The Effect of Prenatal Maternity Leave Duration on Short and Long-term Child Outcomes

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Introduction

- **Motivation**
  - Maternity leave (ML) policies essential for ensuring health of pregnant workers and unborn children.
  - Little is know about the optimal ML duration, existing policies not evidence-based.
  - No microlevel studies with credible identification.
- **Research question**
  - **Substantial prenatal mandatory maternity leave extension in Austria.**
  - Beneficial for children and their mothers?
    - Better birth outcomes?
    - Better subsequent maternal fertility outcomes?
    - Better long-run outcomes?
  - **External validity:** How does Austria compare to other OECD countries?
- **Findings**
  - Robust zero LATEs throughout, also in our cross-country analysis.

The grand scheme of things

- Why is it interesting to look at a ML extension of two weeks?
- Related: how does **maternal employment during pregnancy** affect children and mothers.
  - Effects of maternal employment during the first years of a child's life are extensively studied. (e.g., Dustmann and Schönberg, 2012; Carneiro et al., 2015; Dahl et al., 2016; Danzer et al., 2017)
  - Scarce evidence on effects of maternal employment *during* pregnancy.
- Quasi-experiment: Women are as-good-as randomly assigned to work two weeks less during pregnancy.
- Cross-country analysis to prove external validity of results.

Mechanisms

- Reduction in psychological and physiological stress level.
- Reduction in specific occupational exposures.
- Substituting work with leisure $\Longrightarrow$ healthier behavior, e.g., more time to rest, healthier diet, time to do necessary prenatal checkups.
- Fetal origins hypothesis $\Longrightarrow$ Importance of prenatal environment on later child and health outcomes. (Almond and Currie, 2011a,b)

Existing literature

- **Rossin (2011, JHE)**
  - U.S. *Family Medical Leave Act* (FMLA) of 1993, stipulated unpaid leave for twelve weeks.
  - Identification based on variation in FMLA policies across states and variation over which firms are covered by FMLA.
  - Results: Birth weight ↑ premature births ↓ infant mortality ↓↓
    $\Longrightarrow$ Effects only present for children of highly educated mothers

- **Steams (2015, JHE)**
  - Evaluates state-based access to paid maternity leave in the USA.
  - Five states were required to provide wage reimbursements to pregnant mothers through their *Temporary Disability Insurance* (TDI) programs.
  - Results: Birth weight ↓ premature births ↓
    $\Longrightarrow$ Driven by disadvantaged African-American and unmarried mothers.

Existing literature

- **Wüst (2015, HE)**
  - Effect of maternal employment during pregnancy on birth outcomes in Denmark?
  - Exploits variation across pregnancies by comparing outcomes of mothers' consecutive children.
  - Results: Premature births ↓

Institutional setting in Austria

- Mandatory paid job-protected maternity leave legislated in 1957.
- Until 1974, six weeks of leave prior to birth were mandated. Reform in April 1974 increased duration to **eight** weeks.
- Mandatory postnatal leave was also extended from six to eight weeks
- Beginning of prenatal leave is estimated based upon the doctor's estimation of date of delivery.
- **Important** Prenatal leave may start earlier, if the mother's or the child's health is at risk due to work.
- During the leave, mothers are fully reimbursed for their lost income (transfer payment, 100% of net earnings).

  $\Longrightarrow$ Did not change due to the reform.
- Mothers cannot be dismissed up until four months after the delivery.

  $\Longrightarrow$ Did not change due to the reform.

Data

- Data from the **Austrian Social Security Database** (ASSD) linked with records from the **Austrian Birth Register** (ABR).
- Universe of all births from 1973 until today.
- **ASSD** Detailed employment and wage histories, demographics, etc.
  - Daily information on occupation, experience, tenure for each worker.
  - Earnings are provided per year per employer, but top-coded
  - We do not observe working hours.
- **ABR** Contains information on birth characteristics
  - Date and place of birth, birth weight, birth length, etc.
  - Socioeconomic information which are not available in the ASSD.

Evaluating the reform

- Mandatory prenatal and postnatal maternity leaves extended from **six** to **eight** weeks, respectively, in 1974.

  ▸ Average ML durations

  $\Longrightarrow$ All other aspects of maternity leave (e.g., transfer payments) unaffected.

  $\Longrightarrow$ Also postnatal leave duration remained unaffected.

- **Experimental set-up** ($N = 7{,}350$)

A	Treatment group	Mothers who gave birth in June '74.
N	Control group	Mothers who gave birth in April '74.

  Step-wise phase-in period during May 1974 $\longrightarrow$ left-out as a *'donut.'*

  Mothers in **A** eligible for one additional medical prenatal check-up.

- *Fuzzy regression discontinuity design* (RDD).

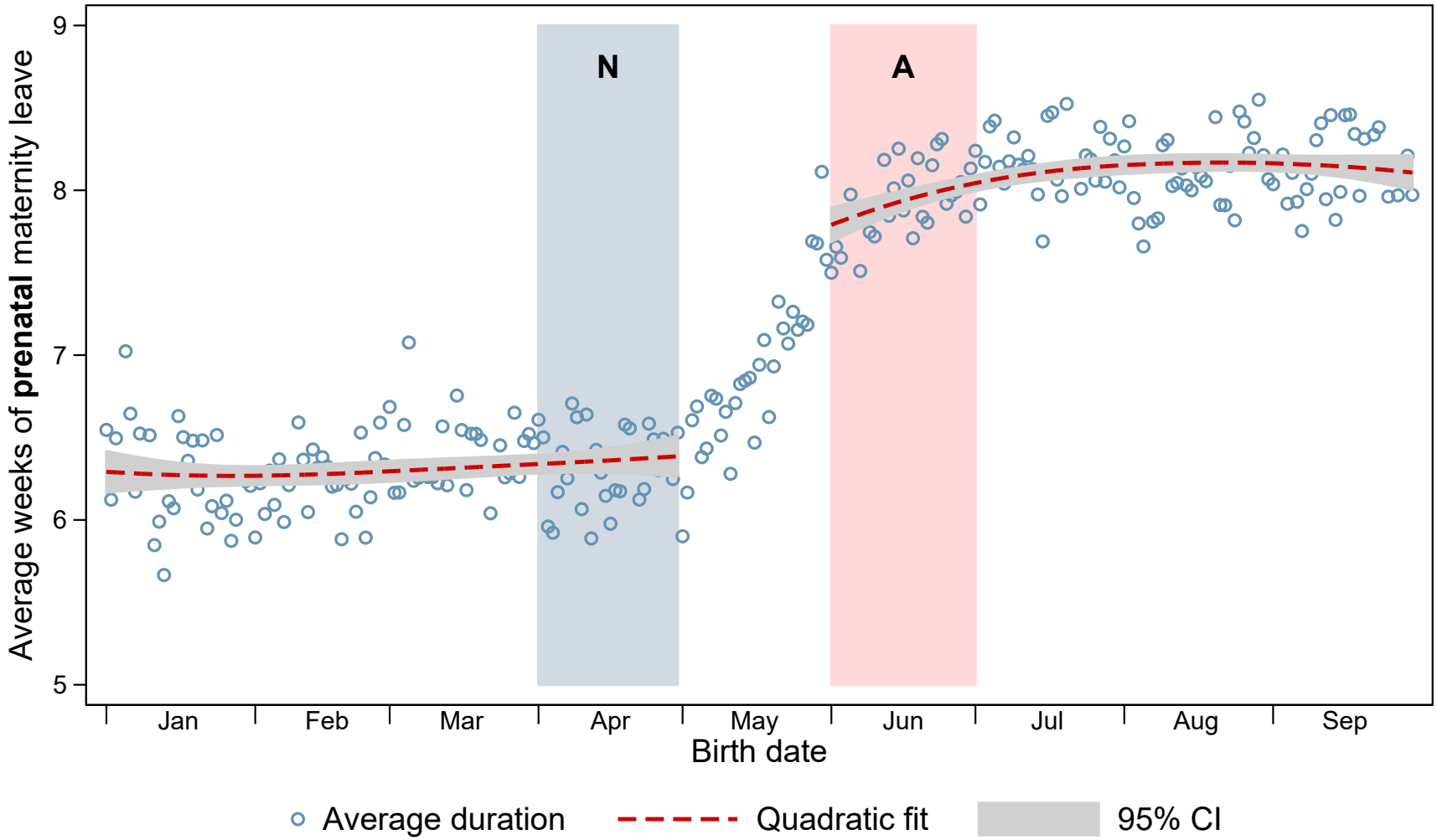
- Eligibility determined by a **cutoff due-date.**

  $\Longrightarrow$ Unobservable, we therefore use the actual birth date as a proxy.

