Small-Tract Mineral Owners vs. Producers: The Unintended Consequences of Well-Spacing Exceptions

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Introduction to Well Spacing

- Mineral rights owners in Texas protected by well-spacing laws which prohibit drilling near property boundaries
- However, Texas could a grant spacing exception to a producer that can't negotiate a lease with a mineral owner **for any reason**
- Spacing exception allows producer to drill close enough to unleased property to capture oil and gas (no compensation required)

Question:

- What is the effect of spacing exceptions on royalty rates?

Answer:

- Spacing exceptions have lowered royalty rates paid to mineral owners

Intuition:

- You are a landowner
- Nearby owners recently lost oil and gas because of a spacing exception
- Will you play hardball in negotiations, or just accept whatever royalty rate the producer offers?

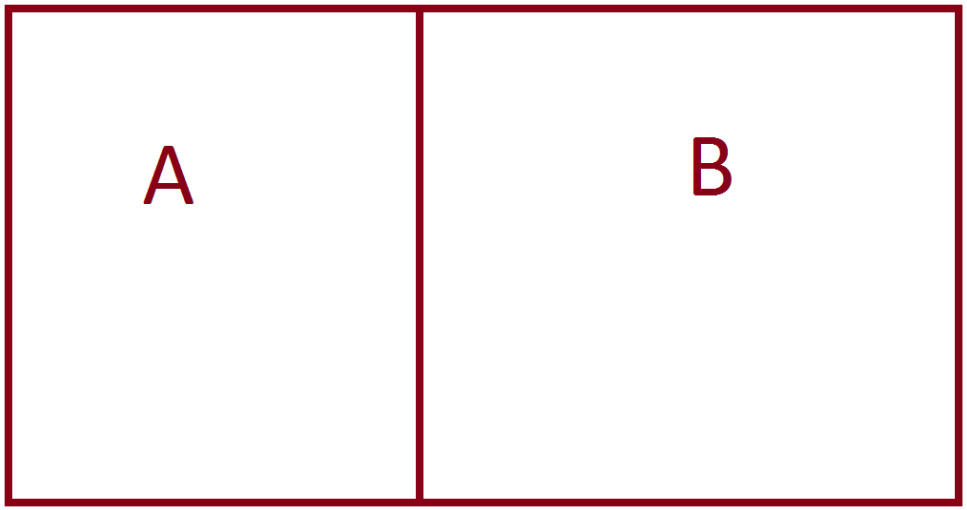
Who Cares?

- Spacing exceptions are rising
- This determines how oil and gas revenue pie is split
  - $\sim$ 4 million people receive royalty checks in Texas
  - Billions of dollars paid annually in royalties
  - Energy producers use exceptions to pay less to poor old retirees living off royalties

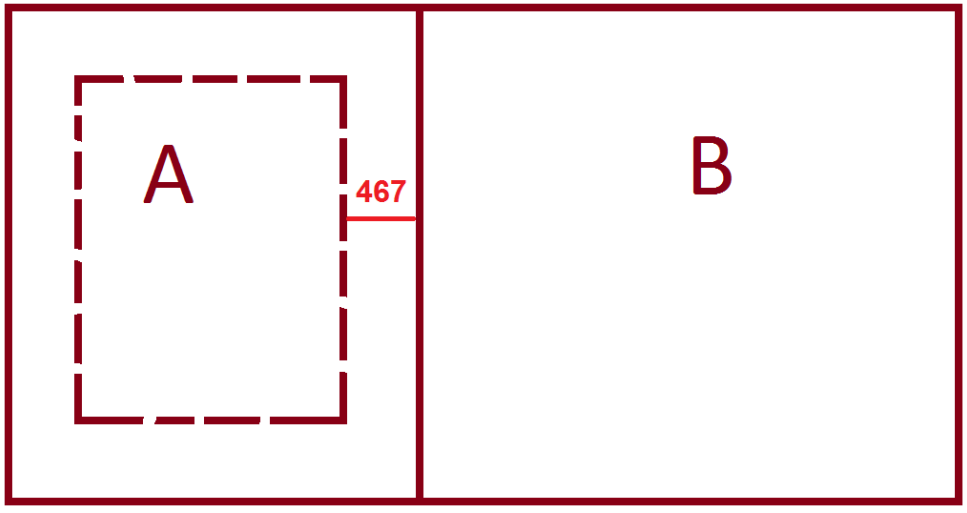
Outline

1. ~~Introduction~~
2. Texas Well Spacing Law
3. Theoretical Model
4. Empirical Model
5. Conclusion and Policy Implications

