The Impacts of Obstetric Care on Maternal and Child Health

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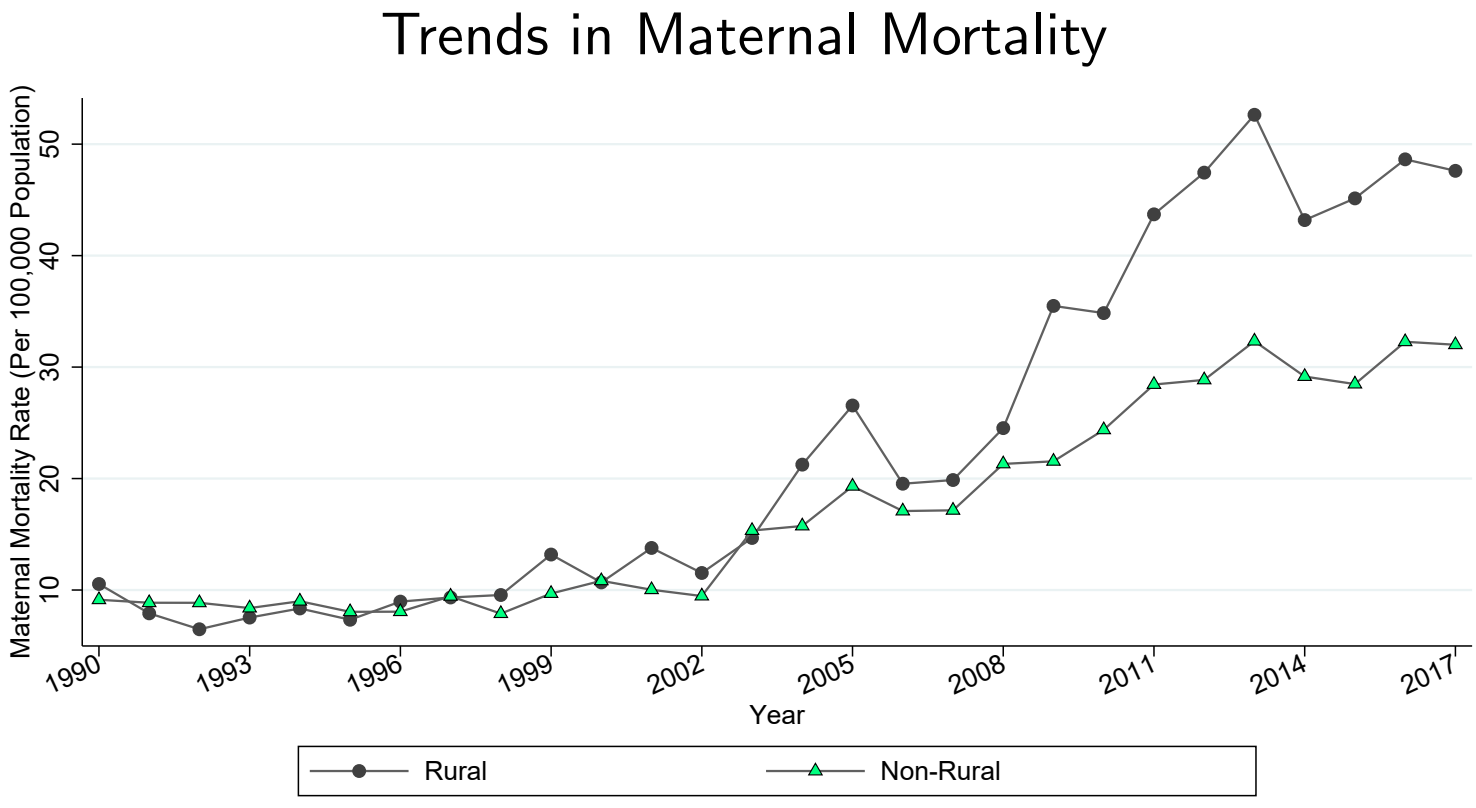
Motivation

- 14.4% of rural OB units have closed between 1990 and 2017.



Rural OB Trends

Rural OB Unit Closures Widely Publicized

The New York Times

It's 4 A.M. The Baby's Coming. But the Hospital Is 100 Miles Away.

Rural Hospitals Are Dying and Pregnant Women Are Paying the Price

Heavily reliant on Medicaid dollars, small hospitals shut down maternity wards just to stay afloat.

By LISA RAB | October 03, 2017

POLITICO MAGAZINE

The New York Times

RISE IN INSURANCE FORCES HOSPITALS TO SHUTTER WARDS

By Joseph B. Treaster

Aug. 25, 2002

Around the country this summer, at least half a dozen hospitals have closed obstetric wards, others have curtailed trauma services, and a string of rural clinics have been temporarily shuttered as a result of soaring costs for medical malpractice insurance.

HUFFPOST

Here's Why Rural Hospitals Are Shutting Down More Quickly In These States

Nearly a hundred rural hospitals have closed since 2010.

01/22/2019 12:04 pm ET | **Updated** Jan 22, 2019

A partnership between **Carolina Public Press** and **HuffPost**

Rural Maternity Wards Are Closing, And Women's Lives Are On The Line

In the mountains of western North Carolina, pregnant women don't know where to deliver.

By Catherine Pearson and Frank Taylor 09/25/2017 05:45 am ET | **Updated** Jun 04, 2018

Why have rural OB units closed?

- Rising costs in OB services (particulary pronounced in rural areas)
  - Increases in malpractice premiums
  - Decreases in reimbursement rates (ACA Medicaid expansion opt-out states)
- Mergers/consolidation
- Declining workforce
- Declining population/changing demographics

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   - Information
   - Management of existing conditions
   - Develop birthing plan

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2. Intrapartum care (labor/delivery)
   - Medical provider present during birth
   - Pain management
   - Management of complications
   - Procedures (e.g., cesarean section)
   - Care of mother and infant directly following birth

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   (1) and (2) don't take into account that closures could encourage women to travel to higher quality hospitals

