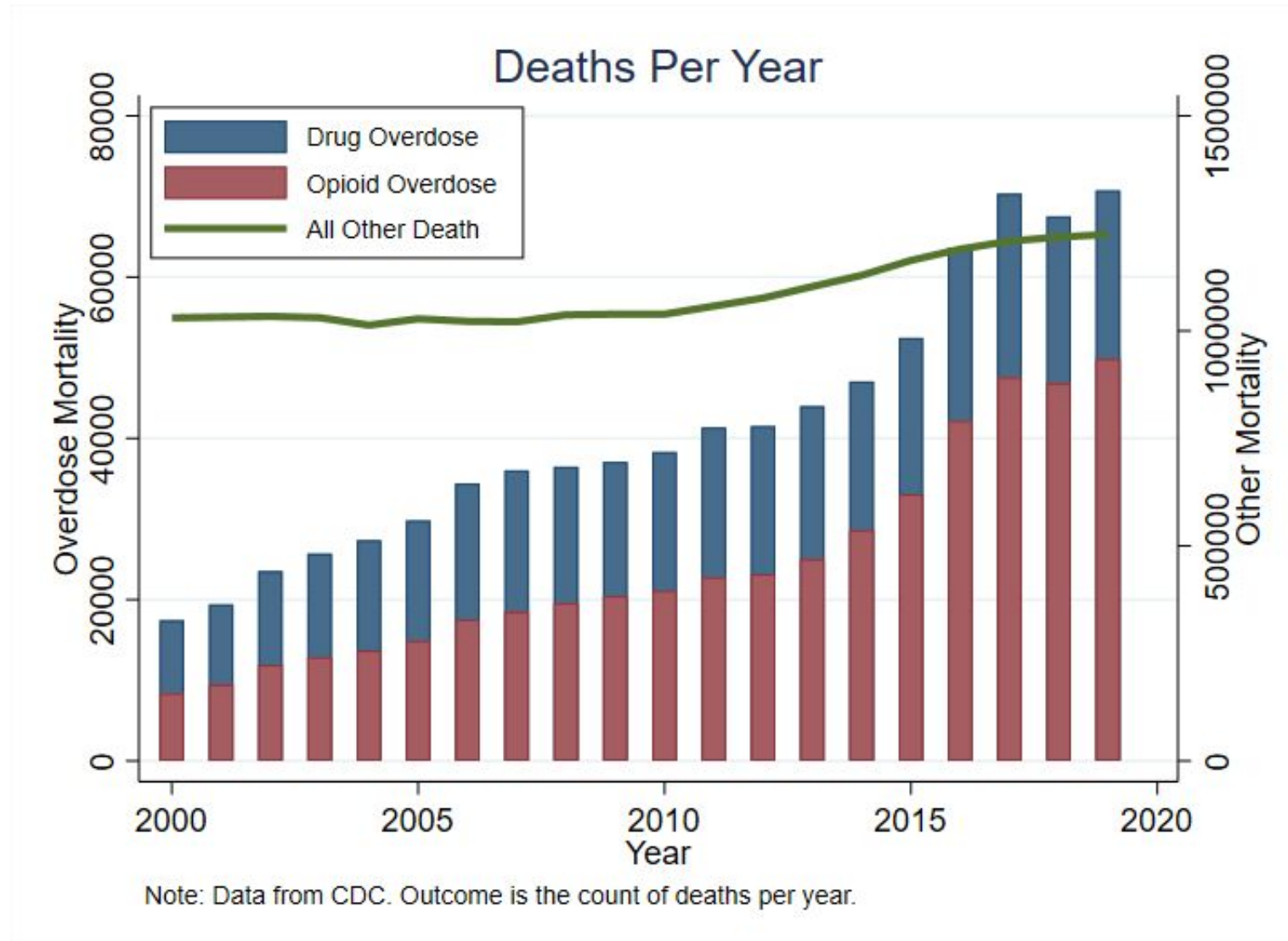


When the Cure Hurts: The Unintended Effects of Opioid Prescription Laws

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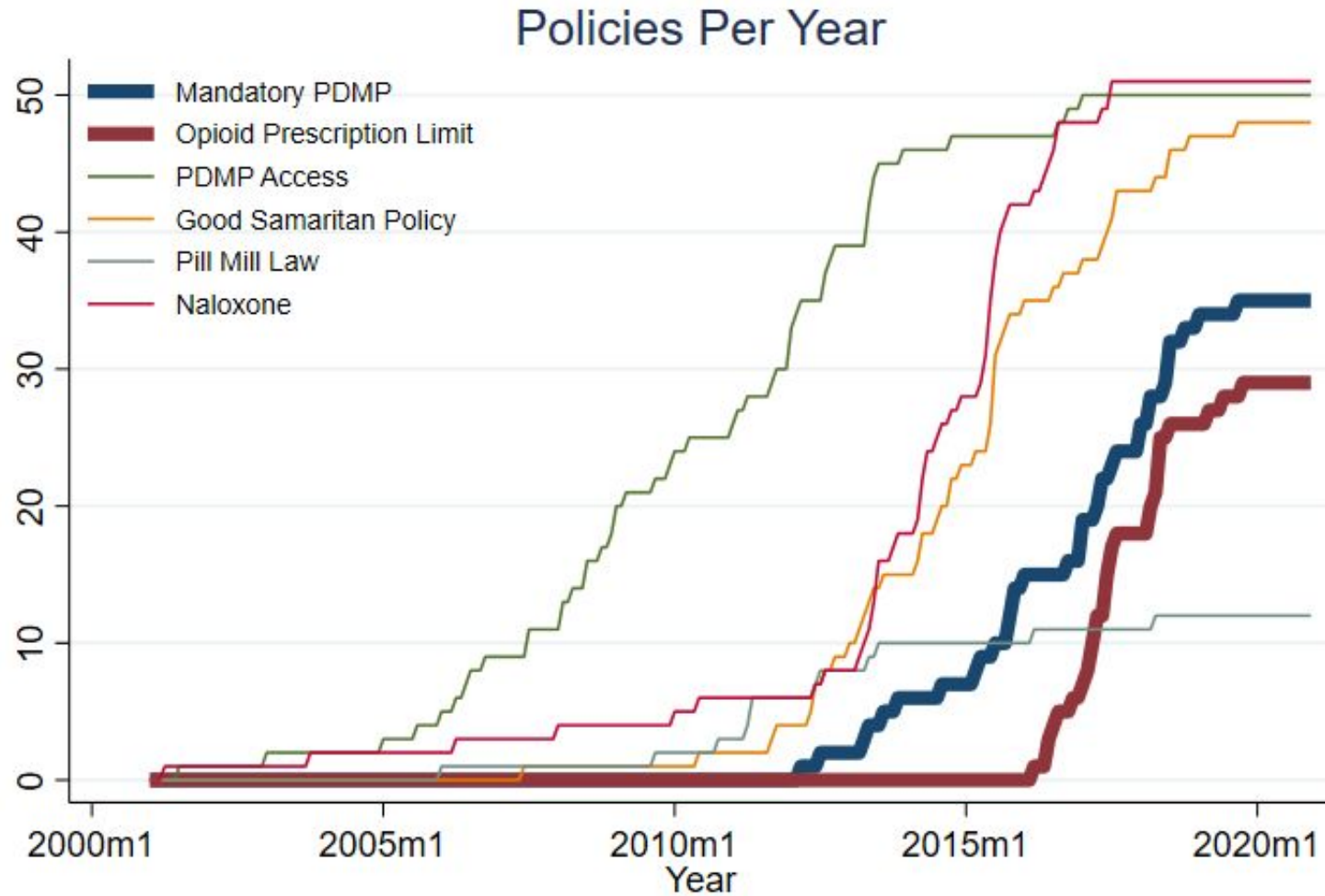
The opioid crisis – increasing death toll of drug overdoses



The causes and policy prescriptions

- Research finds the marketing of OxyContin as the driver of the opioid crisis
- The more recent waves are associated with rapid increases in overdose deaths involving illicit opioids
- Policies have been implemented to
 - Limit the supply of prescription opioids (e.g. PDMP, Opioid Prescription Limit Laws, Pill Mill Law)
 - Provide medical assistance to drug overdoses (e.g. the Good Samaritan Harm Reduction Policy, Naloxone Access Laws)
 - Increase insurance coverage of prescribed opioids (e.g. Medicaid Expansion)

Interest of The Paper



Policy details

- Mandatory PDMP requires health care providers to see patients' prescribing histories to inform their prescribing decisions and reduce high-risk prescribing behaviors.
- The opioids prescription limit laws limits the duration or amount of opioid prescriptions issued by physicians for initial treatment of acute pain.
- Mandatory PDMP and Prescription Limit both intend to reduce addiction though limiting the supply of opioids. However, the PDMP applies to any stage of addiction while the prescription limit mostly targets the initial prescription with a doctor.

