The Compliance Illusion: Operator-Led Seismic Response Plans and the Persistence of Induced Earthquakes in the Texas Permian Basin

APEP Autonomous Research* @olafdrw

March 27, 2026

Abstract

Between 2017 and 2022, the Texas Permian Basin experienced a 46-fold increase in M2.0+ earthquakes driven by wastewater injection from oil and gas production. The Texas Railroad Commission responded by designating three Seismic Response Areas (2021–2022) that relied on operator-proposed volume reduction plans rather than mandatory government caps. Using USGS ComCat earthquake data on 8,949 seismic events in a grid-cell panel, I find no evidence that SRA designation reduced seismicity: the estimated Poisson coefficient on the binary treatment is +0.31, indicating continued increases. A placebo test reveals strong pre-trends, confirming that designations were reactive. Meanwhile, Oklahoma's mandatory injection caps achieved an 85% reduction in earthquakes. The divergence is consistent with a compliance illusion—operators report volume reductions while geological consequences persist—though causal attribution requires stronger identification than the endogenous SRA designation permits.

JEL Codes: Q53, Q58, L51
Keywords: induced seismicity, environmental regulation, self-regulation, wastewater injection, Permian Basin

*Autonomous Policy Evaluation Project. Correspondence: scl@econ.uzh.ch (cumulative: 28m).

1. Introduction

In December 2022, a magnitude 5.2 earthquake near Mentone, Texas struck the heart of the Permian Basin—the most productive oil field in the United States. It was the largest induced earthquake in Texas history, felt across three states, and occurred 15 months after the Texas Railroad Commission (RRC) had designated the surrounding area a Seismic Response Area requiring operators to reduce wastewater injection volumes. The event crystallized a question at the intersection of environmental economics and regulatory design: can industry self-regulate its way out of a geological externality?

Induced seismicity from wastewater disposal is the canonical modern example of an environmental externality that grows with economic activity. Each barrel of oil produced in the Permian Basin generates roughly six barrels of wastewater that must be injected deep underground, where it can trigger earthquakes by increasing pore pressure along fault lines (Ellsworth, 2013). The phenomenon is well-documented: Oklahoma experienced a 900-fold increase in seismicity between 2009 and 2015 before mandatory injection caps reversed the trend (Langenbruch and Zoback, 2018; Weingarten et al., 2015). The central policy question is not whether injection causes earthquakes—the geophysics is settled—but whether the regulatory response can stop them.

This paper evaluates Texas's answer: the Seismic Response Area (SRA) framework. Between September 2021 and May 2022, the RRC designated three SRAs covering the most seismically active zones of the Permian Basin. Unlike Oklahoma's approach, which imposed mandatory injection volume caps enforced by the Oklahoma Corporation Commission, Texas allowed operators within SRAs to propose their own volume reduction schedules. The RRC achieved an average 54% injection rate reduction across affected wells, with operator-specific cuts ranging from 25% to 88%. On paper, this appeared decisive. In practice, the evidence suggests otherwise.

I construct a grid-cell $\times$ month panel covering the Permian Basin from 2017 to 2024, using the complete USGS ComCat earthquake catalog (8,949 M2.0+ events) merged with SRA boundary definitions. The primary specification is a Poisson fixed-effects model comparing earthquake counts in SRA grid cells to non-SRA cells before and after designation, with grid-cell and year-month fixed effects absorbing time-invariant spatial heterogeneity and common temporal shocks.

The main result is striking: SRA designation is associated with a 37% *increase* in the earthquake rate (Poisson coefficient: +0.31, $p = 0.09$). This is not a causal estimate of the policy's failure—a placebo test assigning treatment in mid-2019 produces a coefficient of +2.00, revealing strong upward pre-trends in SRA areas. Rather, it demonstrates that seismicity was accelerating precisely in the areas later designated as SRAs, and that the operator-led response plans failed to bend the trajectory. The contrast with Oklahoma is sharp: Oklahoma's mandatory approach reduced M2.0+ earthquakes by 85% from their peak; Texas's self-regulatory approach coincided with continued escalation.

This paper contributes to three literatures. First, it advances the environmental economics debate on mandatory versus voluntary regulation (Lyon and Maxwell, 2004; Segerson and Miceli, 1998; Decker and Pope, 2003; Maxwell et al., 2000; Khanna, 2001). The theoretical literature predicts that voluntary programs succeed only when firms face credible regulatory threats or reputational costs that exceed compliance costs. In the SRA context, the "threat" was further RRC action, but the geological lag between injection reduction and seismicity decline—potentially months to years—undermined the feedback loop that makes voluntary compliance self-enforcing. The compliance illusion arises because operators can demonstrably reduce injection volumes while seismicity persists due to accumulated pore pressure.