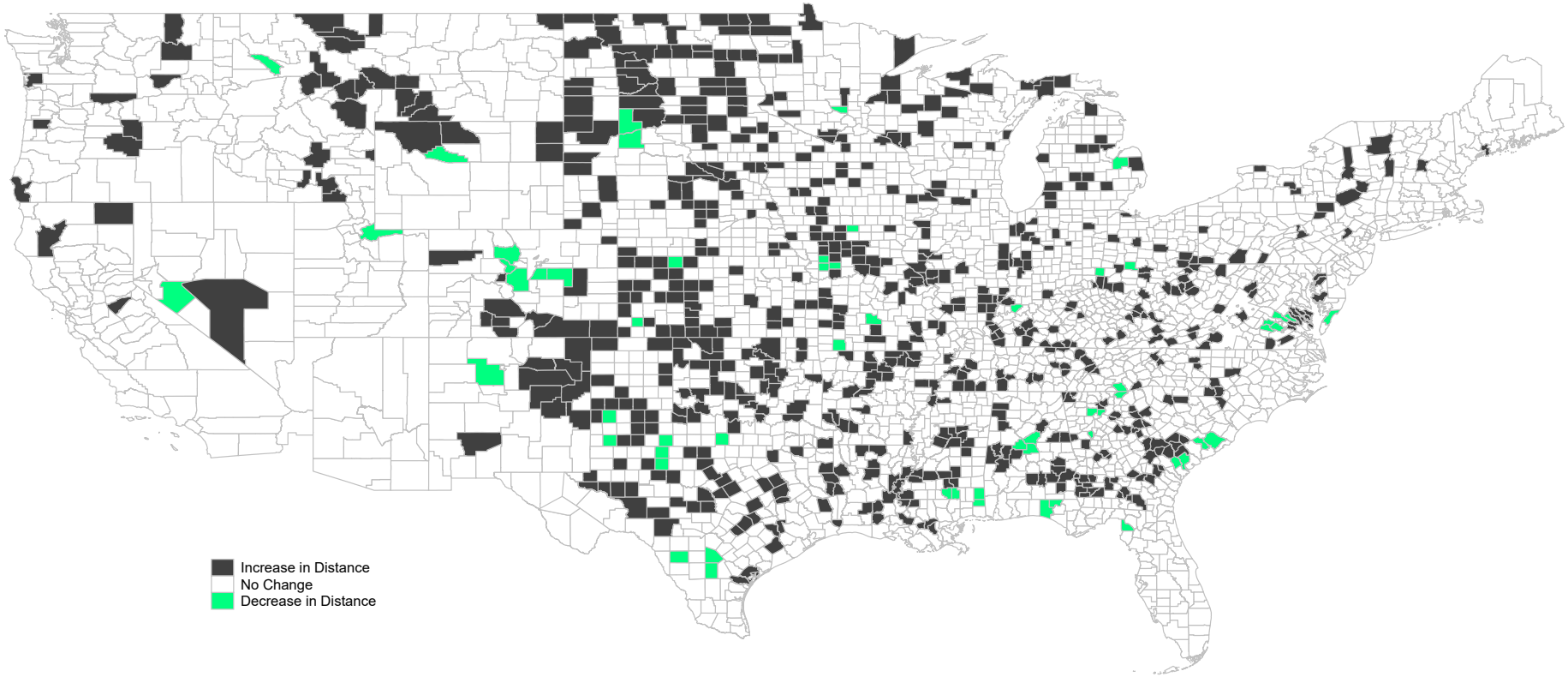
⇒ Countervailing effects – an empirical question

This Paper

Question: How does obstetric unit access affect maternal and child health?

- Setting: US 1990-2017
- Data: American Hospital Association (AHA), National Vital Statistics System (NVSS) Natality and Mortality files
- Empirical design: D-in-D
  - Leverage variation across counties and time in access to OB units
  - Treatment: distance (in mi.) to the nearest OB unit
- Contribution: first to causally estimate effects of access to OB care in US

OB Units Access Over Time: 1990-2017



- "Access" defined as the distance between the pop-weighted centroid of a mother's county of residence to the pop-weighted centroid of the nearest county with an operating OB unit.

Empirical Framework: Diff-in-Diff

$$Y_{cy} = \beta \text{DistOB}_{cy} + \gamma X_{cy} + \delta_c + \delta_{sy} + \delta_{uy} + \varepsilon_{cy}$$

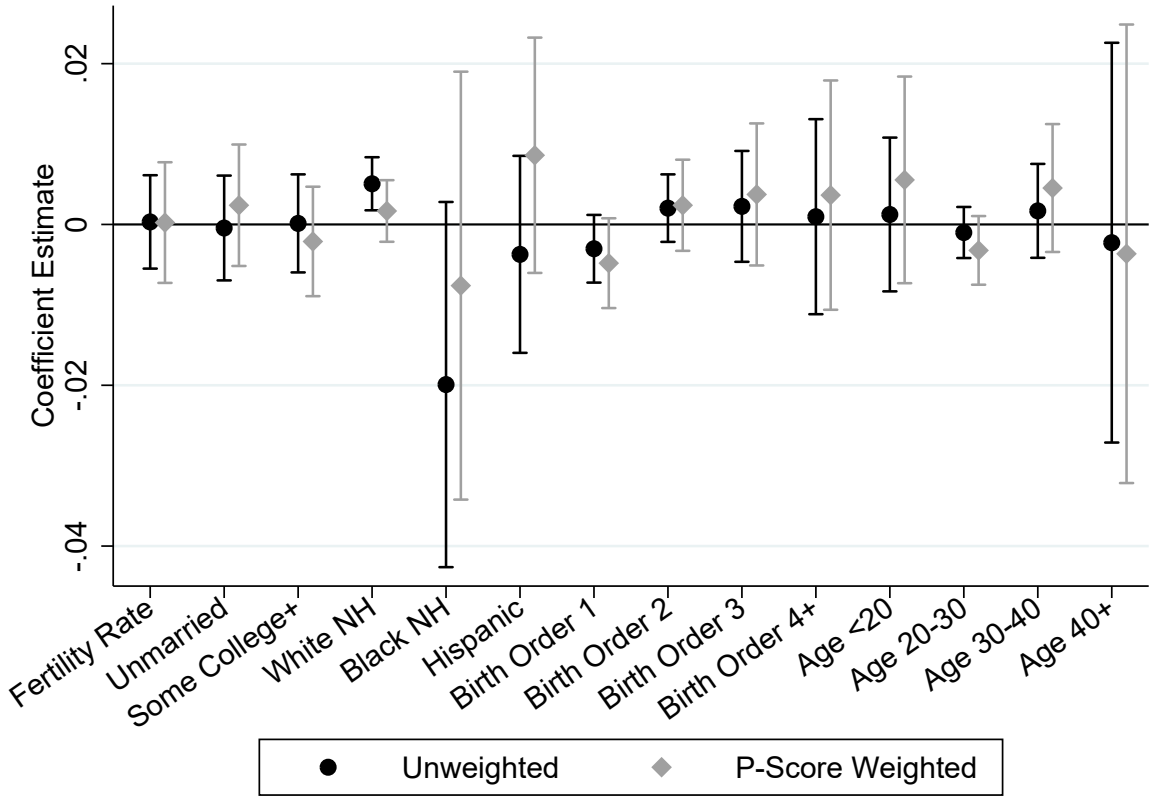
- Y_{cy} is the outcome in county c and year y
  - **Outcomes:** location of birth, prenatal visits, gestation length, birthweight, cesarean delivery, infant/maternal mortality
- DistOB_{cy} is the distance to the nearest OB unit
- Controls/Fixed Effects
  - X_{cy}, δ_c, and δ_{sy} and are county time-varying controls, county FE, and state-year FE
  - δ_{uy} are urban group-by-year FE (five urbanicity dummies interacted with year FE), following Bailey and Goodman-Bacon (2015)

Thought Experiment: Compare outcomes of mothers/infants in counties who experienced no change in OB unit access to those who experienced a change