- What if actual birth date $\neq$ expected birth date?
  - In **A** but not assigned $\Longrightarrow$ Pregnancy duration of $\geq$ 44 w. (ovr. 0.02%)
  - In **N** but assigned $\Longrightarrow$ Pregnancy duration of $\leq$ 34 w. (ovr. 1.7%)

Average maternity leave duration around the cut-off

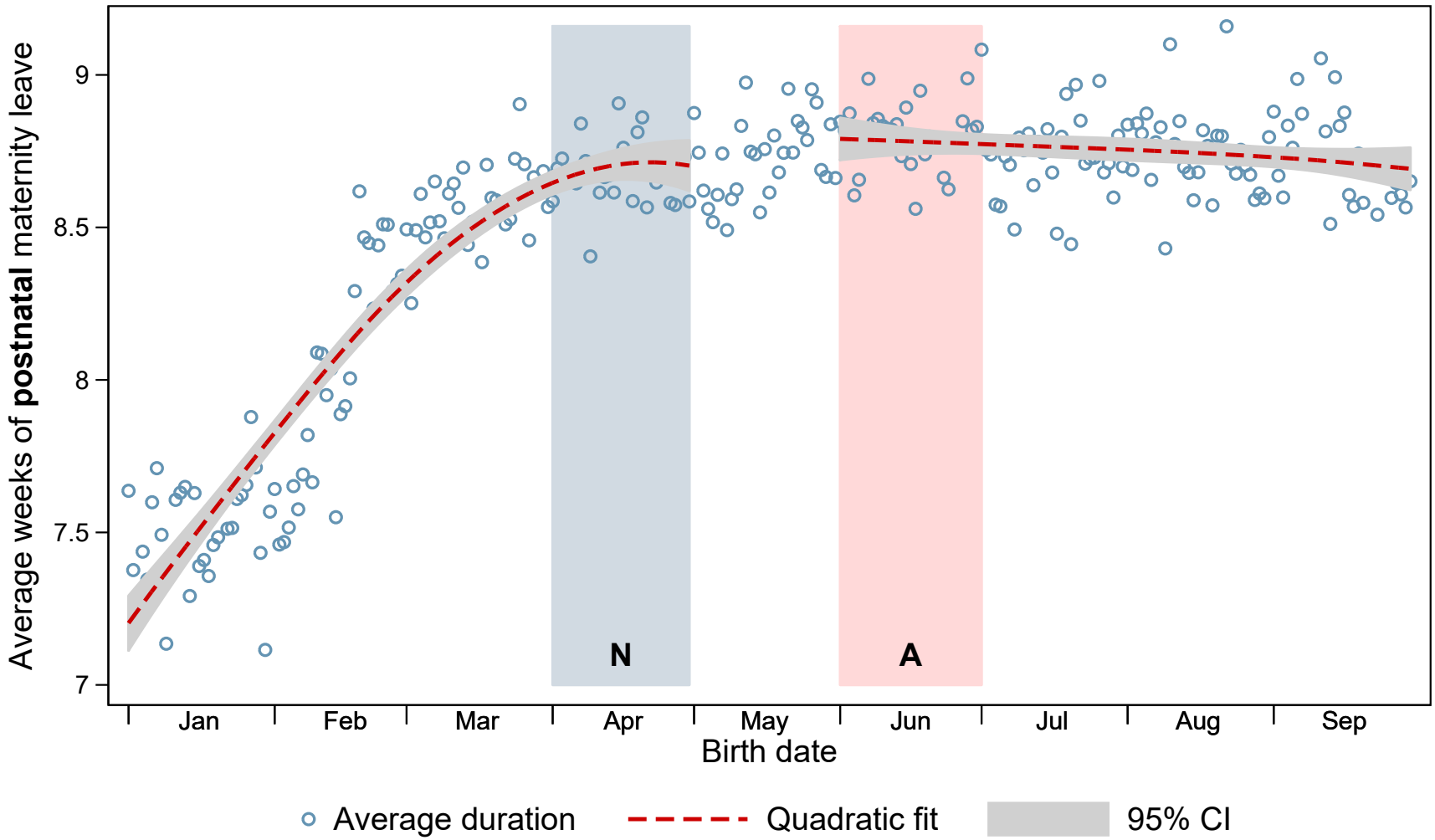
Prenatal maternity leaves **A** . . . assigned, **N** . . . not assigned



▸ Longer window

Average maternity leave duration around the cut-off

Postnatal maternity leaves **A** . . . assigned, **N** . . . not assigned



▸ Longer window

Empirics

Fuzzy regression discontinuity design

$$mldur_i = \alpha_0 + \alpha_1\, jun_i + \mathbf{x}_i\gamma' + \eta_i$$

$$y_i = \beta_0 + \varphi_{\text{rdd}} \cdot \widehat{mldur}_i + \mathbf{x}_i\delta' + \varepsilon_i, \qquad i \in W,$$

y	Outcome	Birth weight, length, maternal survival, etc.
$mldur$	Treatment	Maternity leave duration in days
jun	Assignment	$jun_i = 1$ if expected birth date is in June 1974
$\mathbf{x}$	Vector of additional control variables[1]	
ε, η	Error terms	
W	Working mothers	

[1] Mother's religion, age, province of residence, and citizenship, as well as a dummy for whether child was born in wedlock.

Identification

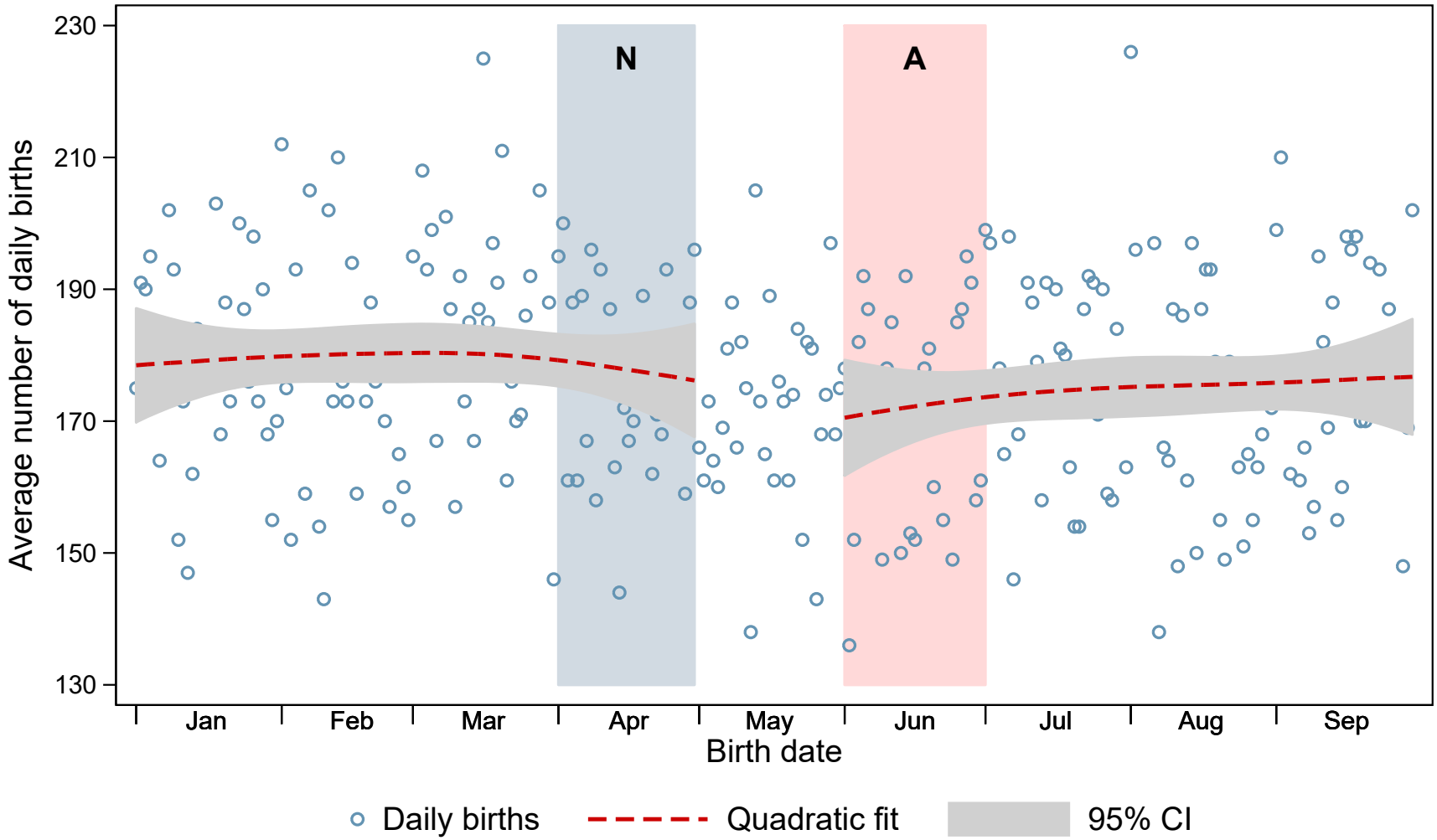
1. **Assignment to the increased prenatal ML duration jun_i must predict actual take-up $mldur$.**
   - Testable $\longrightarrow \hat{\alpha}_1 = 1.587\ (0.058)$, first-stage F-statistic 757.

2. **Mothers must not precisely manipulate their child's expected date of birth around the cutoff.**
   - Timing of reform rules out that parents adjusted conception behavior.
   - Bill was passed March 6, 1974 and became effective April 1, 1974.
   - Smooth densities around the threshold. ▸ Graph

