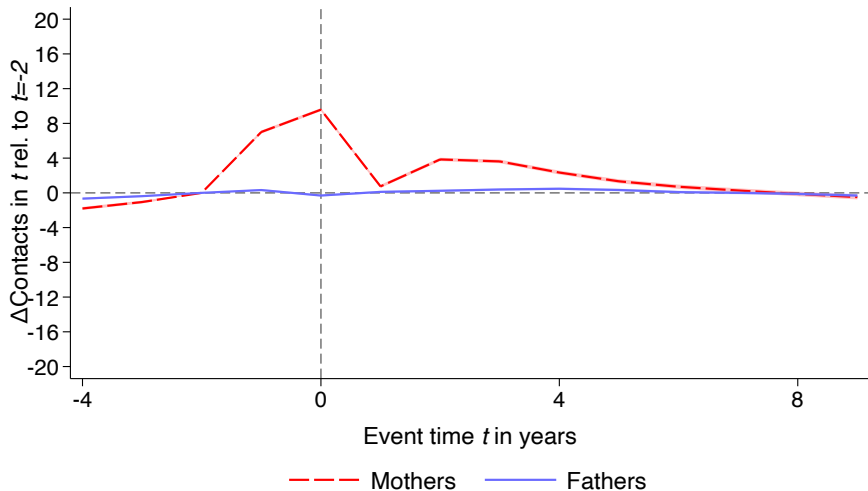


(p) Other specialists (excluding neurologists, psychiatrists, and psychologists)

Notes: These figures show the estimated percentage point change in physician visits before and after having a child. All estimates control for age and year dummies and rely on robust standard errors.

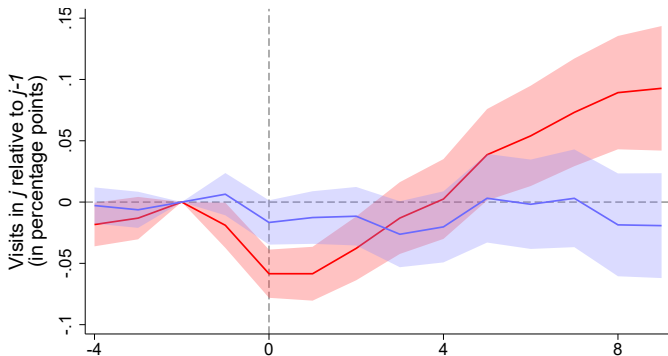
▶ Back

## Is the gender gap due to differential help seeking behavior? – Denmark



▶ Back

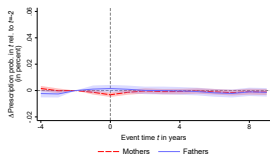
# Consultations of neurologists, psychiatrists, and psychologists – Austria



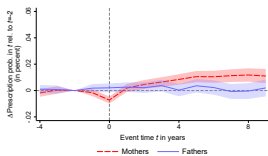
(q) Neurologists, Psychiatrists, and Psychologists

Notes: These figures show the estimated percentage point change in physician visits before and after having a child. All estimates control for age and year dummies and rely on robust standard errors.

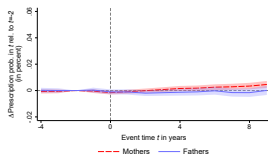
# ATC-N, Nervous system prescriptionn by sub-group – AT



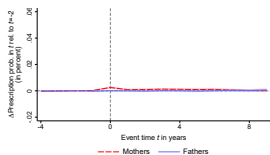
(a) Anesthetics



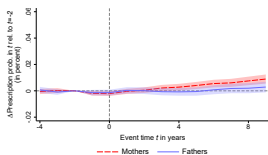
(b) Analgesics



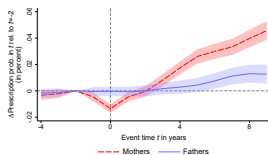
(c) Antiepileptics



(d) Anti-parkinson drugs



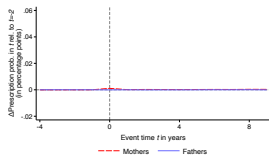
(e) Psycholeptics



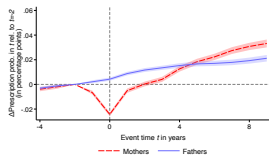
(f) Psychoanalectics (comprising Anti-depressants)