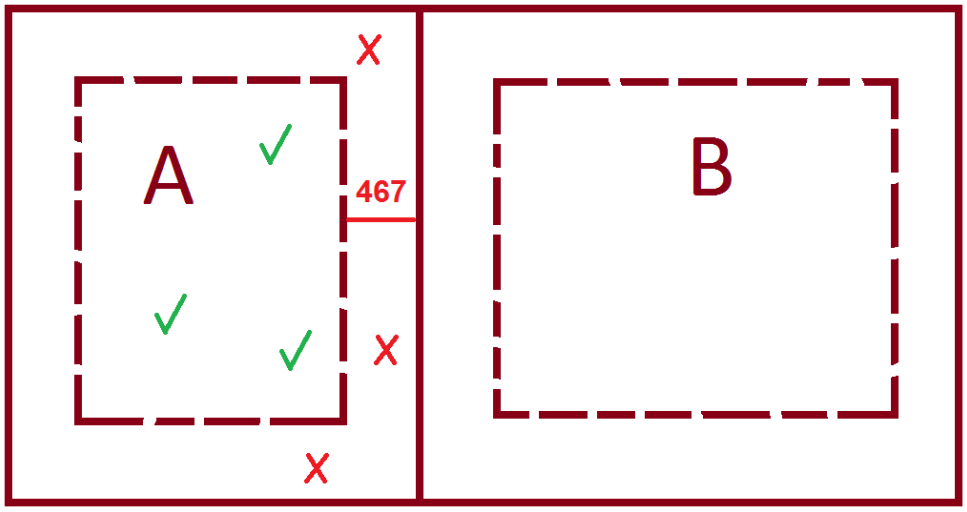
Texas Well Spacing Law



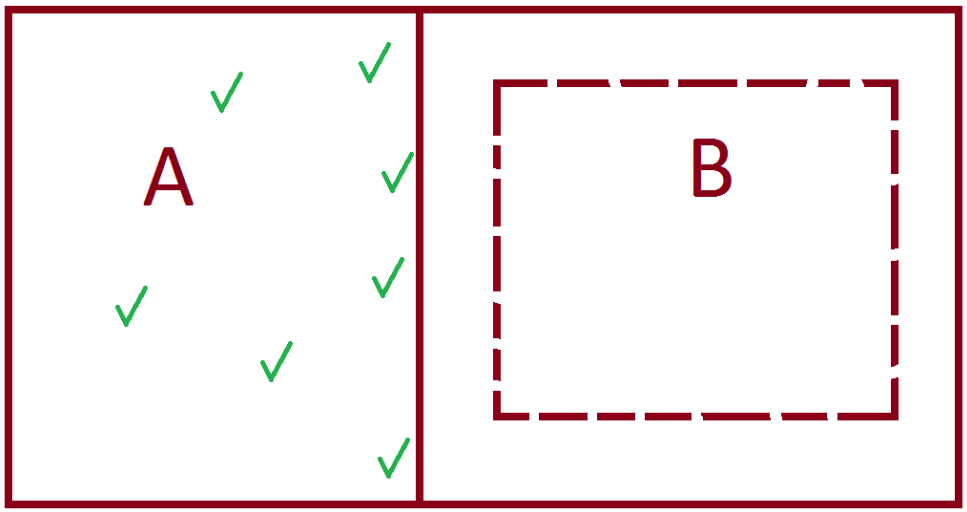
- Imagine a producer wants to extract oil and gas beneath properties owned by A and B
- Texas law encourages producers to negotiate lease agreements with A and B



