Does Private Equity Ownership Make Firms Cleaner? The Role Of Environmental Liability Risks

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“The tiny reptile lives (...) where Vista Proppants & Logistics Ltd. was looking to build a sand mine. Vista is owned by a **private equity firm**, First Reserve Corp (...). [The lizard] was prolific enough to stay off any endangered or threatened lists. What Vista did next may be surprising. The miners worked with local conservationists to make sure as **few lizards as possible were harmed**".

Source: Bloomberg, Melissa Mittelman

“Sometimes the companies do well. But far too often, the private equity firms are like **vampires** – bleeding the company dry and walking away enriched even as the company succumbs. (...)"

Source: End Wall Street’s Stranglehold On Our Economy, Elizabeth Warren

Research question

Do PE firms create shareholder value at the expense of society?

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Consumers

Health care (Pradhan et al., 2014 and Eliason et al., 2019), restaurant (Berstein et al. 2016 (RFS)), retail products (Fracassi et al. 2018), education (Eaton et al. 2018 (RFS))

Governments

Kaplan, 1989 (JF), Eaton et al. 2018 (RFS), Olbert et al. 2019 (R&R, JF)

Workers

Boucly et al. 2011 (JFE), Davis et al. 2014 (AER), Cohn et al. 2019 (R&R, RFS)

Missing stakeholder: people incurring the cost of pollution

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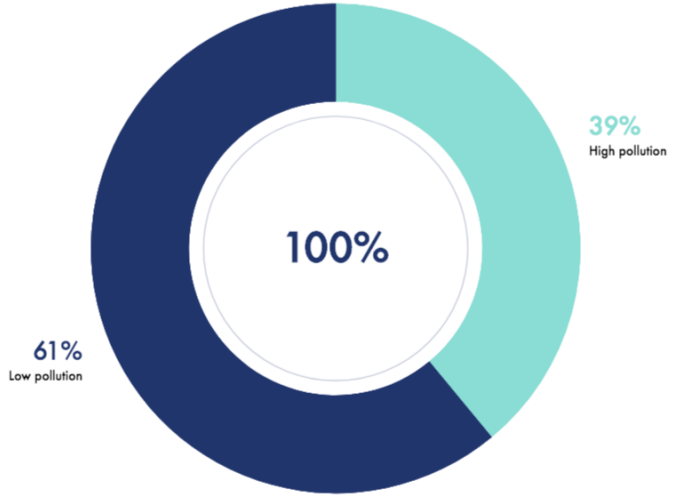
Missing stakeholder: people incurring the cost of pollution

What is the economic mechanism, friction, incentive driving the effect?

Why it matters

- PE firms managed $3.4 trillion of assets in June 2018
- They invest heavily in industries that pollute: 30 to 40% of acquisitions
  - Include: Natural resources, energy, heavy industry and infrastructure sectors



- Toxic pollution has adverse effects on public health, worker productivity, housing price and environmental sustainability

Challenges and suggested solutions

- **Challenge 1: Finding micro-data on pollution and its intensity**

- **Challenge 2: Endogeneity of PE deals**

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  - Collect administrative data on chemicals and satellite data on CO2 emissions
  - Unique and novel picture on corporate environmental policies
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- **Solution: use the oil and gas industry as an empirical setting**
  - Second sector in terms of PE attractivity (after computer industry)
  - 55 million households live in a shale basin
  - 28% of methane emissions come from the oil and gas industry in the US

Findings

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  - 70% of the baseline level for toxic pollutants
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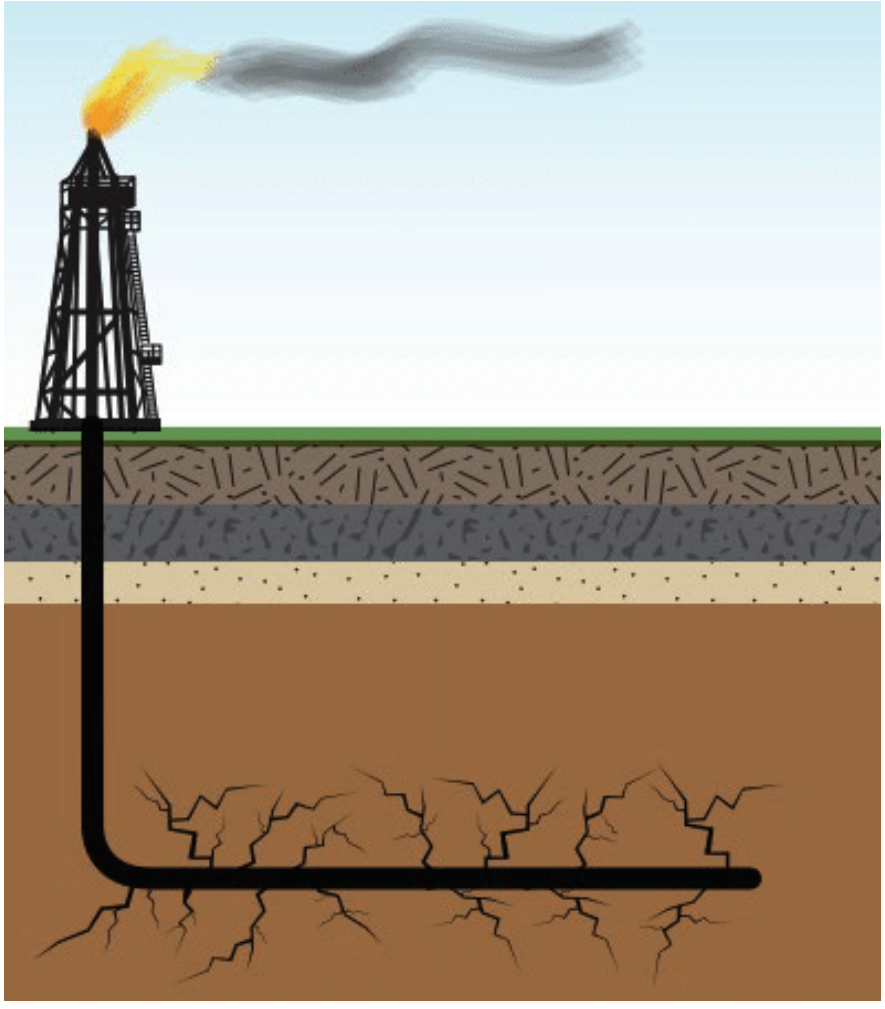
- **PE ownership causes *a drop* in pollution**
  - 70% of the baseline level for toxic pollutants
  - 50% of the baseline rate of flaring
- Consistent with the maximization of **long-term** shareholder value
- PE firms reduce pollution to increase the **exit value**
  - Polluted assets are traded with a negative discount
    - ★ They expose the new owner to more environmental liability risks
    - ★ Informational and belief frictions about these risks create heterogeneous demand
  - Incentive to change the amount of pollution (Osborne and Pitchik, 1987)
    - ★ Increase the number of potential buyers
    - ★ Attract buyers with a higher valuation

Institutional framework

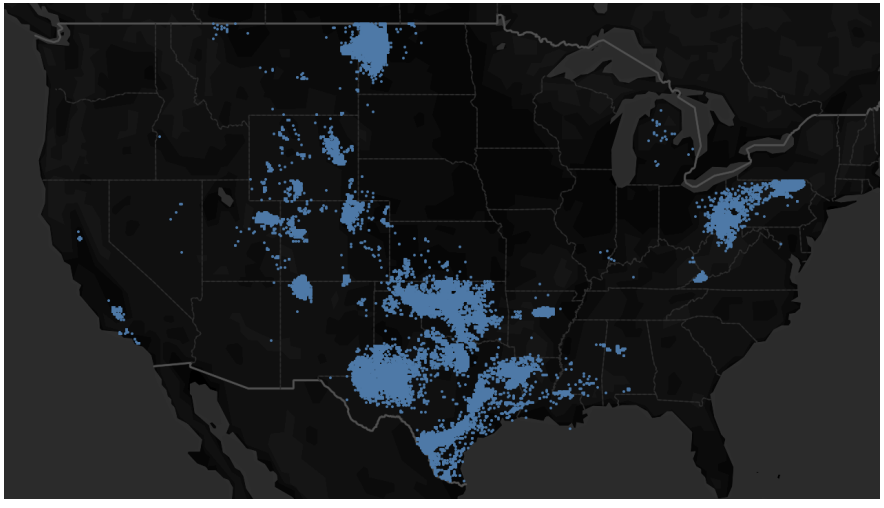
Fracking: background

- Oil and gas companies:
  - Find an acreage
  - Drill a well
- Injection of toxic chemicals
  - Hydraulic fracturing: creates cracks in the rock to extract the oil and gas
- Gas is sometimes burnt (flaring) when extracting oil
  - Gas and oil are often co-product



