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Research Article

Policy Expansion in Local Government Environmental Policy Making

Abstract: *Relatively little is known about when, why, and how some jurisdictions "double down" on policy priorities, rapidly adopting multiple measures tackling the same issue. Rapid policy expansion can emerge in fast-evolving, uncertain, and contested policy arenas in which pressures for policy making are not satisfied, and even may be strengthened, by initial policy innovation. This article analyzes local government policy making on high-volume hydraulic fracturing by New York State municipalities from 2008 to 2012. Policy path dependence, peer influence, and policy design appear to play a critical role in determining whether public officials respond to these pressures with policy expansion. Initial policy innovations can open windows for policy participants to secure additional measures that strengthen or enlarge the scope of action. Public officials and stakeholders seeking particular policy outcomes should take a long view of the policy process while simultaneously remaining alert for opportunities afforded by pressurized policy dilemmas.*

Evidence for Practice

- When public officials make policy to address pressing environmental challenges, their actions can have spillover effects, encouraging neighbors to behave similarly.
- Policy design can help lower costs that stakeholders may encounter when seeking to engage in the policy process.
- Adoption of a policy innovation can open a window for entrepreneurial officials to secure adoption of additional measures that strengthen or enlarge the scope of action.
- Institutions and capacities that develop around policies may shape subsequent policy making, even in arenas that are not directly connected.

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Between 2008 and 2012, New York municipalities passed 358 laws and resolutions opposing high-volume hydraulic fracturing (fracking), a controversial, increasingly widespread technique for mining hydrocarbons from underground shale. Eventually, local policies (in conjunction with state limitations) restricted drilling on more than 60 percent of the state's shale-overlaying land, arguably making Governor Andrew Cuomo's 2014 decision to ban fracking statewide fait accompli (Kaplan 2014). What factors drove this wave of local policy making? And what can practitioners learn from it?

A notable dimension of this local campaign was the willingness of 78 municipalities to "double down" on anti-fracking policy making, passing multiple measures addressing different dimensions of the issue. We find that serial adoption built and sustained the movement's momentum, creating positive feedbacks that made a jurisdiction more likely to adopt additional measures and encouraged other jurisdictions to act. This phenomenon—policy expansion, the adoption of two or more topically similar policy innovations by the same jurisdiction (Boehmke and Witmer 2004; Tolbert, Mossberger, and McNeal 2008)—can manifest when policy dilemmas remain "pressurized" by political conflict, public contestation, and technical uncertainty. The New York fracking case is textbook example of a pressurized policy dilemma (Arnold, Long, and Gottlieb 2017; Dodge and Lee 2017). So are many of the "wicked" policy problems faced by officials in a range of substantive areas, where uncertainty, dynamism, and value conflicts can result in ongoing demands for policy action.

Our analysis of New York municipal fracking policy making demonstrates the critical role that policy path dependence,[1] peer jurisdiction behavior, and stakeholder access play in determining whether public officials respond to pressurized dilemmas with policy expansion. Officials in jurisdictions where past policy making has established a commitment to particular

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development patterns or quality-of-life standards are apt to respond to threats to those commitments in oppositional ways. Officials exposed to information about neighboring jurisdictions' policies are more likely to adopt similar measures and to adopt additional measures in response to ongoing pressure and available exemplars. When previous relevant policy-making efforts are inclusive, encouraging public engagement, stakeholders may be more likely to remain involved in the policy process and encourage additional policy action.

Fracking Prompts a Spate of Local Environmental Policy Making in New York

New York overlays 20,569 square miles of the Marcellus Shale, the world's largest unconventional natural gas reserve (Pierce, Coleman, and Demas 2011). Fracking was anticipated to generate more than 54,000 jobs in New York over 30 years and increase public revenues by $32 million to 126 million annually (Rugh 2012). Yet these benefits are largely unrealized. In 2008, when fracking was ramping up elsewhere, New York became the first state to adopt a fracking moratorium. The moratorium's stated goal was to give state officials time to tailor regulations to the new challenges fracking posed (Executive Order 41, 2010), and it was expected to last a year at most (McLernon 2014). But the large anti-fracking movement that developed in New York belied this expectation.

