Note

December 11, 2024 Coly Elhai

1 Updates

- NM analysis
- Wrapping up methane paper

2 NM analysis

Motivation

- In 2021, New Mexico passed new rules banning routine natural gas flaring
- NM rules called for operators to phase out venting and flaring by 2026
- Large differences in flaring between NM and TX, but large differences in economics too
- How effective are flaring regulations, given challenges of enforcement + monitoring?

Background on NM regulations

- **May 2021:** New Mexico passed new rules banning routine natural gas flaring
  - Companies must achieve ≥98% gas capture by 2026
  - Phase-down targets are company-specific and based on pre-rule flaring rates
  - Rules still allow for flaring/venting during emergencies and malfunctions
  - Producers also required to file natural gas management plans for new wells, install better flare tech
- **February 2023**: Oil/gas producers must file documents attesting that they are on track
  - Many operators did not file by the deadline
  - Of those that did, 62% reported ≥100% capture rates
- By March 2023, only 2 companies had been fined for lack of compliance (for failing to report capture rates)
- NM relies on self-reported information due to limited capacity for on-site inspection
- "There's no incentive for the operators to do anything about it"- Charlie Barrett, Earthworks

Data

- **Prices**
  - Henry and Waha Hub natural gas spot prices (S&P Global Platts)
  - Cushing WTI oil spot and futures prices (EIA)
- **Oil and gas production**
  - Lease-month level oil and gas production (Enverus DrillingInfo)
  - TX disposition data, including vented/flared gas (Texas Railroad Commission)
  - NM disposition data, including vented/flared gas (New Mexico Oil and Conservation Division)
- **Flaring**
  - NASA/NOAA VIIRS satellite estimates of flare counts and volume (Elvidge et al., 2016)

Findings:

Table 1: Natural Gas Capture Rates

Statistic	Min	Pctl(25)	Median	Pctl(75)	Max	N
Reported Q4 2021	0.00	99.10	100.00	100.00	100.00	327
Baseline Rate	0.00	98.00	98.00	98.00	98.00	315
Target for 2022	14.70	98.00	98.00	98.00	98.00	870
Target for 2026	98	98	98	98	98	903

- The majority of operators that reported to the OCD pre-policy reported capture rates above 98%
- Most producers were assigned capture targets of 98% as soon as the policy was implemented (2022)
- There is no observable change in flaring rates in NM after the policy was implemented

Next steps:

- Determine whether there are spillovers within company across states (e.g. investing in new flaring tech in NM and then porting that tech to TX)
- Decompose why NM and TX are different in ways that are not policy-related
- Determine whether flaring post 2020 would have gone down less without policy
  - Estimate static profit model on pre 2020 data
  - Estimate post-2020 flaring using those parameters
  - Compare to observed post-2020 flaring. If same, policy had no effect
- Determine whether differences between self-reported and VIIRS data are meaningful. Are companies reporting correctly? Is enforcement the issue, or monitoring?
- What do we need to do for this to be a complete project?
- Where should we submit this?

Figure 1: TX and NM Permian Flaring (VIIRS)

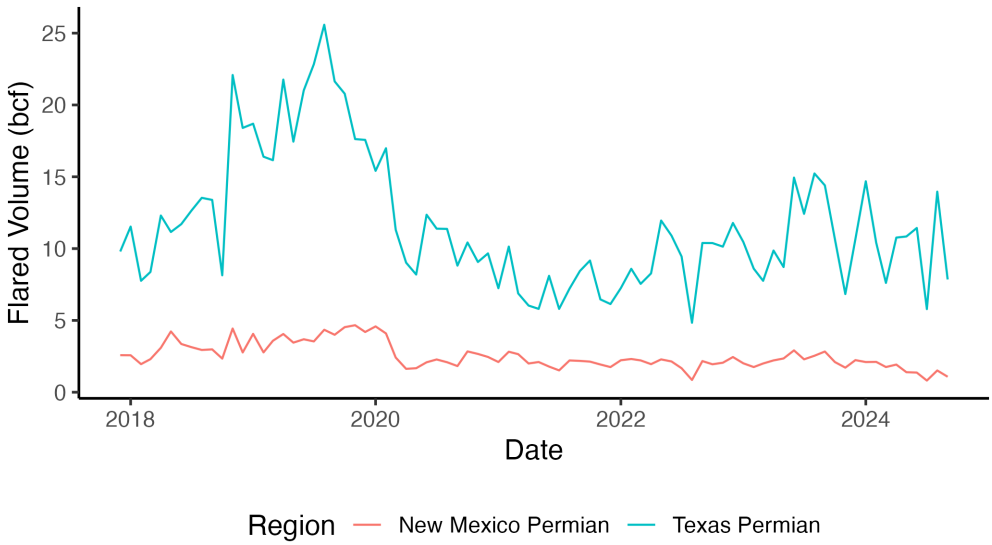

Figure 2: TX and NM Delaware Subbasin Flaring (VIIRS)