Tests of Research Design Validity

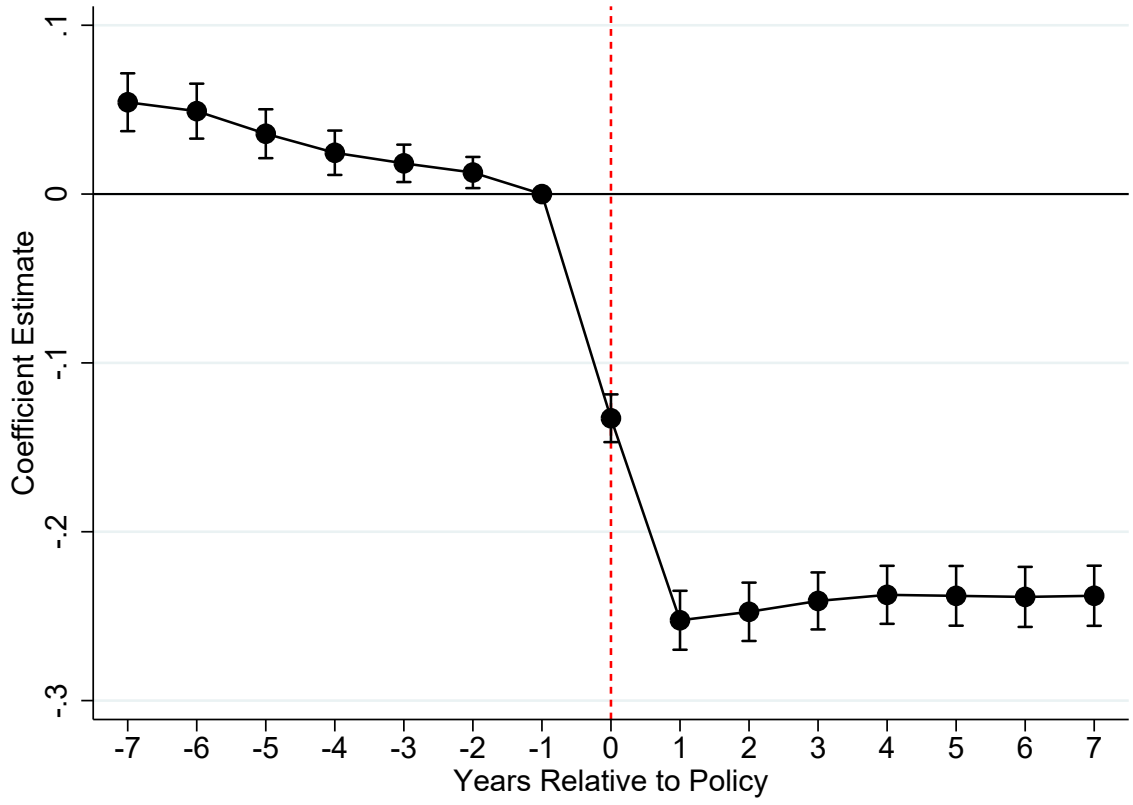
- Is composition of mothers changing over time?
  - Use fertility rate/mother characteristics as the outcome (i.e., balance test)
- Does timing of closure coincide with changes in outcomes?
  - Estimate event studies for all outcomes to ensure none of the results are driven by trends
- Are treatment and control counties comparable?
  - Reweight by propensity to experience a change in distance to force comparability

Testing for Selection: Maternal Characteristics



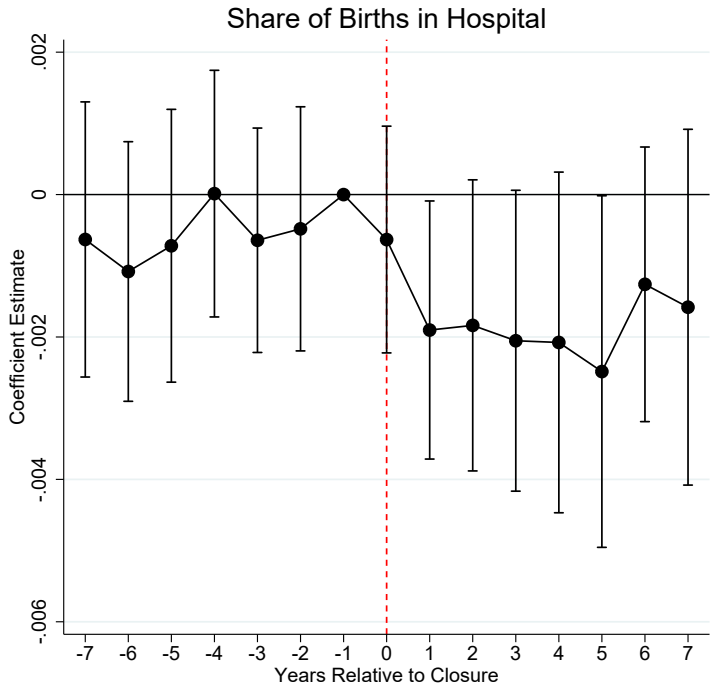
→ Fertility rate and maternal characteristics not changing

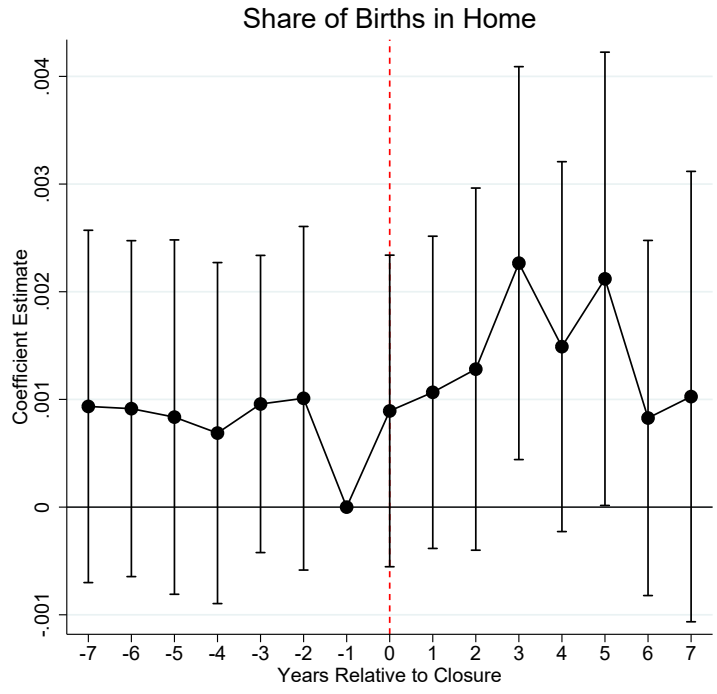
"Zero" Stage: Share of mothers giving birth in county of residence



- Effect of a 30 mile increase (DiD Coefficient)
  - Share of births in county of residence (pre-closure mean = 0.360): -0.182 (0.007)***

Where are mothers going?





