

Understanding Local Fracking Regulatory Stringency

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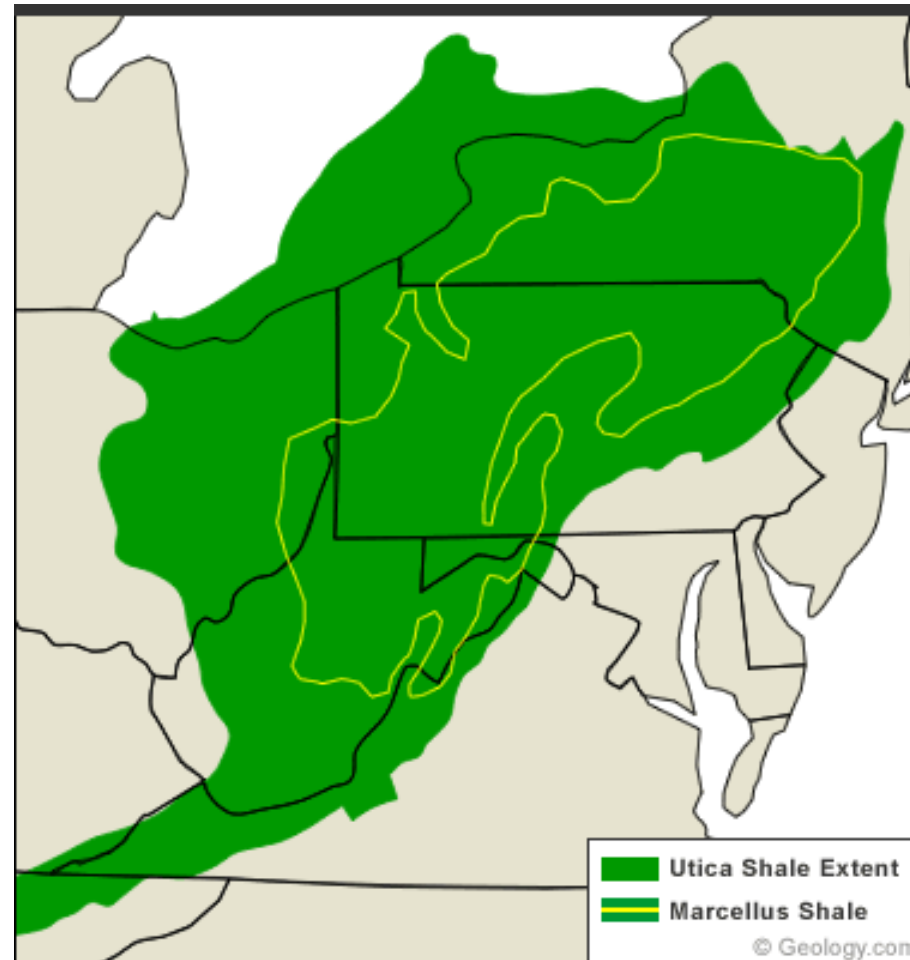
Workshop



Overview

- **Main question:** What factors encourage **more (less) stringent policy design** in local regulation of high-volume hydraulic fracturing (fracking)?
- **Main answers:**
 - **Greater citizen liberalism** encourages municipal adoption of more stringent anti-fracking policies.
 - So does **greater governmental capacity** (municipal revenue per capita).
 - Stringency appears to have **expressive** and **resource-related** drivers.

Case: Municipal anti-fracking policy adoption in New York



Policy design stringency

- **Underexplored** area in policy adoption scholarship.
- Scholars more frequently study drivers of **implementation stringency**:
 - Compliance expenditures
 - Enforcement actions
 - Regulated entities' experience-based perceptions
 - Stream miles cleaned, emissions prevented, effluent pounds reduced
- What factors shape the framework within which implementation occurs?

Drawing lessons from . . .

Social construction theory

- Policies convey, create, and enshrine societal attitudes and values (Mettler and SoRelle 2014; Schneider and Ingram 1993)
- Benefits and burdens assigned to groups based on power and valence (positive/negative view)
- Policymaking as expression and power struggle

Policy innovation theory

- Mohr (1969): Innovation is a function of motivation, opportunities, and obstacles
- Innovation facilitated by pressure for change and lack of contextual factors inhibiting it
- I theorize that decision-makers consider pressure/contextual variables prospectively when choosing policy designs

Existing scholarship

- State choices about welfare policy stringency post-PRWORA substantially explained by **government liberalism**, **percent minorities** on AFDC, and **voter economic status** (Avery and Peffley 2005; Soss et al. 2001).
- Stringency in state early childhood education policy reliably predicted by **citizen liberalism** (Rigby 2007).
- Adoption of weak- and medium-stringency RPS standards explained by **citizen liberalism**, and strong RPS by **government liberalism** (Carley and Miller 2012).