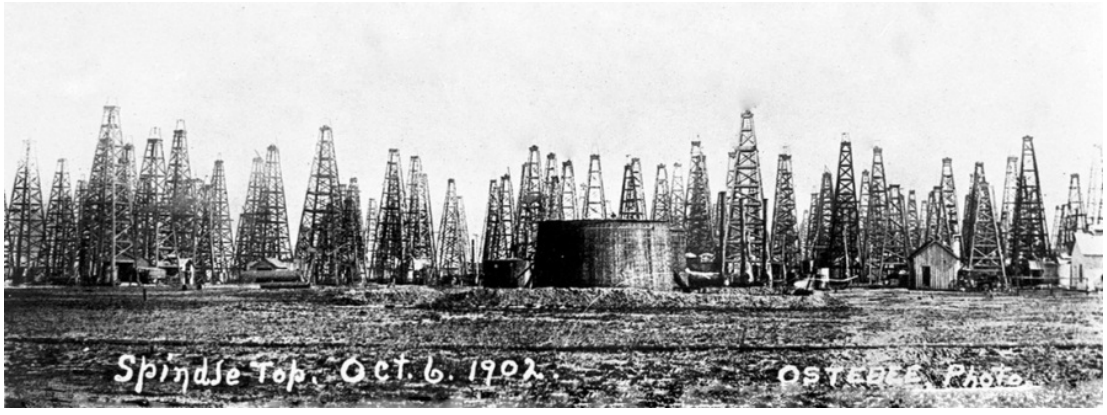
- A negotiates a lease with the producer
- B is unwilling/unavailable to negotiate a lease
- Rule 37: Producer can't drill within 467 feet of the property line
    - Prevents uncompensated capture of B's oil and gas



- Producer has two options:
  1. Drill away from the property boundary
  2. Apply for a well-spacing exception
     - Protesting costly, if no protest, spacing exception automatically granted



- A spacing exception removes all spacing restrictions on A's property
- Producer can drill anywhere on A's property (and capture B's oil and gas)
- B would not be compensated



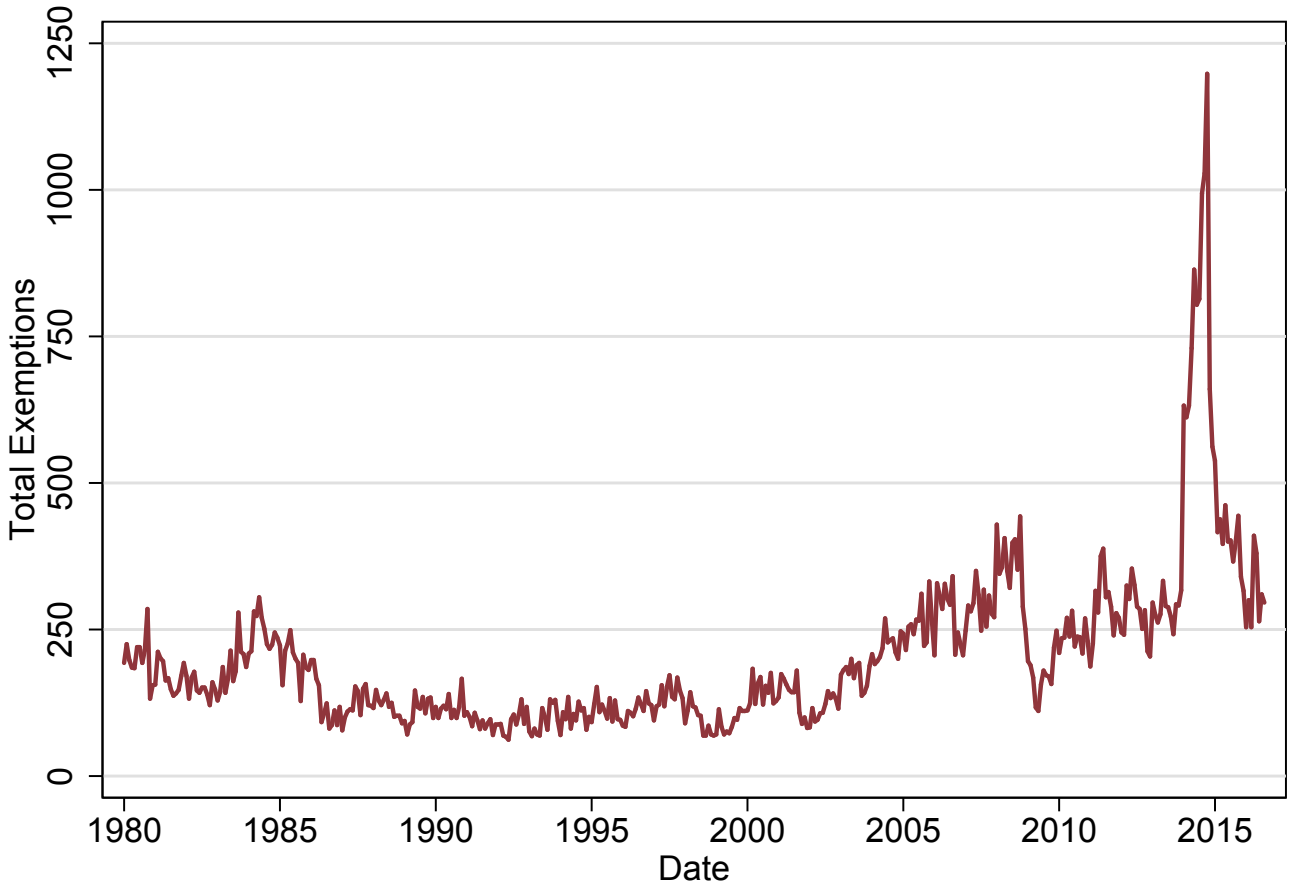
Why have well-spacing laws?