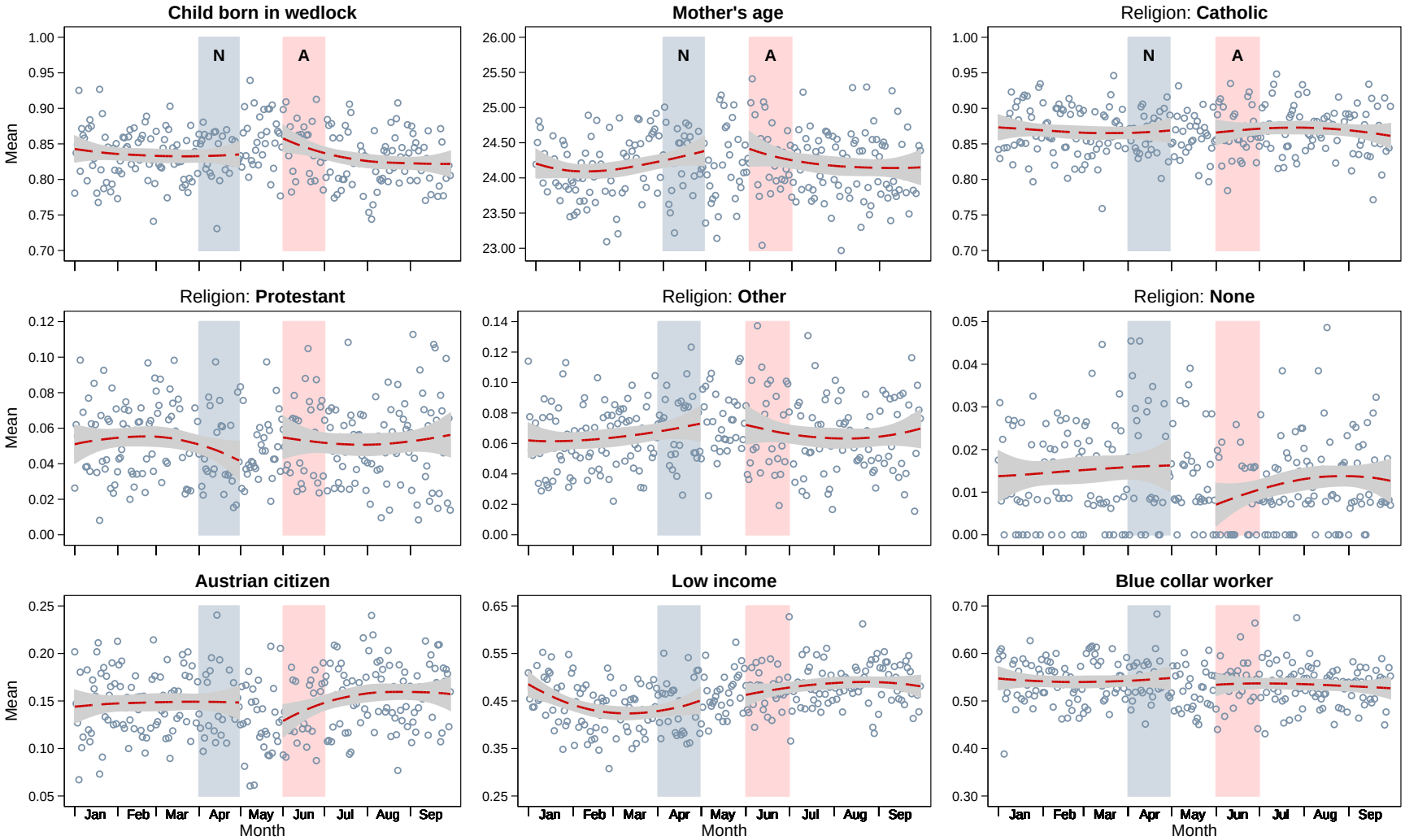
3. **Assignment a_i must not be correlated with any outcome-determining factor.**
   - Not testable, but none of our covariates changes discontinuously around the cutoff. ▸ Graph

Average number of daily births

A . . . assigned, **N** . . . not assigned



Covariate balancing



Outcome variables

Short name	Variable	Support	Source
Health at birth outcomes			
Birth weight	Log of birth weight in dg.	$[0, \infty)$	ABR
Low birth weight	Probability that birth weight is < 250 dg.	$\{0, 1\}$	ABR
SGR	Probability of having low birth weight and a low PI ($PI = kg/m^3$)	$\{0, 1\}$	ABR
Length	Length of child in cm.	$[0, \infty)$	ABR
Premature birth	Probability of delivering prematurely	$\{0, 1\}$	ABR
Subsequent maternal fertility outcomes			
20 year survival	Probability that mother survived until 20 years after delivering	$\{0, 1\}$	ASSD
40 year survival	Probability that mother survived until 40 years after delivering	$\{0, 1\}$	ASSD
No. of next birth	Number of further children conceived by the mother	$[0, \infty)$	ASSD
Further birth	Probability of conceiving again	$\{0, 1\}$	ASSD
Time to next birth	Time until next birth in days, conditional on conceiving again	$[0, \infty)$	ASSD
Childrens' long-term outcomes			
Employed	Probability of being employed at age 40	$\{0, 1\}$	ASSD
Wage	Log of annual wage at age 40	$[0, \infty)$	ASSD
White collar	Probability of being a white collar worker at age 40	$\{0, 1\}$	ASSD

▸ Summary statistics and variable descriptions

Health at birth outcomes

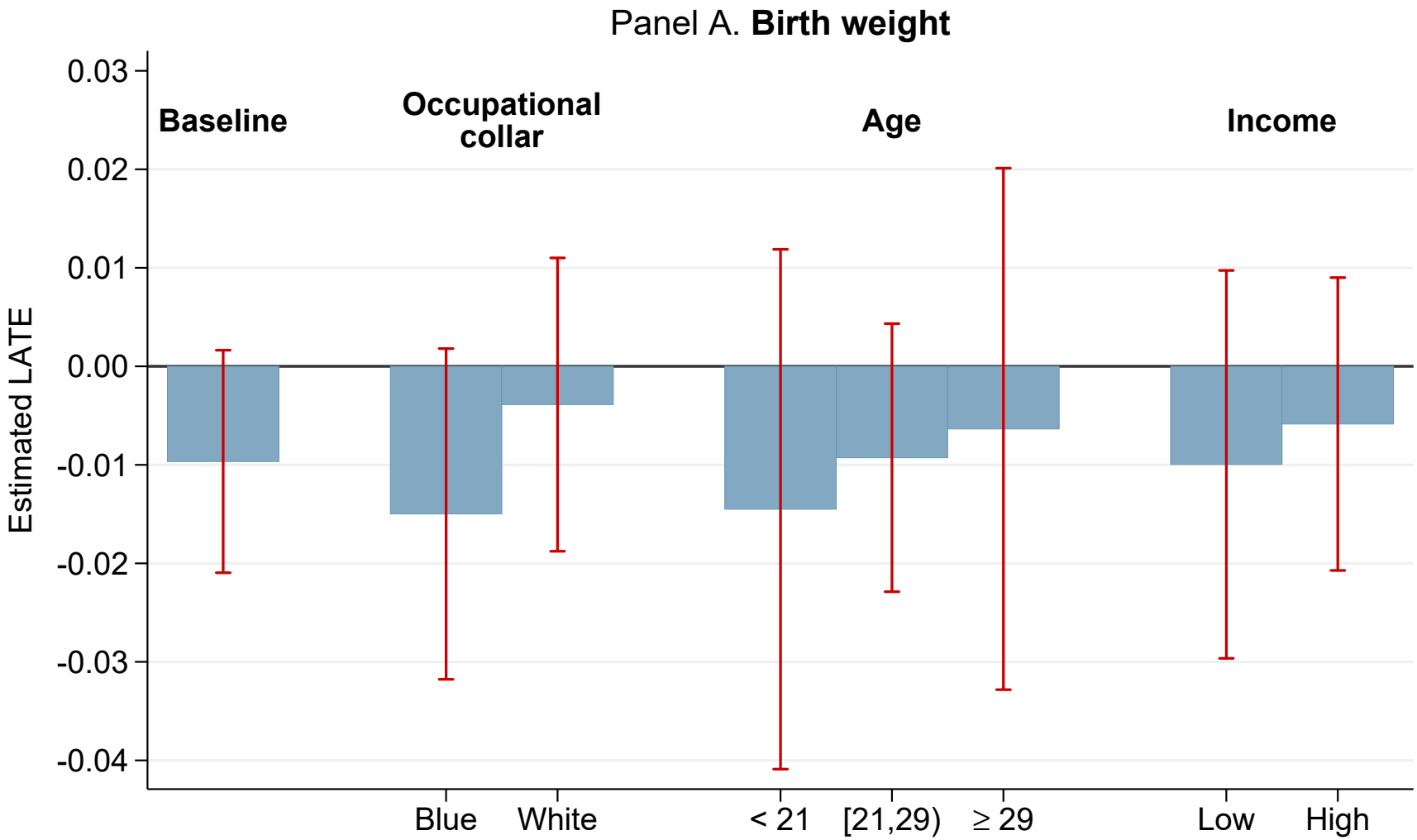
Main estimates

	(1) Birth weight	(2) Low birth weight	(3) Symmetric growth restr.	(4) Length	(5) Premature birth
Panel A. RDD					
Duration of prenatal maternity leave	-0.005*	0.001	0.000	-0.001	0.005
	(0.003)	(0.003)	(0.003)	(0.001)	(0.004)
No. of observations	7,350	7,350	7,350	7,350	7,350
Mean of outcome	5.77	0.06	0.04	3.92	0.06
Std. dev. of outcome	0.19	0.23	0.19	0.06	0.24
Kleinbergen-Paap rK Wald F-statistic	756.93	756.93	756.93	756.93	756.93
Panel B. OLS					
Duration of prenatal maternity leave	0.009***	-0.010***	-0.006***	0.002***	-0.020***
	(0.001)	(0.002)	(0.001)	(0.000)	(0.002)
No. of observations	7,350	7,350	7,350	7,350	7,350
Mean of outcome	5.77	0.06	0.04	3.92	0.06
Std. dev. of outcome	0.19	0.23	0.19	0.06	0.24

Notes: Robust standard errors in parentheses, stars indicate statistical significance: * p<0.10, ** p<0.05, *** p<0.01.