Method – Event Study

- The study will exploit the variation in the timing of enactment of opioid limit laws across states. The following difference-in-difference model will be estimated to assess time variant treatment effect.

$$Y_{jst} = \alpha_s + \sum_{\tau=-q}^{-1} \gamma_{\tau} \cdot I[t - Implement_s = \tau] + \sum_{\tau=0}^m \varphi_{\tau} \cdot I[t - Implement_s = \tau] + \delta \cdot X_{st} + \theta_t + \mu_j + \varepsilon_{jst}$$

Y_{jst} : outcome of interest for unit j in state s during month t

$Implement_s$: time of policy implement in state s

$Policy_{st}$: equals 1 if policy is in place in state t during month t

X_{st} : indicator of other policies

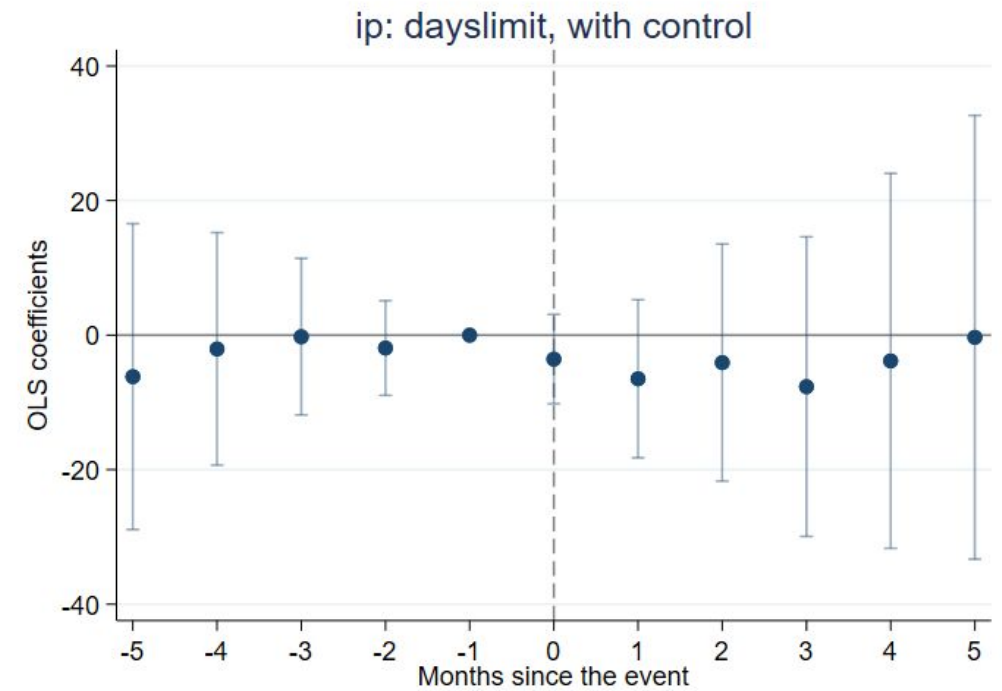
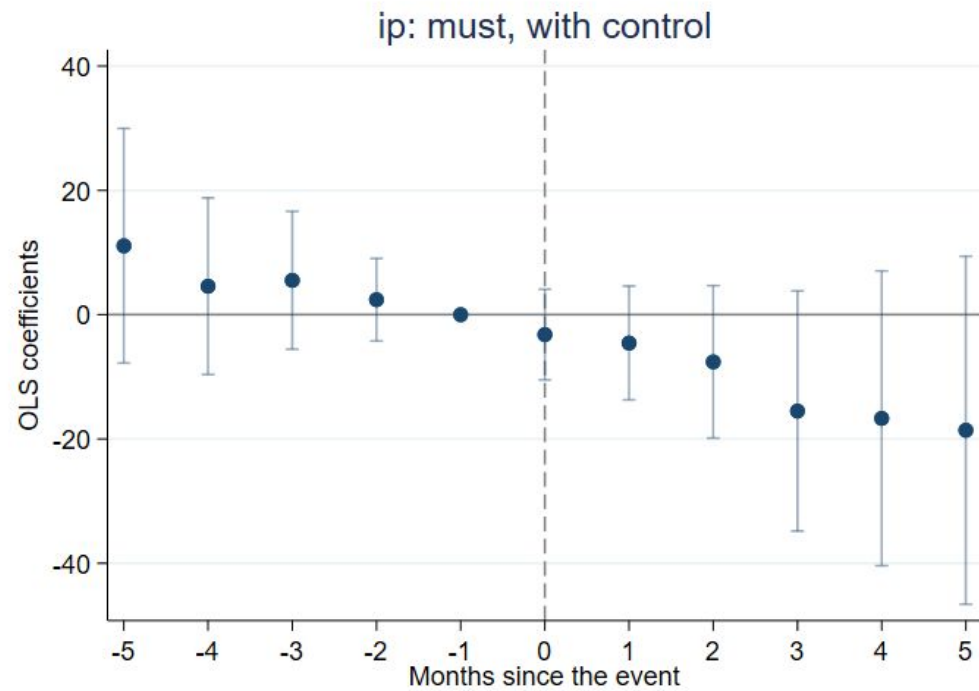
Data sources