Social construction theory

- *Hypothesis 1 (H1): Municipalities with a greater proportion of **liberal citizens** will adopt more stringent anti-fracking policies.*
- U.S. fracking opinion is politically polarized.
- Liberal citizens are more likely to accept more rigorous government intervention.
- Anti-fracking policymaking = political expression.

Policy innovation theory

- *Hypothesis 2 (H2): **Wealthier** municipalities will adopt more stringent anti-fracking policies.*
- Innovation adoption is facilitated by government capacity.
- More knowledgeable officials may know how to develop more rigorous policies.
- Officials assess resources for implementation when crafting policy.

Note: Liberalism and municipal wealth correlated at 0.1577 in dataset.

Data collection

- 2013-2016: Acquisition of **local fracking policies**, sourced from . . .
 - Food and Water Watch, Frac Tracker, Joint Landowners Coalition of New York, Keuka Lake Citizens Against Hydrofracking, NYSLLD
 - FOIL requests to obtain full texts and determine/verify date of passage
 - Acquisition and analysis of public meeting minutes to ensure that policy action was motivated by fracking
 - 358 policies passed by 235 municipalities, 2008-2012
- Other data from . . .
 - County election boards, U.S. Census, NYS Comptroller, NYS Department of Environmental Conservation, USDA NASS (and others)

TOWN OF DANBY LOCAL LAW #3 OF 2011

AMENDMENTS TO TOWN OF DANBY ZONING ORDINANCE

**A LOCAL LAW AMENDING AND CLARIFYING THE TOWN OF DANBY,
TOMPKINS COUNTY, NEW YORK, ZONING ORDINANCE TO PROHIBIT
GAS AND PETROLEUM MINING AND RELATED ACTIVITIES**

BE IT ENACTED BY THE TOWN BOARD OF THE TOWN OF DANBY AS
FOLLOWS

SECTION 1: TITLE AND APPLICABILITY – The Town of Danby hereby adopts this local law, to be known as the Town of Danby Local Law Number__ of 2011 (the “Local Law).”

SECTION 2: PURPOSE – The purpose of this Local Law is to clarify, update, and amend the Town of Danby Zoning Ordinance by, among other things: clarifying allowed uses relative to light industrial uses and operations; clarifying allowed uses relative to gas and oil mining and hydraulic (and other) fracturing; and to ensure that Town of Danby zoning laws comport with the Town of Danby Comprehensive Plan.

SECTION 3: DEFINITIONS – The following definitional terms are added to Appendix I, entitled “Definitions,” of the Town of Danby Zoning Ordinance, and these terms shall have the meanings shown:

LOCAL LAW # 3, 2011

**A LOCAL LAW
IMPOSING A MORATORIUM
ON HEAVY INDUSTRY WITHIN
THE TOWN OF ANDES
COUNTY OF DELAWARE**



WHEREAS, the Town of Andes has received requests from its citizens concerning the need to address and possibly regulate heavy industry in the Town; and

WHEREAS, the Town Board has discussed several recommendations for proposed actions, surveys and statutory changes to accomplishment such regulation within the Town; and

WHEREAS, the Town of Andes is also considering local laws to preserve roadways in the Town, as well as other related statutes that may effect the quality of life for all Town residents, and these local laws, if implemented, would have a significant impact on the overall development and regulation of land and road use within the Town;

NOW THEREFORE, BE IT ENACTED by the Town Board of the Town of Andes as follows:

Section 1. PURPOSE

The current local laws of the Town of Andes as currently written may be inadequate to address certain uses of property within the Town. The anticipation of possible heavy

Town of Dansville

Local Law No. 1 of the year 2012

Environmental Conservation Law, Highway Law Section 140, Highway Law section 320, Town Law section 130, and Vehicle and Traffic law section 1660.

A local law entitled "Town of Dansville Road Preservation Law"

Be it enacted by the Town Board of the Town of Dansville as follows:

Section 1. Title.

with damage from endeavors that typically require high frequency use of heavy
This local law may be cited as the "Town of Dansville Road Preservation Law".