A number of controversies became grist for anti-fracking advocates seeking stringent state restrictions or a ban. Fracking was linked to groundwater contamination (Osborn et al. 2011); air, noise, and light pollution (Goodman et al. 2016); damage to public infrastructure, particularly roadways (Abramzon et al. 2014); and increased cancer incidence (MacKenzie et al. 2012). The claims of anti-fracking advocates were criticized as overblown and inaccurate by interests that saw the industry as an economic lifeline for New York's economically struggling but shale-rich Southern Tier (e.g., Festa 2013). Landowners interested in fracking formed associations in at least 14 counties and statewide; initially focused on education and self-help, many of these coalitions morphed into pro-fracking lobbies (Jacquet and Stedman 2011).

Public opinion on fracking was divided (e.g., Siena Research Institute 2011). Science offered little resolution: experts debated fracking's benefits and dangers (Engelder 2011; Howarth, Santoro, and Ingraffea 2011), disputed its role in water contamination (Davies 2011; Osborn et al. 2011; Saba and Orzechowski 2011; Warner et al. 2012), and argued over a federal study that appeared to find fracking fluid in Wyoming groundwater (Lustgarten 2013). Struggles between pro- and anti-fracking interests buoyed the moratorium until Governor Cuomo banned fracking entirely (Sadasivam 2014).

Local policy making played a critical role in this ban (Mufson 2014). Stymied by the protracted state regulatory process, anti-fracking advocates shifted their lobbying to local governments. Municipalities, particularly those overlaying shale, were pressured to address fracking by tourism interests concerned that fracking would depress "heritage tourism" and the growing wine industry (DeWitt 2012); environmentalists concerned about contaminated groundwater, air pollution, and habitat destruction (Dutzik, Ridlington, and Rumpler 2012); and residents concerned about quality-of-life impacts. Leveraging New York's tradition as a strong home rule state[2] (Kenneally and Mathes 2010), advocates encouraged localities to leverage land-use controls to hobble the industry locally and use anti-fracking measures as signals to state decision makers of localities' opposition to fracking (Arnold, Long, and Gottlieb 2017; Mufson 2014).

A number of localities responded as advocates hoped. Some acted out of concern that the state would allow fracking before localities could study and respond to potential local impacts. Others, worried that state regulations would be overly permissive, sought to preemptively establish a stringent regulatory regime. Others acted to mitigate fracking's likely impacts on local infrastructure, restricting and requiring financial bonding for fracking-associated heavy truck traffic. Municipalities adopted one or more of four types of policies: bans, moratoriums, resolutions, and road measures.

Policy Innovation: Not One-and-Done

Studies of policy innovation and diffusion largely do not focus on variation in the number or nature of innovations adopted. By decontextualizing policy innovation, this approach limits our ability to understand resulting changes in a substantive issue area. It also paints a sterilized picture of the politics that drive policy (Karch 2007), failing to capture how public officials iteratively respond to pressures from political actors and how those pressures may open windows for additional policy change (Kingdon 1984).

Many policy innovation scholars employ event history analysis, a statistical approach that allows simultaneous consideration of internal and geographic determinants of a binary adoption outcome (Berry and Berry 1990). This approach models a jurisdiction's initial foray into a new policy space (Berry and Berry 2007), implicitly or explicitly operationalizing innovativeness as earliness of policy adoption. From this vantage, the timing of a jurisdiction's policy adoption defines its innovativeness, not the design of the policy itself or any subsequent (non)activity in the same policy area.

This view is myopic. Timing as a heuristic for innovation misses variation in attentiveness, creativity, and resource investments that may characterize a jurisdiction's approach, potentially yielding programs of substantially different quality and scope (Clark 1985; Glick and Hays 1991; Tolbert, Mossberger, and McNeal 2008). Policy making and innovation are rarely one-and-done events but rather are incremental processes (Lindblom 1959; Rice and Rogers 1980). Initial actions may be intended to pave the way for subsequent actions. For example, the City of San Francisco tackled plastic bag use with successive policies, first banning plastic bags in grocery stores in 2007, then amending the ban to cover retail stores in 2012 and grocery stores in 2013 (Zaremba 2012). Subsequent actions may be required to make initial actions substantively meaningful. Joining the U.S. Conference of Mayors' Climate Protection Agreement, for example, has little consequence if not followed by complementary changes in building codes and government purchasing (see Krause 2012).