- Health data – CDC Vital Statistics & Healthcare Cost and Utilization Project (HCUP)
 - IP: inpatient utilization due to opioid overuse
 - ED: emergency department visits due to opioid overdose
 - Deaths: mortality from drug overuse (CDC Vital Statistics)
- Crime data - National Incident-Based Reporting System (NIBRS)
 - Drug-related: criminal incident involving possession and distribution of drugs
 - Property crime: burglary, theft, vandalism, etc.
 - Violent crime: robbery, assault, murder, etc.

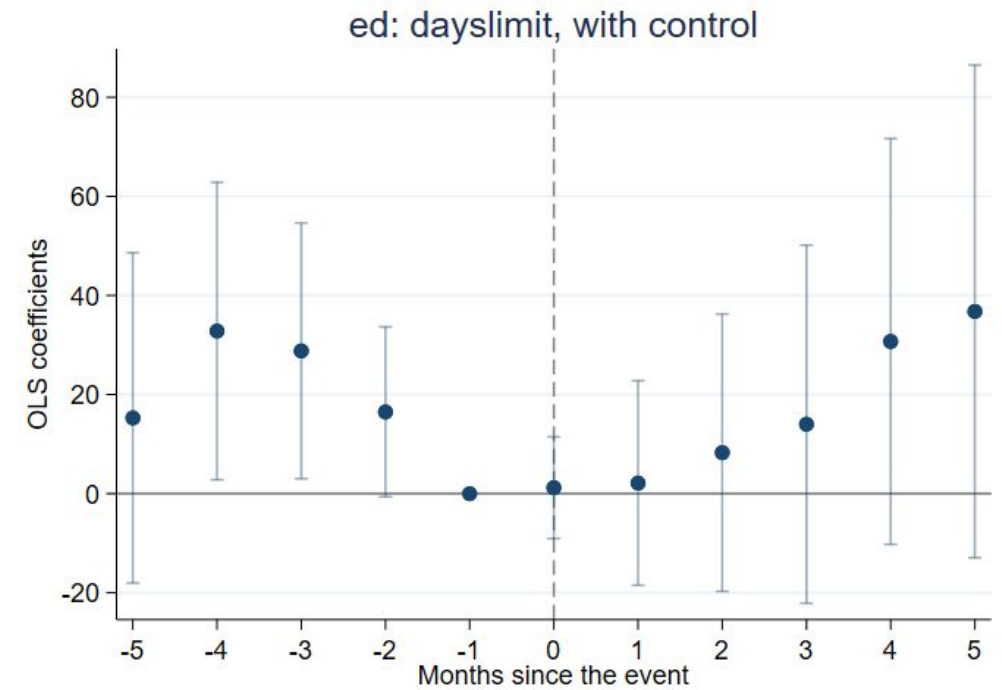
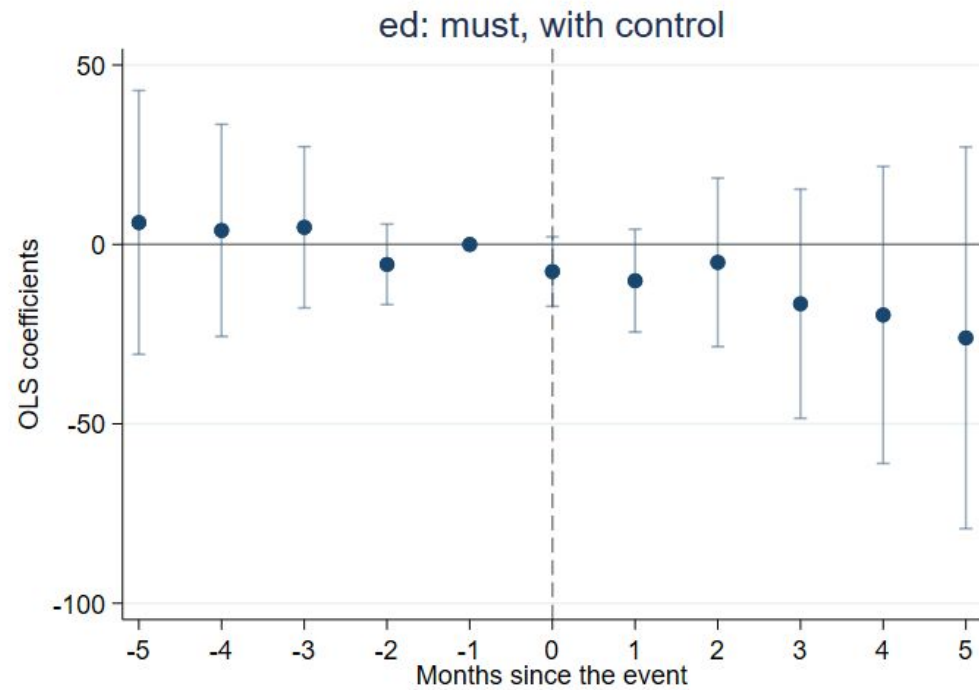
Cloud Resources