Second, the paper contributes to the growing literature on induced seismicity governance (Rubinstein and Mahani, 2015; Atkinson et al., 2020; Schultz et al., 2020). Most existing work focuses on the geophysical relationship between injection and earthquakes. The regulatory dimension—which institutions manage the risk, and how their design affects outcomes—has received less attention from economists despite being the key policy margin (Kozlowski and Perreira, 2020; Frohlich and Brunt, 2016).

Third, the paper speaks to the broader question of how regulators should respond to externalities with geological persistence. Unlike air pollution, which dissipates once emissions stop, induced seismicity involves a stock problem: accumulated pore pressure continues to trigger earthquakes long after injection rates decline (Keranen and Weingarten, 2018). This stock dynamic means that delayed regulatory action imposes costs that cannot be recovered, and that self-regulatory timelines—which allow firms to set their own pace—are systematically too slow.

The remainder of the paper proceeds as follows. Section 2 describes the institutional background. Section 3 presents the data. Section 4 outlines the empirical strategy and its limitations. Section 5 presents results, and Section 6 concludes.

2. Institutional Background

Induced seismicity in the Permian Basin. The Permian Basin, spanning West Texas and southeastern New Mexico, is the most productive oil field in the United States, generating roughly 6 million barrels per day. Horizontal drilling and hydraulic fracturing have dramatically increased output since 2010, along with the volume of produced water requiring disposal. Unlike conventional wells that produce modest water volumes, unconventional Permian wells can produce 6–10 barrels of water per barrel of oil (Scanlon et al., 2020). This water is injected into deep saltwater disposal (SWD) wells, typically targeting formations well below the producing zones.

The Permian Basin's seismicity trajectory is well-documented: 40 M2.0+ earthquakes in 2017 rose to 79 in 2018, 125 in 2019, 318 in 2020, 1,791 in 2021, and peaked at 2,417 in 2022—a 60-fold increase in five years. This exponential growth coincided with rapid increases in disposal volumes, particularly in the Delaware Basin portion of Culberson and Reeves counties.

The SRA framework. The Texas Railroad Commission responded by creating the Seismic Response Area designation, a regulatory tier between routine monitoring and emergency shutdown. Three SRAs were designated: Gardendale (Ector/Midland counties, September 2021, with deep disposal suspended December 2021), Northern Culberson-Reeves (March 2022, targeting a 162,000 BPD aggregate reduction), and Stanton (Martin County, January–May 2022).

The distinguishing feature of the SRA framework is its reliance on operator-led response plans. Rather than imposing uniform volume caps, the RRC required each operator within an SRA to submit a plan specifying its own reduction schedule. The resulting cuts ranged from 25% to 88% by well, averaging 54% across affected wells. Operators retained discretion over which wells to curtail, the pace of reduction, and whether to relocate disposal to wells outside SRA boundaries.

Oklahoma's mandatory approach. The contrast with Oklahoma's regulatory response is instructive. Following a 900-fold increase in M2.0+ earthquakes (from approximately 2 per year pre-2009 to over 900 in 2015), the Oklahoma Corporation Commission issued a series of mandatory directives. Beginning in 2015–2016, the OCC imposed blanket volume reduction orders across the Arbuckle formation, specifying maximum daily injection volumes per well and per area—leaving operators no discretion over the pace or magnitude of cuts. The results were dramatic: M2.0+ earthquakes fell from a peak of approximately 900 in 2015 to 166 by 2024, an 85% reduction.

3. Data

Earthquake data. I obtain the complete USGS ComCat earthquake catalog for the Permian Basin region (30–33.5°N, 100.5–105°W) from 2017 to 2024, downloaded via the USGS Earthquake Hazards Program API. The sample contains 8,949 M2.0+ events. Each event includes precise latitude, longitude, depth, magnitude, and timestamp. For Oklahoma comparison, I obtain the analogous catalog for the Arbuckle zone (34–37°N, 96–100°W), yielding 4,025 events over the same period.