- Avoid inefficiency
- Protect mineral owner's property rights by preventing uncompensated capture through drainage

Why have well-spacing exceptions?

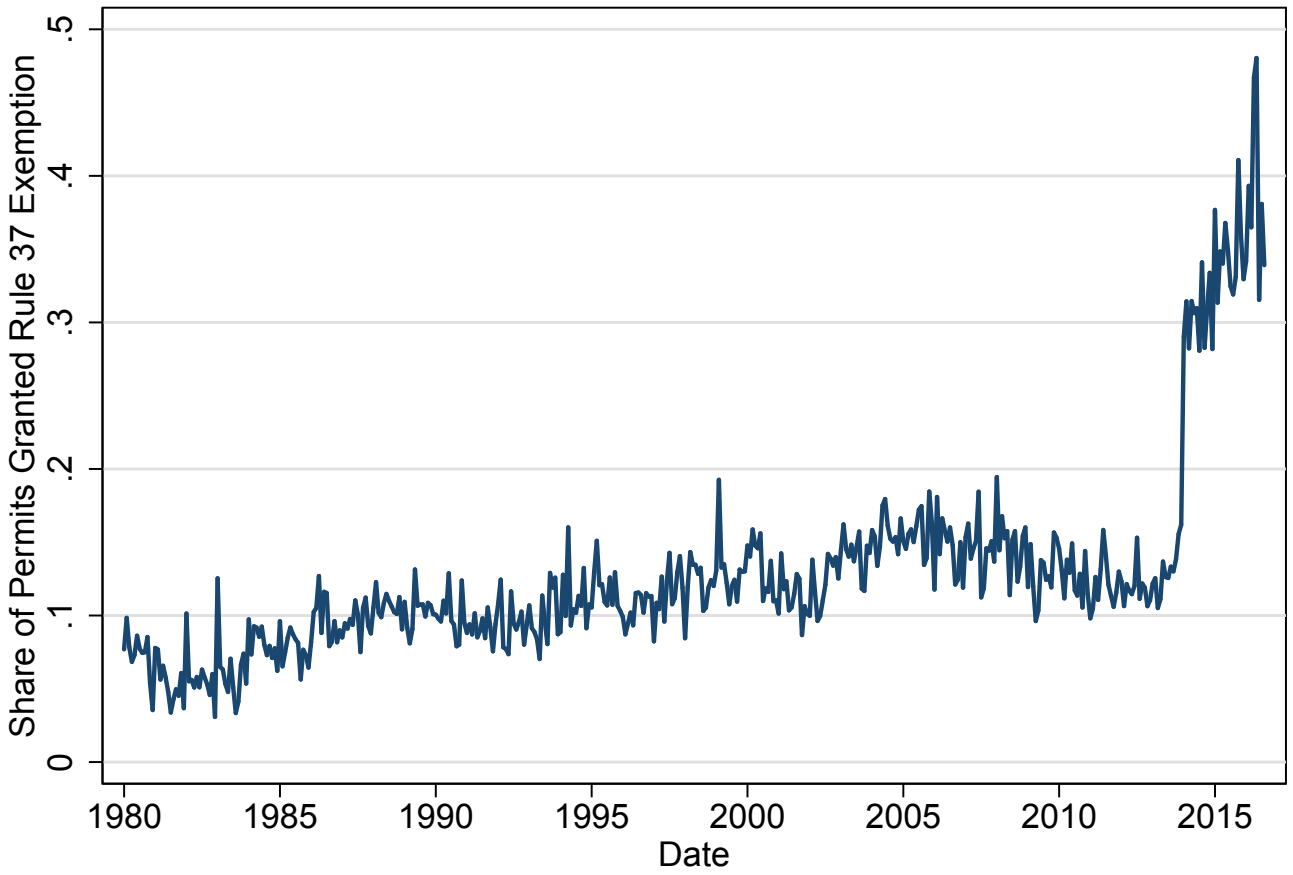
- Avoid inefficiency
- RRC's charge, "Prevent waste of the state's natural resources."
- A single holdout could prevent a multi-million dollar energy development project

