Note

December 16, 2024 Coly Elhai

1 Updates

- Data centers: public health/data science researchers agreed to let us explore data before committing to a collaboration
- Climate grants: acquired data, talking to folks to learn more about background
- Wrapping up methane paper: rewriting draft, new plan for dynamics
- NM analysis: trying to decide if we should do more analysis, or just write up and submit
- Next semester: teaching a sophomore tutorial on climate change. So, trying to make a lot of research progress before the semester starts
- General question: How do I balance these projects and how can I prioritize?

2 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. They are more interested in the health and other local impacts of data centers, not the energy/spatial aspects.

Questions:

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

3 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 possible sources of variation we've discussed:

- Timing of Hazard Mitigation Plan deadlines: plans are due on a 5 year cycle and are a prerequisite for FEMA funding. However, writing the plan may itself be a precursor to applying for funds for specific projects
- Geographic differences in prevalence of multijurisdiction vs. single jurisdiction plans: in some states, it's more common for counties to file plans on behalf of all their constituent communities. This saves smaller communities a lot of work

- Retirements among key local government employees working on climate and resilience: relies on both identifying these key employees and figuring out when they leave (some combination of LinkedIn data and other sources)
- Direct Technical Assistance: we talked with someone at FEMA who works on this, and learned there's significant selection bias into applying but we should be able to predict winning fairly well condiitonal on applying. So, we'd need data on who applies for DTA, not just who wins - requires FEMA's cooperation

Generally, our two goals are to 1) see if we can construct a good measure of local government capacity using LinkedIn, and 2) figure out if we have a source of exogenous variation in local capacity relevant to climate grants.

Questions:

- Are these the right goals to have?
- Anything else we should be thinking about?

4 Wrapping up methane paper

- We finally have the data on pipeline disruptions and maintenance events! Now, we need to use this data to construct a measure of pipeline interruptions, then rerun emissions/flaring analysis with this measure as an instrument for Waha basis
- Meanwhile, 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?

5 NM analysis

We have collected data and run initial analysis for a project on the effects/non-effects of New Mexico's new flaring regulations. We compare flaring in NM to flaring in TX, particularly in the Delaware Subbasin of the Permian, which spans both states.

Policy background: NM's regulations passed in 2021 and required operators to phase out venting and flaring by 2026 (defined as achieving 98% gas capture). Phase-down targets were company-specific and based on pre-rule flaring. Rules seem to rely entirely on self-reporting because of limited enforcement capacity.

Data: Our main outcome variables are both remotely sensed flaring data (VIIRS) and self-reported flaring data. We also have data on production and prices.

Findings:

- The majority of NM operators that reported gas capture rates pre-policy reported rates above 98%. As a result, the policy may not have had any effect on these operators.
- Although there is more flaring in TX than NM both before and after the policy, this is driven by flaring in the more oil-focused subbasin of the Permian, which is in TX.
- There is no observable change in flared volumes or flaring rates in NM after the policy was implemented

Additional analysis we could do:

- 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?

Questions:

- Should we focus on writing up what we have as quickly as possible, or on doing more analysis to have a more complete story?
- What are the most interesting components of this analysis?
- Where should we submit this project? (I'm also asking this question to environmental faculty)

Figure 1: TX and NM Permian Flaring (VIIRS)

