Note

December 16, 2024 Coly Elhai

1 Updates

- Data centers: talked again with public health/data science researchers
- Climate grants:
- Wrapping up methane paper
- NM analysis: trying to decide if we should do more analysis, or just write up and submit

2 Questions

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- Methane:

3 Data centers

My plan on this is now clearer. The two public health/data scientists (assistant prof in biostatistics at UCLA, post-doc in public health at Harvard) have agreed to allow us access to their data as we scope out potential collaborations. I plan to:

1. Look for patterns in the data in where data centers are located
2. Talk with a Harvard G2 (Yixin Zhou), who has more experience with electricity research, to figure out what might be possible through combining data center information with electricity market data (e.g., can we figure out the impact of data centers on the grid)

My goals are to figure out as quickly as possible how interesting this has the potential to be.

Regarding the two Berkeley econ graduate students (G5, G3) I've been working with so far, we've agreed that if this is my JMP, it will be mine alone. If I do not write a JMP on data centers, then I may stay engaged with their work but will likely not spend much more time on data centers over the next couple years.

Questions:

- Does this sound like a reasonable approach?
- What kind of initial data exploration would be most helpful?

4 Climate grants

Simon and I are still working with an RA to put together a dataset on local government employment. We've successfully gone through the IRB process and should have full access to LinkedIn data soon. Meanwhile, we've been gathering information and talking with stakeholders to learn more about potential sources of variation in local government capacity. Below are some avenues we've discussed:

- Timing of Hazard Mitigation Plan deadlines
- Geographic differences in prevalence of multijurisdiction vs. single jurisdiction plans
- Retirements among key local government employees working on climate and resilience
- Direct Technical Assistance: we talked with someone at FEMA who works on this. For this approach to work, we'd need data on who applies for DTA, not just who wins it (there's significant selection bias into applying).

5 Wrapping up methane paper

- We finally have a contract to use the data on pipeline disruptions and maintenance events! Now, need to use the data to construct a measure of pipeline interruptions, then rerun emissions/flaring analysis with this measure as an instrument for Waha basis
- We're working on adding newer analysis to our draft: updated empirics, revised estimation of static model, counterfactuals
- We also need to 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

    We're considering using the same approach, but in direct projections because of econometric concerns. The goal would be to calculate the elasticity of drilling with respect to price. We can then compare our result to the elasticity that would be necessary to switch the sign

Questions:

- Does this approach to dynamics make sense? Do we need any more modeling to justify it?
- If we use this approach to dynamics, does it add value to also include the dynamic model of the producer's problem?
- Is there anything else we need for this next draft?

6 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 $\geq$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)

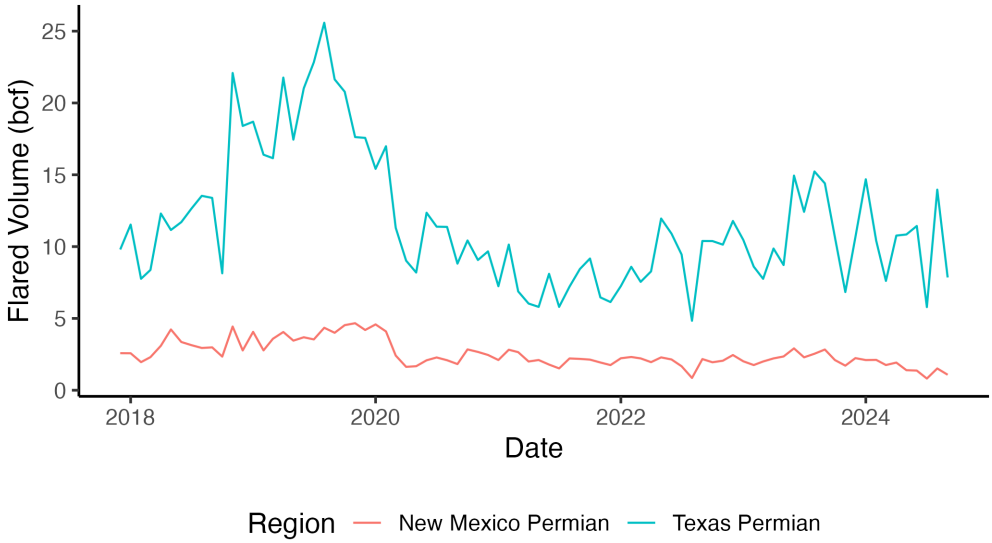


Figure 2: TX and NM Delaware Subbasin Flaring (VIIRS)