- Effect of a 30 mile increase (DiD Coefficient)
  - Share in hospital (pre-closure mean = 0.988): -0.0016 (0.0006)***
  - Share in home (pre-closure mean = 0.010): 0.0012 (0.0004)***

→ Very few mothers substitute toward home births

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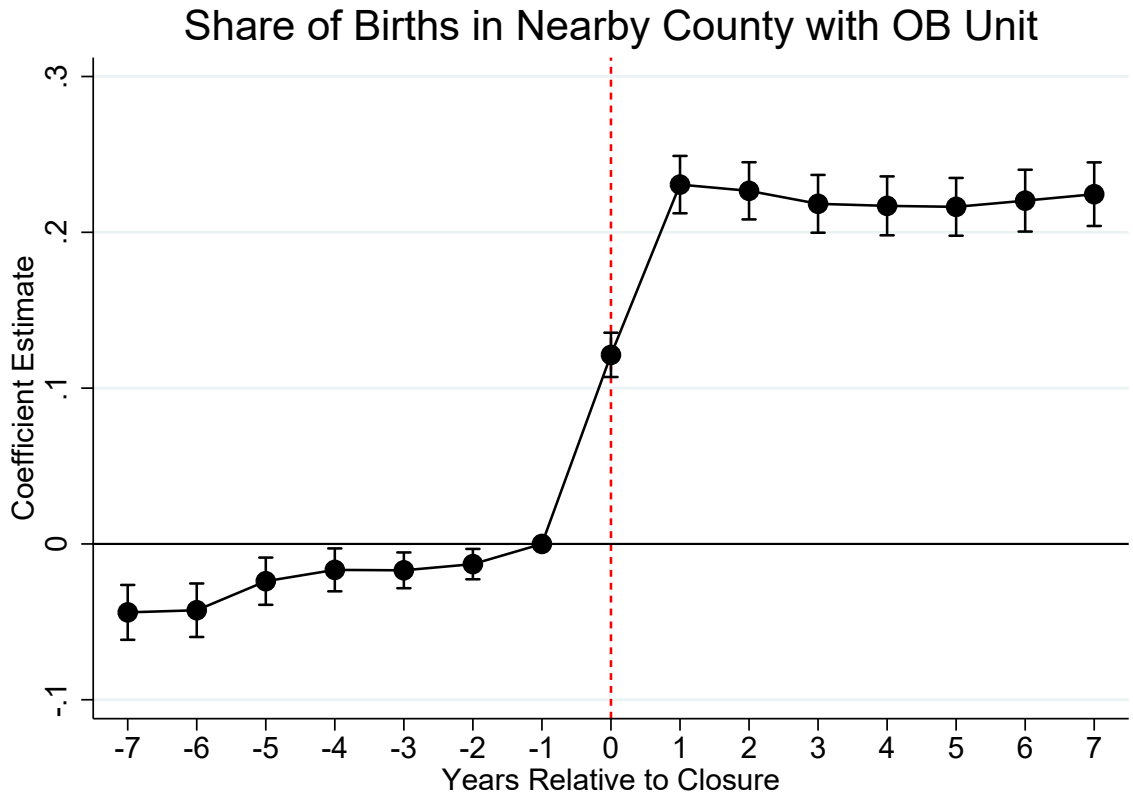
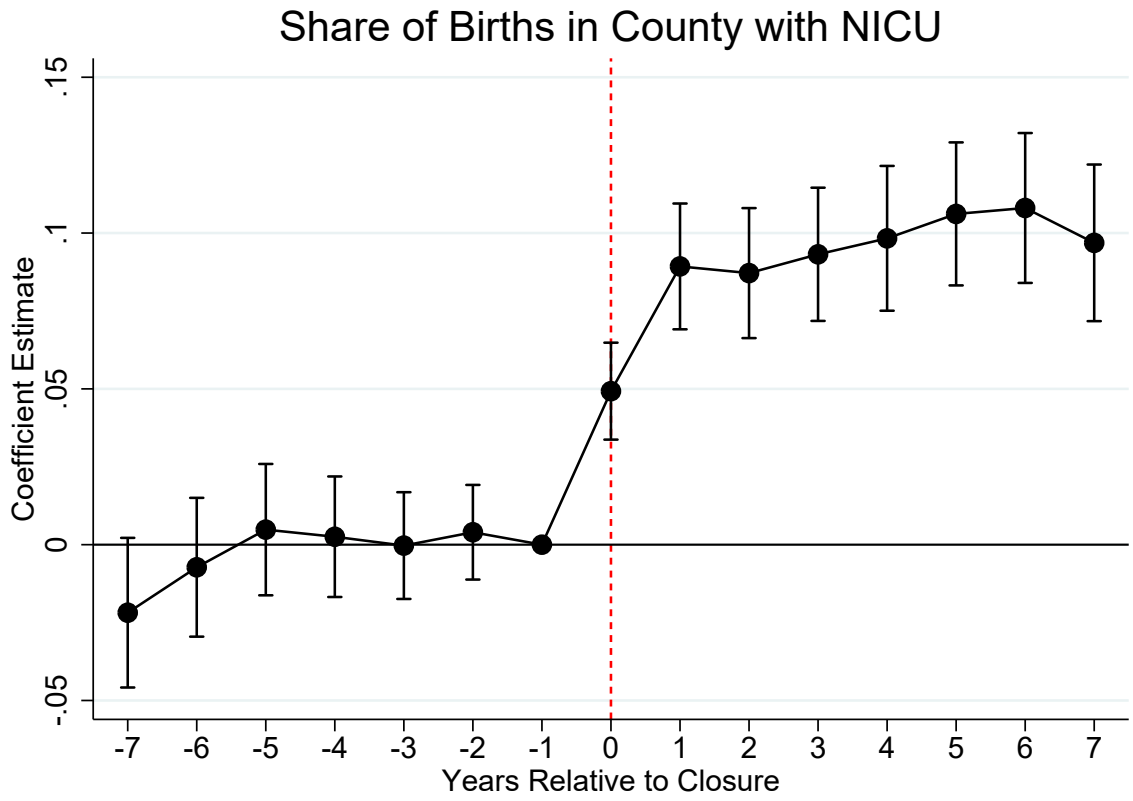


- Effect of a 30 mile increase (DiD Coefficient)
  - Share of births in nearest 4 counties w/ OB unit (pre-closure mean = 0.502): 0.171 (0.008)***

$\rightarrow$ Nearly all affected mothers ($\approx$94%) travel to a nearby OB unit

What types of hospitals do mothers travel to?



- Effect of a 30 mile increase (DiD Coefficient)
  - Share of births in county with NICU (pre-closure mean = 0.326): 0.074 (0.006)*** No Change in NICU Risk

