Caution Driver! Children Present: Traffic, Air Quality, and Infant Health

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Motivation

- Let’s not forget about criteria pollutants!
- Since 1990, the concentration of criteria pollutants has decreased drastically
  - PM10 has fallen by 31%
  - NOx by 40%
  - CO by 68%
  - Ozone by 14%
- Given these decreases, should we still worry about their levels?
  - What are the benefits, if any, of further reductions?
- Separate analysis of “Case Control” sampling
  - Why do I always get myself into these things!?!?
Existing evidence

- Currie and Neidell analyze the effects of CO, PM10 and O3 on infant mortality within California
- They bring together California birth certificate data and EPA monitor data from 1989 to 2000
- Their identification strategy is to use “case control sampling” and include a large number of fixed effects (and other controls)
  - Weather variables
  - Year FE, MOY FE
  - Spline in child’s age
  - Gender, race, marital status, education, age of mother, parity, insurance, birth weight and gestation period
  - Zip code*MOY FE
Currie and Neidell (QJE 2005) Results

4. Adding zip code * month fixed effects

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<tbody>
<tr>
<td>CO</td>
<td>2.631</td>
<td>2.89</td>
</tr>
<tr>
<td></td>
<td>[0.977]**</td>
<td>[1.040]**</td>
</tr>
<tr>
<td>PM10</td>
<td>0.002</td>
<td>-0.036</td>
</tr>
<tr>
<td></td>
<td>[0.039]</td>
<td>[0.042]</td>
</tr>
<tr>
<td>O3</td>
<td>-0.077</td>
<td>-0.046</td>
</tr>
<tr>
<td></td>
<td>[0.065]</td>
<td>[0.067]</td>
</tr>
<tr>
<td>R²</td>
<td>0.29</td>
<td>0.29</td>
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5. Magnitudes of the panel 4 effects in lives saved per unit pollution reduction

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<tbody>
<tr>
<td>CO</td>
<td>16.501</td>
<td>18.125</td>
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<tr>
<td>PM10</td>
<td>0.013</td>
<td>-0.226</td>
</tr>
<tr>
<td>O3</td>
<td>-0.483</td>
<td>-0.288</td>
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- **Findings:** Large effects from CO
- No evidence of other pollutants having an effect
Our goals

• Understand the role of traffic
  • As both an IV and the reduced form
    • We may think within-year variation in pollution might be correlated with other factors that influence health
      • e.g., economic activity, correlated with other pollutants

• Understand whether the results continue to hold, after the large decreases from 1990 to 2000

• Somewhat surprising that CO is the significant pollutant

• Future: Extend beyond infant health
Why traffic?

- Large regulatory burden placed on automobiles
  - Continue to ramp up this burden (e.g., ZEV mandate)
  - Will further abatement be useful?

- Known connection between traffic and CO, PM10 (both pretty clean) and O3 (little shakier due to titration)

- Can use unanticipated changes in traffic (e.g., road closures, accidents)
  - We believe this passes exclusion restriction
    - Catherine’s point aside
Data

- From 2001 - 2006 (limited due to traffic)
- Traffic
- Pollution
- Weather
- Infant health outcomes
• Freeway Performance Management System (PeMS)
• Use total flow of cars, average speed, and “delay vs. 60 mph”
Pollution

- EPA air pollution monitors (as reported by CARB)
- Generate weekly average ambient pollution level of all three pollutants
Area of study
Area of study
Area of study
Weather

- From National Weather Service (Global Surface Summary of the Day)
- Max temperature, max wind speed, dewpoint, and rainfall
- Why weather?
  - Known influence on infant health
  - May influence how traffic drives pollution
Infant Outcomes

- Birth Cohort data (reported by California Department of Health)
- Tracks infants for a year after birth, links deaths
- Mother characteristics (e.g. race, age, education, location, insurance)
- Does not include smoking info