Section 2. Authority for this Local Law.

The Town Board of the Town of Dansville enacts this local law under the authority granted by Section 10 of the New York State Municipal Home Rule Law, New York State Constitution Article IX § 2(c)6, Town Law, subsection 1(ii)(a)(6), subdivision 2 of section 23-0303 of the Environmental Conservation Law, Highway Law Section 140, Highway Law section 320, Town Law section 130, and Vehicle and Traffic law section 1660.

Section 3. Purpose.

The purpose of this local law is to maintain the safety and general welfare of Town residents and other using Town highways by regulating high impact commercial activities that have the potential to adversely impact roads and property. The intent is to protect the Town roads and property from damage from endeavors that typically require high frequency use of heavy equipment with heavy loads. It is the intent of this law to protect the Town roads and property from damage from endeavors that typically require high frequency use of heavy equipment with heavy loads.

**Town of Middlefield
PO Box 961
Cooperstown, NY 13326**

RESOLUTION #9 OF 2010

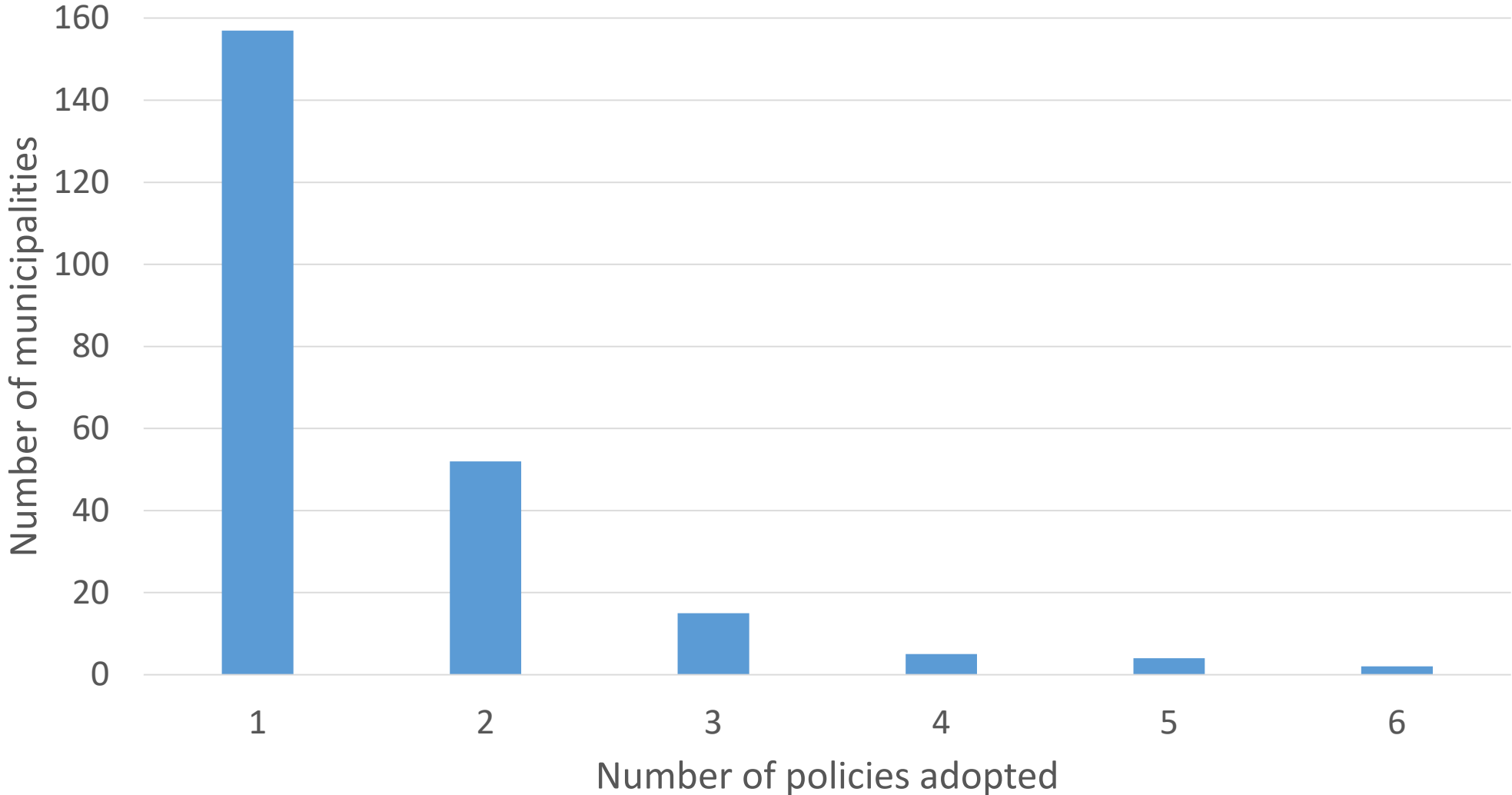
WHEREAS, there has been great debate in the Town of Middlefield, and Otsego County regarding the practice of hydrofracking and horizontal drilling for natural gas in Otsego County, and