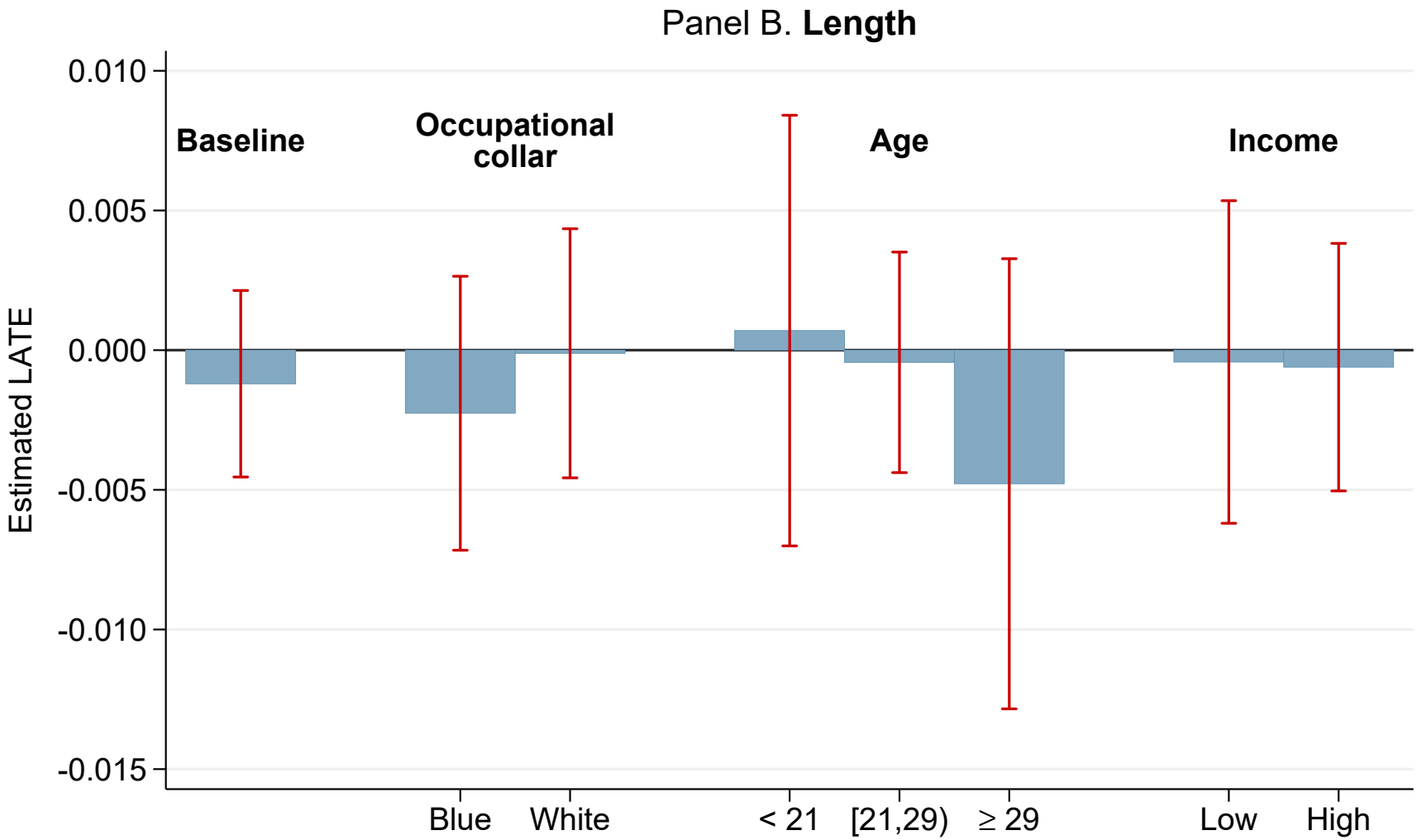
Health at birth outcomes

Heterogeneous effects



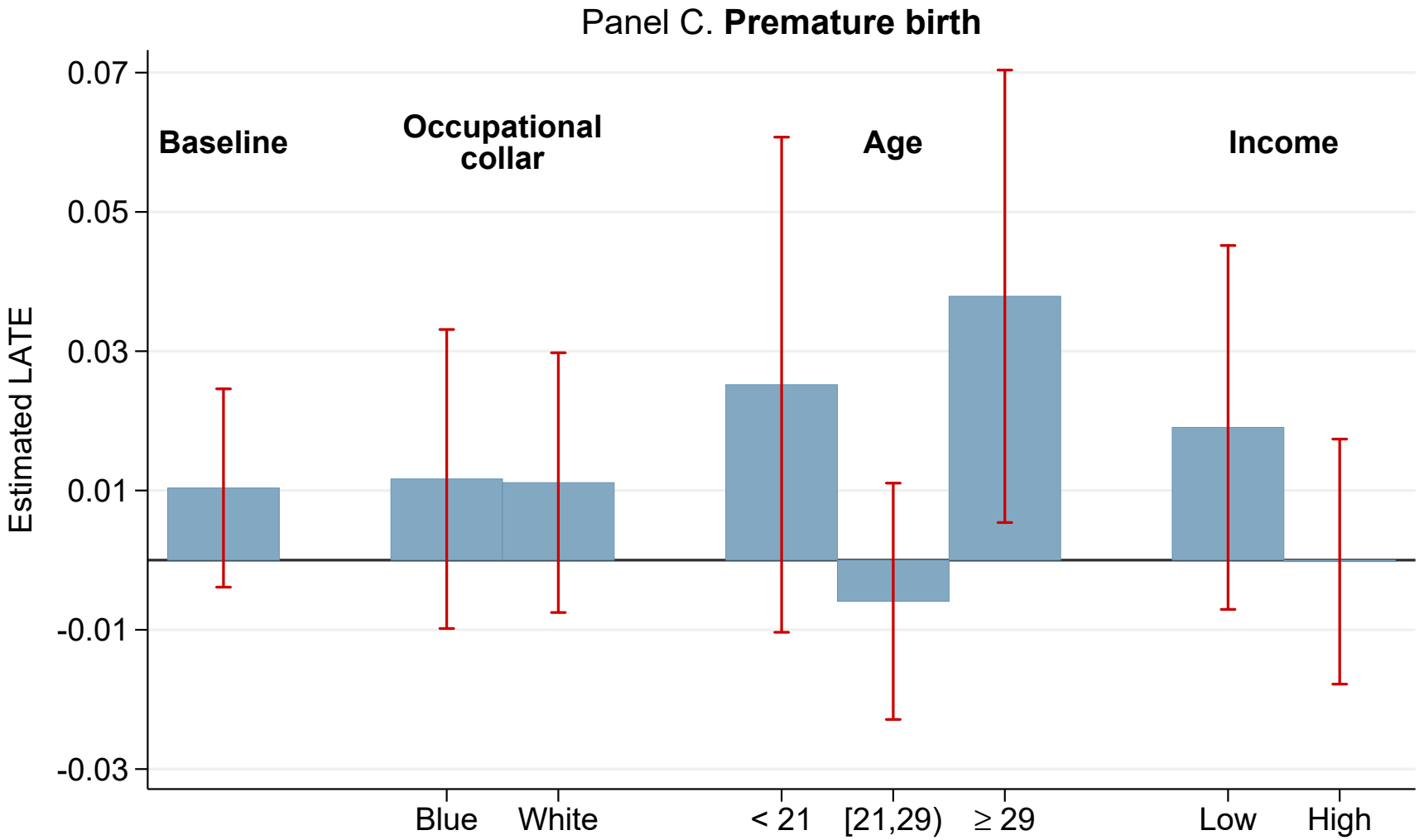
Health at birth outcomes

Heterogeneous effects



Health at birth outcomes

Heterogeneous effects



Mothers' subsequent maternal outcomes

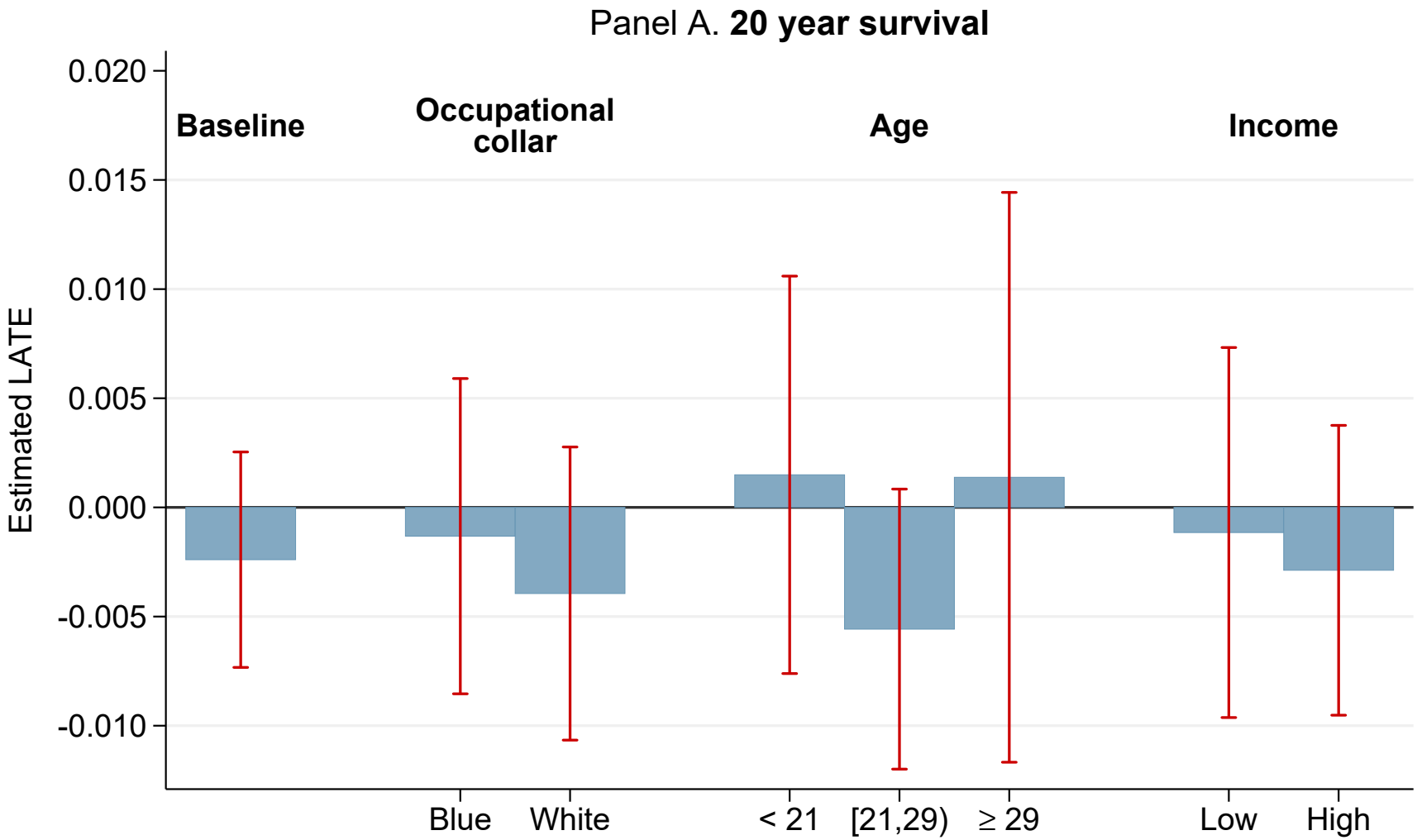
Main estimates

	(1) 20 year survival	(2) 40 year survival	(3) No. of next births	(4) Further birth	(5) Time to next birth†
Panel A. RDD					
Duration of prenatal maternity leave	-0.001	-0.007*	0.015	0.007	-0.002
	(0.001)	(0.004)	(0.012)	(0.007)	(0.016)
No. of observations	7,350	7,350	7,350	7,350	3,619
Mean of outcome	0.99	0.92	0.70	0.49	7.10
Std. dev. of outcome	0.09	0.27	0.88	0.50	0.73
Kleinbergen-Paap rK Wald F-statistic	756.93	756.93	756.93	756.93	366.27
Panel B. OLS					
Duration of prenatal maternity leave	0.000	-0.000	0.002	0.003	-0.006
	(0.000)	(0.001)	(0.004)	(0.002)	(0.005)
No. of observations	7,350	7,350	7,350	7,350	3,619
Mean of outcome	0.99	0.92	0.70	0.49	7.10
Std. dev. of outcome	0.09	0.27	0.88	0.50	0.73

Notes: Robust standard errors in parentheses, stars indicate statistical significance: * p<0.10, ** p<0.05, *** p<0.01. † Time to next birth is conditional on giving birth again, thus the samples includes only mothers who had another child afterwards.