A jurisdiction's innovativeness in a policy area may be most accurately defined not by a single action but as a property of

its policy trajectory, constituted by the series of decisions to complement, supplement, replace, or even walk back previous innovations on an issue. This coheres with the behavior of strategic political actors, who often use "salami tactics," dividing risky proposals into smaller steps and presenting them iteratively to decision makers, so that each step makes the next more palatable (Zahariadis 2007). We argue, therefore, that a jurisdiction's innovativeness can be operationalized as the number, type, and nature of related policy innovations it adopts in response to an issue—in other words, as policy expansion.

Policy Expansion

Policy adoption is a response to political pressures, both internal and external, by jurisdictions with capacity and willingness to respond (Shipan and Volden 2006). Policy expansion is iterated policy adoption (Boehmke and Witmer 2004). It can manifest when pressure for policy making is not dissipated, and in fact may be enhanced, by initial policy action.

A modest literature investigates whether and how policies are modified, or "reinvented," over time (e.g., Boehmke and Witmer; Glick and Hays 1991; Mooney and Lee 1995, 1999; Volden 2006). These studies are largely concerned with how later adopters change the design of a policy, comparing the choices of early versus late adopters and their determinants. Few consider iterated actions by the same jurisdictions. Those that do tend to explore how factors that emerge during policy implementation, and changing contextual conditions, may prompt policy modification. These studies understand modifications as changes to a policy once accepted as a definitive solution to a policy problem. Modifications become likely when stakeholders and decision makers no longer perceive the policy as adequate.

In contrast, we argue that jurisdictions may adopt suites of policy tools in which any single tool may not be widely viewed as a satisfactory, comprehensive, or final solution; the policy situation remains "pressurized." This can happen when uncertainties over the problem to which a policy is applied persist despite the policy's adoption or when popular interpretations and narratives about the problem are in flux and contested (Dodge and Lee 2017). In such cases, policy expansion is evidence of public officials attempting to piece together a whole policy solution; officials' changing understandings of the problem are reflected in their choices to address it anew.

When a policy situation remains pressurized because of political conflict, serial policy adoption may also be a strategic phenomenon. Advocates who are victorious in a contentious policy arena may act to consolidate power, seeking additional policies to further entrench their preferred policy regime. These measures may make it difficult for their successors to change policy (Moe 2005), both by explicit design and because of the inertia that develops around extant institutions (Pierson 2000). For example, the U.S. Senate's rule change allowing approval of high court nominees with a simple majority is expected to reduce the likelihood of the minority party successfully opposing an appointee. An initial policy success (the election of President Donald Trump and a Republican Senate majority) created a window of opportunity that officials leveraged into additional policies designed to cement power and policy preferences. Three dynamics may make public officials more likely to respond to pressurized policy dilemmas with policy expansion: path dependence, neighbor effects, and action-spurring policy design.

Path Dependence

Path dependence is the notion that a course of action can be difficult to reverse once introduced because it catalyzes positive feedbacks that raise the costs of switching paths (Baumgartner and Jones 1993; Pierson 2000). It is tightly linked to the argument that "policy creates politics" by shaping societal perceptions of the focal issue (Schattschneider 1935). These perceptions then "feed forward" to affect future policy action (Pierce et al. 2014; Schneider, Ingram, and DeLeon 2014). Policies that assign benefits to some social groups create constituencies likely to advocate for continued receipt of benefits (Mettler and Soss 2004; Schneider and Ingram 1993).

Path dependence suggests that when policies are more widely applied, they become more entrenched in the repertoires of actors who deploy them, assuming a "taken for granted" status that resists modification (e.g., Brown, Ashley, and Farrelly 2011). For example, states that imprison more people under "three strikes" laws are less likely to modify such laws (Karch and Cravens 2014). Boehmke and Witmer (2004) find that states that allow casino gaming are more likely to adopt and expand Indian gaming compacts, arguably because their polities and legal institutions are already receptive to such endeavors.

Interest groups advantaged by policies further entrench path dependence by mobilizing to resist policy change. States are less likely to modify three strikes laws when they have a prison officers' union and rely more heavily on private prisons presumably advantaged by such laws (Karch and Cravens 2014). Similarly, states with larger collections of stakeholders involved in Head Start implementation experience more stakeholder lobbying against programs they view as competition, lowering the likelihood of such states supporting separate publicly funded preschools (Karch 2010).