- Target: use cloud services to
 - store and process incident level crime data,
 - compute summary statistics,
 - get a cleaned subset for regression models to be estimated in R/Stata
- Cloud services employed
 - Blob storage
 - SparkR on Azure Databricks:

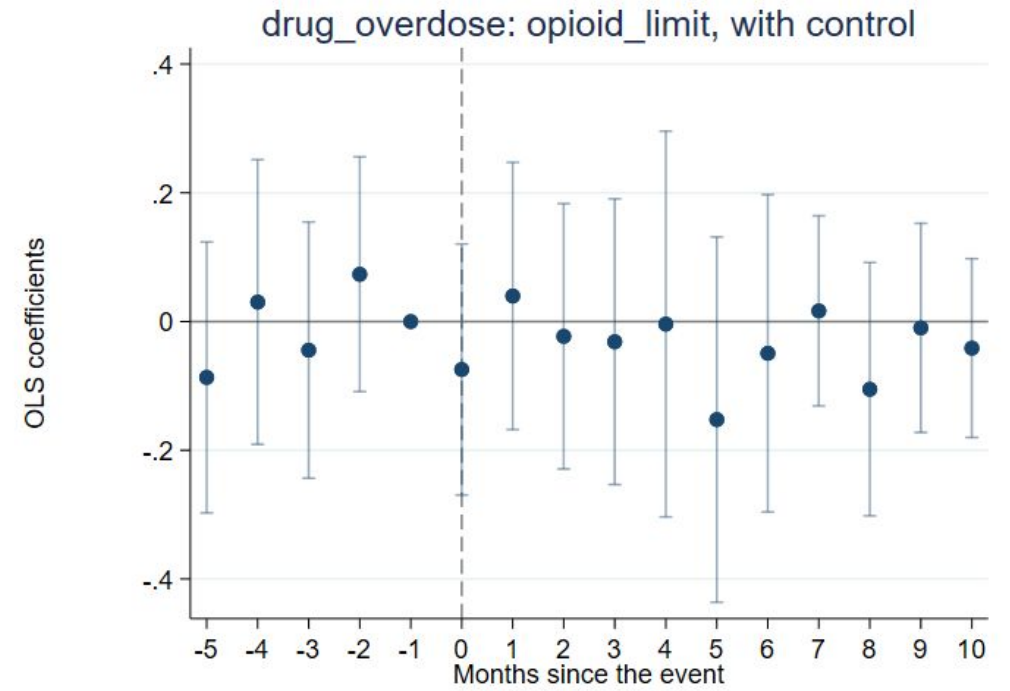
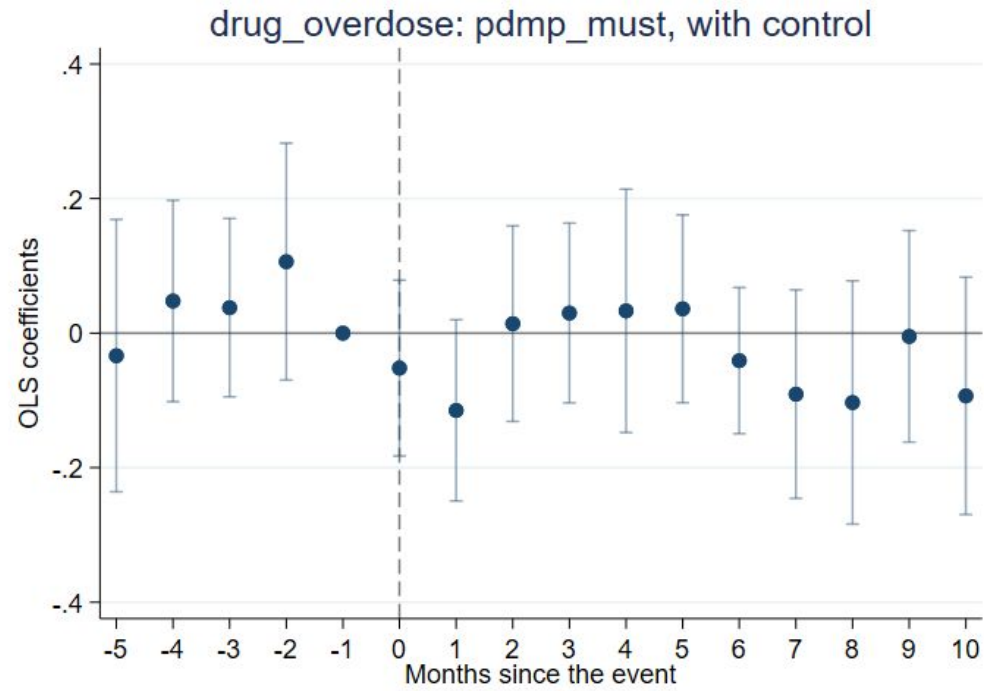
Inpatient care admissions related to opioids misuse