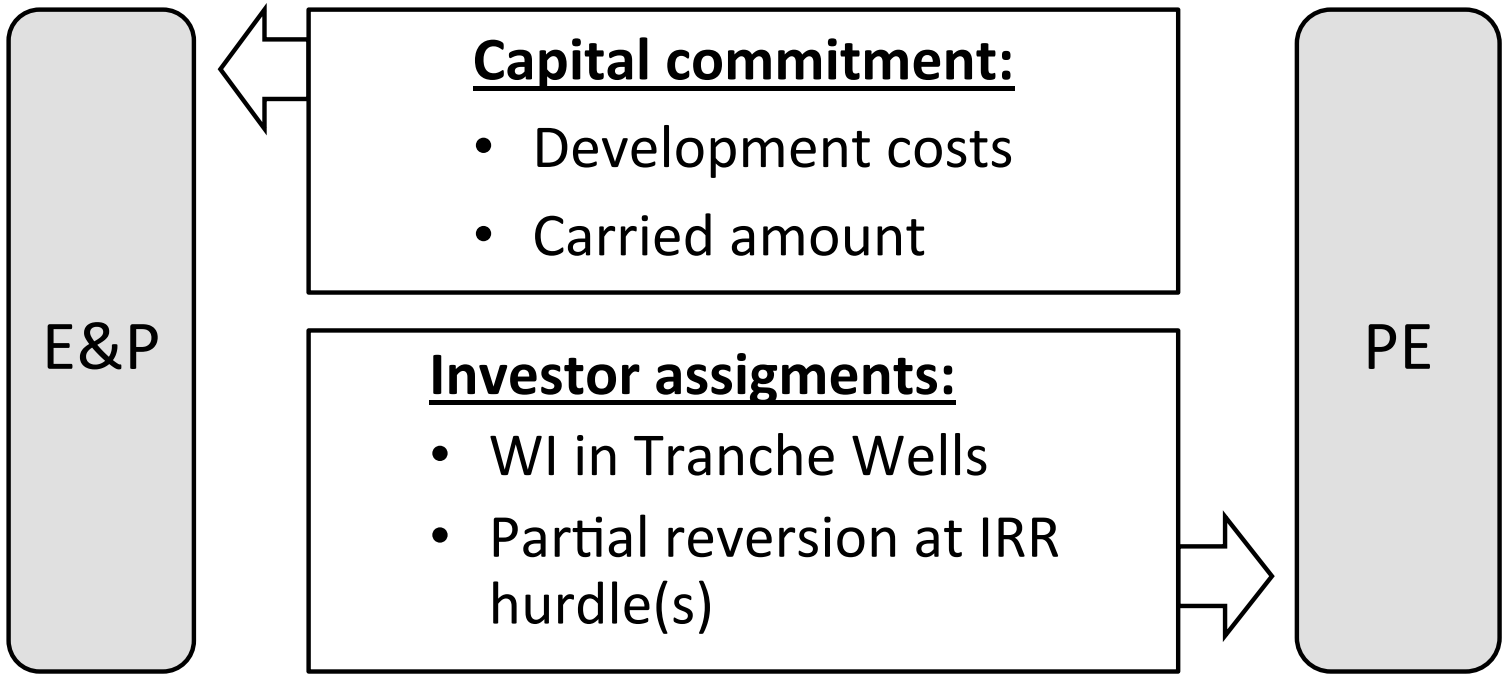
Oil and gas datasets

- Use administrative databases merged to commercial data
  - **Toxic component**: congressional reports
  - Exempt from federal regulation and local anecdotal evidence of contamination
- Construct a dataset on flaring using satellite imaging methods
- Descriptive statistics of the sample:
  - 135,503 projects started between 2010 and 2019
  - Between 75 and 135 billion dollars
  - 97.49 projects for a firm on average
  - Average rate of pollution: 0.3 toxic chemical and 20% of flaring
  - 106 final PE deals with transfer of ownership, 55 PE firms and 50 DrillCo contracts



Geographical distribution of the projects

Drillco contracts



- No change in control rights: "**We don't micro-manage operational details about how you're fracking the**
- **wells**" (Tim Murray from Benefit Street Partners)
- No value at exit but streams of income

Net effect of PE ownership on pollution

Identification approach

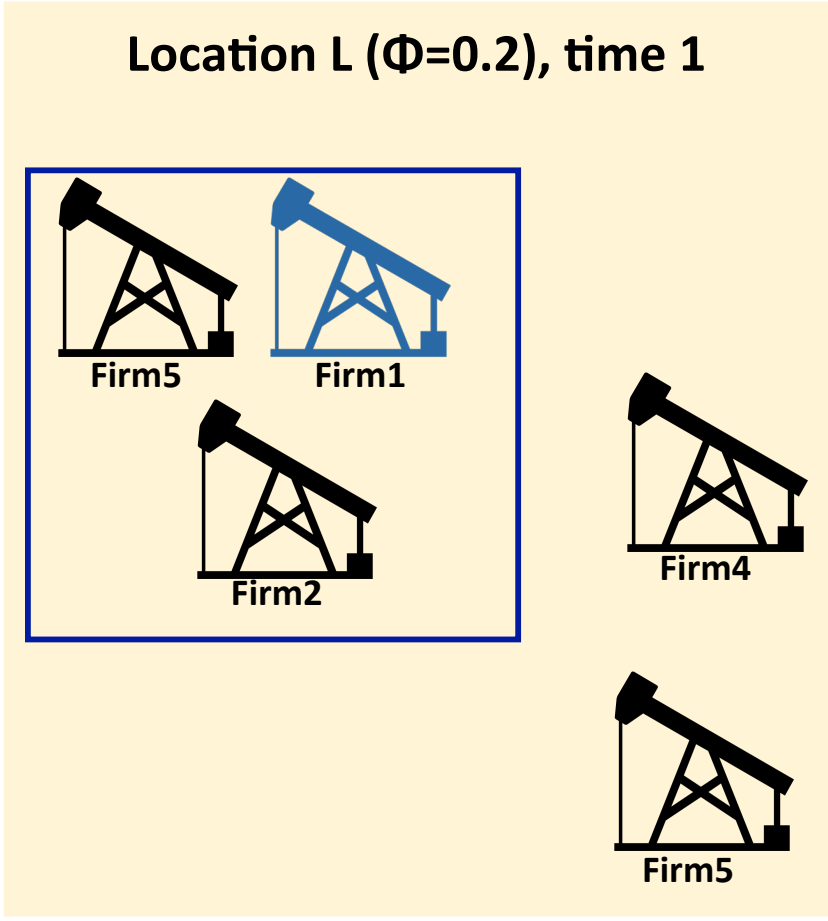
Endogeneity problem: PE firms do not randomize. Their acquisition can plausibly correlate with major milestones in the development of the firm, like an expansion

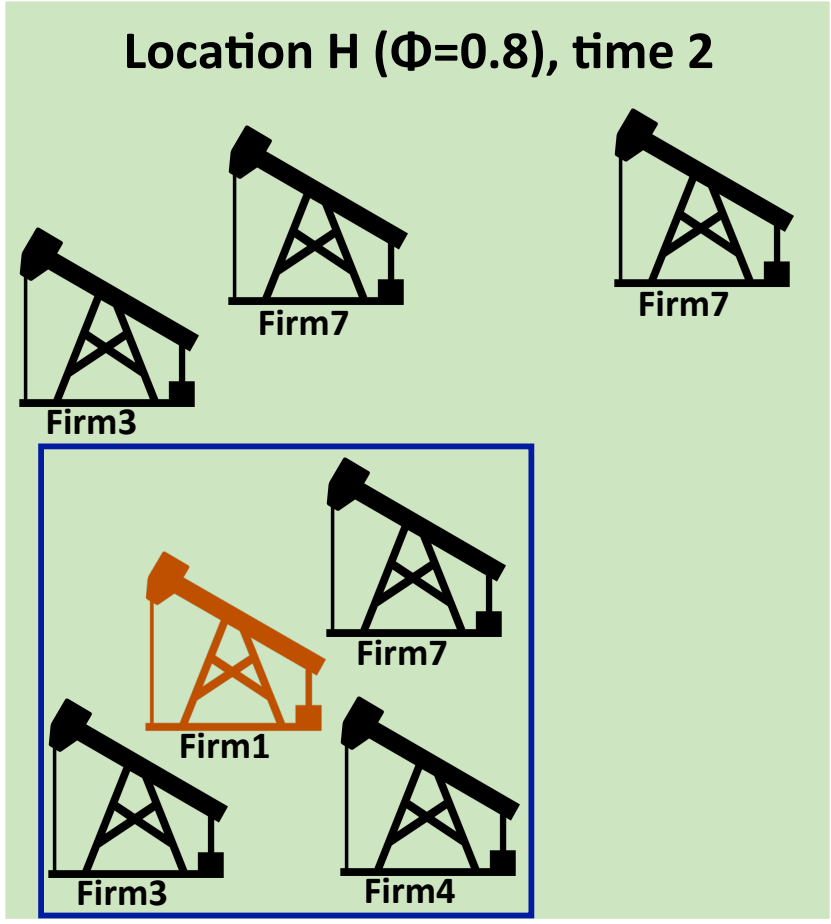
Location L (Φ=0.2), time 1

Location H (Φ=0.8), time 2

Identification approach

Identifying assumption: Project-level marginal cost and benefit of polluting are the same for two wells located in the same area and completed the same year





Difference-in-differences: toxic chemicals

$$Y_{pijt} = \text{Firm}_i + \text{Year}_t \times \text{Location}_j + \sum_{\tau=-6}^{10} \boldsymbol{\gamma_\tau}.(\mathbb{1}_{i,t,\tau}) + X_{pt} + \epsilon_{pijt}$$