In New York, we expect that municipalities with government units devoted to land-use management, such as zoning boards,[3] and regulations which these units implement, such as site planning requirements, will be more likely to pursue anti-fracking actions because they are accustomed to regulating local concerns rather than waiting for state or federal action. They also are likely to have accumulated institutional capacity in the form of programmatic resources, staff expertise, and institutional memory (Wolsink 2000) to support such action. Policy actors "look for work" (Zahariadis 2007), and their units seek to sustain themselves (Meyer and Rowan 1977), often seeking out new tasks (Cooley and Ron 2002). Public officials are a constituency whose preferencing by past policies enables their future involvement in fracking policy making. We also expect that municipalities whose past policies have addressed tourism or environmental concerns will be more likely to pursue anti-fracking policies because these policies are likely to have politically empowered constituencies which view fracking as threatening. We posit the following:

> **Hypothesis 1**: A municipality with more past policies inimical to fracking will be more likely to adopt anti-fracking policy innovations and pursue policy expansion.

Neighbor Effects

Jurisdictions may adopt fracking policy innovations and pursue expansion based on neighbor effects, changes in a municipality's motivations and capacities for policy adoption that result after learning of adoption of similar policies by peers or neighbors (Berry and Berry 2007). Another jurisdiction's adoption of a policy innovation enables focal governments to observe the innovation and gauge the costs and benefits of a similar policy choice (Walker 1969). Given fracking's high media profile during the study period and extensive on-the-ground activism in New York (Arnold, Long, and Gottlieb 2017), New York localities were likely to know whether neighbors had passed fracking measures.

A number of mechanisms underpin neighbor effects; a jurisdiction may adopt a policy because it is mimicking, learning from, or economically competing with a neighbor or because both are affected by coercion from a higher level of government (Shipan and Volden 2008). Mimicry and learning appear most salient to the New York case; confronting a new, controversial, uncertainty-shrouded topic, local governments may have looked to neighbors for best policy practices and/or examples of ways to satisfy (or defuse) local anti-fracking pressures. For example, in June 2011, at a public meeting of the Town Board of Alfred, a local college professor "presented the [moratorium-associated] resolution and explained that other towns in New York State are adopting moratoriums."[4] In November 2011, Alfred adopted its first a moratorium. In October 2008, at a similar meeting in the Town of New Lisbon, the town supervisor "noted that New Berlin is adopting rules for gas drilling and other towns have adopted moratoriums."[5] New Lisbon adopted its first moratorium in the same month. As more neighbors took action on fracking, public officials may have experienced increasing pressure to behave similarly (e.g., Volden 2002; Yi, Krause, and Feiock 2016).

Boehmke and Witmer (2004), examining states' initial adoption of Indian gaming compacts and the number of compacts they subsequently adopt (expansion), find support for the argument that while neighbor effects drive policy innovation, they negligibly affect subsequent policy (non)expansion. The authors reason that once a jurisdiction adopts a policy, it can use its own experience to gauge policy effectiveness and determine whether the policy should be continued, terminated, or replaced; the jurisdiction no longer relies on information or cues from others.

We posit that it is unlikely that a government would abandon a source of information just because a new resource (its own experience) becomes available. It may be desirable to continue observing and/or learning from neighboring governments while officials process and evaluate the jurisdiction's own policy experiences, particularly when the issue is new, contested, and uncertain. Moreover, given the diversity of policy types jurisdictions could use to address fracking, a jurisdiction's experience with one of these policies might not provide applicable information when its officials subsequently consider a different type. In such situations, drawing lessons and examples from other jurisdictions could be particularly useful. We thus expect that neighbors' policy making will impact adoption decisions, both initially, in the choice to take action on fracking, and over time, as jurisdictions grapple with pressures for policy expansion.

> **Hypothesis 2**: Municipalities experiencing more policy influence from neighboring municipalities will be more likely to adopt anti-fracking policy innovations and more likely to pursue policy expansion.