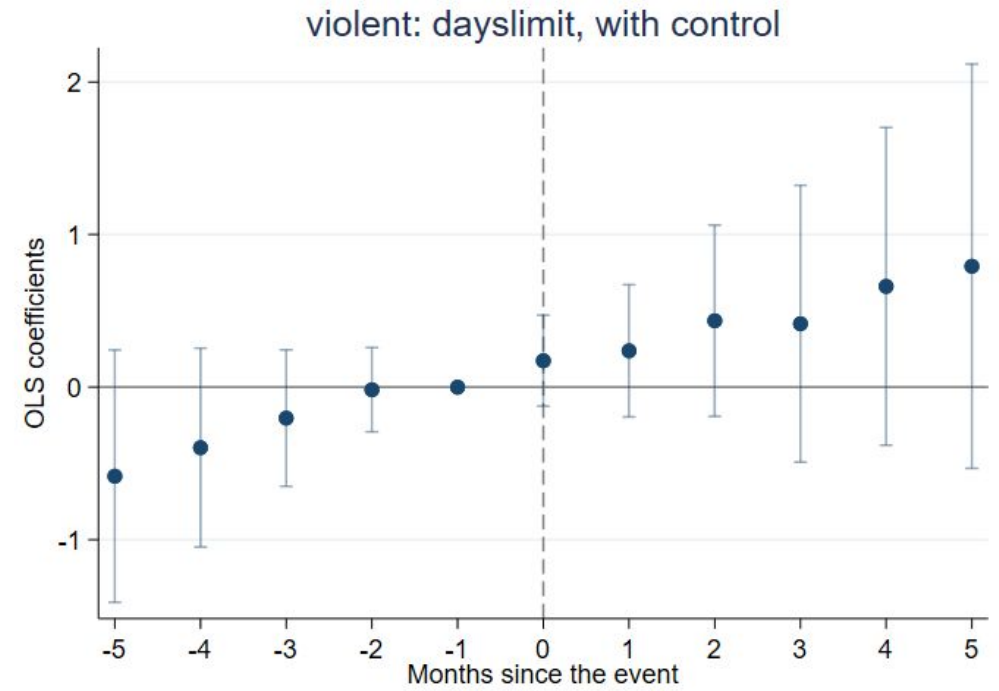
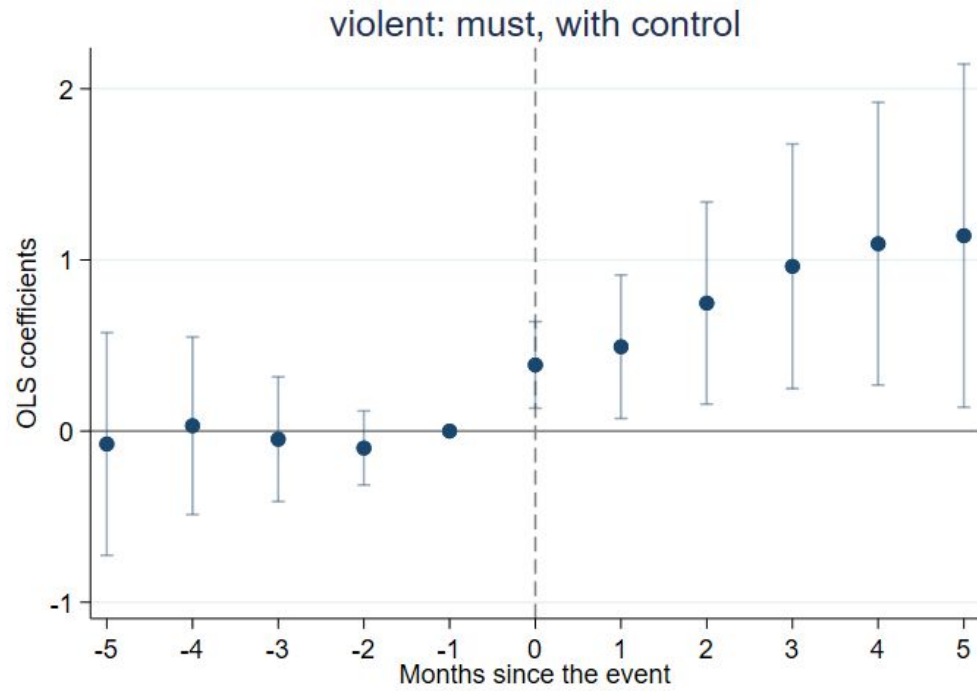
Emergency Department admissions of opioid overdose