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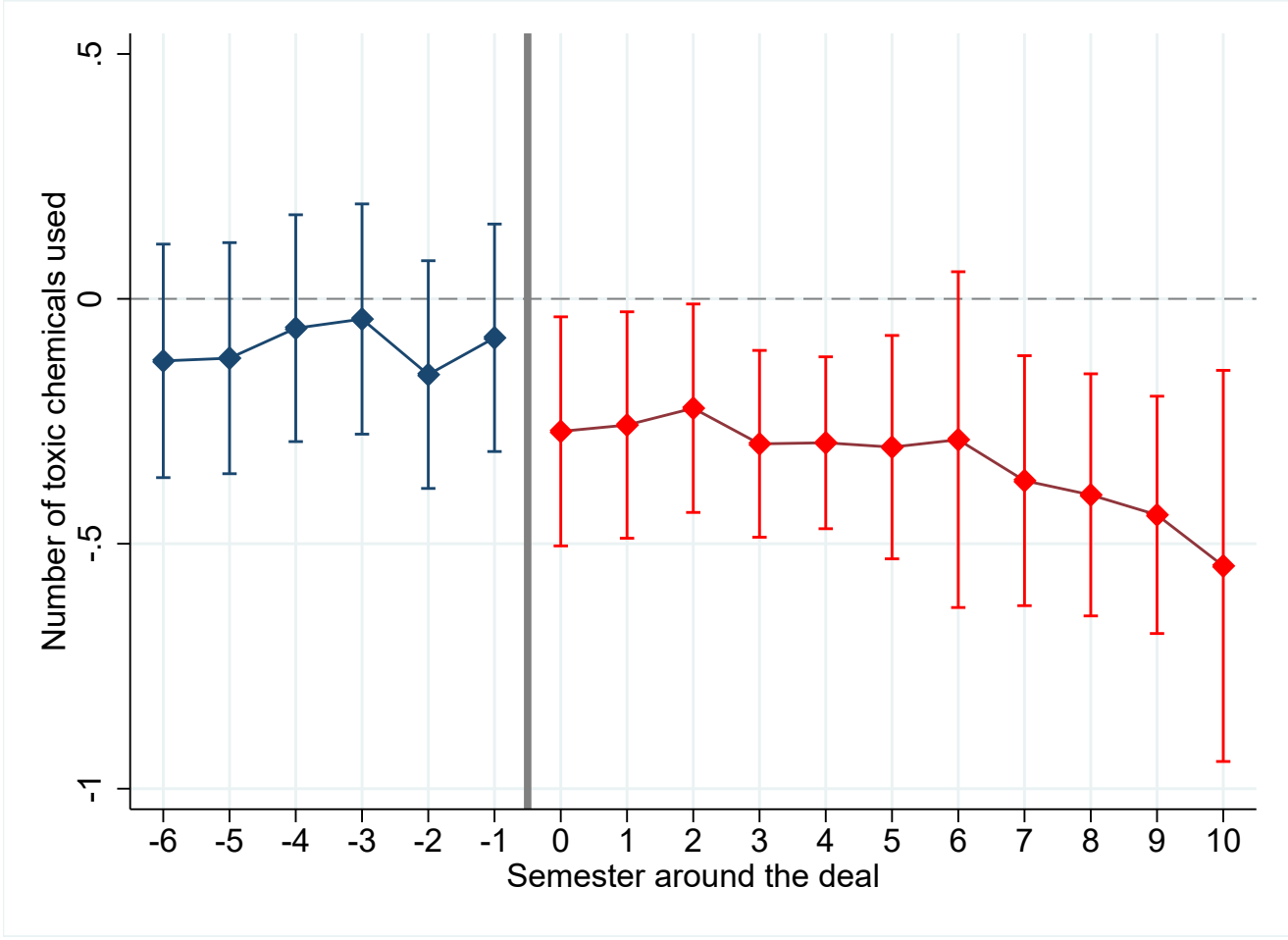
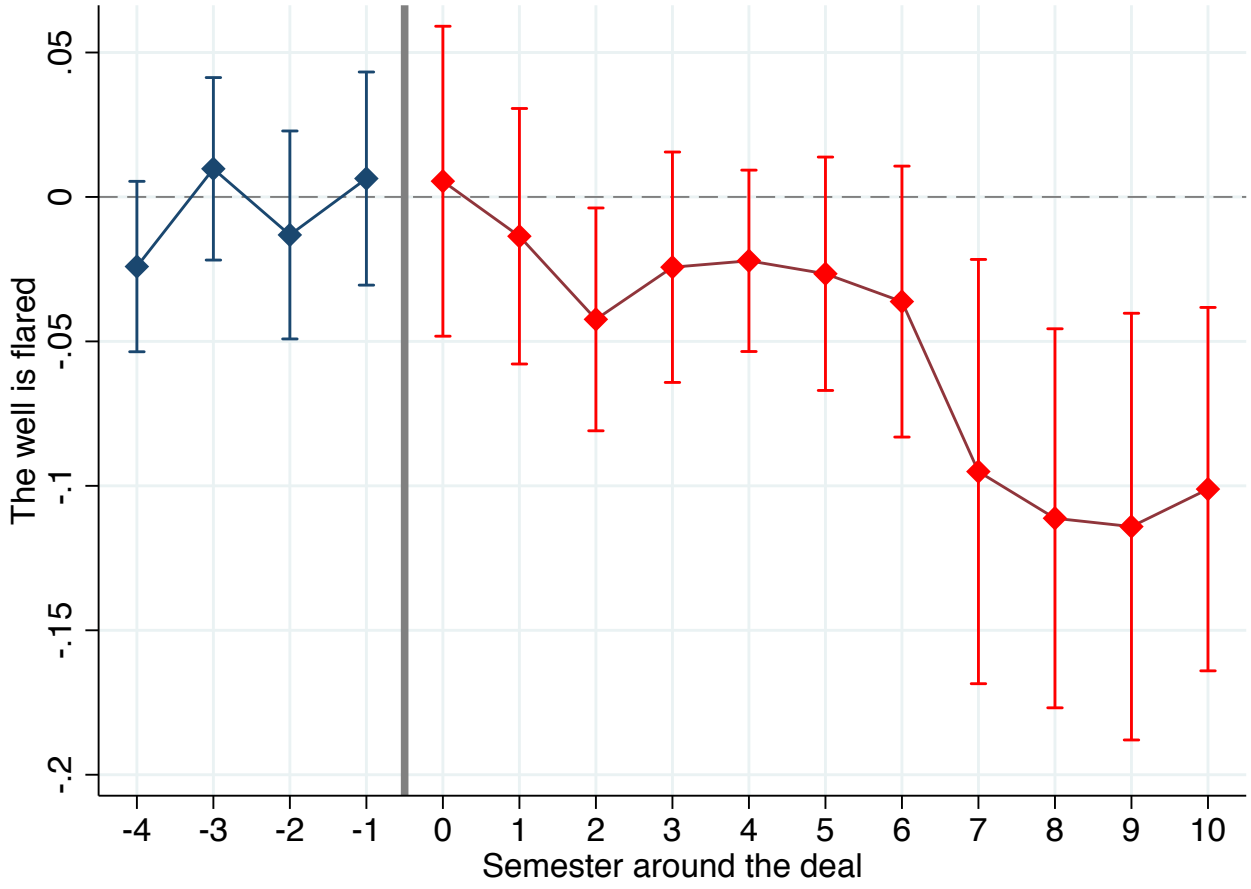


Reduction equivalent to 70% of the baseline number of toxic chemical

Difference-in-differences: flaring

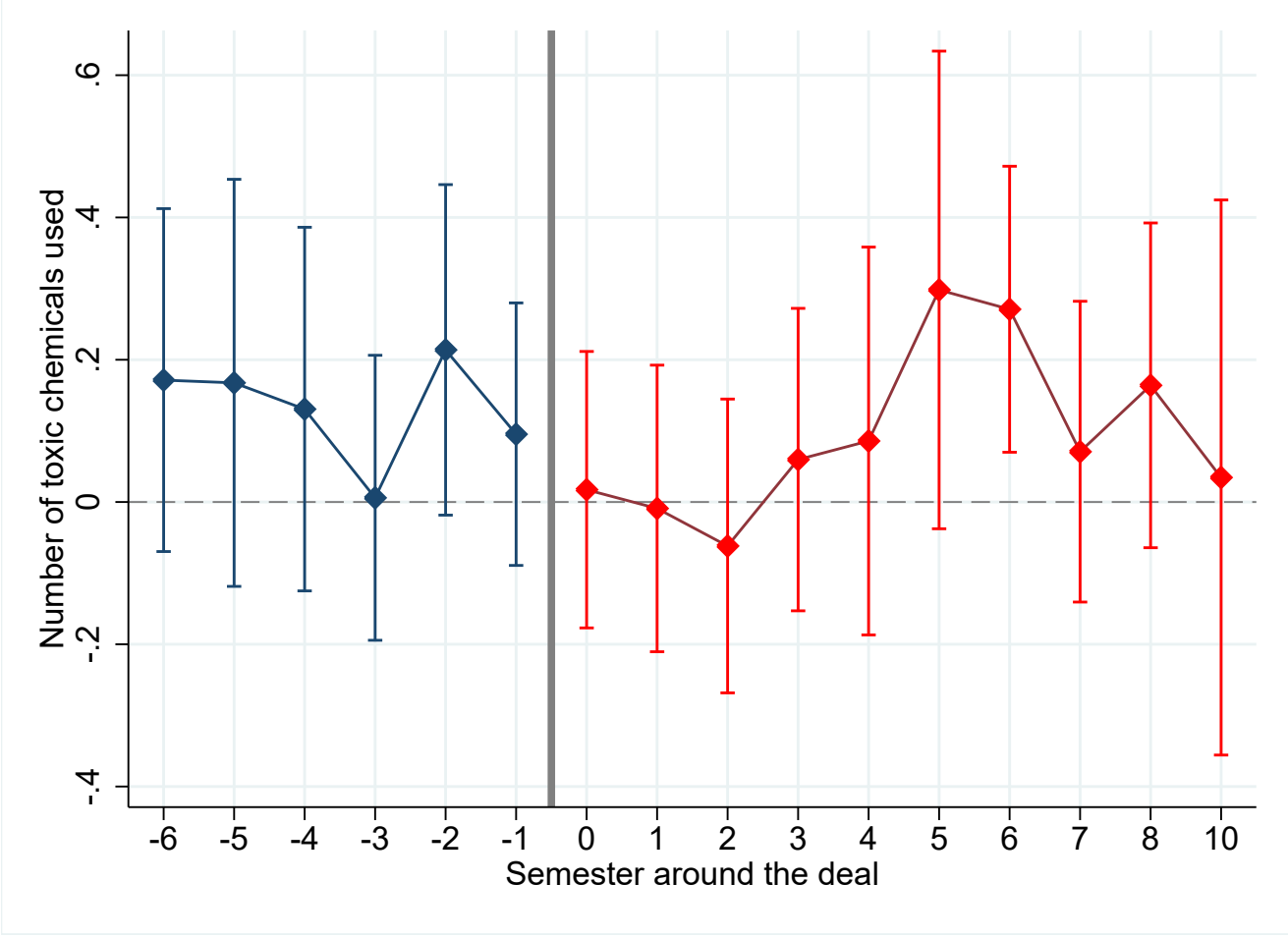
$$\text{Flaring}_{pijt} = \text{Firm}_i + \text{Year}_t \times \text{Location}_j + \sum_{\tau=-4}^{10} \boldsymbol{\gamma_\tau}.(\mathbb{1}_{i,t,\tau}) + X_{pt} + \epsilon_{pijt}$$