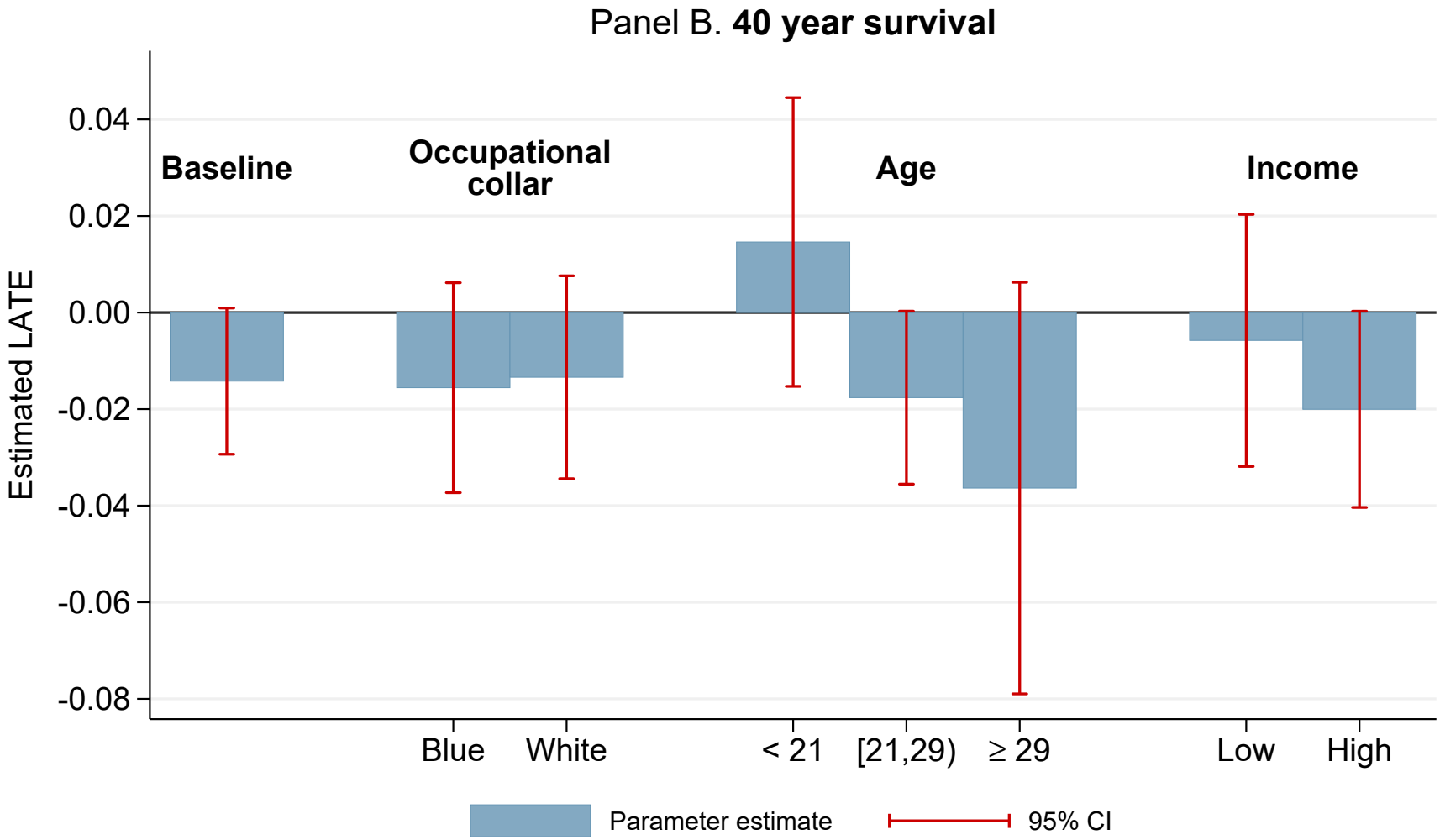
Mothers' subsequent maternal outcomes

Heterogeneous effects



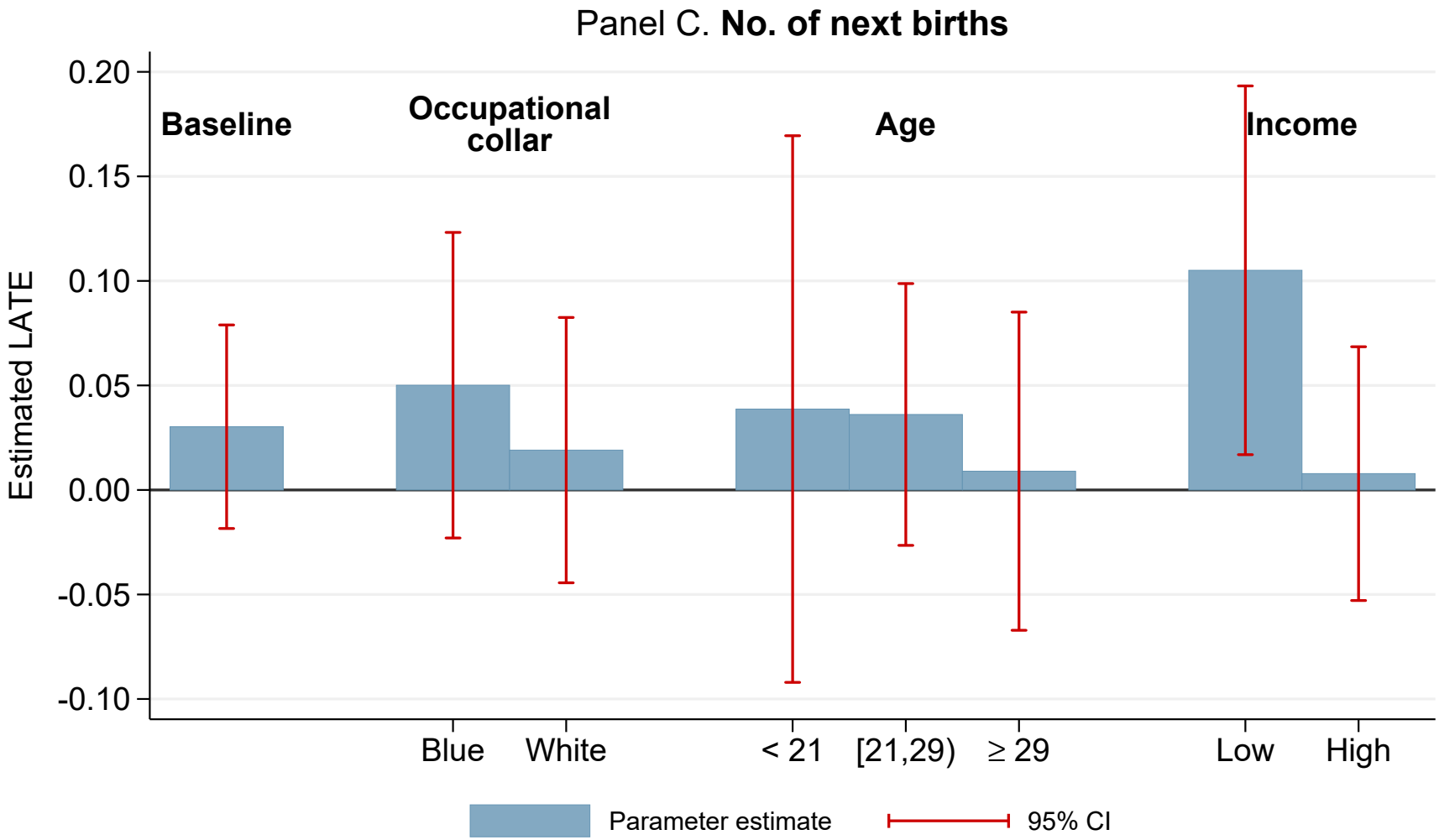
Mothers' subsequent maternal outcomes

Heterogeneous effects



Mothers' subsequent maternal outcomes

Heterogeneous effects



Childrens' long-term outcomes

Childrens' long-term outcomes

	(1) Employed	(2) Wage	(3) White collar	(4) Outpatient expenses	(5) Hospital days
Duration of prenatal maternity leave	0.007	0.009	-0.013	-38.000	-1.431
	(0.010)	(0.017)	(0.014)	(131.584)	(1.395)
No. of observations	2,395	1,559	2,002	511	511
Mean of outcome	0.84	4.68	0.69	1832.21	9.19
Std. dev. of outcome	0.37	0.51	0.46	2339.60	23.90
Kleinbergen-Paap rK Wald F-statistic	204.82	151.20	176.63	48.91	48.91

Notes: Robust standard errors in parentheses, stars indicate statistical significance: * p<0.10, ** p<0.05, *** p<0.01.