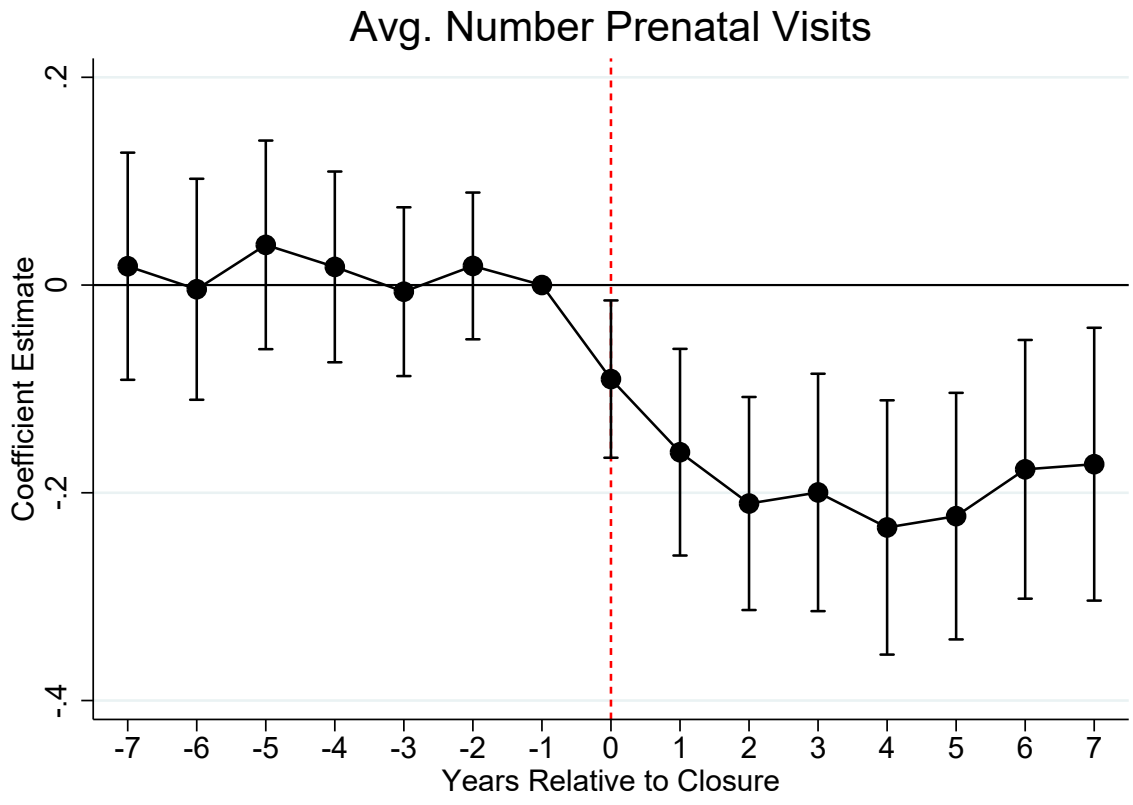
→ Much more likely to give birth in county with NICU. Mothers are likely giving birth in higher quality hospitals (i.e., more resources).

Maternal and Infant Health Results

Two types of outcomes:

- Outcomes affected by prenatal care:
  - # prenatal visits, gestation length, birthweight
- Outcomes additionally affected by travel or conditions at time of birth (e.g., hospital quality)
  - cesarean delivery, infant/maternal mortality

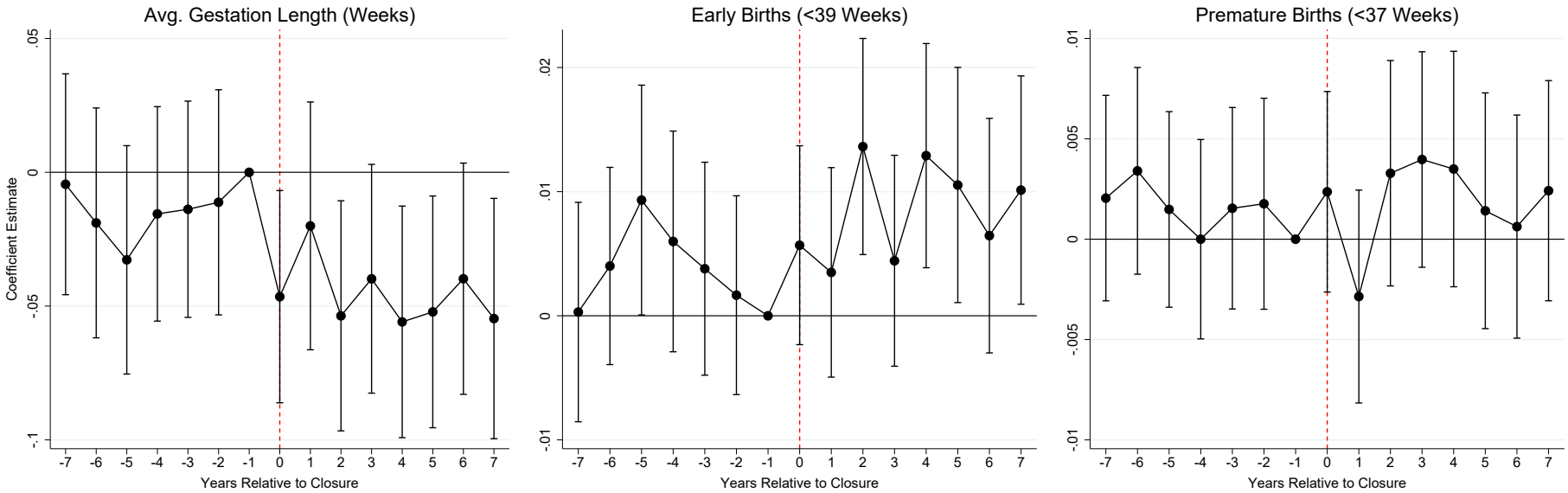
Outcome: prenatal visits



- Effect of a 30 mile increase (DiD Coefficient)
  - Avg. Number Prenatal Visits (pre-closure mean = 11.17): -0.112 (0.30)***, 10.1% of SD