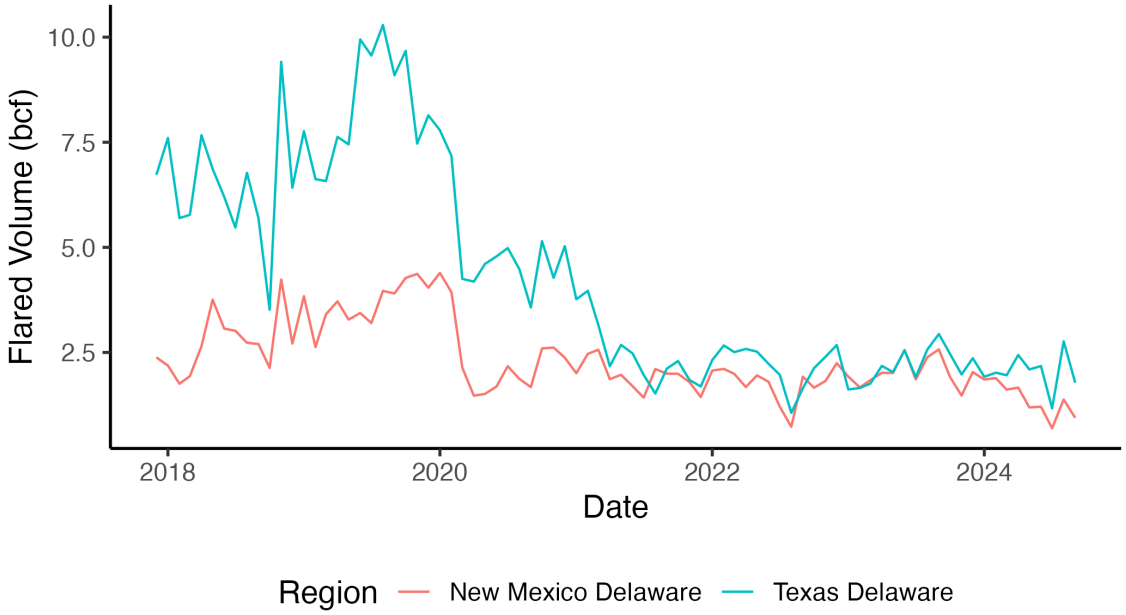

Figure 3: Permian Subbasin Flaring (VIIRS)

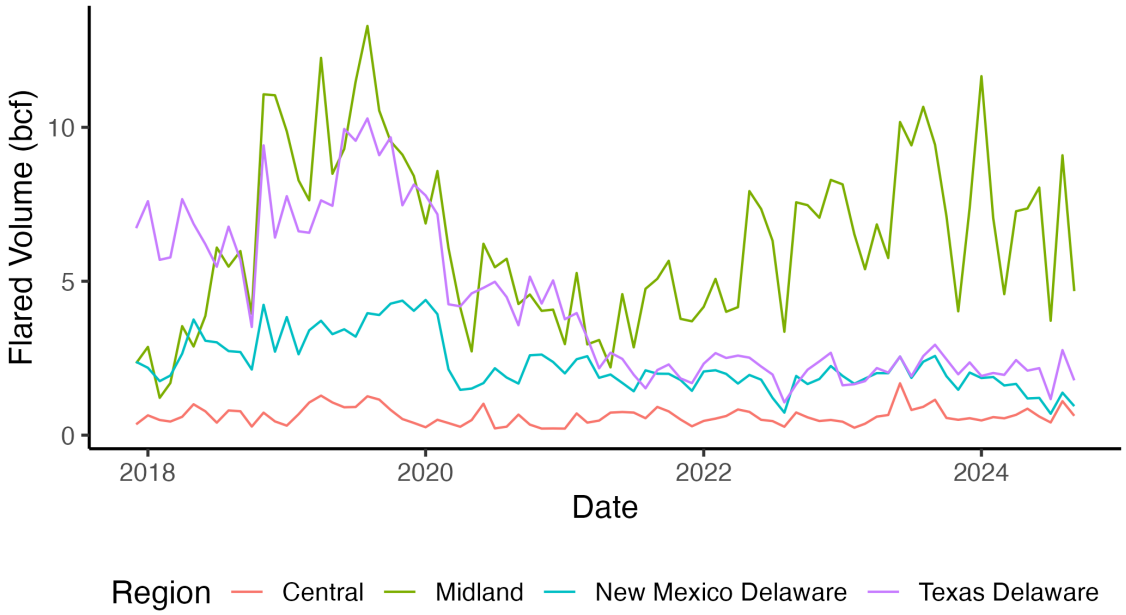

Figure 4: TX and NM Delaware Subbasin Flaring as Share of Production (VIIRS)