Action-Spurring Policy Designs

Engaging with public institutions can be costly for stakeholders in terms of time, acquisition of relevant knowledge, and acquisition of access-facilitating resources (Irvin and Stansbury 2004). However, previous successful interactions with local political institutions can embolden stakeholders to engage politically by lowering perceived and actual burdens of engagement (Herd et al. 2013). Previous forays into advocacy may build stakeholders' capacity for mobilization, establish a positive rapport with public administrators, and result in "lessons learned" about strategies for productive lobbying (Bingham, Nabatchi, and O'Leary 2005).

Through policy design choice, public administrators can shape the visibility, and thus viability, of future policy making on an issue (Moynihan and Soss 2014). Policies that explicitly encourage stakeholder engagement can foster stakeholders' subsequent political participation, potentially resulting in additional policy making. Policies containing few or no inclusive mechanisms are less likely to have similar results. Expansion should be favored when jurisdictions adopt the former type of design initially rather than the latter type.

In New York, both nonbinding resolutions and temporary moratoriums frequently called on citizens, stakeholders, and officials to learn more about fracking's impacts, sometimes in collaboration. Moratoriums often explicitly stated policy makers' intent to revisit the question of local fracking regulation, institutionally establishing opportunities for reengagement. For example, in 2011 Augusta adopted a moratorium to "allow necessary time for the Town Board to examine whether additional local regulation is necessary [and] the extent of such regulation."[6] Anti-fracking advocates saw the moratorium as a signal of the board's receptivity to restricting fracking locally and rallied stakeholders to push for additional policy making, as shown in public meeting minutes from June 2012: "Some [members of the] public... reiterated that, as shown by petitions that were submitted, that it is evident that 2/3 of the town[']s constituents want Hydr[o]fracking banned."[7] Augusta adopted two more anti-fracking policies in the next 12 months.

In contrast, bans and road measures are definitive actions to solve policy problems. They do not invite revision or reconsideration of an issue and are permanent unless repealed. Moreover, the technical specificity of road measures and their appearance of narrow focus on transportation impacts may have limited the ability of nonexpert stakeholders to understand these measures' connection to fracking and/or engaging meaningfully. We posit the following:

> **Hypothesis 3**: A municipality that initially adopts a resolution or moratorium will be more likely to pursue policy expansion than a municipality that initially adopts a ban or road measure.

Data and Methods

Modeling Approach

We use multivariate regression models to investigate anti-fracking policy expansion by local governments in New York ($n = 1{,}531$)[8]

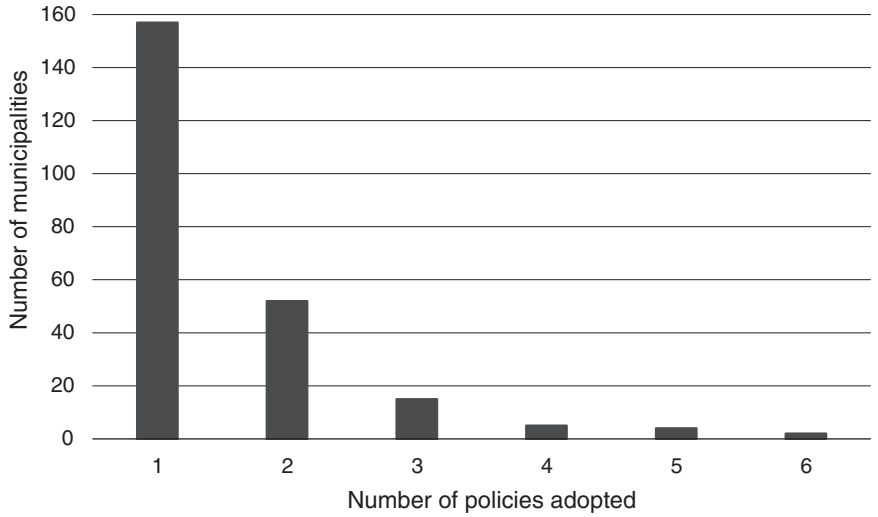


Figure 1 Municipalities by Number of Policies Adopted

each year, 2008–12, and across this period. New York municipalities first adopted anti-fracking policies in 2008, and the rate of passage substantially slowed by late 2012 (Dokshin 2016).[9]

Negative binomial regression models the number of policies a jurisdiction adopts across the entire period. Logistic regressions predict whether a jurisdiction adopts one or more policies each year. The logistic regressions also allow exploration of the feed-forward effects of specific policy designs (hypothesis 3). The logistic functional form is appropriate for outcomes bounded by 0 and 1, and the negative binomial approach is appropriate for count data affected by overdispersion.[10]

The advantage of the overall negative binomial model is that it uses all available data. A disadvantage is that it may attribute causal influence to temporally implausible dynamics: support for hypothesis 2 could be inferred from a jurisdiction passing a policy in 2008 and experiencing neighbor effects in 2011. It also cannot evaluate how a jurisdiction's past policy making on fracking affects subsequent choices.