$\rightarrow$ Fewer prenatal visits, 1% reduction

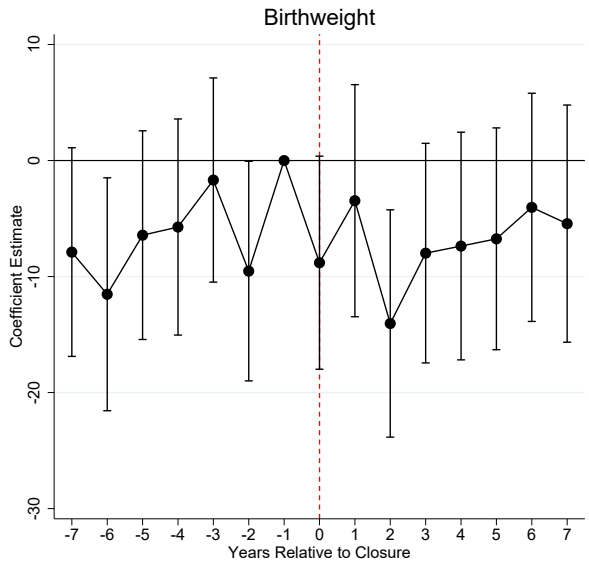
Outcome: gestation length

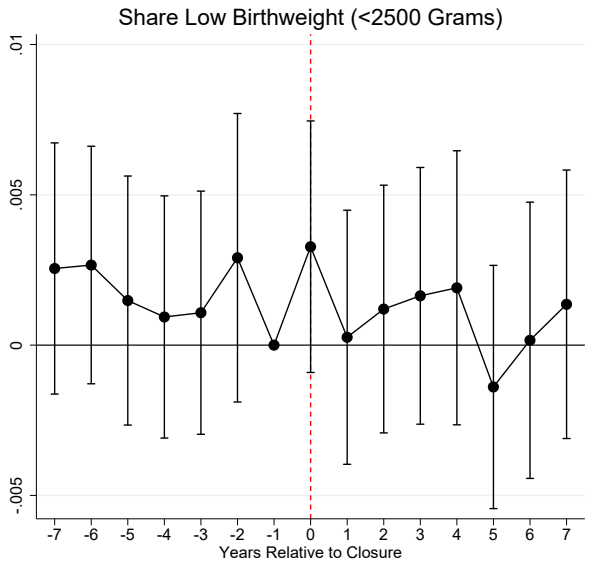


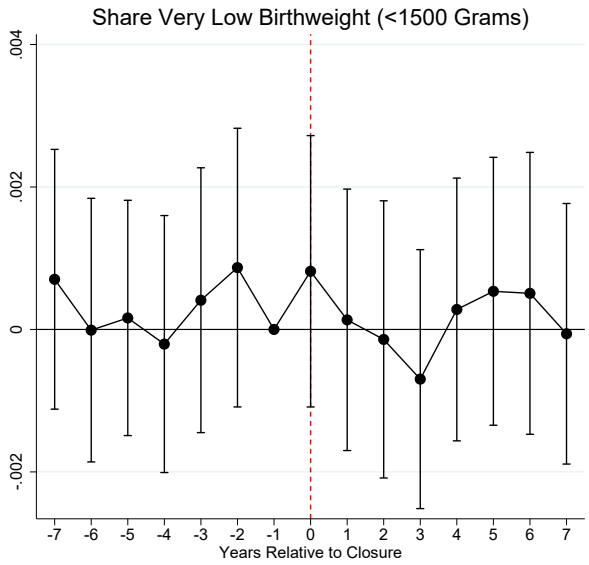
- Effect of a 30 mile increase (DiD Coefficient)
  - Avg. Gestation Length (pre-closure mean = 38.90): -0.017 (0.006)***, 3.9% of SD
  - Share Early Births (pre-closure mean = 0.353): 0.0027 (0.013)**, 3.3% of SD
  - Share Premature Births (pre-closure mean = 0.114): -0.0009 (0.007), 2.2% of SD

$\rightarrow$ Decrease in average gestation length, driven by slightly early births

Outcome: birthweight



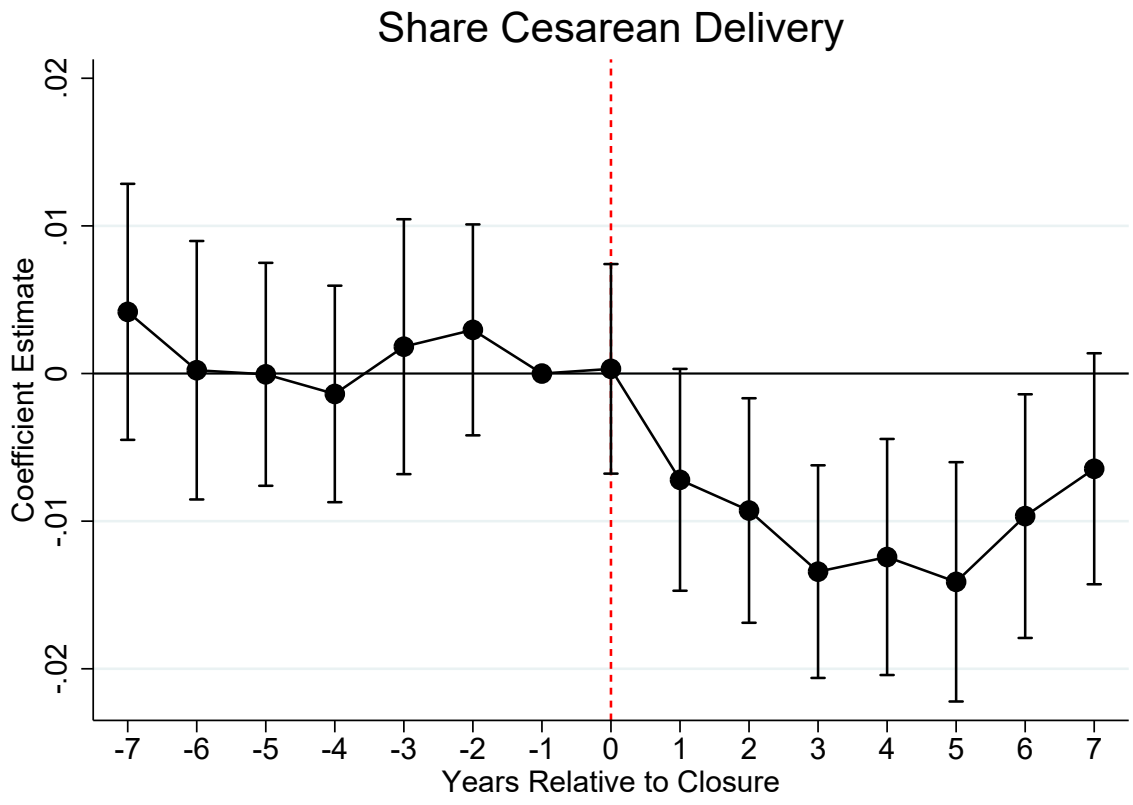




- Effect of a 30 mile increase (DiD Coefficient)
  - Avg. Birthweight (pre-closure mean = 3,321): 0.748 (1.343), 0.7% of SD
  - Share Low Birthweight (pre-closure mean = 0.073): -0.0011 (0.0005)**, 3.5% of SD
  - Share Very Low Birthweight (pre-closure mean = 0.012): -0.00004 (0.0002), 0.4% of SD