Robustness: Non-working mothers

- We use **non-working mothers as a control group** in an RDD difference-in-differences (RDD-DiD) setting.
- Mothers who did not work in the year they gave birth were not eligible for maternity leave.
- Using them as a control group differences-out certain heterogeneities, e.g., seasonal effects or age effects.

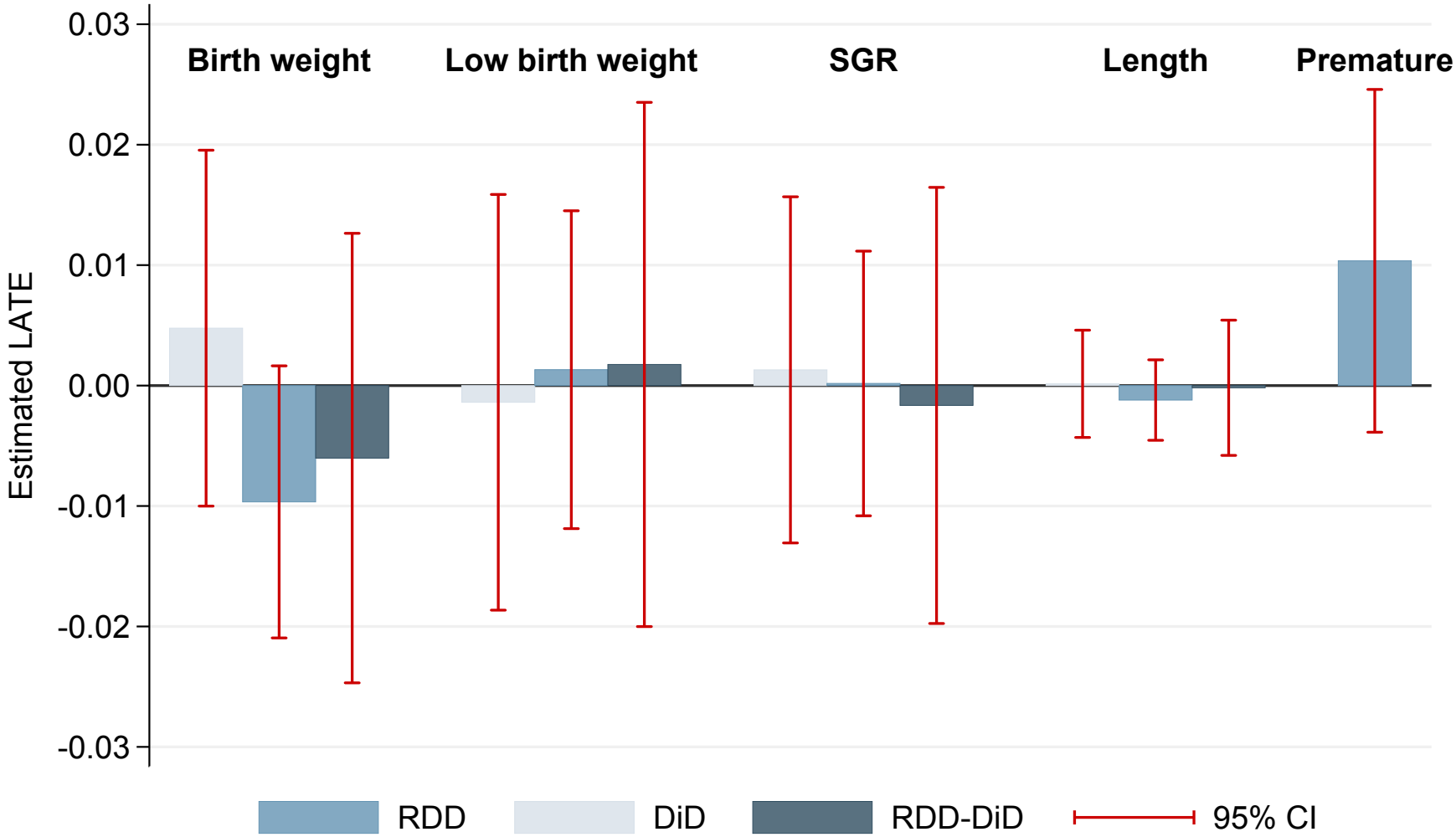
Regression discontinuity difference-in-differences design

$$ml_i = \theta_0 + \theta_1 jun_i + \theta_2 w_i + \theta_3 (jun_i \times w_i) + \mathbf{x}_i \boldsymbol{\zeta}' + u_i$$

$$y_i = \rho_0 + \varphi_{\text{rdd-did}} \cdot \widehat{mldur}_i + \rho_1 a_i + \rho_2 w_i + \mathbf{x}_i \boldsymbol{\iota}' + v_i, \qquad i \in N,$$

where $w_i \in \{0, 1\}$ is an indicator for whether mum i was employed at the time she gave birth.

Robustness: RDD-DiD results

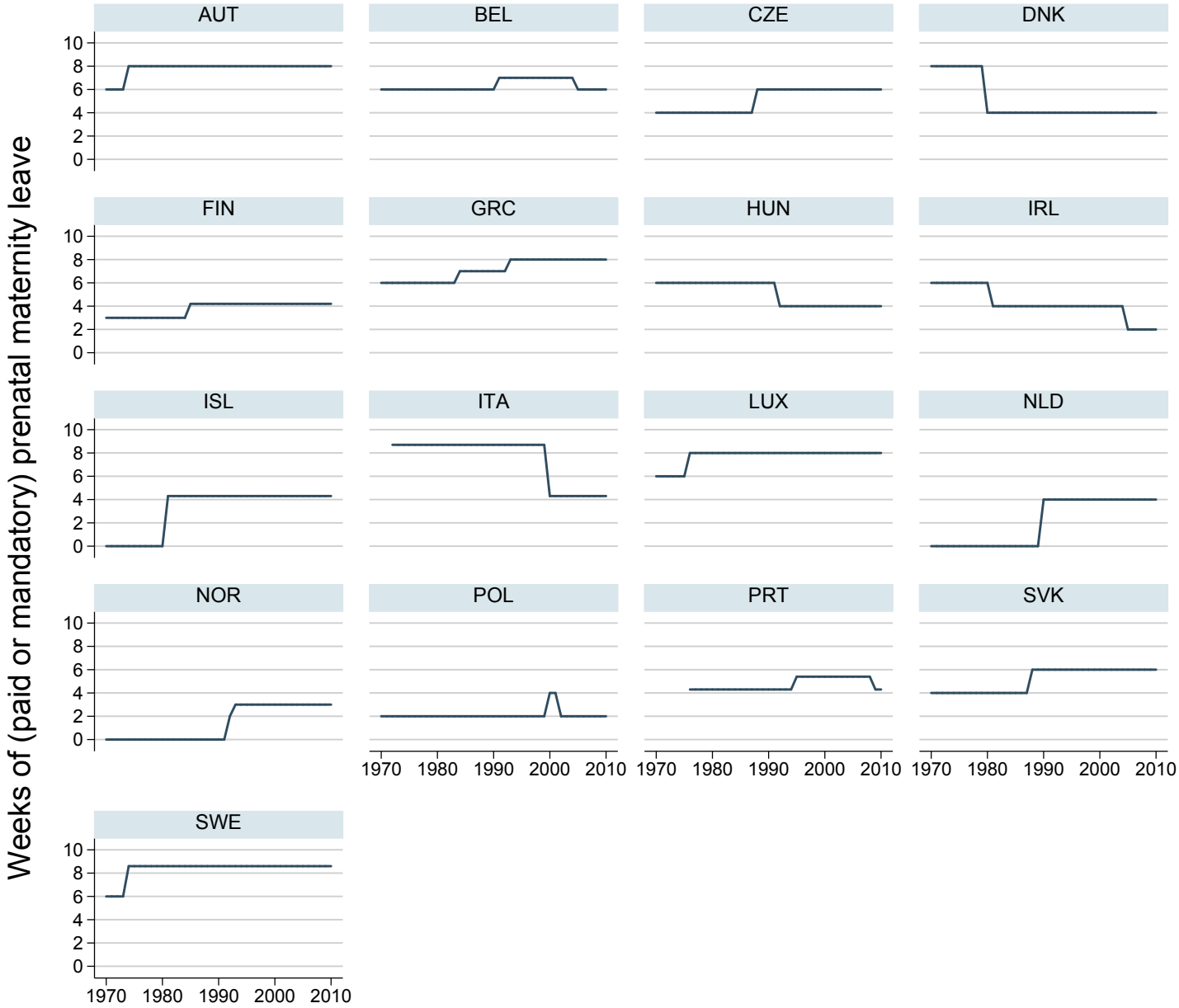


Cross-country analysis

- **Findings so far** No significant benefits for children or mothers, neither at birth nor later on, in Austria.
- **Cross-country study** to overcome three obstacles to the external validity of our findings:
  - Austria has a very generous welfare system.
  - Other protection measures for pregnant women since 1957, e.g., ban of job tasks which involve long standing, heavy lifting, or piecework with high working speed.
  - If doctors detect health issues, working women may either go into sick leave or early maternity leave.
- We analyze different maternity leave reforms across OECD countries.
- Effects on aggregate health at birth measures, maternal mortality and subsequent fertility.