The annual logits avoid these problems by considering the cumulative impact of the fracking-relevant policy actions by neighbors and by the focal jurisdiction only in previous years. However, unlike the overall model, the annual logits cannot distinguish between adoption and expansion because they predict a municipality's adoption of one or more policies each year; a jurisdiction adopting a third policy in 2011 is treated the same as a jurisdiction adopting its first. Also, the number of policies adopted early on is small: 15 in 2009 and 26 in 2010.[11] When nonzero cases are rare, maximum likelihood estimation can be biased downward (King and Zeng 2001). We use penalized maximum likelihood, which uses one-half the logarithm of the determinant of the information matrix to penalize the log-likelihood, based on Leitgob's (2013) demonstration that this approach appears unbiased even when the number of nonzero cases is small.

Dependent Variables

We collected the full texts of fracking policies passed by municipalities between the start of New York's moratorium through 2012, drawing on lists compiled by FracTracker, Food and Water Watch, and Keuka Citizens Against Hydrofracking. Between January 2013 and 2016, the team checked these sources for updates and searched the internet for news articles documenting fracking policy passage every three to six months. We also searched the New York State Public Law Database (NYSPLD) for fracking-related keywords to identify measures not noted elsewhere. We identified 358 anti-fracking policies passed by 235 municipalities.

We classified all policies into one of four types: bans, moratoriums, resolutions, and road measures. Bans permanently prohibit fracking or related activities, typically drawing on a jurisdiction's land-use and/or police power authorities. Moratoriums temporarily halt fracking and/or associated activities for anywhere from three months to three years.[12] Nonbinding resolutions express local sentiment about fracking. Road measures limit the weight or frequency of vehicles traveling local roads and/or impose conditions on their freight and activities.

Seventy-eight jurisdictions adopted two or more policies (figure 1). Figure 2 shows that early adopters primarily adopted resolutions and road measures. Policy making took off in 2011, with a rapid outbreak in adoption of moratoriums and bans.

Independent Variables

Path dependence (hypothesis 1) is measured three ways. *Land-use tools* counts the number of five core land-use tools (a comprehensive plan, zoning regulations, subdivision regulations, site planning requirements, and a planning board) adopted/established by a municipality in or before 2008 (New York State Commission on Rural Resources 2008). We used the NYSPLD to construct two variables indicating whether, in the five years before the study period, a jurisdiction passed one or more policies referencing "tourism" (*tourism policy, 2003–07*) and "environmental" (*environmental policy, 2003–07*). These variables help assess whether past commitments to low-environmental-impact community development predict similar subsequent action in the form of anti-fracking policies.

Neighbor effects (hypothesis 2) is operationalized by the count of contiguous neighbors adopting unique anti-fracking policies in