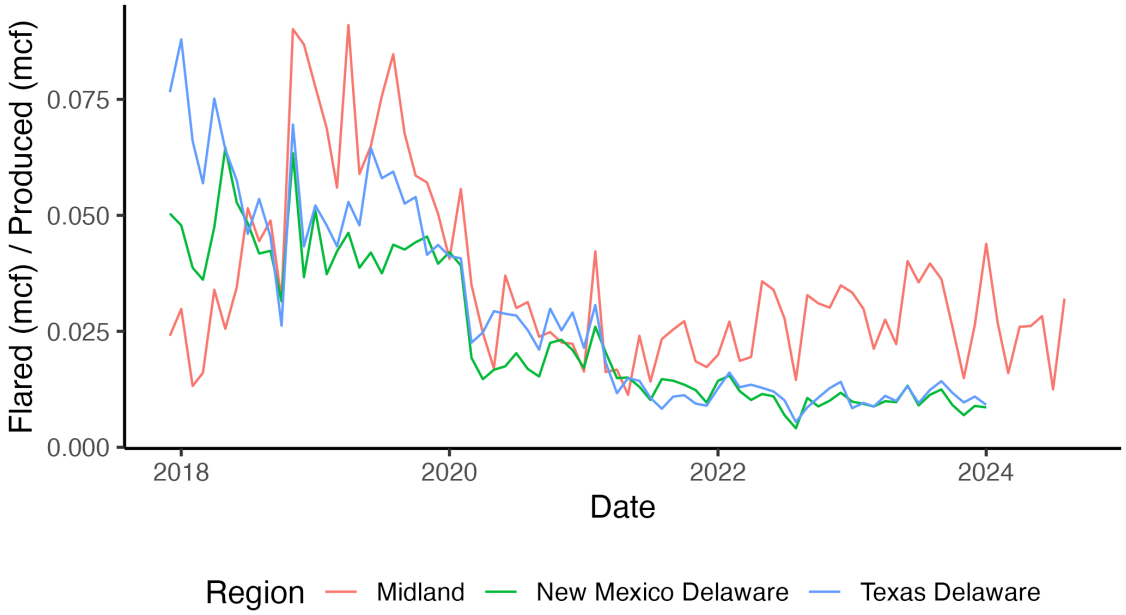

Figure 5: VIIRS Flaring Data vs. Self-Reported Flaring Data

(a) Texas

(b) New Mexico

3 Wrapping up methane paper

- Finally have a contract to use the data on pipeline disruptions and maintenance events!
- Need to write up newer analysis: updated empirics, revised estimation of static model, counterfactuals
- Decide how to approach dynamics
  - Rather than a fully estimated dynamic model, we're leaning towards a reduced-form approach
  - We want a model that suggests what regression makes sense to estimate the relationship between drilling and prices
  - In Newell, Prest, and Vissing (JAERE, 2019), they estimate the following regression in first differences:

$$\Delta \ln(w_t) = \beta_0 + \sum_{l=0}^{L} \left[\beta_{1,l} \Delta \ln(\tilde{p}_{\text{gas},t-l} \tilde{q}_{\text{gas},t-l}) + \beta_{2,l} \Delta \ln(\tilde{p}_{\text{oil},t-1} \tilde{q}_{\text{oil},t-l})\right] + \gamma' (\Delta X_t) + \varepsilon_t$$

    where

    * w_t : the number of wells spudded in period t
    * $\tilde{q}_{\text{gas},t}$, $\tilde{q}_{\text{oil},t}$: expected productivity in gas and oil in period t (proxied for using the average initial production for wells drilled in the prior 2 quarters)
    * $\tilde{p}_{\text{gas},t}$, $\tilde{p}_{\text{oil},t}$: expected prices of gas and oil in period t (average of the next 12 months of futures), Henry Hub and WTI oil adjusting for inflation

    Is this a good option for us? Do we need any more modeling to justify this approach?