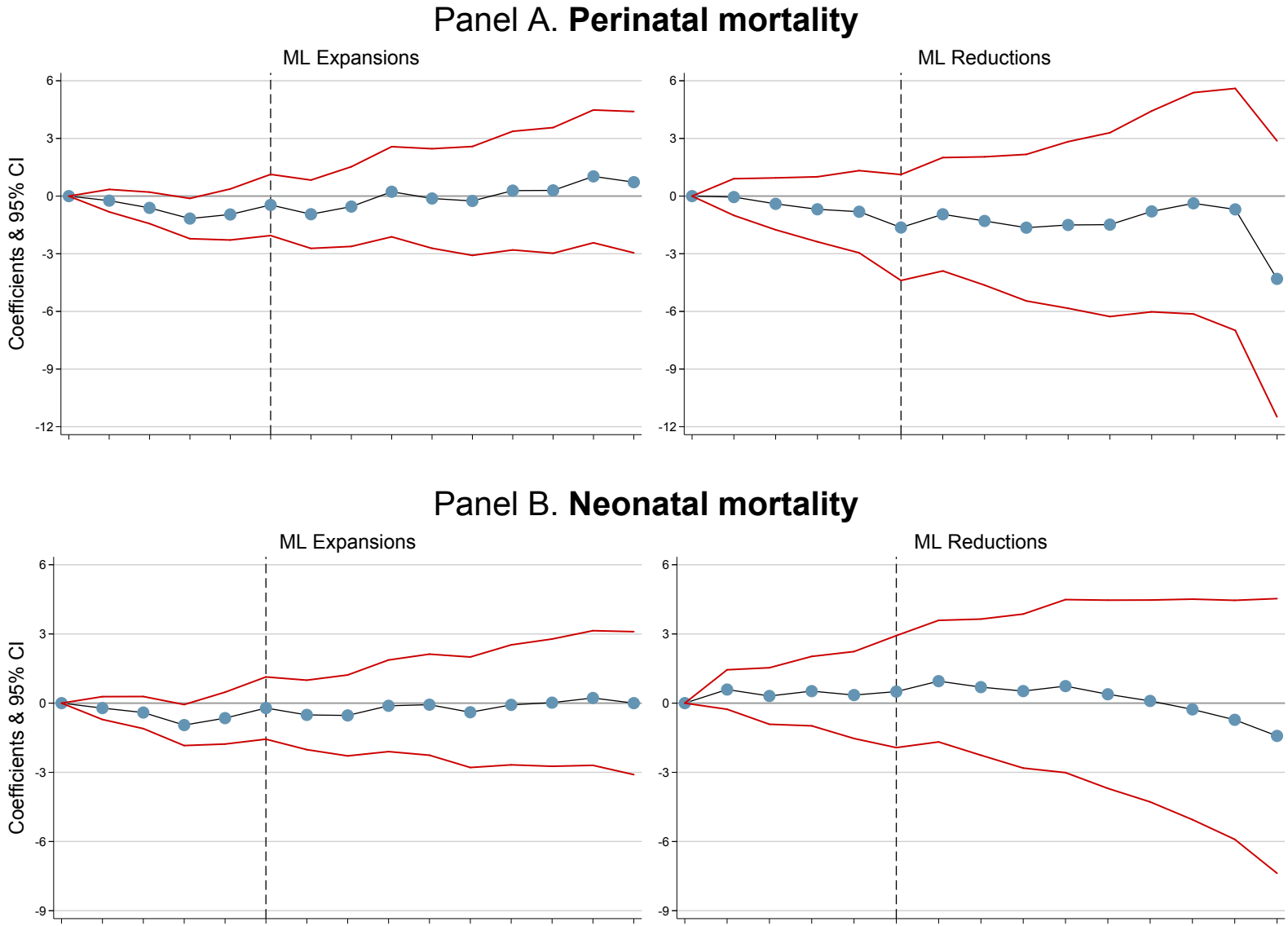
▸ Summary statistics and variable descriptions

Reforms across OECD countries



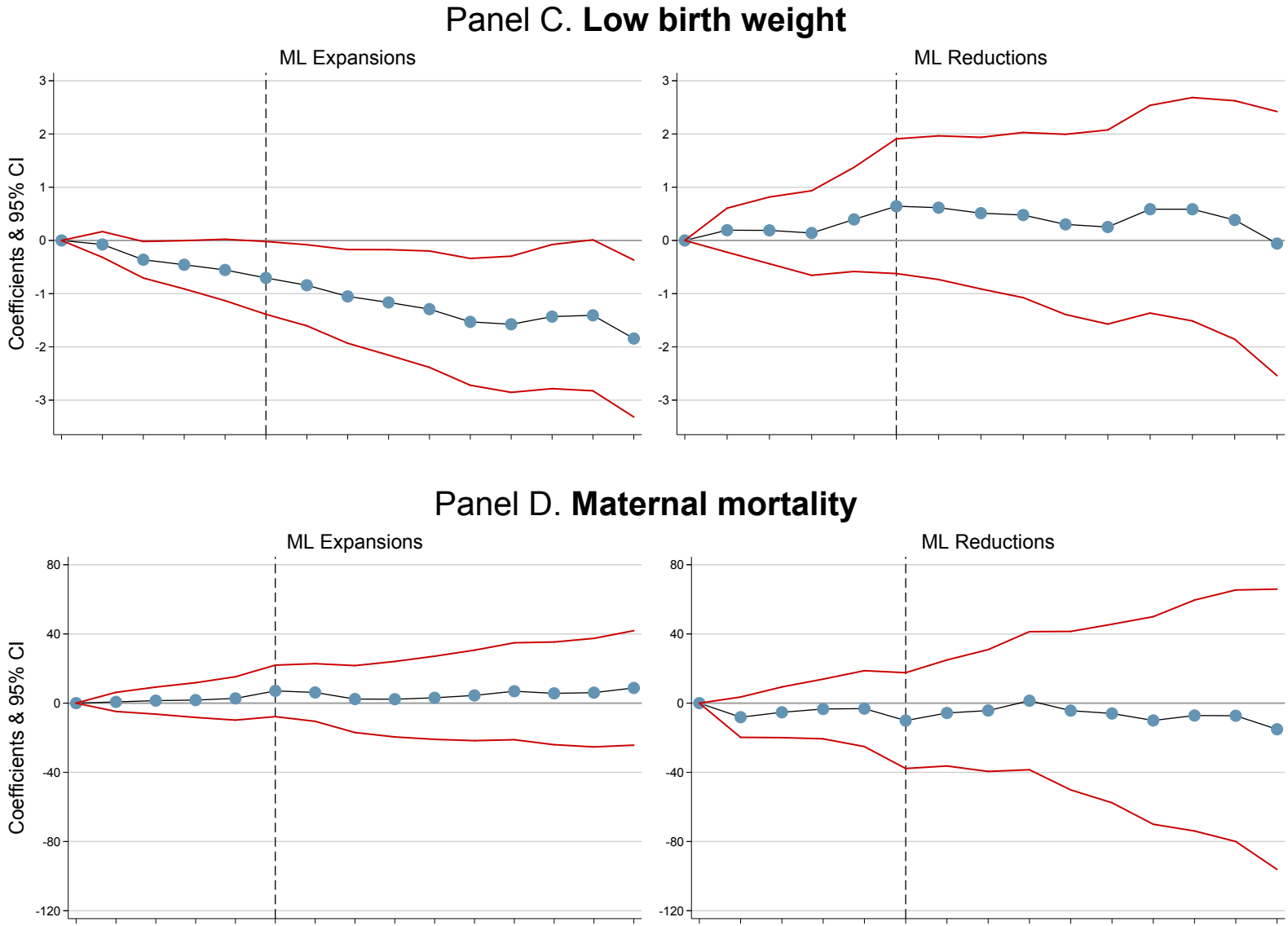
Results of cross-country analysis

Perinatal and neonatal mortality *(linear DiD estimations with qubic time trends)*



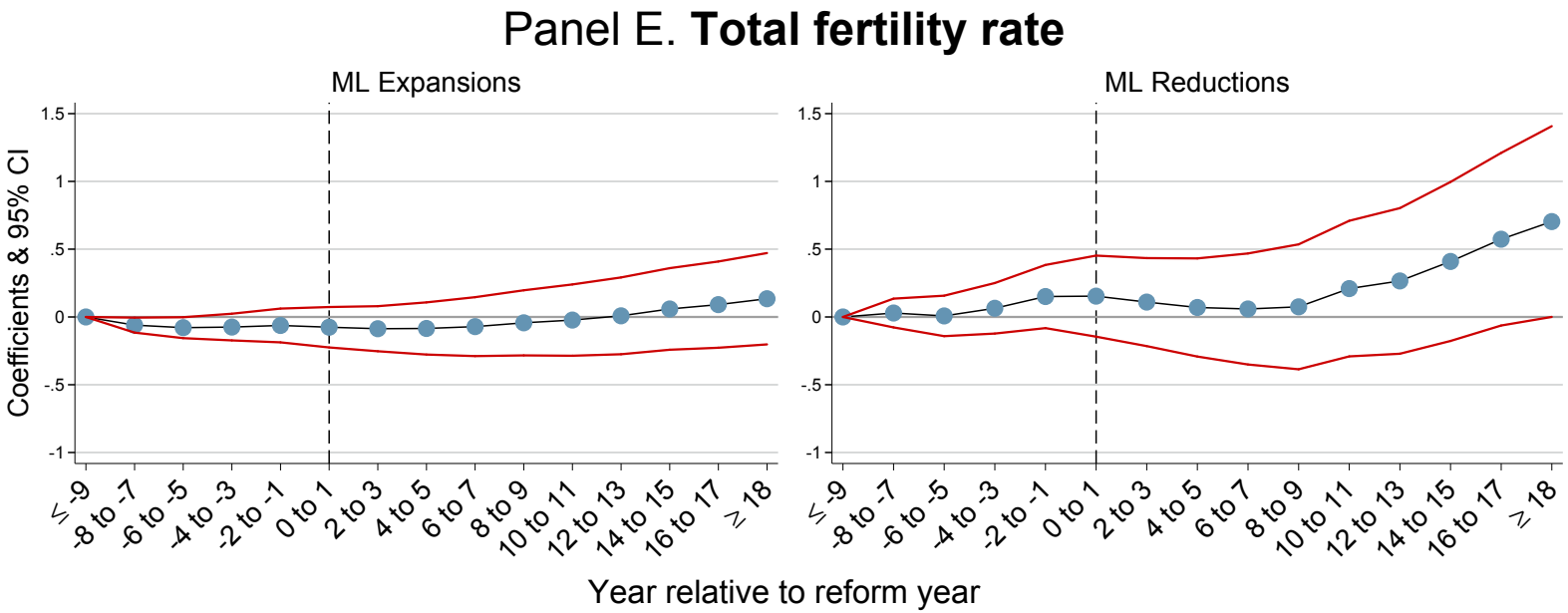
Results of cross-country analysis

Low birth weight and maternal mortality *(linear DiD estimations with qubic time trends)*



Results of cross-country analysis

Total fertility rate *(linear DiD estimations with qubic time trends)*



Conclusions

- In Austria, an increase in the duration of prenatal maternity leave had from six to eight weeks had **no effect** on
  - Childrens' health at birth outcomes
  - Subsequent maternal fertility
  - Childrens' long-run labor market and health outcomes
- Not only in Austria, but **also in other OECD countries** changes in mandated maternity leave duration does not seem to be beneficial for mothers or their children.
- Yet to do ...
  - More robustness checks necessary?
  - Any other suggestions?