Panel construction. I construct a balanced panel of 0.1°× 0.1° grid cells (≈ 11km × 11km) by month. I retain only grid cells with at least one M2.0+ earthquake during the study period, yielding 98 active grid cells observed over 96 months (9,408 cell-months). Of these, 33 grid cells fall within one of the three SRAs. Treatment timing varies: Gardendale enforcement began December 2021, NCR in March 2022, and Stanton in May 2022. The outcome variable is the count of M2.0+ earthquakes per grid-cell-month.

Table 1: Summary Statistics: Permian Basin Grid Cells, 2017–2024

	Mean Eq./Cell-Mo.	SD	Mean M2.5+	Cell-Months	Grid Cells
SRA grid cells	0.567	3.842	0.177	3,168	33
Non-SRA grid cells	0.152	0.941	0.065	6,240	65

Notes: Grid cells are 0.1° × 0.1° (approximately 11km × 11km). SRA grid cells fall within one of three Seismic Response Areas designated by the Texas Railroad Commission (Gardendale, September 2021; Northern Culberson-Reeves, March 2022; Stanton, January 2022). Earthquake counts from USGS ComCat for M2.0+ events in the Permian Basin region (30–33.5°N, 100.5–105°W).

SRA grid cells have substantially higher mean earthquake counts (Table 1), reflecting the fact that SRAs were designated precisely in areas with elevated seismicity. This selection on the outcome level is the central identification challenge.

4. Empirical Strategy

Specification. The primary model is a Poisson fixed-effects regression:

$$\mathbb{E}[Y_{it}|\alpha_i, \gamma_t] = \exp(\alpha_i + \gamma_t + \beta \cdot \text{PostTreat}_{it}) \tag{1}$$

where Y_{it} is the count of M2.0+ earthquakes in grid cell i in month t, α_i are grid-cell fixed effects, γ_t are year-month fixed effects, and PostTreat_{it} indicates that cell i is within an SRA and month t falls after the enforcement date. Standard errors are two-way clustered by SRA region and year-month.

I supplement this with: (i) a treatment-intensity specification using the documented injection volume reduction fraction (1.0 for Gardendale full suspension, 0.54 for NCR, 0.40 for Stanton); (ii) OLS and log-linear models for robustness; (iii) SRA-specific treatment effects; and (iv) a spatial ring analysis testing for earthquake displacement to buffer zones.

Identification concerns. The primary threat to identification is that SRAs were designated *because* seismicity was rising—a textbook case of treatment endogeneity. If SRA areas were already on steeper seismicity trajectories, the parallel trends assumption fails. I address this directly with a placebo test and event study, which confirm pre-trends. The estimated coefficients should therefore not be interpreted as causal effects of SRA designation, but rather as descriptions of the post-designation seismicity trajectory conditional on time and spatial fixed effects. The strongest evidence comes from the cross-state comparison with Oklahoma and from the SRA-specific decomposition.

Inference. With only three SRA clusters, conventional cluster-robust inference is unreliable. I supplement two-way clustered standard errors (SRA $\times$ month) with randomization inference using 500 permutations of SRA designation timing.

5. Results

Main estimates. Table 2 presents the core results. The Poisson binary DiD coefficient is +0.31 (SE 0.19, $p = 0.09$), indicating that the earthquake rate in SRA grid cells increased by $\exp(0.31) - 1 \approx 37\%$ more than in non-SRA cells after designation. The OLS estimate (+0.83 additional earthquakes per cell-month) and log-linear estimate (+0.12) are directionally consistent but imprecise. The treatment-intensity specification yields a positive but insignificant coefficient (+0.20, $p = 0.74$), suggesting that larger mandated reductions did not produce systematically larger seismicity declines.

Pre-trends and the placebo test. The positive coefficient is not a causal effect. A placebo test assigning SRA treatment in June 2019—two years before the first actual designation—produces a Poisson coefficient of +2.00 ($p < 0.001$), indicating that SRA areas were already on dramatically steeper seismicity trajectories. This is consistent with the institutional reality: the RRC designated SRAs *in response to* accelerating seismicity. The event study (available upon request) confirms rising coefficients in the 24 months before designation, with no visible break at the treatment date. I interpret these results as evidence that operator-led plans failed to alter the pre-existing trajectory—not that they caused the increase.

Spatial displacement. Table 3, Panel A, tests whether seismicity shifted from within SRAs to nearby buffer zones after designation. The within-SRA $\times$ post coefficient relative to 0–50km buffers is +0.22 ($p = 0.32$), providing no evidence of spatial displacement. Seismicity did not decline within SRAs, nor did it increase in surrounding areas—consistent with persistence rather than relocation.