Well-Spacing Exceptions Rising



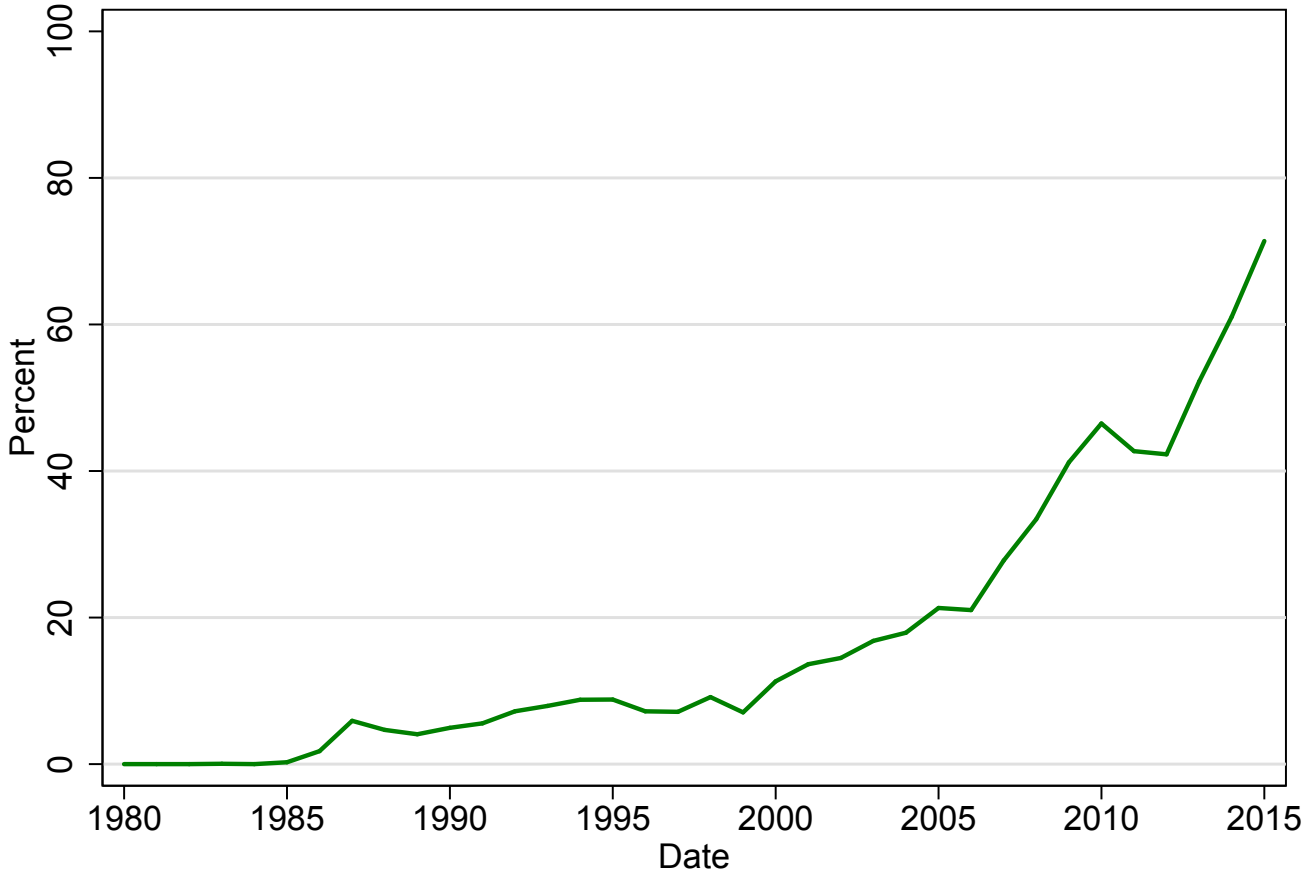
Source: Texas Railroad Commission

Exceptions as a Share of Permits Jumped



Source: Texas Railroad Commission

Fraction of Spacing Exceptions for Horizontal Wells



Source: Texas Railroad Commission, Author's calculations

Horizontal wells driving exception increase

Model of Oil and Gas Leasing

- Three agents (1 owner and 2 producers) and two periods (1 and 2)
- Mineral rights owner can lease to a producer in period 1 or period 2
- In period 1, owner receives royalty offer of R_1 from producer
- Owner can accept offer, or hold out until period 2 and accept R_2 from another producer

Let,

- $E_1[R_2]$ be the expected value of R_2 in period 1
- r be the interest rate

The owner will lease in period 1 if

$$R_1 \geq \frac{1}{1+r} E_1\left[R_2\right] \tag{1}$$

Otherwise the owner waits until period 2 to lease

Adding Spacing Exceptions

Producer can seek spacing exception in period 1 if owner holds out for a better royalty offer

ρ: Probability producer granted spacing exception $(0 < \rho < 1)$

- w/ probability ρ: holdout owner receives no compensation
- w/ probability $(1 - \rho)$: holdout owner receives R_2 in period 2

Facing a spacing exception, the mineral rights owner leases if

$$R_1 \geq \frac{1}{1+r} E_1[(1-\rho)R_2] + \rho \cdot 0 \tag{2}$$

For all $\rho > 0$,

$$\underbrace{\frac{1}{1+r} E_1[(1-\rho)R_2]}_{\text{with spacing exceptions}} < \underbrace{\frac{1}{1+r} E_1[R_2]}_{\text{without spacing exceptions}} \tag{3}$$

Testable Implication: Owners facing a large ρ will accept lower royalty rates than owners facing a small/zero ρ

Note: This only applies to small-tract owners