▶ Back

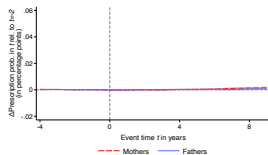
# ATC-N, Nervous system prescriptionn by sub-group – DK



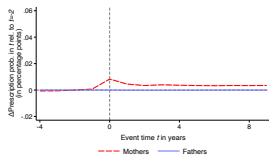
(a) Anesthetics



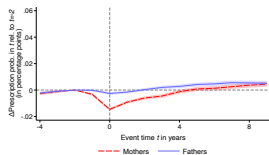
(b) Analgesics



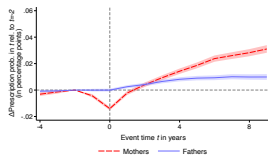
(c) Antiepileptics



(d) Anti-parkinson drugs



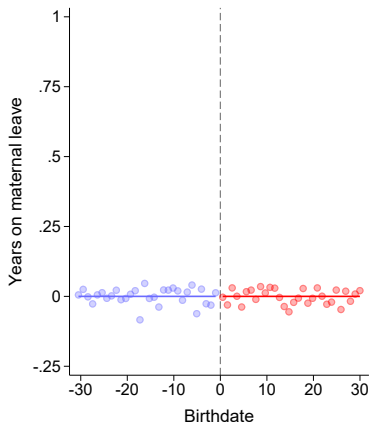
(e) Psycholeptics



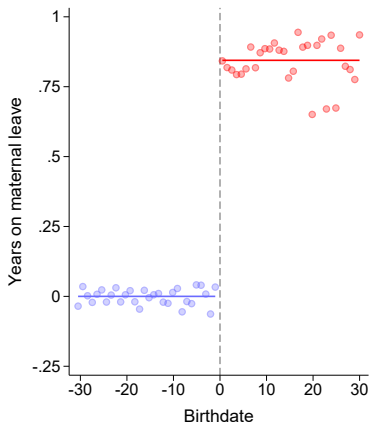
(f) Psychoanalectics (comprising Anti-depressants)



# Effects of 1990-reform on yrs of maternal leave (first stage)



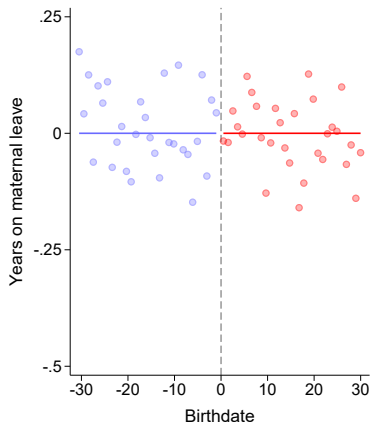
(g) Pre-reform year 1989



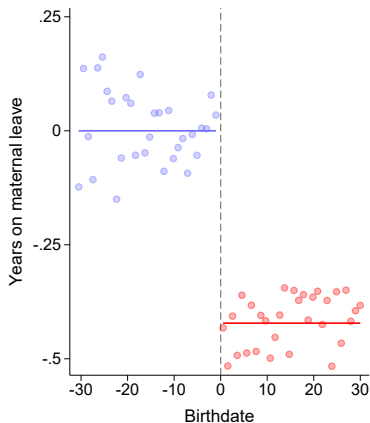
(h) Reform year 1990

figures are covariate adjusted. For comparison, we plot the pre-reform year (left-hand side) and the reform year (right-hand side)

# Effects of 1996-reform on yrs of maternal leave (first stage)



(i) Pre-reform year 1995

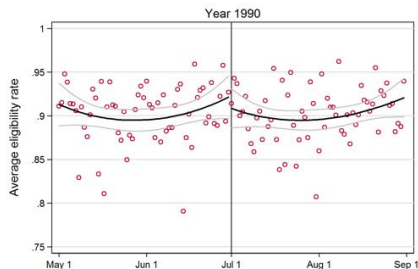


(j) Reform year 1995

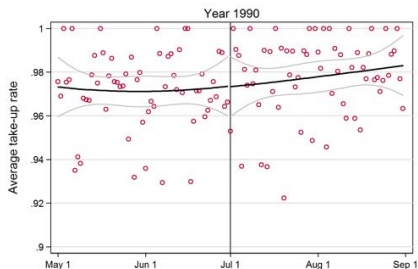
The figures are covariate adjusted. For comparison, we plot the pre-reform year (left-hand side) and the reform year (right-hand side)