WHEREAS, it is the goal of drilling companies that “fracking fluid” never enter ground water, but known cases are in existence in Northern Pennsylvania where wells have been contaminated, and

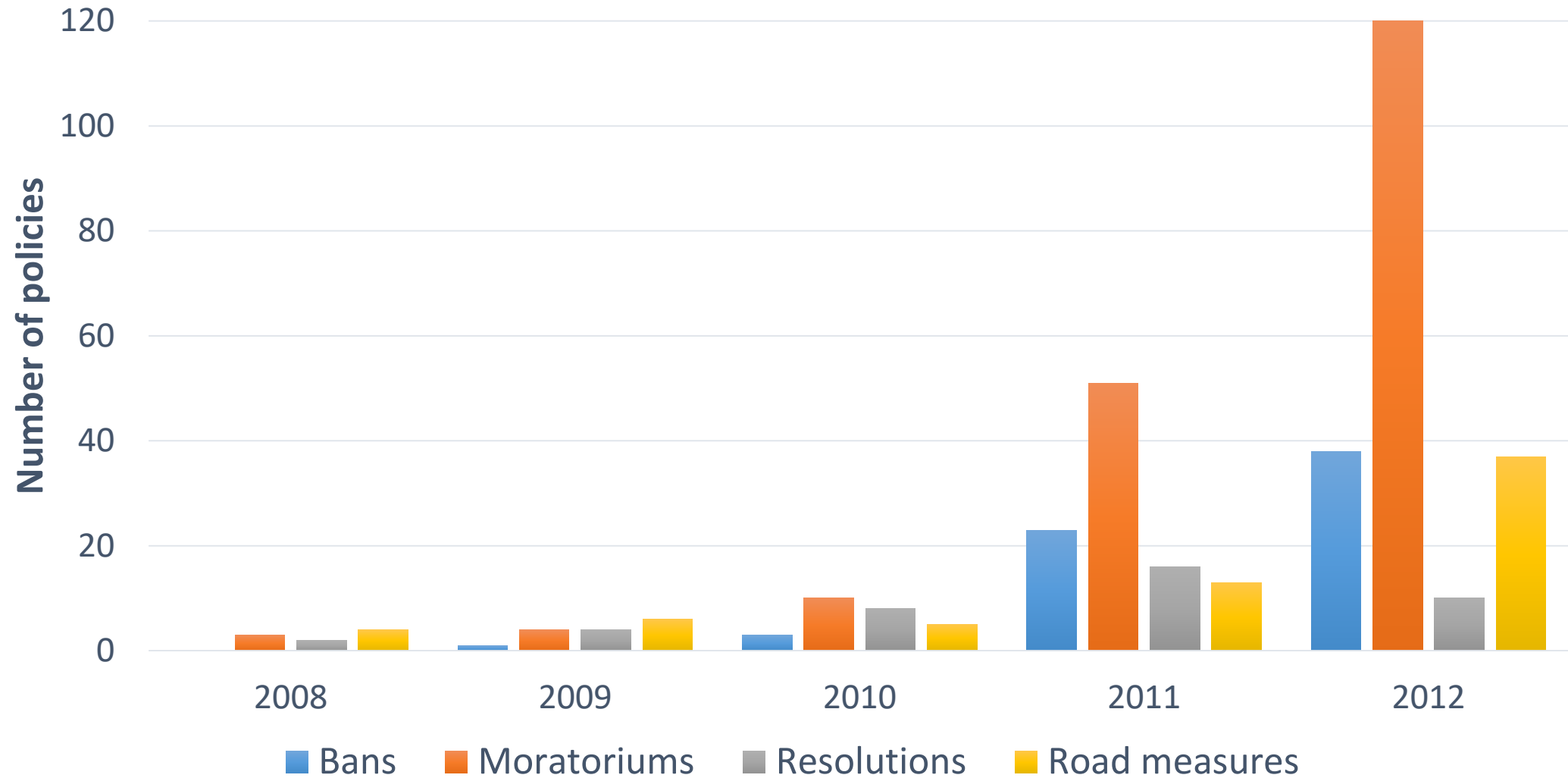
WHEREAS, even though manufacturers have a “proprietary” right to non-disclosure of the composition of the “fracking fluid” used in this process, analysts have found at least 63 different compounds in “fracking fluid” and of these, about three quarters have one or more toxic chemicals known as neurotoxins which affect the activity of the brain and nervous system, and