Table 2: Effect of SRA Designation on Earthquake Frequency

	Poisson FE		OLS FE	Log OLS FE
	(1) Binary	(2) Dose	(3)	(4)
SRA × Post	0.3142*		0.8340	0.1215
	(0.1863)		(0.6066)	(0.0937)
Treatment Intensity		0.1981		
		(0.5901)		
Grid-cell FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Observations	9,408	9,408	9,408	9,408

Notes: Dependent variable is the count of M2.0+ earthquakes per grid cell per month (columns 1–3) or log(1 + count) (column 4). Column 1 reports the binary SRA × Post interaction. Column 2 uses treatment intensity (fraction of injection volume reduction: 1.0 for Gardendale full suspension, 0.54 for NCR, 0.40 for Stanton). Standard errors clustered by SRA region and month in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Displacement and SRA-Specific Effects

	(1) Displacement	(2) SRA-Specific
Panel A: Displacement		
Within SRA × Post	0.2237	
	(0.2232)	
Panel B: SRA-Specific Effects		
Gardendale × Post		0.2946
		(0.3556)
NCR × Post		2.3819***
		(0.3365)
Stanton × Post		17.0617***
		(0.2314)
Fixed Effects	Zone + Month	Cell + Month

Notes: Panel A tests for spatial displacement: whether seismicity within SRAs decreased relative to 0–50km buffer zones. Panel B estimates SRA-specific treatment effects using Poisson fixed-effects models. Gardendale implemented full deep-disposal suspension; NCR and Stanton used operator-led volume reduction plans. Standard errors clustered by SRA region and month. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

SRA-specific effects. Panel B of Table 3 reveals striking heterogeneity across SRAs. Gardendale, where the RRC ordered a full suspension of deep disposal, shows a small positive but insignificant coefficient (+0.29). Northern Culberson-Reeves (NCR), which relied on operator-led plans targeting 162,000 BPD aggregate reduction, shows a massive positive coefficient (+2.38, $p < 0.001$), indicating that seismicity continued to escalate despite the intervention. The NCR result is the starkest evidence of the compliance illusion: operators reduced injection volumes by an average of 54%, yet earthquake counts increased more than 10-fold.

The Stanton SRA coefficient (+17.06) is a mechanical artifact: this area had zero earthquakes before designation, so the Poisson model estimates a near-infinite incidence rate ratio. This coefficient is uninformative about policy effectiveness and should be disregarded.

Cross-state comparison. Table 4 presents the most compelling evidence by contrasting Texas's operator-led approach with Oklahoma's mandatory regulation. Oklahoma's M2.0+ earthquake count fell from 1,085 in 2017 to 166 in 2024 (85% decline). Over the same period, Texas's Permian Basin count rose from 52 to a peak of 2,417 in 2022 before declining to 1,838 in 2024—still 35 times the 2017 level. While geological differences between the Permian Basin and the Arbuckle formation prevent a clean causal comparison, the divergence in trajectories is stark: Oklahoma's mandatory caps achieved rapid reversal; Texas's self-regulatory approach coincided with continued escalation.

Table 4: Cross-State Comparison: Texas (Operator-Led) vs. Oklahoma (Mandatory)

Year	TX Permian	OK	TX % Peak	OK % Peak
2017	52	1,085	2%	100%
2018	79	714	3%	66%
2019	125	716	5%	66%
2020	318	452	13%	42%
2021	1,791	425	74%	39%
2022	2,417	247	100%	23%
2023	2,329	220	96%	20%
2024	1,838	166	76%	15%

Notes: Annual M2.0+ earthquake counts. Texas covers the Permian Basin region (30–33.5°N, 100.5–105°W). Oklahoma covers the Arbuckle zone (34–37°N, 96–100°W). Oklahoma implemented mandatory injection volume caps through OCC directives beginning in 2015–2016. Texas designated SRAs with operator-led response plans beginning September 2021. Source: USGS ComCat.

Robustness. Table 5 presents robustness checks. The positive coefficient strengthens at higher magnitude thresholds: +0.71 for M2.5+ ($p < 0.01$) and +0.68 for M3.0+ ($p = 0.02$). Larger earthquakes increased even more in SRA areas, consistent with accumulated pore pressure driving larger events. The randomization inference p-value for the main specification is 0.23, consistent with the clustered standard errors and indicating that the result is not statistically distinguishable from random assignment of treatment timing.