# Eligibility for maternal leave and actual take-up

## Share of eligible mothers



## PL take-up rates

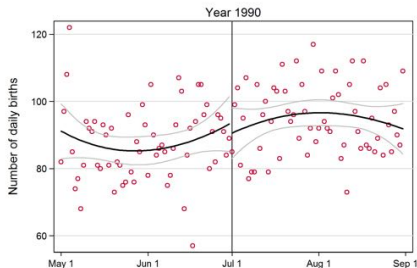
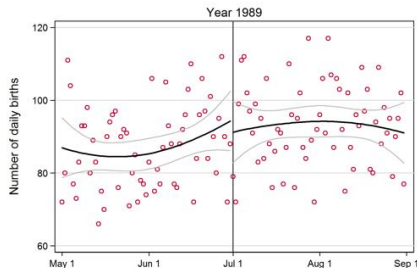


Notes: Daily averages with a second degree polynomial fit and 95% CI. Data: Austrian Social Security Database

- ▶ About 90% of all mothers were eligible (*Sample: first time mothers*)
- ▶ About 97% of eligible mothers took PL
- ▶ **No discontinuity in eligibility or take-up rates**

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# Density of births — 1989 vs. 1990

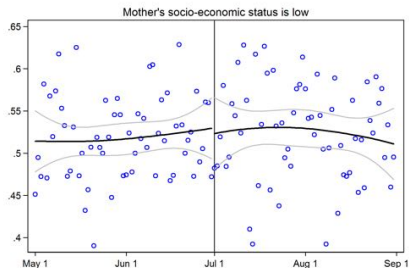
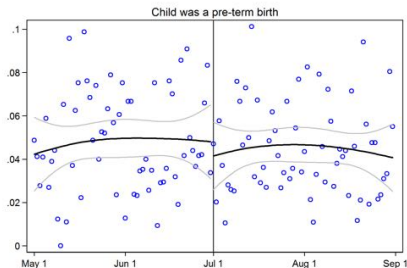


Notes: Daily averages with a second degree polynomial fit and 95% CI

- ▶ No evidence of sorting
- ▶ Equivalent seasonality pattern in 1989 and 1990

▶ Back

# Balancing: pre-determined variables (examples) — 1990

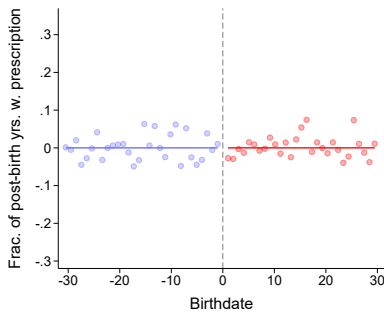


Notes: Daily averages with a second degree polynomial fit and 95% CI

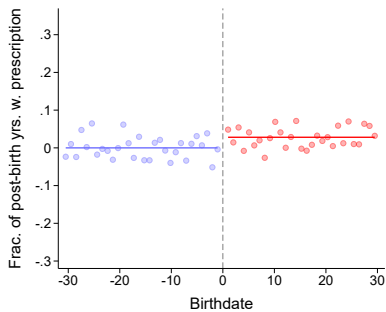
- ▶ No discontinuities in other pre-determined variables and covariates (e.g. mother's age, marital status or migration background, birth outcomes of child)

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# Covariate-adjusted reduced form plot for the 2000-reform



(k) Pre-reform year 1999



(l) Reform year 2000

*Notes:* The right figure shows the reduced form covariate-adjusted plots between being assigned to the respective new regulation and maternal mental health for the 2000 reform. This plot is obtained by (i) estimating the model in (??), (ii) setting  $\alpha_1$  to zero, (iii) predicting the outcome  $\hat{Y}_i$  for  $\alpha_1 = 0$ , (iv) calculating the residual as  $Y_i - \hat{Y}_i$ , and (v) plotting the residuals. For comparison, we show an equivalent plot for the pre-reform year reform (left-hand side). Maternal mental health is captured by the fraction of post-birth years with an antidepressant prescription.