WHEREAS, we have concern that our Town infrastructure, including our roads, are not to a standard to accommodate the traffic and related activities that will occur from gas drilling in or near our Town, and

Municipalities by number of policies adopted



Policies by type and year



Policy types

- **Bans**: Permanent prohibition on fracking or related activities, usually via zoning
- **Moratoriums**: Temporary (3 months to 3 years) prohibition on fracking or related activities
- **Resolutions**: Expression of anti-fracking sentiment, often asking the state to take anti-fracking action; no real impact
- **Road measures**: Limiting, preventing, or conditioning certain road uses to mitigate infrastructure damage from heavy (fracking-related) truck traffic

How to measure stringency?

- **Duration**

- How much **fracking-protected time** did a municipality secure through the suite of policies it adopted?
- Resolutions not counted
- Permanent measures assumed to last until the end of the study period (January 1, 2013)

- **Number of (unique) policies adopted**

- Adopting more than one policy indicates greater intensity of opposition
- When policies are unique, serial adoption shows a municipality addressing different dimensions of fracking

How to measure stringency?

- **Policy type**

- One or more bans > moratoriums > resolutions > road measures*

OR

- One or more bans > moratoriums > resolutions

*Analyzing road measures with the others may be problematic because of different approach to fracking.

- **Hybrid**

- Frequency (number adopted) AND duration

Type construction

Value	Type with road	Type
1	Road measure	Resolution
2	Road + resolution	Moratorium
3	Resolution	Moratorium + resolution
4	Moratorium + road	Ban
5	Moratorium + road + resolution	Ban + resolution
6	Moratorium	Ban + moratorium
7	Moratorium + resolution	Ban + moratorium + resolution
8	Ban + road	
9	Ban + road + resolution	
10	Ban	
11	Ban + resolution	
12	Ban + moratorium	
13	Ban + moratorium + resolution	

Analysis: Heckman selection models

- Controlling for selection bias is important because stringency can only be observed for municipalities that passed one or more policies.
- First-stage probit selection equation variables selected based on strong predictive value in Arnold and Nguyen Long (2017) and Arnold (2017):

$$y^* = \alpha + \sum [] + \varepsilon$$

where [] is

$\beta(\text{city}) +$

$\beta(\text{population density}) +$

$\beta(\text{logged per capita av. municipal revenue 08-12}) +$

$\beta(\text{contiguous neighbor anti-fracking policymaking 08-12}) +$

$\beta(\text{extent of land use regulatory infrastructure})$

	OLS: Duration (NR)	OLS: Frequency + Duration (NR)	OLS: Type (R)
City			
Land use infrastructure			
Landowner coalition			- ***
Average municipal revenue per capita 08-12			+ **
Obama 08 vote share	+ *	+ **	+ ***
Oil/gas wells, 90-07			+ ***
Shale overlaying			
SES			
Unemployment			
LR or Wald fit test	NS	NS	***
Censored obs	190	190	231

* $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

	OLS: Type (NR)	Ordered logit: Type (R)	Ordered logit: Type (NR)
City			
Land use infrastructure			
Landowner coalition		- ***	
Average municipal revenue per capita 08-12	+ **	+ **	+ *
Obama 08 vote share	+ ***	+ **	+ ***
Oil/gas wells, 90-07		+ **	
Shale overlaying			
SES			
Unemployment			
LR or Wald fit test	***	***	***
Censored obs	191	231	191