→ No strong evidence of a change in birthweight

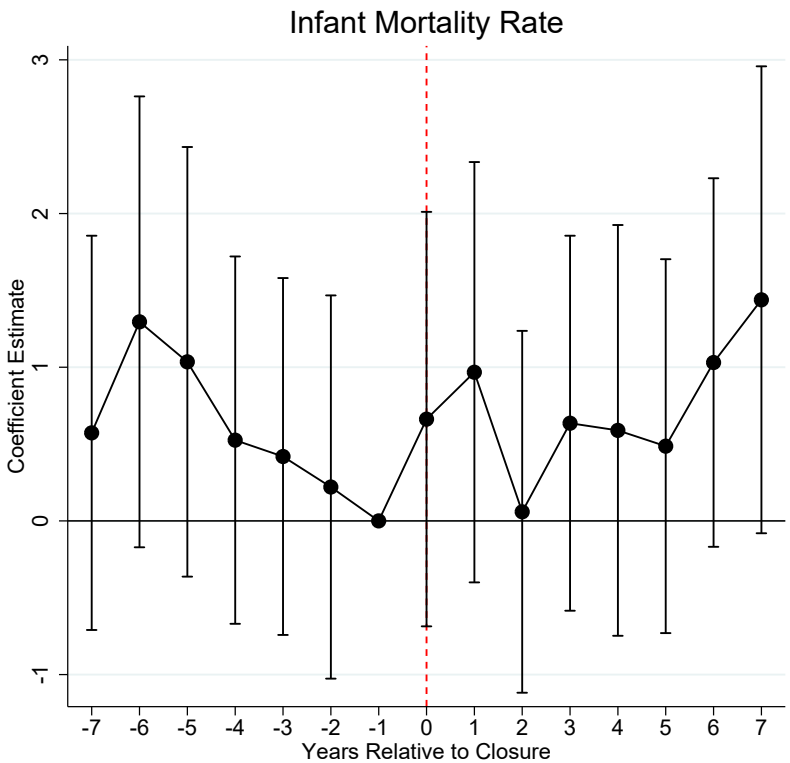
Outcome: cesarean delivery

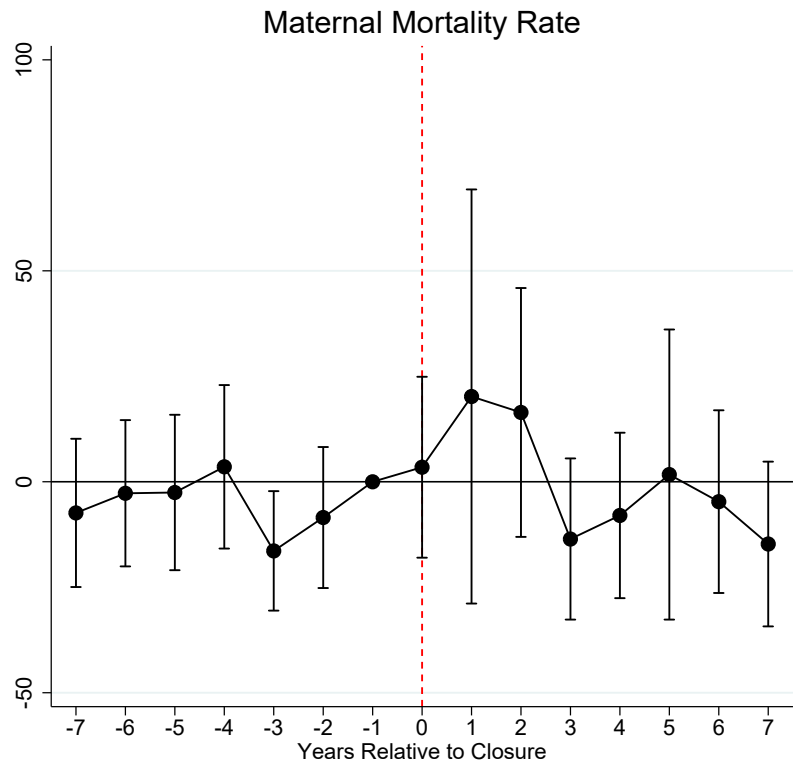


- Effect of a 30 mile increase (DiD Coefficient)
  - Share Cesarean Delivery (pre-closure mean = 0.261): -0.0074 (0.0015)***, 9.7% of SD

$\rightarrow$ Reduction in c-sections, 3%

Outcome: infant & maternal mortality





- Effect of a 30 mile increase (DiD Coefficient)
  - Infant Mortality Rate (pre-closure mean = 7.88 per 1,000): 0.0075 (0.142), 0.0% of SD
  - Maternal Mortality Rate (pre-closure mean = 12.89 per 100,000): 5.534 (3.829), 6.2% of SD

→ No strong evidence of impact on infant or maternal mortality

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- Decrease in access
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  - $\downarrow$ prenatal visits
  - $\downarrow$ gestation length, $\uparrow$ early births
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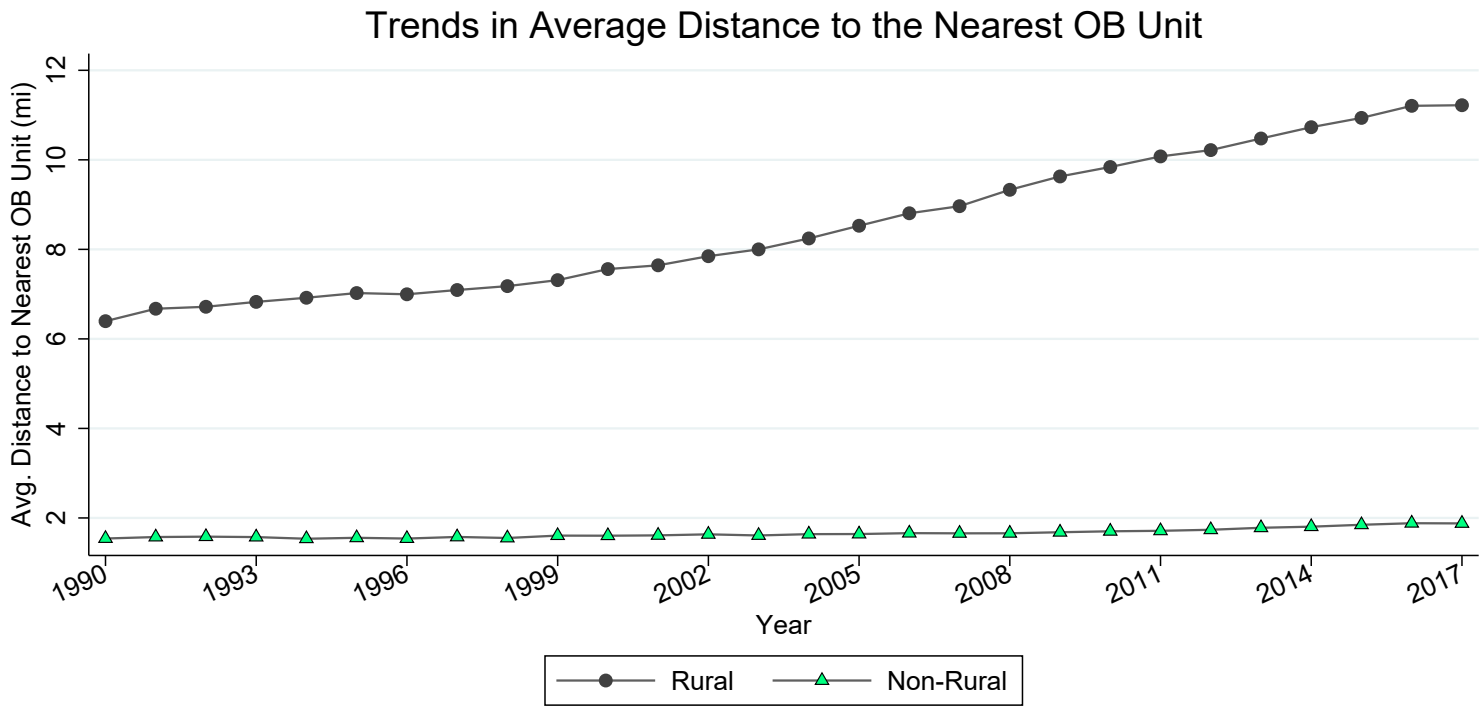
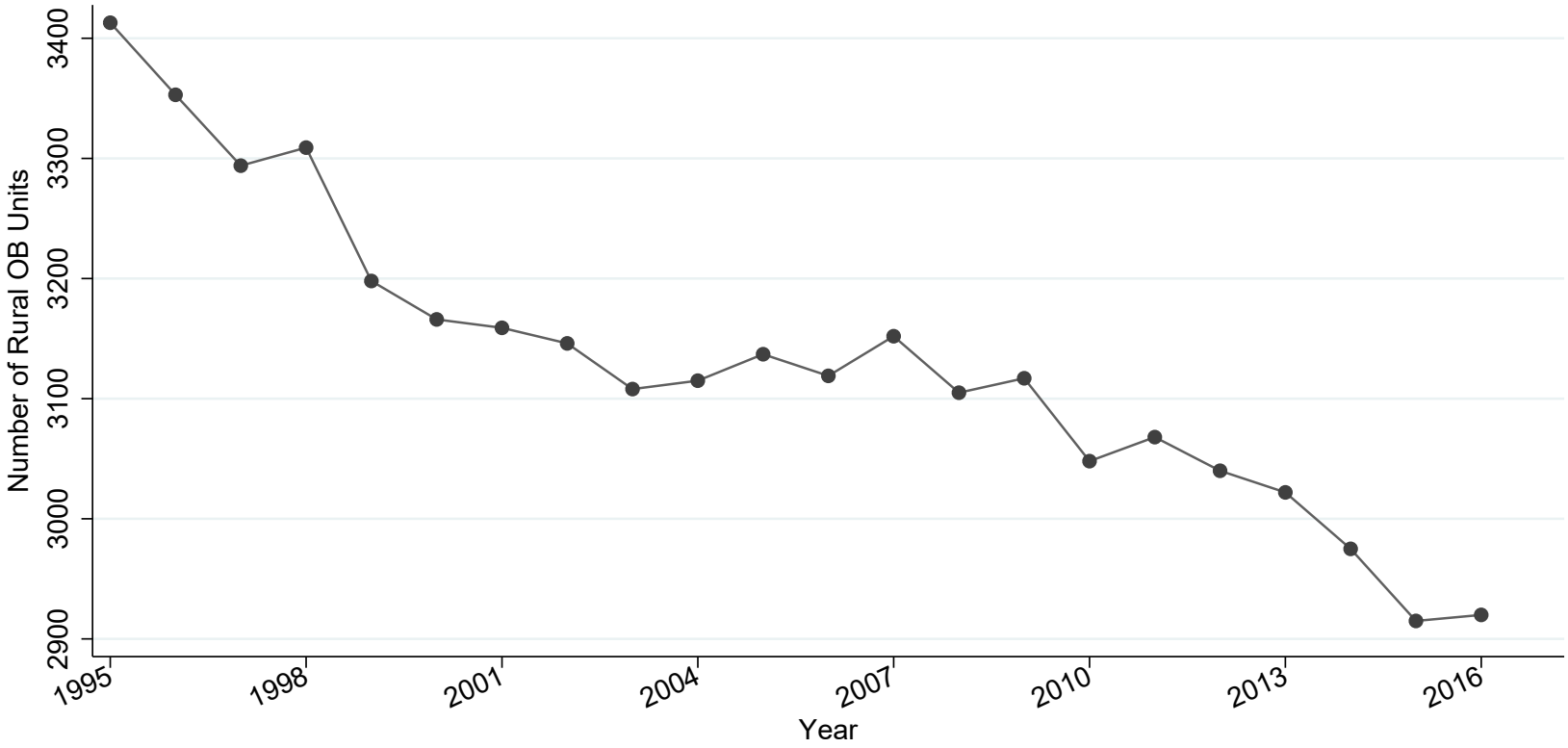
  - $\downarrow$ in c-sections