# LATE estimates for all reforms, outcome var 2

	(1)	30 day bandwidth		(4)	60 day bandwidth	
	No covariates	Some covariates	More covariates	No covariates	Some covariates	More covariates
<b>1990 reform</b>						
Years of maternal leave	0.9376** (2.1175)	0.8964** (2.0262)	0.8766** (1.9950)	0.5203* (1.6922)	0.4947 (1.6151)	0.4771 (1.5661)
Observations	2070	2070	2070	4141	4141	4141
<b>1996 reform</b>						
Years of maternal leave	0.6245 (0.8614)	0.6245 (0.8814)	0.6842 (0.9800)	0.2920 (0.5482)	0.2319 (0.4379)	0.2920 (0.5590)
Observations	2140	2140	2140	4160	4160	4160
<b>2000 reform</b>						
Years of maternal leave	0.7436** (2.3477)	0.7816** (2.4755)	0.7940** (2.5238)	0.6414*** (2.8775)	0.6507*** (2.9363)	0.6820*** (3.0660)
Observations	1861	1861	1861	3756	3756	3756

Notes: This table provides estimates of the local average treatment effect of an additional year of maternal leave (see  $\hat{\gamma}_1$  in equation ??) by being assigned to the respective new regulation on maternal mental health. The latter is captured by the number of post-birth years with an antidepressant prescription. Columns (1) to (3) use a bandwidth of 30 days and Columns (4) to (6) a bandwidth of 61 days. The specification "some covs" (columns 2 and 5) controls for mother's age and marital status, and for the child's sex. The specification "more covs" (columns 3 and 6) additionally controls for the child's legitimacy status, for whether the child is born preterm, for maternal education, and for whether the mother was born abroad.

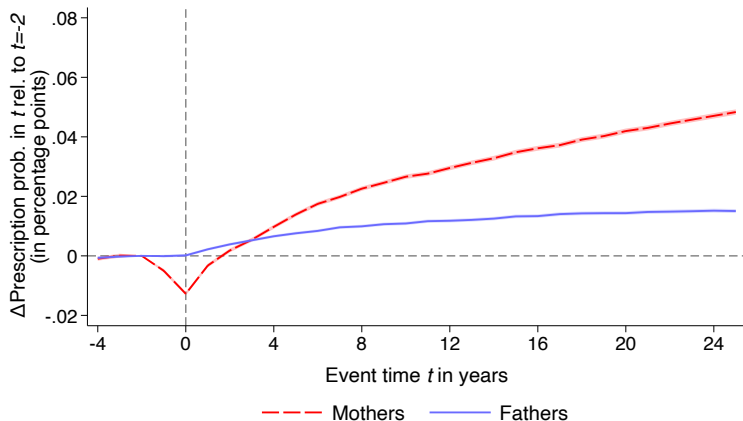
# LATE estimates for all reforms, outcome var 3

	(1)	30 day bandwidth		(4)	60 day bandwidth	
	No covariates	Some covariates	More covariates	No covariates	Some covariates	More covariates
<b>1990 reform</b>						
Years of maternal leave	0.0527*	0.0568**	0.0515*	0.0306	0.0327*	0.0300
	(1.9591)	(2.1219)	(1.9411)	(1.6285)	(1.7450)	(1.6107)
Observations	33200	33200	33200	66246	66246	66246
<b>1996 reform</b>						
Years of maternal leave	0.0361	0.0312	0.0389	0.0166	0.0098	0.0168
	(0.8130)	(0.7079)	(0.8992)	(0.5040)	(0.2988)	(0.5193)
Observations	33642	33642	33642	65897	65897	65897
<b>2000 reform</b>						
Years of maternal leave	0.0471**	0.0493**	0.0504**	0.0415***	0.0434***	0.0457***
	(2.2346)	(2.3370)	(2.4050)	(2.8126)	(2.9453)	(3.1074)
Observations	27431	27431	27431	55222	55222	55222

Notes: This table provides estimates of the local average treatment effect of an additional year of maternal leave (see  $\hat{\gamma}_1$  in equation ??) by being assigned to the respective new regulation on maternal mental health. The underlying data set has a panel structure, and maternal mental health is captured a binary variable equal to one each year with an antidepressant prescription. Columns (1) to (3) use a bandwidth of 30 days and Columns (4) to (6) a bandwidth of 61 days. The specification "some covs" (columns 2 and 5) controls for mother's age and marital status, and for the child's sex. The specification "more covs" (columns 3 and 6) additionally controls for the child's legitimacy status, for whether the child is born preterm, for maternal education, and for whether the mother was born abroad.