Reduction equivalent to 50% of the baseline rate in flaring

Difference-in-differences: Drillco contracts

$$Y_{pijt} = \text{Firm}_i + \text{Year}_t \times \text{Location}_j + \sum_{\tau=-6}^{10} \boldsymbol{\gamma_\tau}.(\mathbb{1}_{i,t,\tau}) + X_{pt} + \epsilon_{pijt}$$

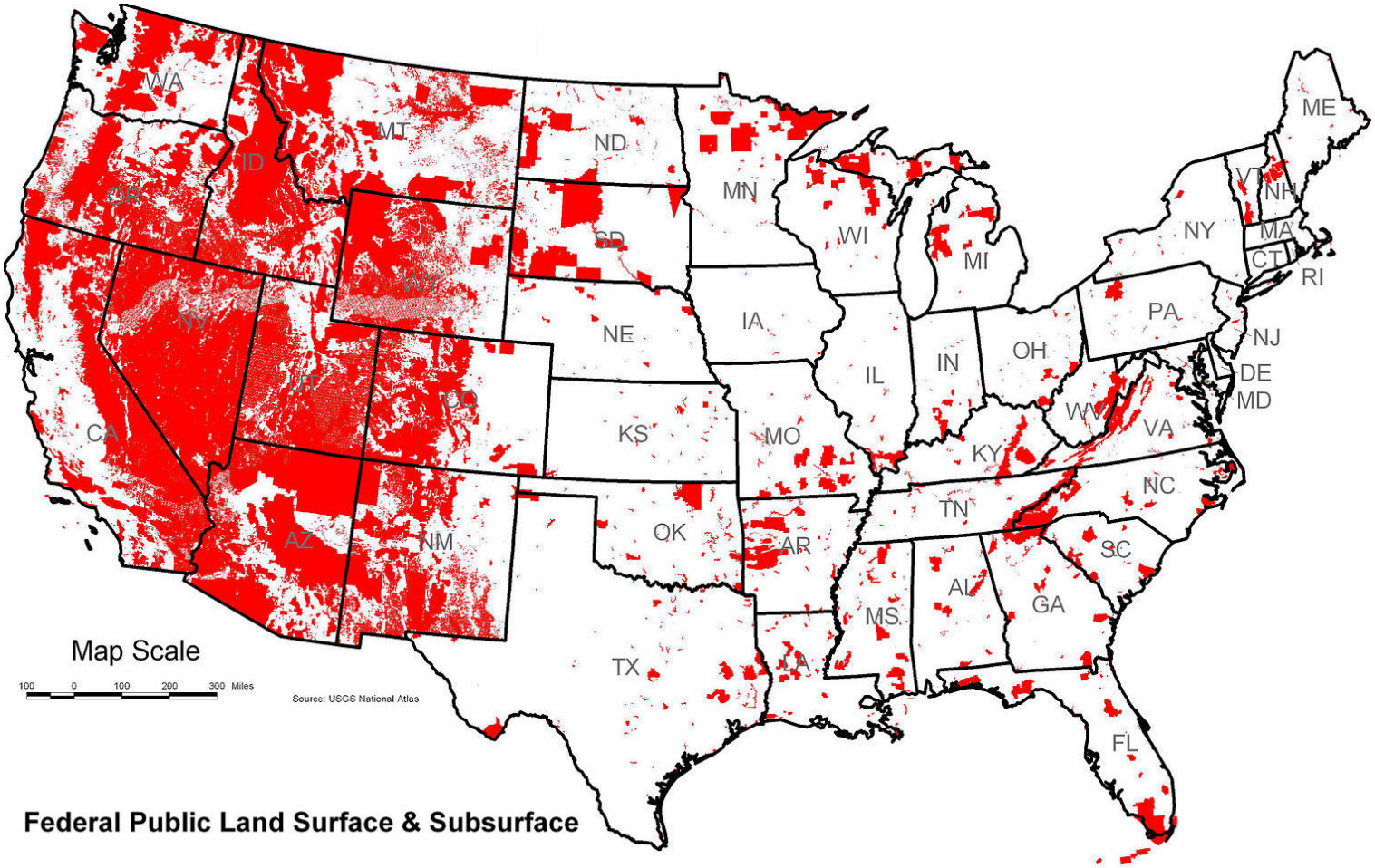


No economic and significant statistical effect on pollution

The role of environmental liability risks

Natural experiment: background

- Bureau of Land Management (BLM): responsible for the environmental regulation of Native American reservation / federal land



Natural experiment: background

2012-2015: the rule is drafted, debated and discussed

- Improve the **disclosure** of operational activities
- Increase the quality and **integrity of the wellbore**
- Increase the standard of **water protection**: "isolate all usable water and other mineral-bearing formations and protect them from contamination"

2015-2018: The ability of BLM to regulate fracking is challenged

- March 20, 2015: various petitioners filed a motion for **preliminary injunction** to challenge the fracking rule
- June 21, 2016: the **rule is abrogated** by the District of Wyoming and three days after the BLM appealed
- January 20, 2017: Trump is inaugurated and the rule is voided in July 25, 2017

2018-today: the rescind is challenged

- State of California and a group of environmental activists **sue the BLM** for voiding the fracking rule

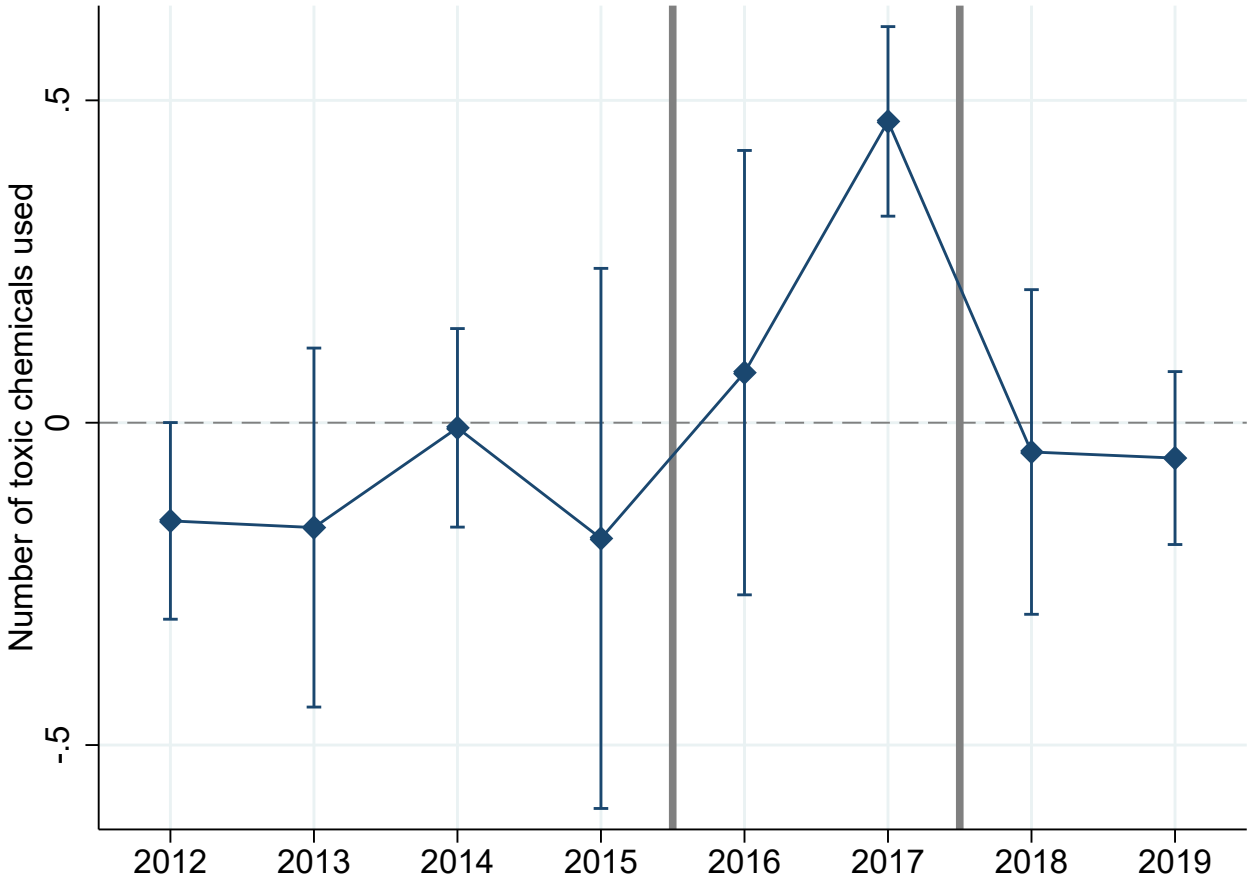
Triple-difference (1/2)

$$Y_{pijt} = \text{Firm}_i \times \text{Year}_t + \text{Location}_j \times \text{Year}_t + \sum_{\tau=2012}^{2019} (\text{year}=\tau) \times (\text{BLM})_{pt} \times (\gamma_\tau + \beta_\tau . \text{PE}_{it}) + X_{pt} + \epsilon_{ijt}$$

- **Interpretation**:
  - Difference in pollution between regulated and non-regulated areas for projects drilled the same year in the same location
  - β_τ is the evolution of this difference for PE-backed firms with respect to non PE-backed firms during year τ
  - After purging out firm-level time trends and observable characteristics in projects

Triple-difference (2/2)

$$Y_{pijt} = \text{Firm}_i \times \text{Year}_t + \text{Location}_j \times \text{Year}_t + \sum_{\tau=2012}^{2019} (\text{year}=\tau) \times (\text{BLM})_{pt} \times (\gamma_\tau + \beta_\tau . \text{PE}_{it}) + X_{pt} + \epsilon_{ijt}$$