Thank you!

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Average prenatal and postnatal leave over time

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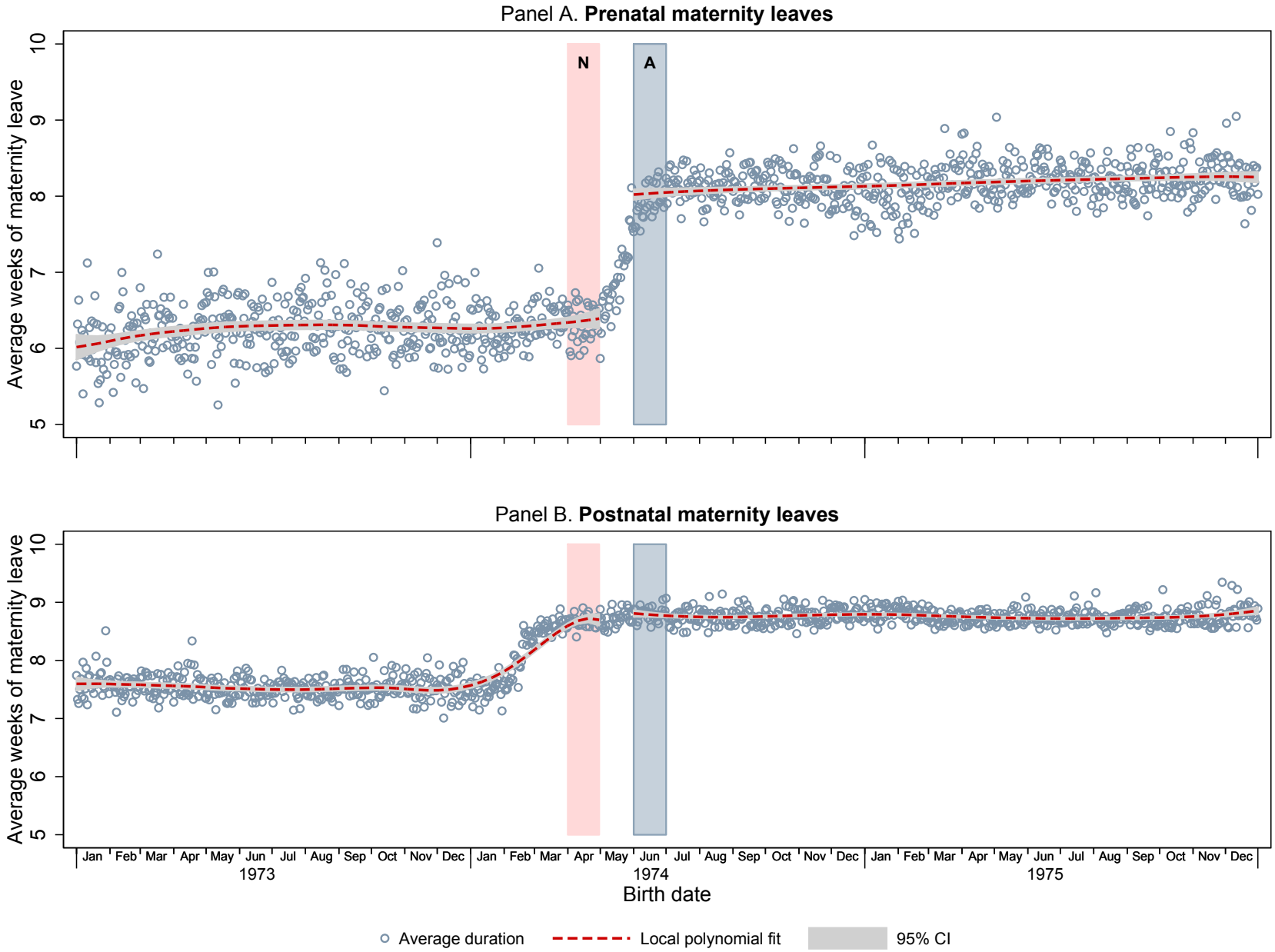

Individual-level analysis

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Summary statistics

	Working mothers					Non-working mothers				
	N	Mean	Std. dev.	Min.	Max.	*N*	Mean	Std. dev.	Min.	Max.
Duration of prenatal maternity leave[a]	7350	7.11	2.60	0.3	33.3	3074	40.00	0.00	40.0	40.0
Health at birth outcomes										
ln(birth weight)	7350	5.77	0.19	3.7	6.3	3074	5.80	0.17	4.2	6.3
Low birth weight[b]	7350	0.06	0.23	0.0	1.0	3074	0.04	0.19	0.0	1.0
Symmetric growth restriction[c]	7350	0.04	0.19	0.0	1.0	3074	0.03	0.16	0.0	1.0
ln(length)	7350	3.92	0.06	3.3	4.1	3074	3.93	0.05	3.4	4.1
Premature birth[d]	7350	0.06	0.24	0.0	1.0					
Subsequent fertility outcomes										
20 year survival probability	7350	0.99	0.09	0.0	1.0	3074	0.99	0.08	0.0	1.0
40 year survival probability	7350	0.92	0.27	0.0	1.0	3074	0.92	0.28	0.0	1.0
Number of next births	7350	0.70	0.88	0.0	8.0	3074	0.71	1.01	0.0	8.0
Probability of having another child	7350	0.49	0.50	0.0	1.0	3074	0.44	0.50	0.0	1.0
ln(time to next birth)	3619	7.10	0.73	5.3	9.1	1364	7.07	0.73	5.7	8.9
Sample stratification variables										
Blue collar worker	7285	0.54	0.50	0.0	1.0					
Below median income in 1973	6762	0.46	0.50	0.0	1.0					
Covariates										
Age at birth	7350	24.29	5.19	15.0	47.0	3074	27.07	5.83	14.0	46.0
Child born in wedlock	7350	0.84	0.37	0.0	1.0	3074	0.92	0.26	0.0	1.0
Religion										
Catholic	7350	0.87	0.34	0.0	1.0	3074	0.92	0.27	0.0	1.0
Protestant	7350	0.05	0.22	0.0	1.0	3074	0.05	0.22	0.0	1.0
Other religion	7350	0.07	0.26	0.0	1.0	3074	0.02	0.15	0.0	1.0
No religion	7350	0.01	0.11	0.0	1.0	3074	0.01	0.09	0.0	1.0
Mother is Austrian citizen	7350	0.14	0.35	0.0	1.0	3074	0.07	0.26	0.0	1.0

Cross-country analysis

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Summary statistics and variable descriptions

	Description	*N*	Mean	Std. dev.	Min.	Max.
Prenatal maternity leave	Maximum number of weeks of (mandatory or paid) maternity leave prior to childbirth	689	5.08	2.42	0.0	8.7
Outcomes						
Perinatal mortality	Number of fetal deaths (27 weeks/1,000 grams) plus deaths within first week per 1,000 total births	649	11.40	6.50	2.6	34.9
Neonatal mortality	Number of deaths within first 28 days per 1,000 live births	666	7.02	5.23	0.9	28.7
Low birth weight	Number of children with a birth weight of below 2,500 grams as percent of total live births	574	5.89	1.62	2.9	11.7
Maternal mortality	Number of maternal deaths per 100,000 live births	634	9.38	10.06	0.0	75.3
Total fertility rate	Number of children per women aged 15 to 49 years old	689	1.80	0.42	1.1	4.0
Control and interaction variables						
Total population	Number of inhabitants (divided by 100,000)	689	11.66	13.69	0.2	60.5
Population aged ≤ 14	Share of inhabitants aged 0-14	689	0.20	0.04	0.1	0.3
Population aged ≥ 65	Share of inhabitants aged 65+	689	0.14	0.02	0.1	0.2
Age at birth	Mean age of women at childbirth	669	28.02	1.64	24.5	31.4
Marriage rate	Marriages per 1,000 inhabitants	689	5.95	1.42	3.5	12.8
Female LFP	Civilian labor force as percent of population aged 15-64, females	568	59.63	13.77	31.0	96.5
Male LFP	Civilian labor force as percent of population aged 15-64, males	568	81.39	8.18	63.6	122.7
Agricultural share	Employment in primary sector as percent of total employment	584	0.09	0.07	0.0	0.4
Manufacturing share	Employment in secondary sector as percent of total employment	573	0.31	0.06	0.2	0.5
Service share	Employment in tertiary sector as percent of total employment	573	0.60	0.10	0.3	0.8
GDP per capita	Real GDP per capita, 2011 USD, chained PPP (divided by 1,000)	649	25.47	12.71	5.3	87.7
Schooling years	Average years of education in the population aged 25+	689	9.49	1.80	3.1	13.2
Labor share	Share of labor compensation in GDP	689	0.60	0.06	0.4	0.7
Hours worked	Average annual hours worked by population engaged (divided by 1,000)	619	1.81	0.22	1.4	2.4

Notes: Statistics are based on a sample of 17 countries (Austria, Belgium, Czech Republic, Denmark, Finland, Greece, Hungary, Ireland, Iceland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Sweden) observed from 1970 to 2010.