# Child penalties in mental health the long run, Denmark

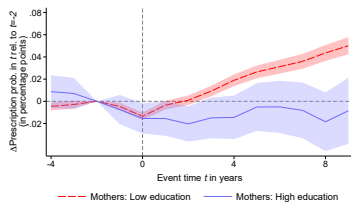


► Notes: Estimated in unbalanced panel.

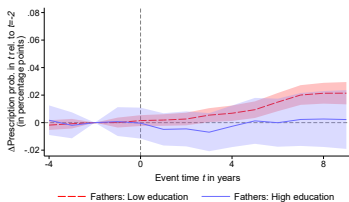
► **Child penalty in mental health**  $P_t = \frac{\hat{\alpha}_t^m - \hat{\alpha}_t^f}{E[\bar{Y}_{ist}^m | t]}$

- Austria ( $t = 9$ ): ?
- Denmark ( $t = 9$ ): 160%

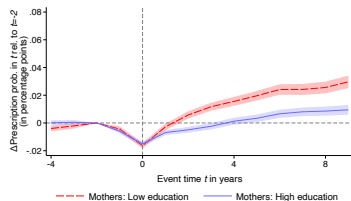
# Child penalties in mental health, by educational attainment



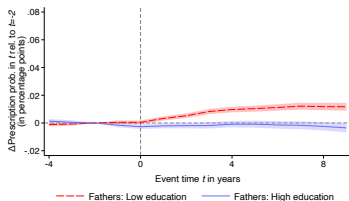
(a) Austria: Mothers



(b) Austria: Fathers



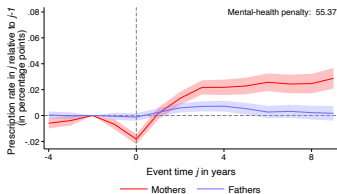
(c) Denmark: Mothers



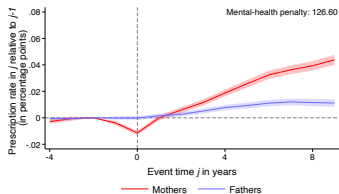
(d) Denmark: Fathers

Notes: These figures show the estimated percentage point change in antidepressant prescriptions before and after having a child for mothers and fathers for Austria and Denmark. All estimates control for age and year dummies and rely on robust standard errors. Panel (a) and (c) compare mothers with high education, where the highest educational attainment is equal to ISCED level 5 or 6, to mothers with low education, that is ISCED levels 1 through 4. Panels (b) and (d) divide the sample by education for fathers.

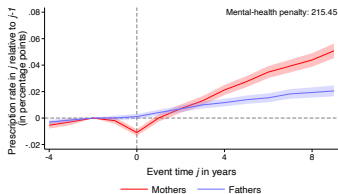
# Child penalties in mental health for further children



(a) 1 child

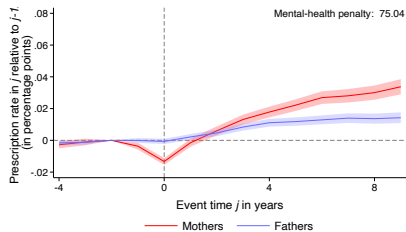


(b) 2 children

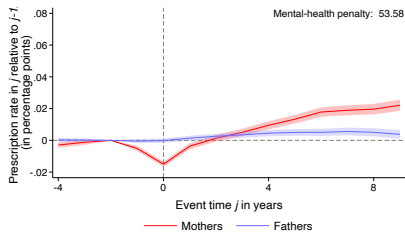


(c) 3 children

# Child penalties in mental health, by distance to mother (in law)



(a) Grandmother in same municipality



(b) Grandmother in other municipality

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