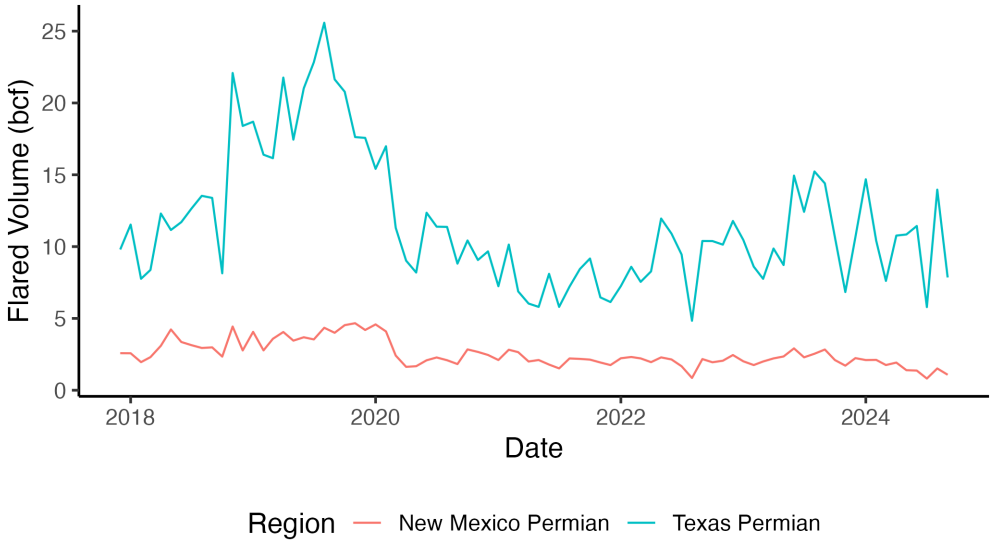

Figure 2: TX and NM Delaware Subbasin Flaring (VIIRS)

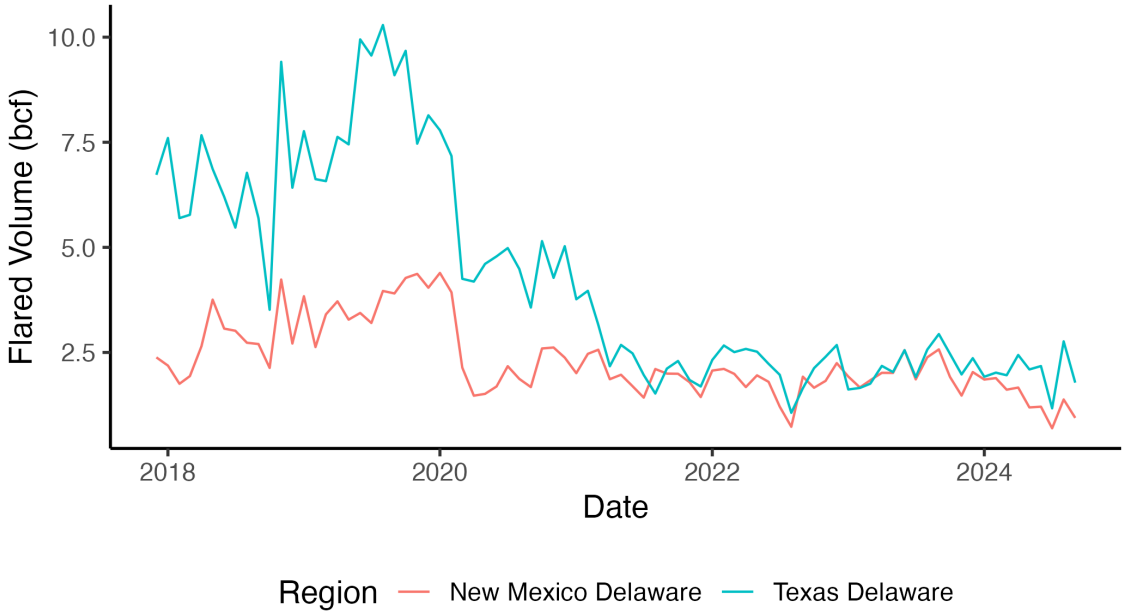

Table 1: Natural Gas Capture Rates

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

6 Appendix

Figure 3: Permian Subbasin Flaring (VIIRS)