More *relative* pollution in areas where regulatory risk is lower

Results And Economic Discussion

- Reject theories based on **non-pecuniary motivations**
  - Unless strong asymmetric information between limited and general partners
  - If ESG is a substitution to government failures ((Benabou and Tirole (2010)), then we should expect a decrease of pollution

- Reject an explanation fully driven by **technological change**
  - Technological progress doesn't correlate with spatial regulatory risks

Potential non-exclusive channels

- Investment **horizon channel** ▸ Public listing ▸ Cash flow
  - Asymmetric information between managers and public investors => Managers take inefficient actions to signal their types (Stein (1989) and (Grenadier et al. (2011))

- **PE firms reduce pollution to increase the exit value**
  - Polluted assets are traded with a negative discount ▸ Evidence
    - ★ They expose the new owner to more environmental liability risks
    - ★ Clean-up (CERCLA), litigation and future compliance cost
    - ★ Informational and belief frictions about these risks create heterogeneous demand
  - Incentive to change the amount of pollution (Osborne and Pitchik, 1987)
    - ★ Increase the number of potential buyers
    - ★ Attract buyers with a higher valuation

- **Interaction of these two channels explains why the decrease in pollution is higher with time**

Concluding remarks

- PE control leads to a **reduction of pollution**
  - 70% reduction of toxic chemicals
  - 50% reduction in flaring
- Driven by **pecuniary motives** from a long-term investor
- **Implication**: Initiatives to decarbonize portfolios could come at the cost of increasing pollution in dirty industries
  - Goal of decarbonization: to reduce production of fossil fuels
  - Mechanism: make the cost of capital higher
  - However, an unintended effect could be to increase pollution in the oil and gas

Appendix

Flaring: usage of satellite dataset

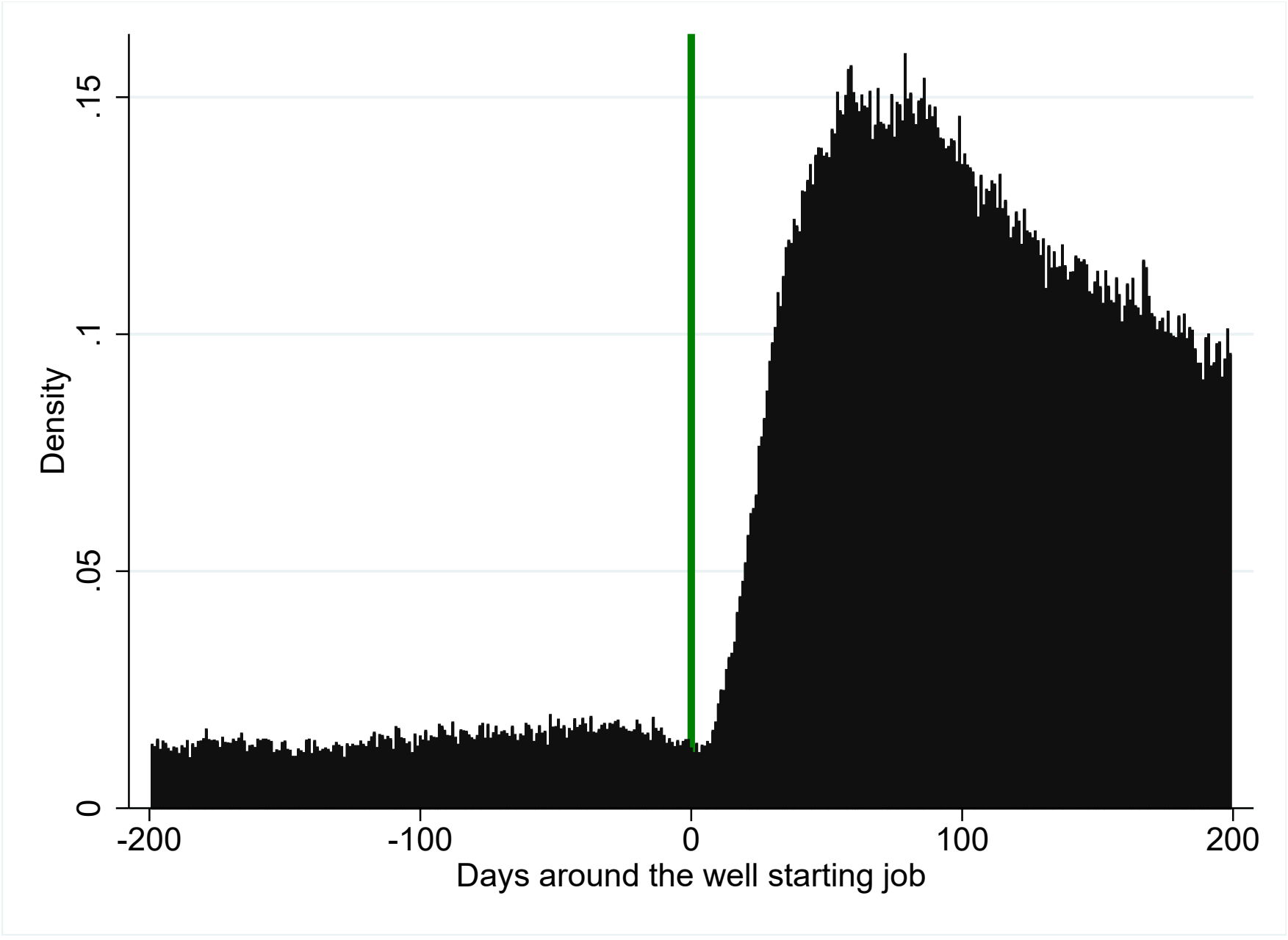
Follow the advance of remote sensing (Elvidge et Al., 2013):

- Satellite pyrometer - NASA/NOAA Visible Infrared Imaging Radiometer Suite (VIIRS) collects the radiation
- Collect the background temperature from NOAA
- Invert the Max Planck equation and use the Wien's Displacement Law
- Temperature for each square at nadir: Flaring if 1600°C and 2000°C

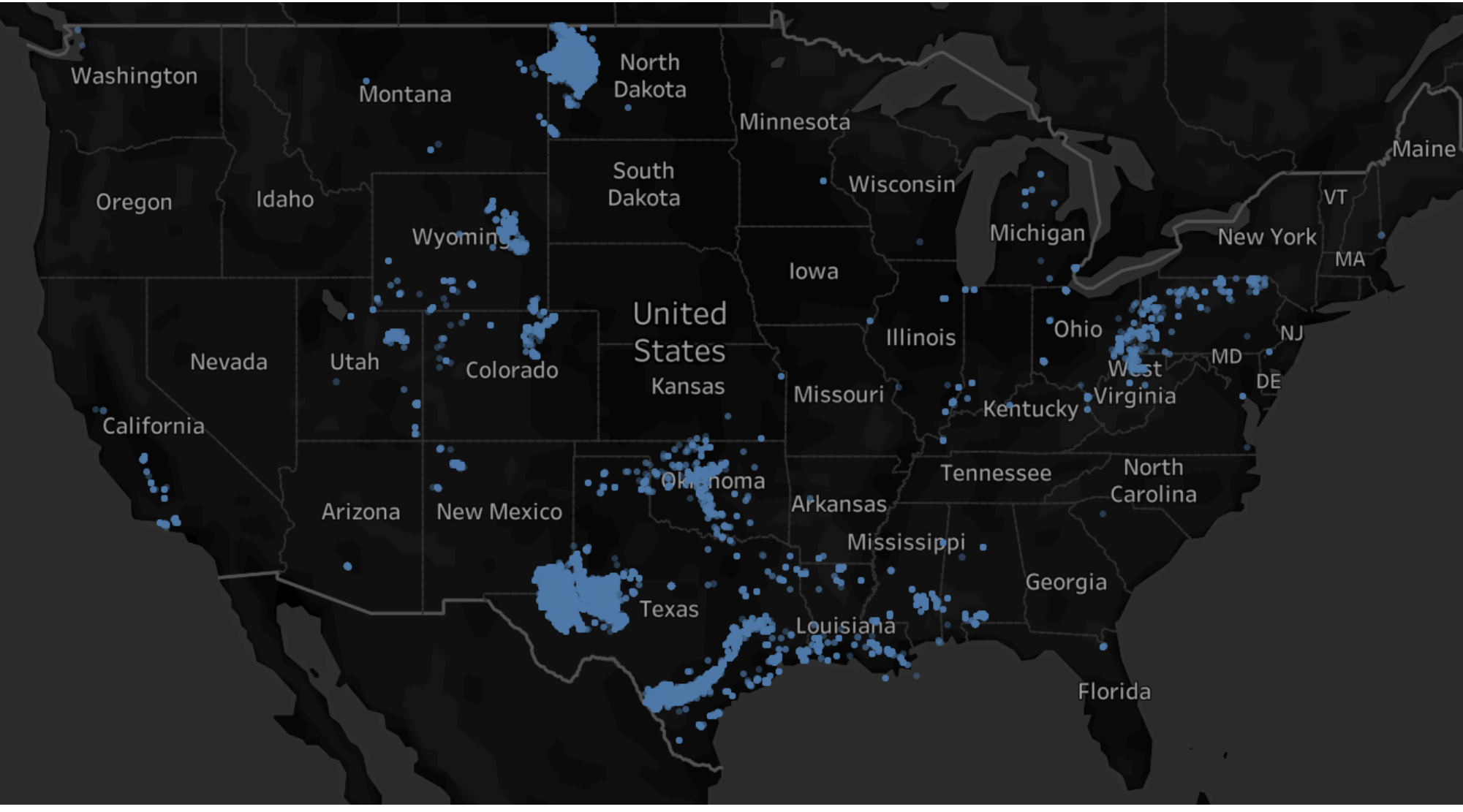
One limitation: cannot identify flaring if two wells are too close to each other