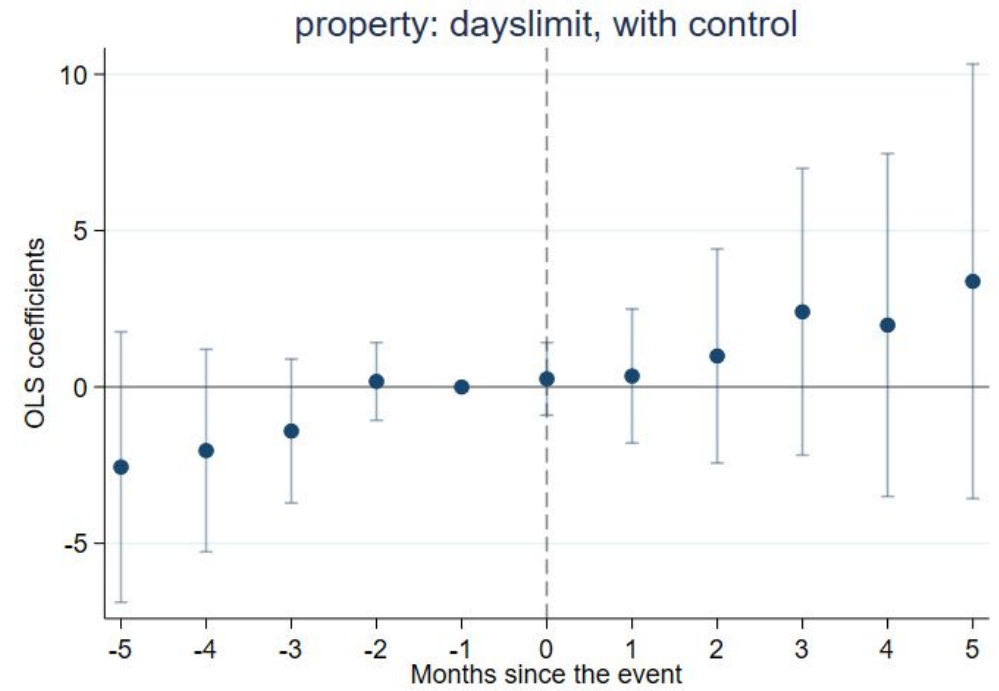
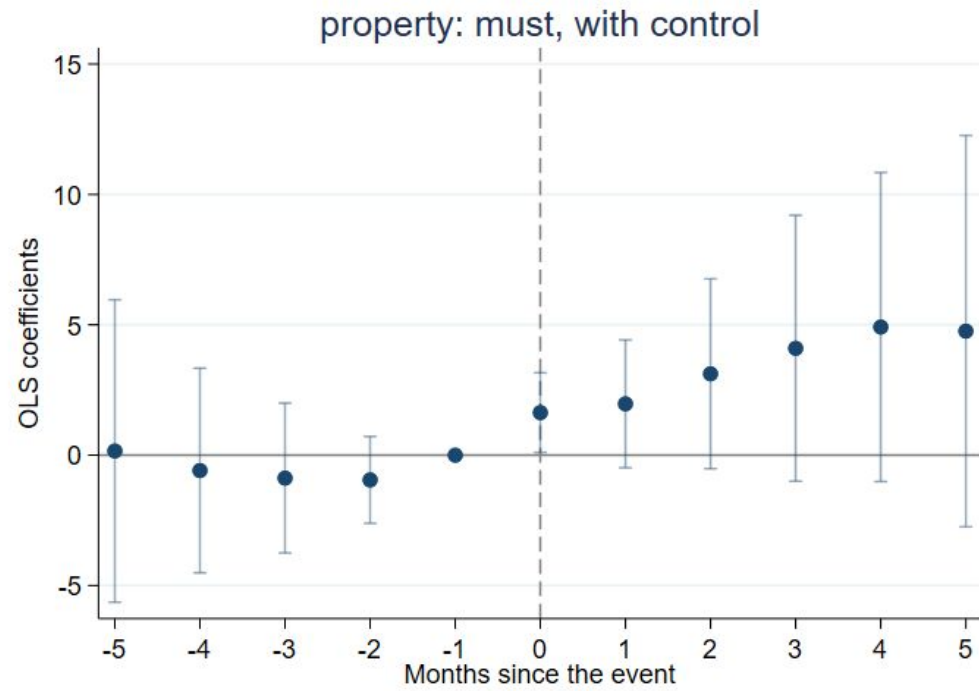
Drug overdose mortality related with opioids



Violent crimes



Property Crimes



Discussion

- Success
 - Blob storage container mounted to Databricks
 - Used distributed computation to process raw data
- Challenge
 - Choose a suitable driver memory:
Error: Driver is up but is not responsive, likely due to GC
 - Learning SparkR
some of SparkR functions are entirely new or have different parameters than R functions
 - Not being able to use sensitive data on cloud

Next steps

- Choice of analysis period
 - Currently use a one-year window, if too-long, there might be enactment of other policies that contaminate the estimated effect
 - But some outcomes are lagged, e.g. mortality -> use lagged outcomes and keep the event window the same?
- The parallel trend assumption does not hold. Will adjust for selection
 - Matching states of outcomes prior to policy to address self selection, then DID
 - Synthetic control?
 - Synthetic DID?
- Placebo tests
- Other advanced adjustment for heterogeneous treatment effect of DID as a robustness check