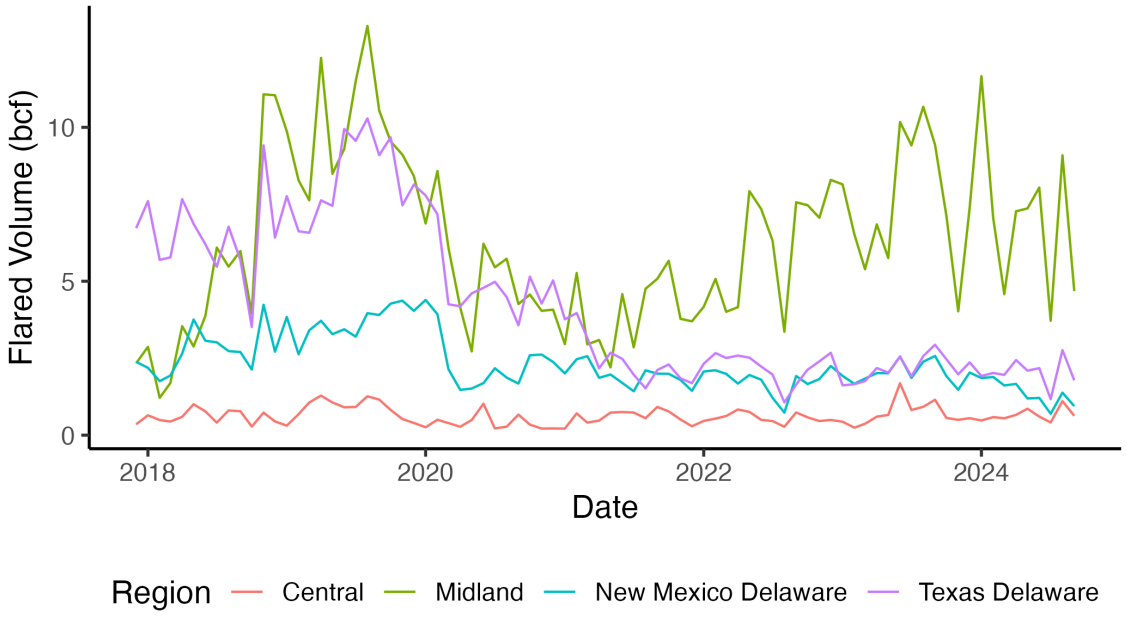

Figure 4: TX and NM Delaware Subbasin Flaring as Share of Production (VIIRS)

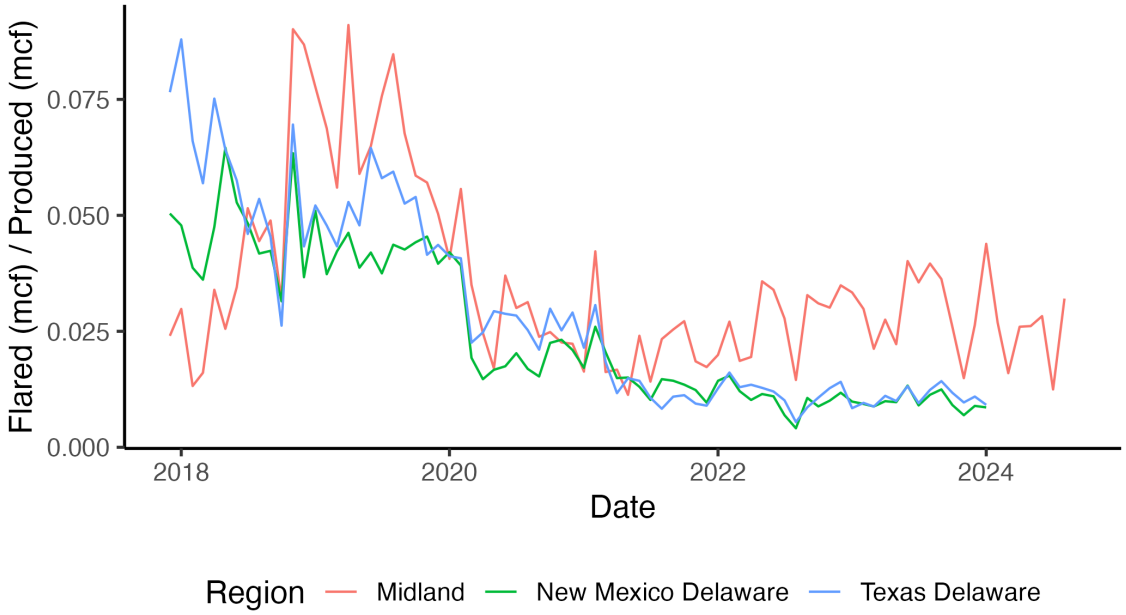

Figure 5: VIIRS Flaring Data vs. Self-Reported Flaring Data

(a) Texas

(b) New Mexico