Back

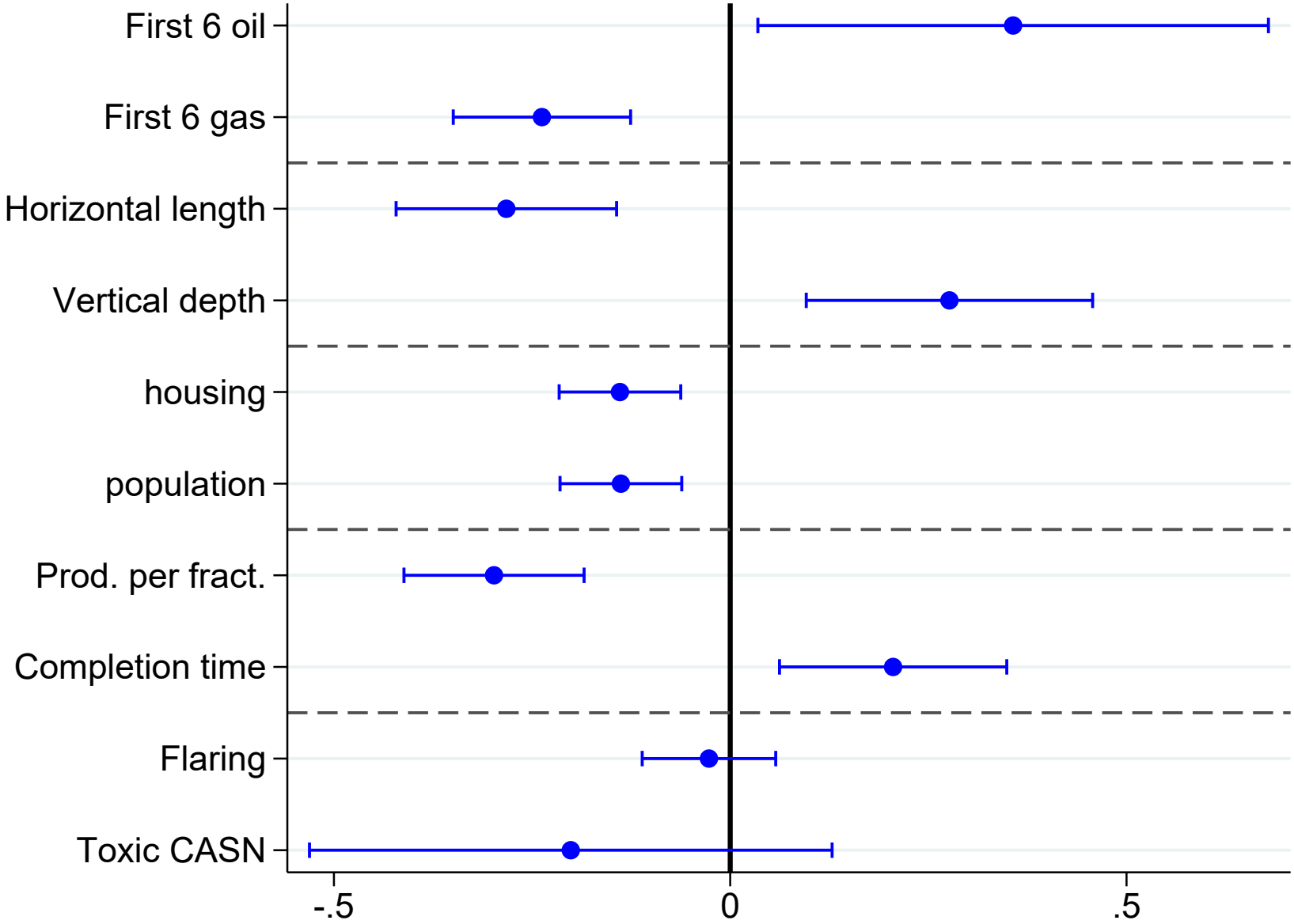
Flaring predicts correctly drilling activities (1/2)



Flaring predicts correctly drilling activities (2/2)



Selection problems: PE ownership



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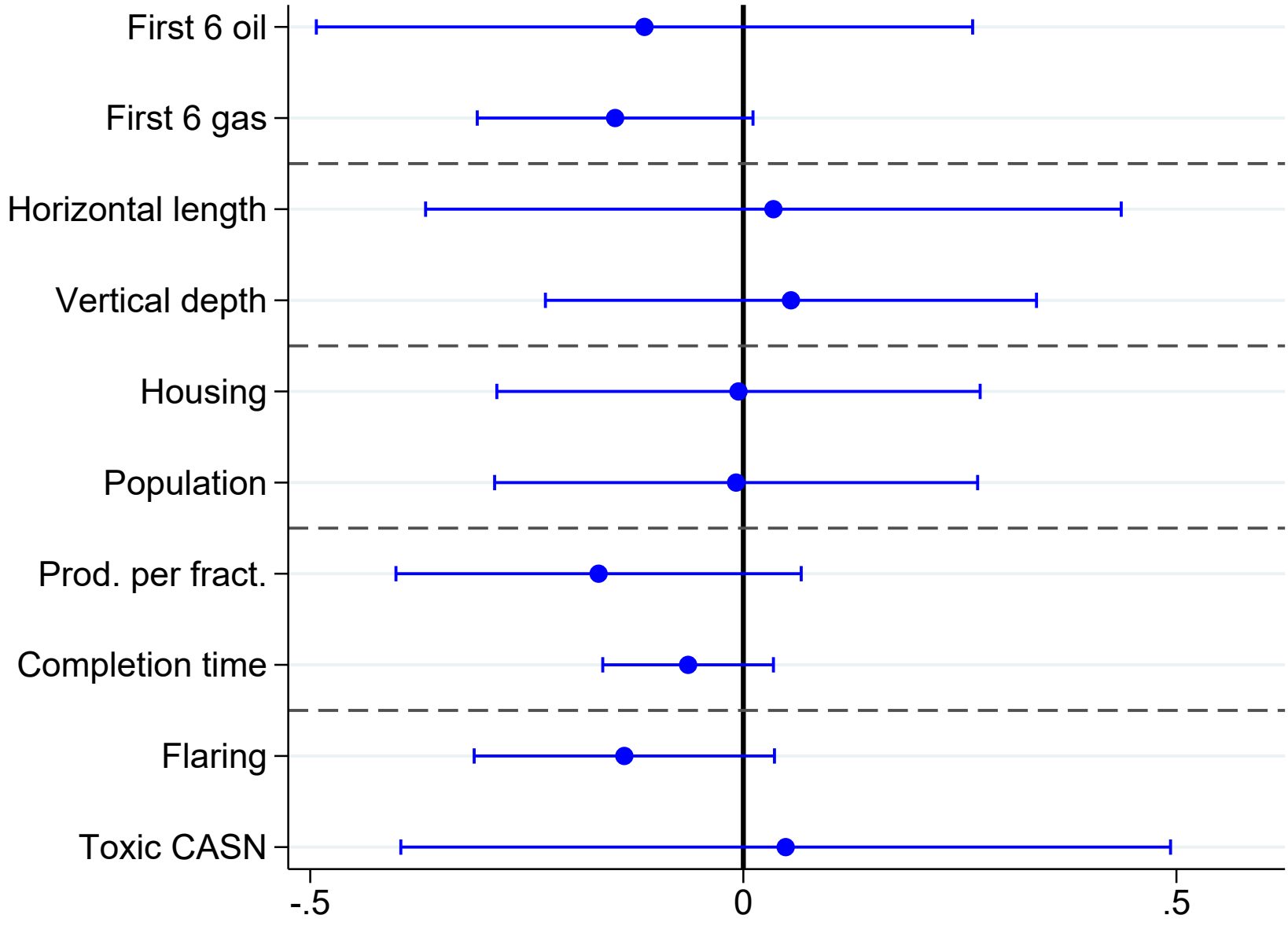
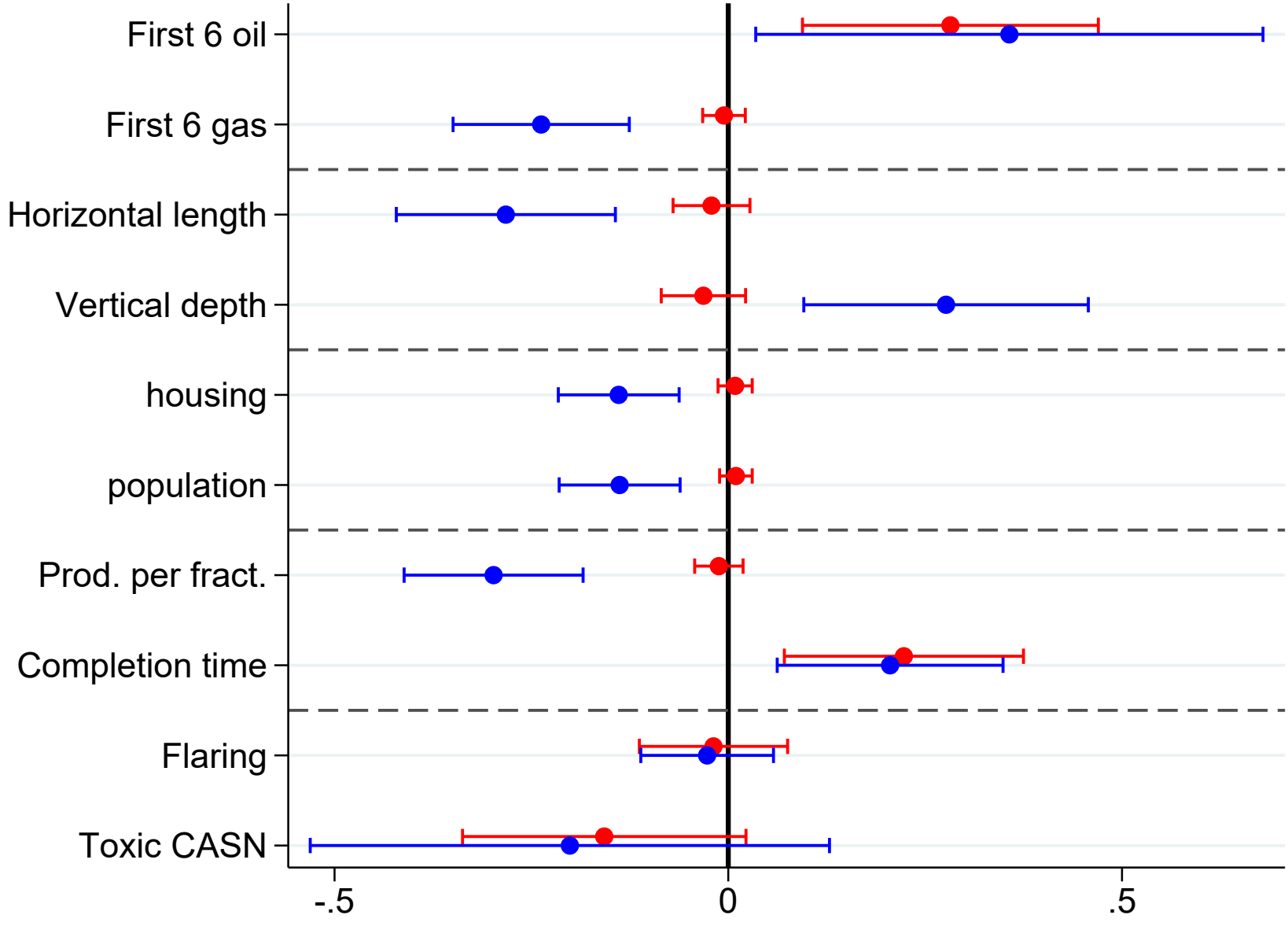
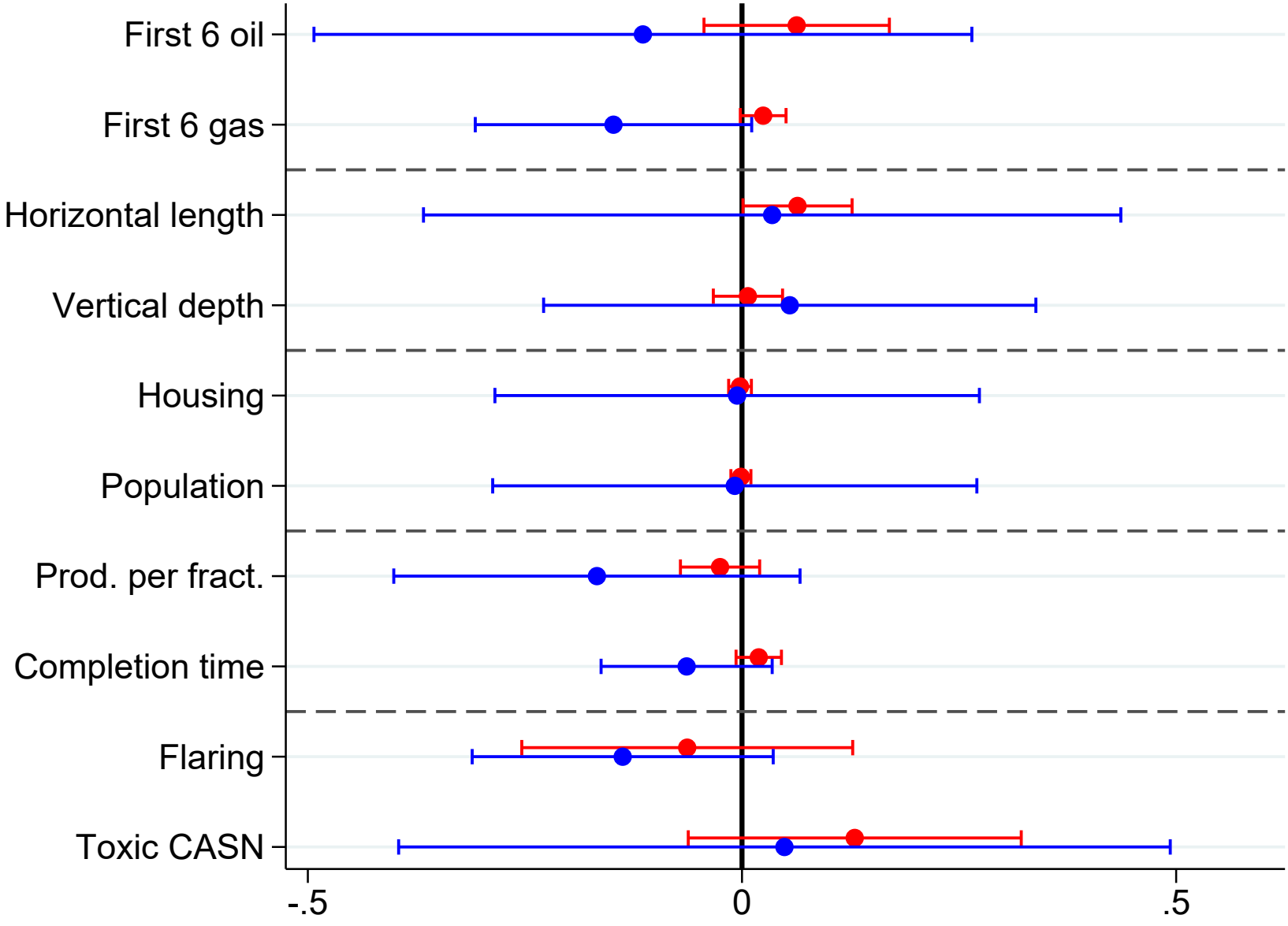
Selection problems: Drillco