- Small Tract: a tract which loses a *significant* portion of its oil and gas to a spacing-exception
- The value of small-tract mineral rights are exceeded by the costs of a prolonged exception fight (time, travel, legal fees, etc.)

Large tracts do not face the same threat from spacing exceptions

- Large tract: a tract which maintains much of its value despite exception
- The value of large-tract mineral rights larger than cost of fighting exception

Data

Texas, 2000-2015

- Lease-level Data for 184,000 small tracts in Texas from DrillingInfo (royalty rate, location, acres, etc.)
- Counts of well-spacing exceptions and drilling permits by date and county from RRC of Texas
- County-level characteristics, land use from USDA
- Oil price data from EIA

Variable	Mean	Std. Dev.	Min.	Max.
Dependent Variable				
Royalty Rate	0.22	0.03	0.002	0.4
Main Explanatory Variable				
Rule 37 Exceptions	10.933	8.939	0	80
Instrument				
Miles to Austin	175.31	33.18	40.35	490.67
Control Variables				
Acres	0.64	1.01	0	5
Urban-Rural Continuum	1.54	1.54	1	9
Permian Basin	0.02	0.14	0	1
Eagle Ford Shale	0.02	0.13	0	1
Barnett Shale	0.85	0.35	0	1
Haynesville Shale	0.03	0.16	0	1
WTI Price (real $)	37.84	10.44	10.4	62.44
Observations		184,091		

Empirical Model

I want to estimate this relationship

$$\text{royalty}_{i,t} = \alpha + \beta \text{ spacing exceptions}_{i,t} + \theta X_{i,t} + v_{i,t} \quad (4)$$

- royalty_{it}: is the royalty rate negotiated for lease i at time t
- $\text{spacing exceptions}_{i,t}$: share of wells near lease granted spacing exceptions
- $X_{i,t}$: lease-, county-level controls, exogenous determinants of royalty rates

Theory model predicts spacing exception coefficient (β) will be negative

Why not just estimate with least squares?