- Next Steps
  - Waiting on detailed address-level data (TX DSHS) to get at:
    - Does hospital quality or resources (e.g., NICU) matter?
    - What's driving Cesarean results?
    - How does health care market adjusts to closures?

Trends in OB Unit Access



Trends in Rural OB Units



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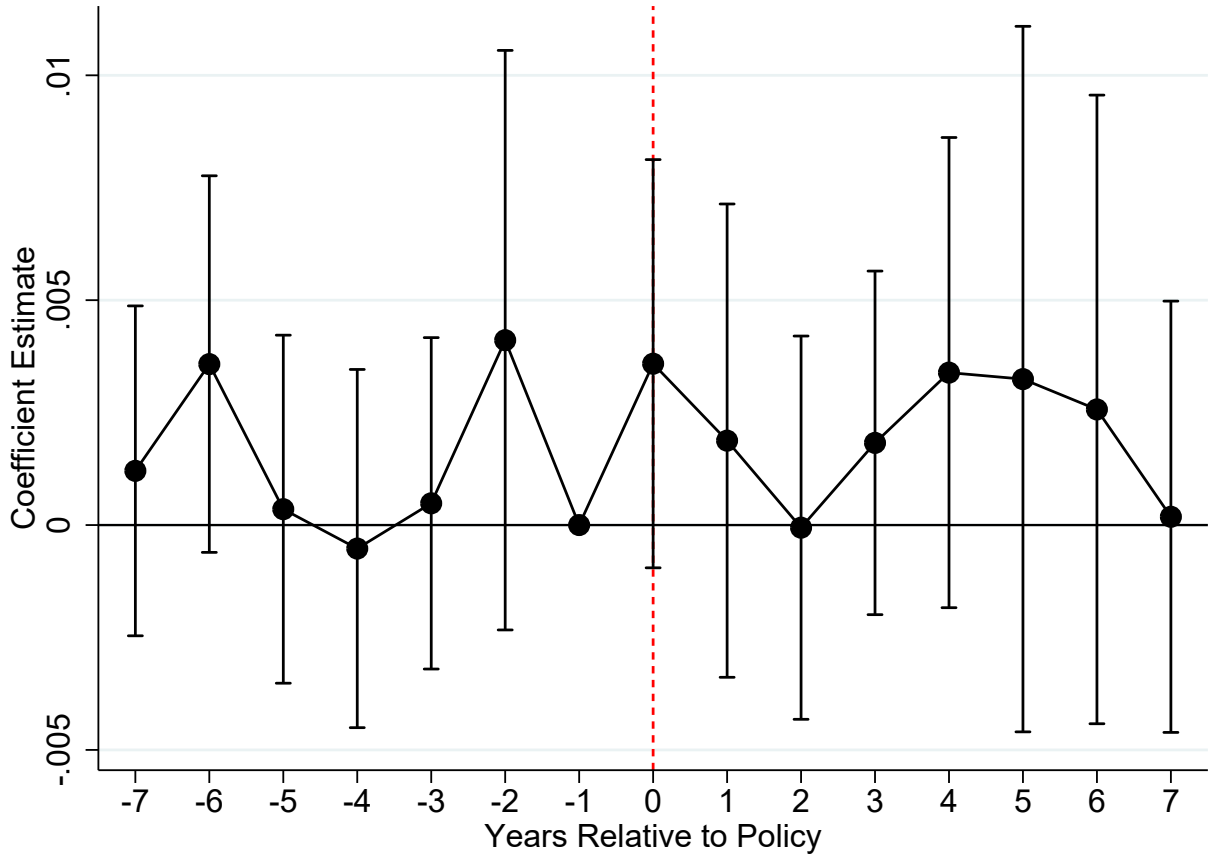
Effect of Closure on NICU Risk Score



- Subset of data denotes whether infant went to NICU. NICU risk score is calculated as a p-score using infant/mother characteristics at birth (age, parity, breech, previous cesarean, gestation length, birthweight, etc.)

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