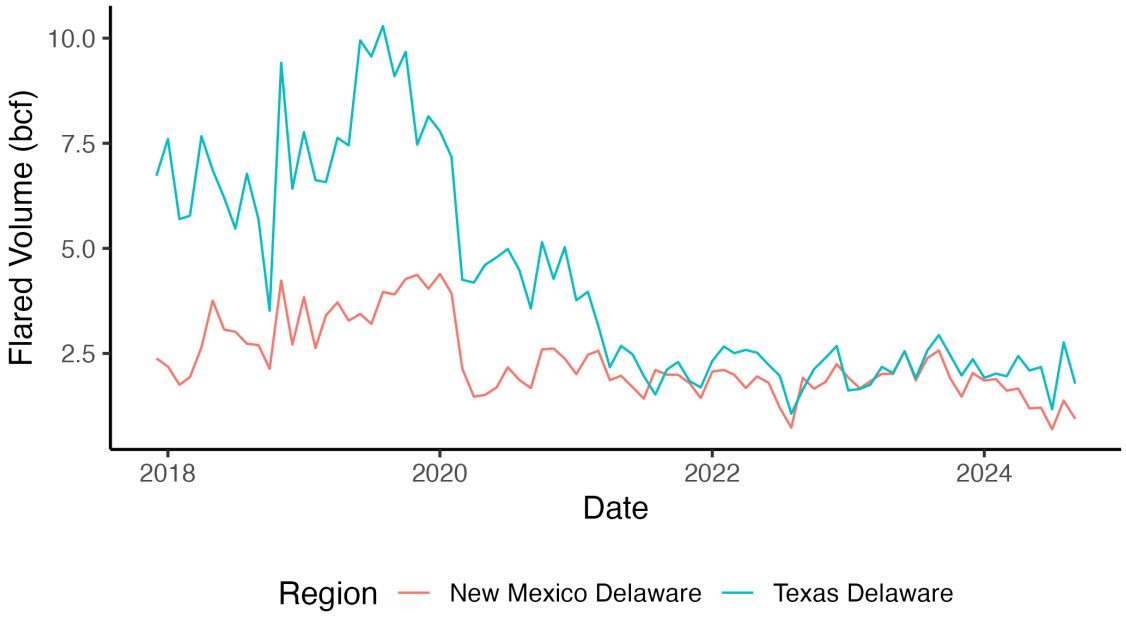


Figure 3: Permian Subbasin Flaring (VIIRS)