Reverse Causality

- Suppose an area has mineral owners hold out if not paid high royalty rates which increases spacing exceptions
- Least squares estimate of Equation (4) would have positive bias
- Even if these spacing exceptions cause owners to accept lower royalty rates, I could find that frequent spacing exceptions are associated with high royalty rates

IV Model

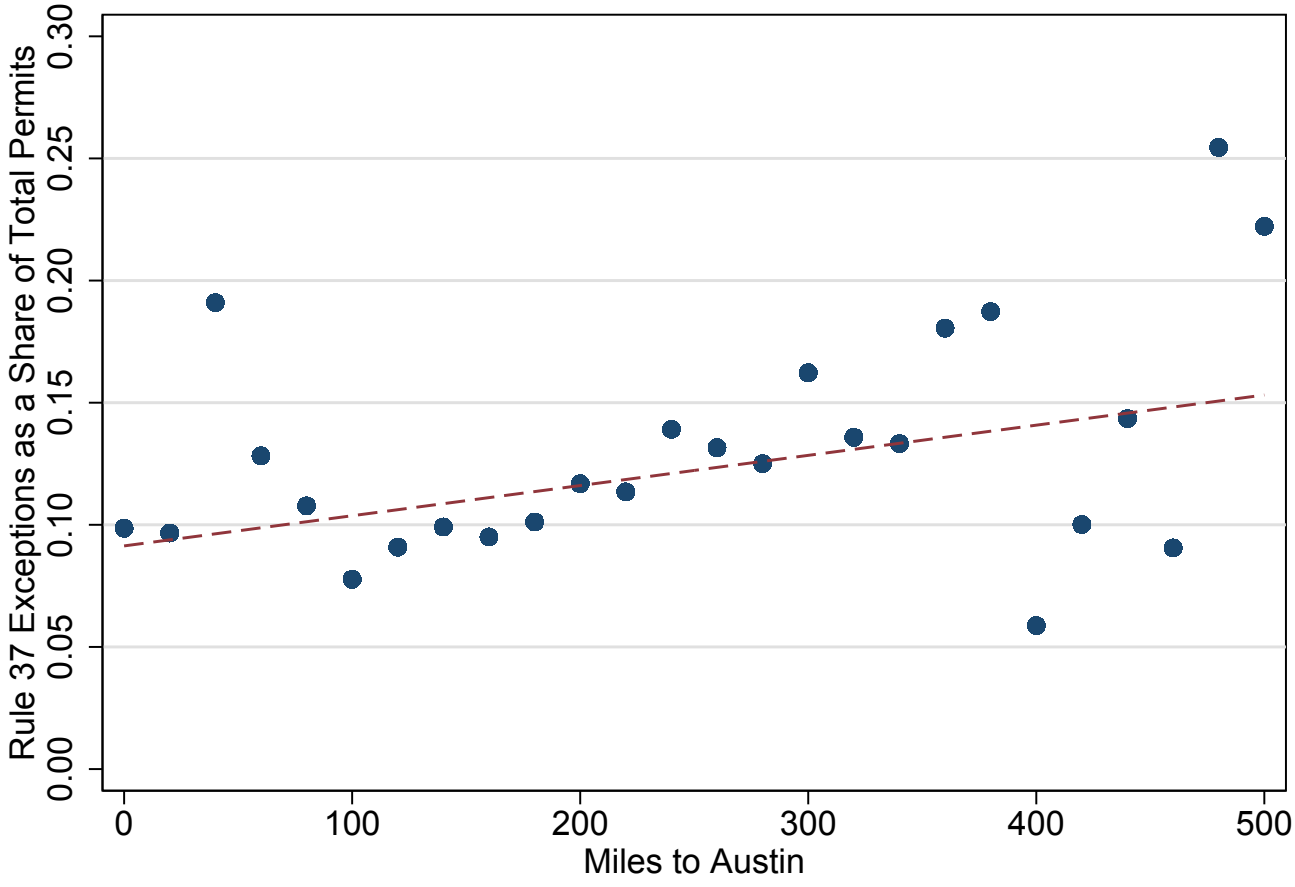
Instrument for Spacing Exceptions: Distance from Austin

- Mineral rights owners have 10 days to protest an exception in person at an RRC hearing in Austin, Texas
- Cost of objecting increases with owner's distance from Austin (San Antonio vs. Amarillo)
- Unchallenged spacing exception petition are (essentially) granted automatically