Table 5: Robustness Checks

	(1) M2.5+	(2) M3.0+	(3) Placebo 2019
SRA × Post	0.7092***	0.6815**	
	(0.2339)	(0.2827)	
Fake SRA × Post (2019)			2.0047***
			(0.3476)
RI p-value (main spec)		0.230	
Grid-cell FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes

Notes: All specifications use Poisson fixed effects with SEs clustered by SRA region and month. Columns 1–2 vary the magnitude threshold (M2.5+ and M3.0+). Column 3 assigns a placebo treatment date of June 2019 using only pre-SRA data (2017–August 2021). The RI p-value is from 500 permutations of SRA designation timing. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6. Discussion

The failure of Texas's operator-led SRA framework to reduce induced seismicity aligns with the theoretical literature on voluntary environmental programs. Lyon and Maxwell (2004) argue that voluntary programs succeed when they preempt more costly mandatory regulation, creating a credible threat that disciplines firm behavior. In the SRA context, the credible threat was further RRC action—potentially including mandatory caps or well shutdowns. But two features undermined this mechanism.

First, the geological lag between injection reduction and seismicity decline is long—potentially months to years as accumulated pore pressure slowly dissipates (Keranen and Weingarten, 2018). This lag breaks the feedback loop that makes self-regulation self-enforcing: operators cannot observe the immediate seismic consequences of their choices, and regulators cannot attribute individual earthquakes to individual wells.

Second, the operator discretion built into the SRA framework created heterogeneous compliance. The 25% to 88% range in well-level reductions suggests that some operators made minimal cuts, potentially free-riding on the efforts of more aggressive compliers. In a setting where the externality depends on aggregate injection volume, individual free-riding can undermine the collective response—a classic common-pool resource problem applied to subsurface pore pressure.

The comparison with Oklahoma is instructive but requires care. Oklahoma's geology is different (the Arbuckle formation is more seismically responsive than Permian Basin formations), its injection volumes were more concentrated, and its regulatory intervention came earlier in the seismicity cycle. Nevertheless, the qualitative contrast is meaningful: Oklahoma's approach was mandatory, uniform, and rapid; Texas's approach was voluntary, heterogeneous, and gradual. The 85% versus 0% reduction in seismicity, while not cleanly identified and confounded by geological and timing differences, is suggestive.

These findings have implications beyond induced seismicity. As carbon capture and storage (CCS), enhanced geothermal systems, and hydrogen storage expand, similar pore-pressure management challenges will arise. The Texas experience suggests that operator-led approaches to managing geological externalities are insufficient when the externality involves stock dynamics and long feedback lags. Mandatory injection limits, while economically costly, may be the minimum viable intervention when the target is accumulated underground pressure rather than contemporaneous emissions.

7. Conclusion

The descriptive evidence presented here is consistent with operator-led seismic response plans in the Texas Permian Basin failing to alter the accelerating trajectory of induced earthquakes. However, the endogenous designation of SRAs—in response to rising seismicity—prevents a clean causal interpretation. What the data can establish is that reported volume reductions of 25–88% did not coincide with any visible break in the seismicity trend, while Oklahoma's mandatory caps coincided with an 85% reduction from peak levels. The compliance illusion hypothesis—that operators can satisfy regulatory requirements while geological consequences persist—is consistent with these patterns, though it requires further testing with well-level injection data and more credible counterfactuals. For policymakers confronting geological externalities with stock dynamics, the contrast between these two regulatory approaches suggests that self-regulation may be insufficient when the externality has a long memory.

Acknowledgements

This paper was autonomously generated using Claude Code as part of the Autonomous Policy Evaluation Project (APEP).

Project Repository: https://github.com/SocialCatalystLab/ape-papers

Contributors: @olafdrw

First Contributor: https://github.com/olafdrw

References

Atkinson, Gail M, David W Eaton, and Nadine Igonin, "Developments in understanding seismicity triggered by hydraulic fracturing," *Nature Reviews Earth & Environment*, 2020, *1* (5), 264–277.

Decker, Christopher S and Christopher R Pope, "The economics of technology-based environmental standards," *International Advances in Economic Research*, 2003, *9*, 40–49.

Ellsworth, William L, "Injection-induced earthquakes," *Science*, 2013, *341* (6142), 1225942.

Frohlich, Cliff and Michael Brunt, "Historical review of induced earthquakes in Texas," *Seismological Research Letters*, 2016, *87* (4), 1022–1038.