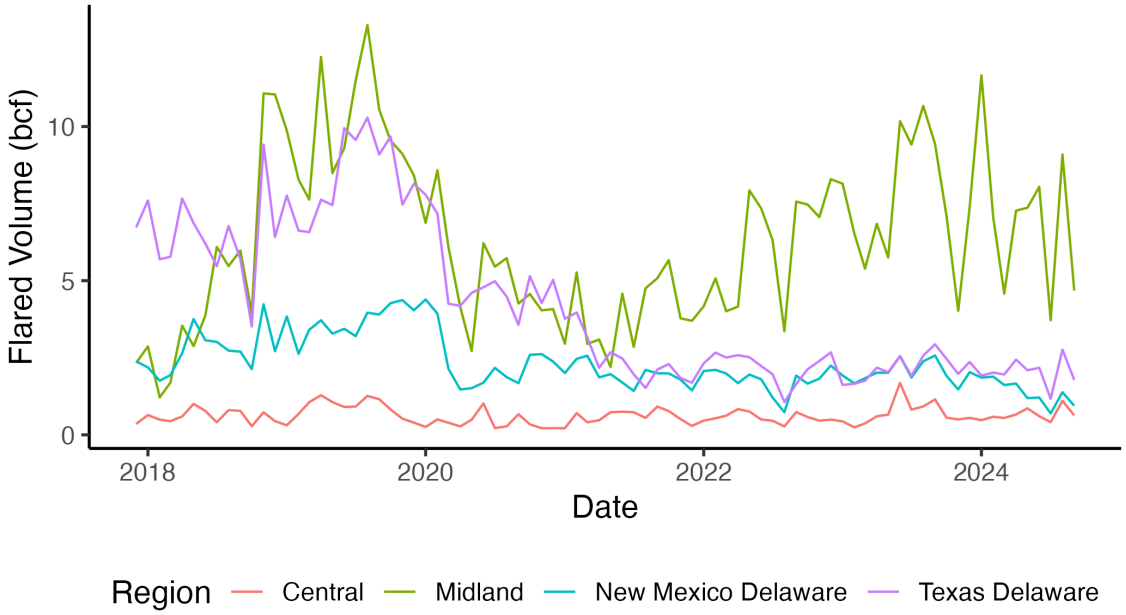


Figure 4: TX and NM Delaware Subbasin Flaring as Share of Production (VIIRS)

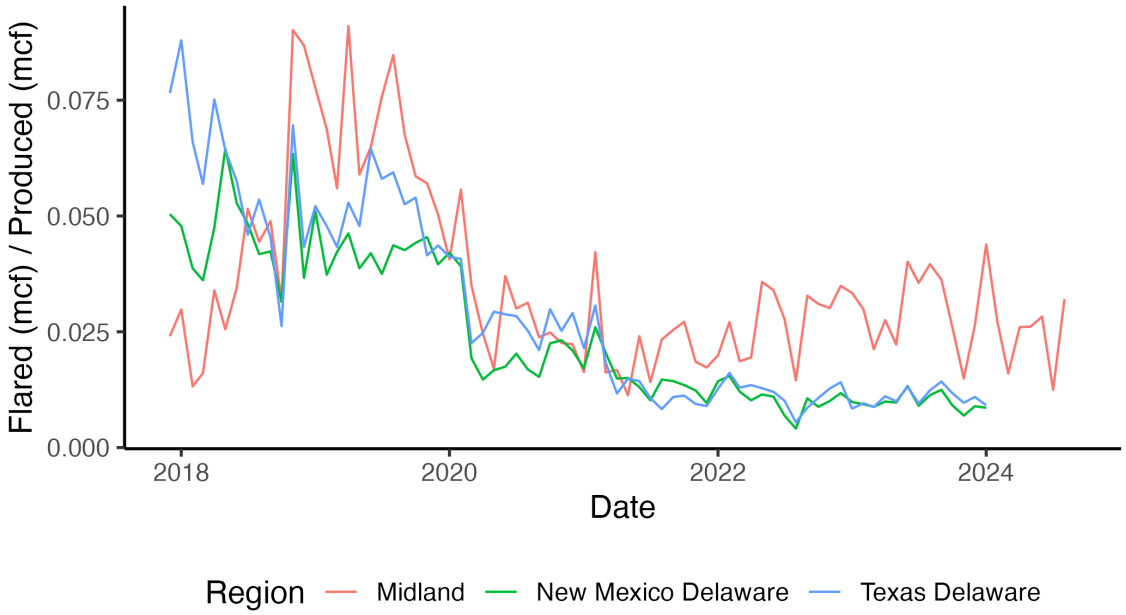
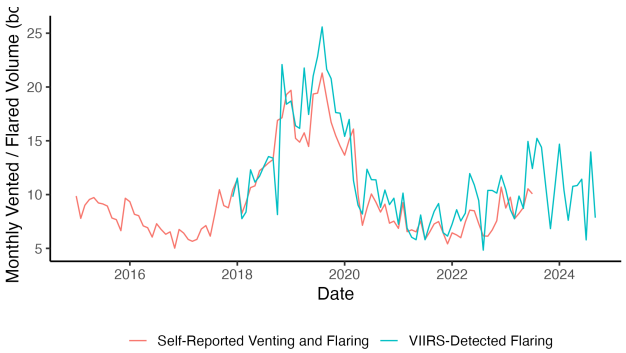


Figure 5: VIIRS Flaring Data vs. Self-Reported Flaring Data

(a) Texas



(b) New Mexico