Claim:

- As cost of challenge $\uparrow$, likelihood of spacing exception $\uparrow$
- Distance from Austin otherwise uncorrelated with royalty rates

Spacing exceptions by distance from Austin



Source: Texas Railroad Commission, Author's calculations

IV Model: First Stage

$$\text{Rule 37}_{i,t} = \alpha + \gamma \text{dis}_i + \eta_{i,t} + \varepsilon_{i,t}$$

- Rule $37_{i,t}$: share of exceptions by county/month (lagged, MA)
- dis_i: Distance from lease to Austin, in miles
- $\eta_{i,t}$: Includes geographic factors that co-vary with distance from RRC
  - Urban-Rural indicators, Long/Lat, shale formation indicators (Permian, Eagle Ford, Barnett, and Haynesville)
  - WTI spot price (real)
  - Tract size
  - Month, year fixed effects

Dependent Variable: Rule 37 Exception Rate by County			
Explanatory Variables	(1)	(2)	(3)
Distance to RRC	0.000429***	0.000313***	0.000394***
	(9.25e-06)	(1.18e-05)	(1.47e-05)
Permian		-0.00726**	0.00839**
		(0.00294)	(0.00383)
Eagle Ford		-0.00842***	-0.00181
		(0.00218)	(0.00317)
Barnett		-0.0360***	-0.0275***
		(0.00179)	(0.00287)
Haynesville		0.0314***	0.0405***
		(0.00220)	(0.00372)
WTI		0.000434***	0.000486***
		(2.00e-05)	(1.95e-05)
Month-Year FE	NO	YES	YES
Rural-Urban FE	NO	YES	YES
Observations	183,802	183,802	149,833
R-squared	0.048	0.411	0.491
Sample	0-5 Acres	0-5 Acres	0-1 Acres

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

First-Stage Estimates

IV Model: Second Stage

$$\text{royalty}_{i,t} = \theta + \beta \widehat{\text{Rule 37}}_{i,t} + \eta_t + \theta_{i,t}$$

- $\text{Royalty}_{i,t}$: Lease-level royalty rates
- $\widehat{\text{Rule 37}}_{i,t}$: Spacing exception predictions from first-stage using distance from Austin instrument
- $\eta_{i,t}$: Controls

Dependent Variable: Royalty Rate			
Explanatory Variables	(1)	(2)	(3)
Rule 37	-0.178***	-0.0216***	-0.0400***
	(0.00480)	(0.00782)	(0.00814)
Permian		0.0156***	0.0150***
		(0.000745)	(0.00102)
Eagle Ford		0.0122***	0.0169***
		(0.000546)	(0.000782)
Barnett		0.0231***	0.0255***
		(0.000597)	(0.000830)
Haynesville		0.00244***	0.00390***
		(0.000621)	(0.000929)
WTI		0.000517***	0.000524***
		(9.66e-06)	(1.02e-05)
Month-Year FE	NO	YES	YES
Rural-Urban FE	NO	YES	YES
Observations	183,466	183,466	148,263
R-squared	0.014	0.374	0.339
Sample	0-5 Acres	0-5 Acres	0-1 Acres

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Second-Stage Estimates

Economically significant?

- No effect for royalty rates within a few hundred miles of Austin
- Royalty rates further away lose 0.6 - 1.0 percentage points (bigger effects for smaller tracts)
- Mineral owner in Amarillo receives royalty payments 3-5 percent below counterpart in San Antonio because of well-spacing exception threat

Conclusion

- Horizontal drilling increased well-spacing exceptions in Texas
- These spacing exceptions cause mineral rights to accept lower royalty rates
- Trend likely to continue in near-term
  - Producers profit $\uparrow$
  - Owners profit $\downarrow$
  - State tax revenue a wash ($\leftrightarrow$)

So what?

Also a few non-obvious impacts

- Local economic multiplier for energy production $\downarrow$
  - Less money to local landowners and more money to (possibly) non-local producers
- Incentivizing inefficient production:
  - Easier to drill in suboptimal location with exception than negotiate to drill in optimal location

Solutions

Lower the cost of protesting spacing exceptions

- Allow owners to attend hearing at regional RRC offices
- Allow more than 10 days to protest
- Producer pays legal fees of owner if producer loses