* $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

Model predictions

- **Minimum Dem vote share** →
 - Most likely to adopt moratorium *OR* moratorium + resolution (depending on specification)
 - 0.4-1 percent likelihood of adopting a ban/ban suite
- **Minimum revenue** →
 - Moratorium *OR* moratorium + road *OR* moratorium + road + resolution
 - 0.4-1 percent likelihood of adopting a ban/ban suite
- **Maximum Dem vote share *OR* maximum revenue** →
 - ban + one or more other restrictions
 - 85-93 percent likelihood of adopting a ban/ban suite

Take-aways

- Analysis largely **supports the hypotheses**.
 - H1: Larger proportion of **liberal citizens** → more stringency.
 - H2: Greater municipal **wealth** → more stringency.
- Other variables significant in some models are signed in theoretically reasonable ways. Overall, **few other variables are predictive**.
- The models do not effectively predict duration.
- In local policymaking, stringency appears predicted by **expressive** and **resource-related** drivers.

Issues and next steps

Issues

- Duration as measured is not duration as viewed by policymakers.
- Road measures may be interpreted as more stringent than resolutions.
Arguments can be made for different ranking approaches (type models).*

Next steps

- Root theory more strongly in policy design and instrument choice literatures
- Other possible measurements of stringency
 - **Number and size of penalties** (only evaluable with moratoriums, potentially road measures)
 - **Negativity of language** (only evaluable with resolutions, moratoriums, possibly road measures)

*Switching ranking of resolution and road measures in the type (R) models does not change sign or significance of regression coefficients. In general, results are robust to ordering tweaks.

Questions?

First-stage probit models predicting (non)adoption

	Duration	Frequency + Duration	Type w/ Roads (OLS)	Type w/ Roads (ordered logit)	Type (OLS)	Type (ordered logit)
City	1.794*** (0.244)	1.790*** (0.243)	1.753*** (0.511)	1.723*** (0.236)	1.818*** (0.245)	1.800*** (0.245)
Land use	0.226*** (0.038)	0.227*** (0.038)	0.177*** (0.033)	0.177*** (0.033)	0.226*** (0.038)	0.224*** (0.038)
Average municipal revenue per capita, '08-12	-0.417*** (0.081)	-0.412*** (0.081)	-0.442*** (0.075)	-0.443*** (0.076)	-0.423*** (0.081)	-0.422*** (0.081)
Neighbor action	1.442*** (0.107)	1.432*** (0.108)	1.408*** (0.101)	1.396 (0.102)	1.453*** (0.106)	1.439*** (0.107)
Population density	-0.262*** (0.036)	-0.262*** (0.035)	-0.281*** (0.033)	-0.279*** (0.033)	-0.264*** (0.036)	-0.262*** (0.036)
Constant	1.347** (0.552)	1.316** (0.550)	1.975** (0.511)	1.396*** (0.513)	1.388*** (0.552)	1.352*** (0.552)
LR/Wald test of ind. equations χ^2 (1 d.f.)	6.43**	12.70***	23.08***	22.78***	9.34***	9.41***
Uncensored observations	1,322	1,322	1,281	1,281	1,321	1,321

Notes: Two-tailed t-tests of null hypothesis that parameter = 0: ** $p \leq 0.05$, *** $p \leq 0.01$. The specifications with roads include those.

Descriptive statistics (DVs)

Measure	Mean	Stdev	Range
OLS: Duration	1.247	4.273	0-36
OLS: Frequency and duration	1.852	5.300	0-24
OLS: Type (R)	2.547	0.932	0-13
OLS: Type (NR)	0.358	1.073	0-7
Ordered logit: Type (R)	0.437	1.101	0-4
Ordered logit: Type (NR)	0.411	1.099	0-3

Descriptive statistics (IVs)

	Mean	Standard deviation	Min	Max
City	0.027	0.162	0	1
Land use infrastructure	3.733	1.588	0	5
Landowner coalition	0.179	0.383	0	1
Average municipal revenue per capita, 2008-2012 (logged)	6.521	0.754	2.168	11.160
Obama 2008 vote share	0.467	0.086	0.217	0.816
Oil/gas wells, 1990-2007	2.177	10.538	0	173
Neighbor action, 2008-2012	0.227	0.382	0	2
Population density (logged)	5.416	1.912	-0.382	10.015
Shale overlaying	0.682	0.466	0	1
Socioeconomic status	0.076	1.755	-6.341	6.033
Unemployment	0.074	0.035	0	0.241