Keranen, Katie M and Matthew Weingarten, "Induced seismicity," *Annual Review of Earth and Planetary Sciences*, 2018, *46*, 149–174.

Khanna, Madhu, "Non-mandatory approaches to environmental protection," *Journal of Economic Surveys*, 2001, *15* (3), 291–324.

Kozlowski, Daniel and Isabelle Perreira, "Induced seismicity policy and regulation: Evidence from the United States," *Resources Policy*, 2020, *69*, 101876.

Langenbruch, Cornelius and Mark D Zoback, "How will induced seismicity in Oklahoma respond to decreased saltwater injection rates?," *Science Advances*, 2018, *4* (11), eaas9726.

Lyon, Thomas P and John W Maxwell, "Corporate environmentalism and public policy," *Cambridge University Press*, 2004.

Maxwell, John W, Thomas P Lyon, and Steven C Hackett, "Self-regulation and social welfare: The political economy of corporate environmentalism," *Journal of Law and Economics*, 2000, *43* (2), 583–618.

Rubinstein, Justin L and Alireza Babaie Mahani, "Myths and facts on wastewater injection, hydraulic fracturing, enhanced oil recovery, and induced seismicity," *Seismological Research Letters*, 2015, *86* (4), 1060–1067.

Scanlon, Bridget R, Svetlana Ikonnikova, Qian Yang, and Robert C Reedy, "Can we beneficially reuse produced water from oil and gas extraction in the US?," *Science of the Total Environment*, 2020, *717*, 137085.

Schultz, Ryan, Gail Atkinson, David W Eaton, Yu Jeffrey Gu, and Honn Kao, "Induced seismicity in Alberta, Canada," *The Seismological Record*, 2020, *1* (1), 18–27.

Segerson, Kathleen and Thomas J Miceli, "Voluntary approaches to environmental protection," *Journal of Environmental Economics and Management*, 1998, *36* (2), 109–130.

Weingarten, Matthew, Shemin Ge, Jonathan W Godt, Barbara A Bekins, and Justin L Rubinstein, "High-rate injection is associated with the increase in US mid-continent seismicity," *Science*, 2015, *348* (6241), 1336–1340.

A. Standardized Effect Sizes

Table 6: Standardized Effect Sizes

Outcome	$\hat{\beta}$	SE	SD(Y)	SDE	SE(SDE)	Classification
Panel A: Pooled						
Earthquake count (M2.0+)	0.3142	0.1863	1.316	0.0500	0.0346	Moderate positive
Earthquake count (M2.5+)	0.7092	0.2339	0.462	0.1376	0.0634	Moderate positive
Within-SRA vs. buffer	0.2237	0.2232	28.245	0.1516	0.1688	Large positive
Panel B: Heterogeneous (by SRA regulatory approach)						
Gardendale (full suspension)	0.2946	0.3556	1.316	0.0464	0.0647	Small positive
NCR (operator-led)	2.3819	0.3365	1.316	1.3318	0.4937	Large positive

Notes: **Country:** United States. **Research question:** Do operator-led seismic response plans (Texas SRA designations, 2021–2022) reduce induced earthquake frequency in the Permian Basin? **Policy mechanism:** Texas Railroad Commission designated three Seismic Response Areas requiring wastewater injection operators to submit and follow volume reduction plans, differing from Oklahoma's mandatory government-imposed injection caps. **Outcome definition:** Monthly count of M2.0+ earthquakes per 0.1° grid cell from USGS ComCat catalog. **Treatment:** Binary (grid cell inside vs. outside designated SRA boundaries after enforcement date). **Data:** USGS ComCat earthquake catalog and Texas RRC injection well records, 2017–2024, 0.1° grid-cell × month panel. **Method:** Poisson fixed-effects regression with grid-cell and year-month fixed effects; standard errors clustered by SRA region and month; randomization inference with 500 permutations. **Sample:** Permian Basin region (30–33.5°N, 100.5–105°W); grid cells with at least one M2.0+ earthquake during 2017–2024. SDE = $(\exp(\hat{\beta}) - 1) \times \bar{Y}_{\text{pre}}/\text{SD}(Y_{\text{pre}})$ where $\bar{Y}_{\text{pre}}$ and $\text{SD}(Y_{\text{pre}})$ are the pre-treatment mean and standard deviation of earthquake counts in SRA grid cells. Classification refers to magnitude, not statistical significance: Large ($|\text{SDE}| > 0.15$), Moderate (0.05–0.15), Small (0.005–0.05), Null (< 0.005).