Reliability of the empirical design (1/2)



Reliability of the empirical design (2/2)



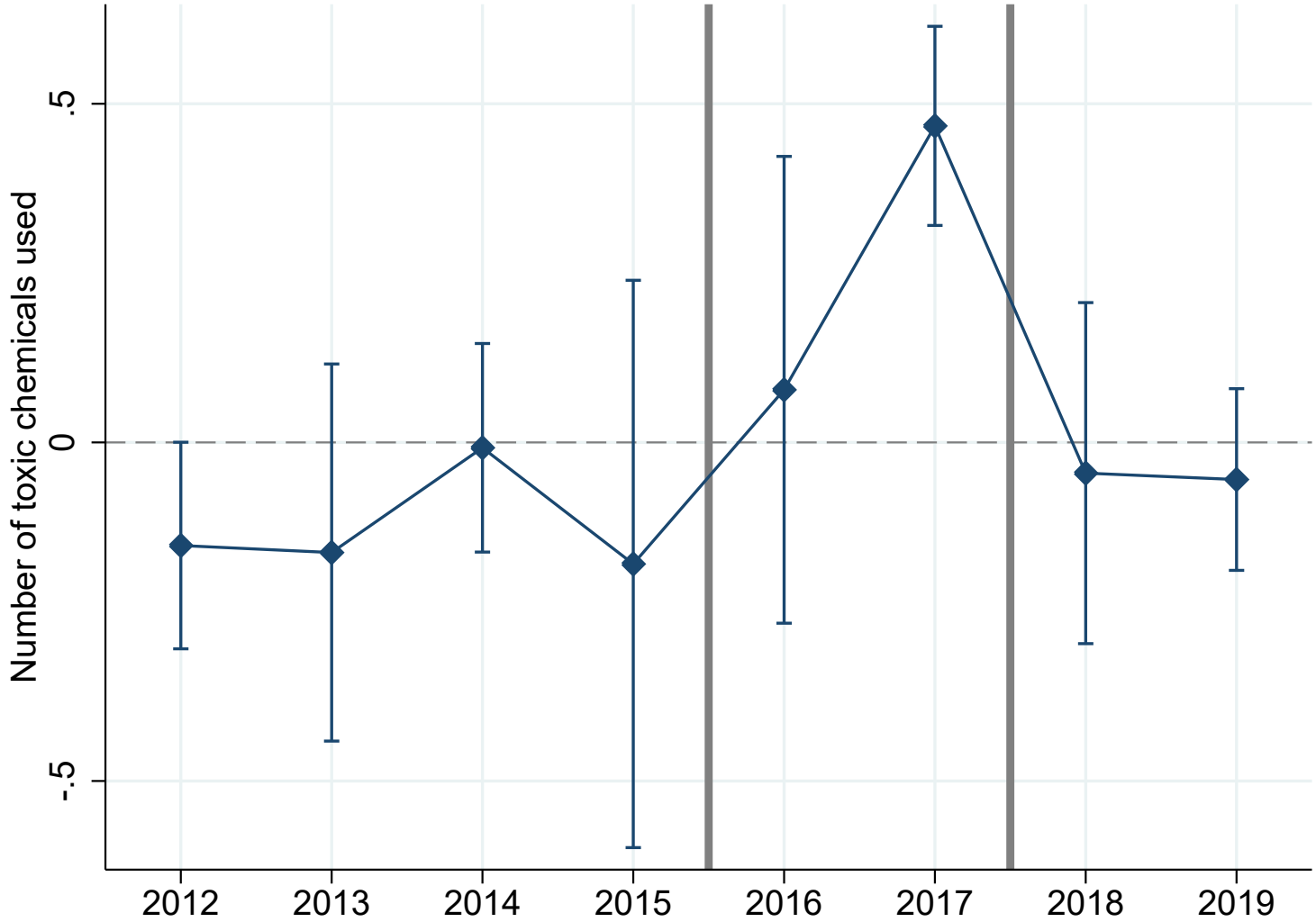
Specification

$$Y_{ijt} = \textbf{Year}_t \times \textbf{Firm}_i + \text{Year}_t \times \text{Location}_j + \sum_{\tau=-6}^{10} (\gamma_\tau . \mathbb{1}_{i,t,\tau} \times .\text{BLM}_{it}) + X_{ijt} + \epsilon_{ijt}$$

Where for a project of firm i in a location j at time t:

- **BLM_{it}: Takes value 1 if the project is located in an area regulated by BLM**
- Y_{ijt} is either the number of toxic chemicals or a dummy for flaring
- Time-varying project-level controls (horizontal length, vertical depth and production (oil and gas))
- Firm_i and Year_t: firm FE and year FE
- Location_j: first two-digit latitude longitude FE or basin FE
- $\mathbb{1}_{i,t,\tau}$ takes the value 1 if firm i is at time t τ semester(s) from the deal (control or DrillCo), 0 otherwise

Main results



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Stylized fact 1a): Public listing

Based on 7 IPO between 2011 and 2019:

	Dependent variable: Number of toxic chemicals		
	(1)	(2)	(3)
Post IPO	0.140*	0.141*	0.275*
	(0.077)	(0.077)	(0.143)
Before IPO			0.210
			(0.211)
Controls		X	X
Firm FE	X	X	X
Location × Year FE	X	X	X

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Stylized fact 1b): Earnings forecasts

	Dependent variable: Number of toxic chemicals	
	(1)	(2)
Under estimate	0.062***	0.062***
	(0.022)	(0.022)
Over estimate	-0.011	-0.012
	(0.088)	(0.088)
(mean) actual	-0.013	-0.013
	(0.012)	(0.012)
Controls		X
Firm FE	X	X
Location × Year FE	X	X

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Stylized fact 2: cash flow of flaring

- Cost paid at the beginning of the project
  - Dehydrators and compressors needs to be installed close to the well. $210,000 per well in the Bakken (INGAA)
  - Connect to a pipeline: $29,000 to $167,000 per mile for a diameter range between 2 and 22 inches(INGAA)

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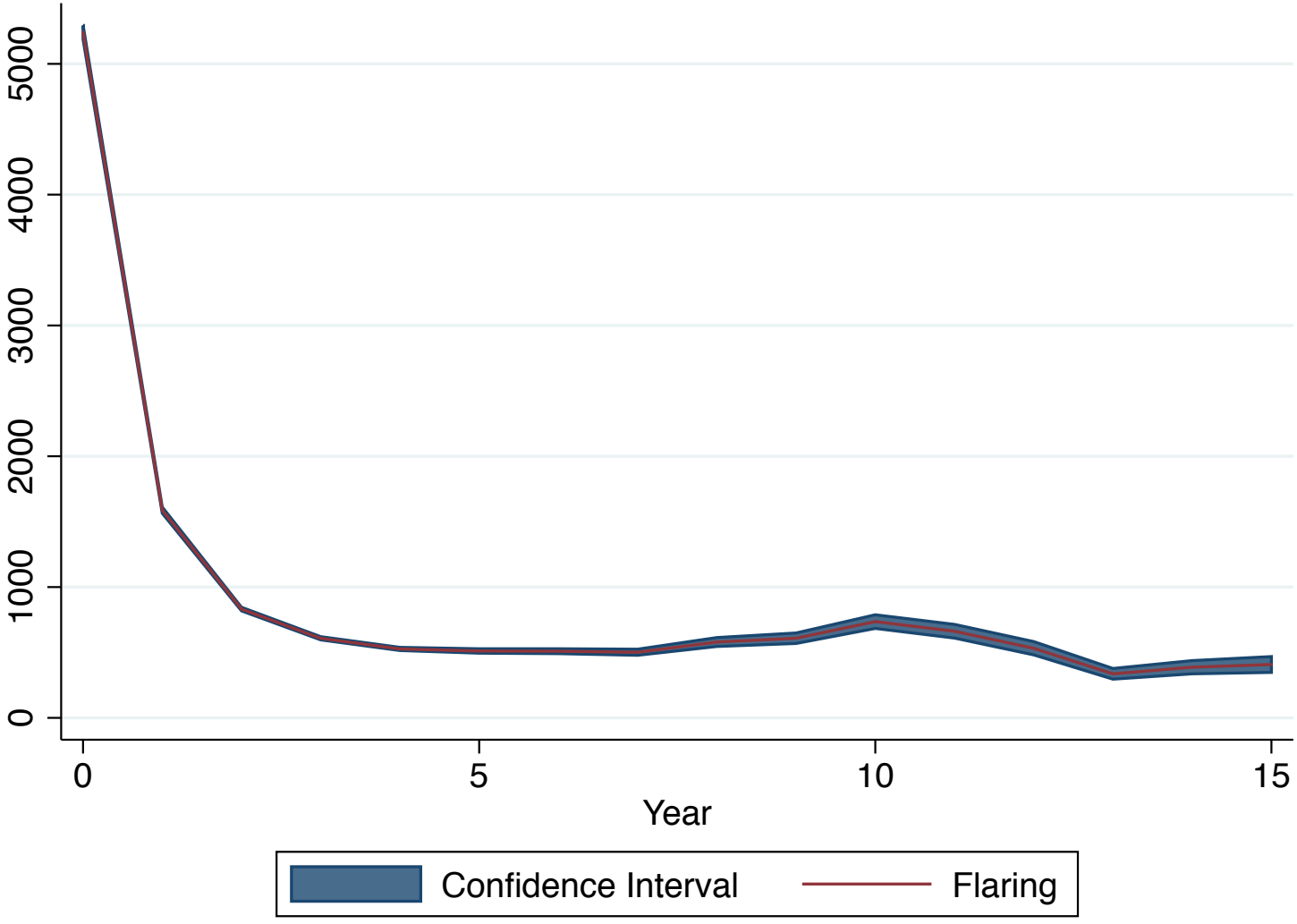
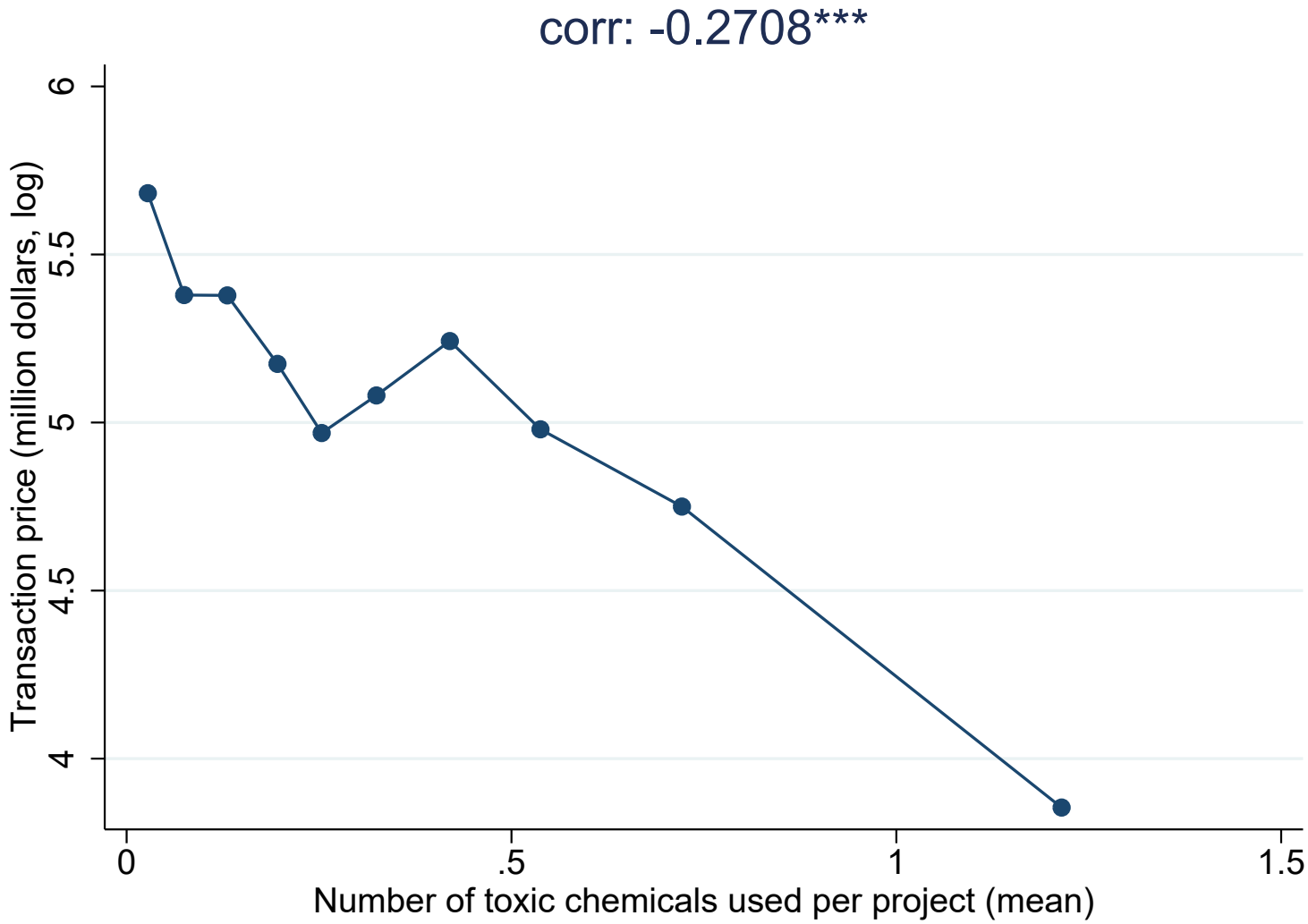
Stylized fact 2: cash flow of flaring

- Gains are not immediate:



Stylized fact: pollution discount in real asset markets



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Identification threats

- Focus on marginal locations
  - $C = \frac{\text{Number of projects in basin j for firm i}}{\text{Total number of projects for firm i}}$
- Drop PE-backed firms that have too much wells in a region
  - $M = \frac{\text{Number of projects in basin j for firm i}}{\text{Total number of projects in basin j}}$
- Is this lower pollution associated with a higher exposure to human activity?
  - No: (1) exposure is reduced and (2) does not affect the results
- Is this reduction driven by an increase in opacity and strategic exposure?
  - No: (1) the quality of reporting increases and (2) does not affect the results
- Other measure of pollution
  - Use a noisier measure: EPA's Integrated Risk Information System (IRIS)
- Other measures of geographical proximity
  - State-Level and 60 by 60 miles square