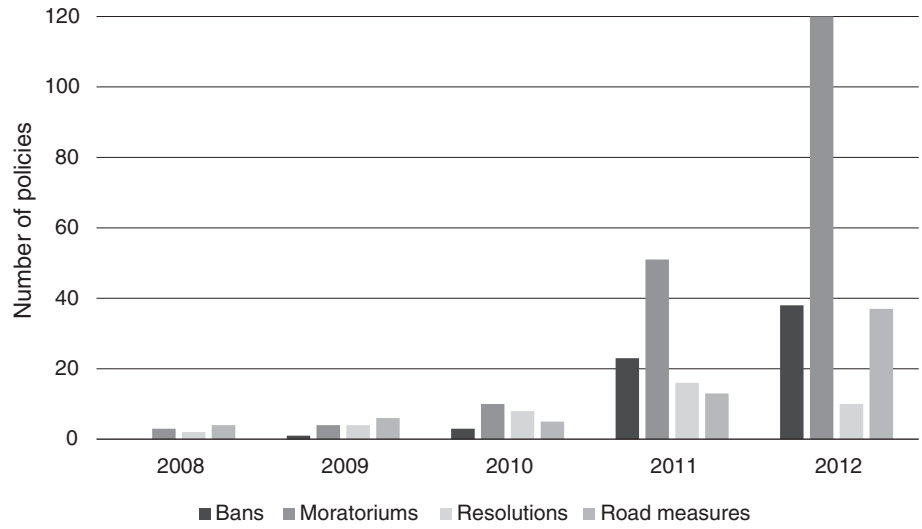


Figure 2 Number of Policies by Type and Year

previous years, normalized by a jurisdiction's number of neighbors. A neighbor adopting multiple policies over the study period is counted each time it adopts a unique type (i.e., we exclude a subsequent policy, such as a second moratorium, that duplicates a previous action). This approach assumes that a jurisdiction is influenced both by awareness that a neighbor is tackling fracking and by the way in which the neighbor addresses it.

Policy design impact (hypothesis 3) is tested with two measures: *past moratorium or resolution* and *past ban or road measure*. These binary variables indicate whether a jurisdiction passed one or more anti-fracking policies of these types in the cumulative years prior to the one considered in an annual logit. Descriptive statistics for these and other variables are reported in table A1 in the Supporting Information online.

Control Variables

The analysis controls for variables found to influence environmental policy innovation or identified as specifically influential in the New York case. Table 1 describes variable construction, data sources, and literature-based expectation for coefficient valences. Municipal revenue measures capacity; better-resourced jurisdictions are expected to have more staff and funds to devote to policy making (Feiock and West 1993). City status is considered because urban areas are less likely to be subject to fracking than rural areas due to lack of available land and more land-use restrictions. Village status is considered because New York villages are service provision districts which overlay town and city boundaries and face uncertainties about which jurisdiction's land-use provisions dominate (NYDOS 2011); this uncertainty may hinder adoption. The number of oil and gas wells drilled proximate to a jurisdiction prior to the moratorium controls for past experience with drilling potentially fostering industry receptivity (Davis 2012; Dokshin 2016). The proportion of the electorate voting for President Barack Obama in 2008 captures citizen liberalism, a common predictor of jurisdiction-level environmental policy adoption (Krause 2011; Ringquist 1994). Fracking is more common in rural areas because of lower land prices and greater open land area (Lane 1994); hence, we control for population density. A jurisdiction's status as shale-overlaying measures its likelihood of being directly affected by fracking. Its socioeconomic status, capturing both education and citizen income, is considered because higher values for both often map to greater likelihood of environmental policy adoption (Krause 2011; Ringquist 1994). Unemployment rate measures economic need, which may discourage citizens and officials from opposing development opportunities such as fracking (Davis 2012). Landowner coalitions[13] tend to form in areas with greatest promise for fracking (Jacquet and Stedman 2011); anti-fracking advocates in these areas would be particularly alert to the threat of fracking and apt try to address it.

Most data used to construct independent variables come from the U.S. Census (2000). We used data from this census, which preceded the start of the U.S. fracking boom in the mid- to late 2000s, to avoid endogeneity: data from the 2010 census could be affected by changes in political, social, or socioeconomic covariates resulting from local actors anticipating fracking or responding to the industry's growth in neighboring Pennsylvania. In some cases, data are from 2008, the year the state's fracking moratorium began.

Results

Table 2 reports the overall (2008–12) negative binomial regression[14] estimating the extent to which each explanatory variable predicts adoption of a single policy (innovation) and adoption of multiple (expansion). Predicted probabilities for this model are reported in table A2 in the Supporting Information online. Table 3 shows the annual logits.

Two of the three path dependence variables positively and significantly predict anti-fracking policy innovation and expansion, supporting hypothesis 1. Their substantive impacts are relatively small. A comparison of predicted probabilities at the 99th and 1st percentiles of these variables[15] shows that municipalities with all five land-use tools in 2008 are expected to be 3.5 percent more likely to adopt a policy compared with those with none and less than a percentage point more likely to expand to two policies. Jurisdictions that passed one or more policies referencing tourism in the five years prior to 2008 are predicted to be 6.2 percent more likely to adopt one anti-fracking policy and 1.1 percent more likely to pass two.

Table 1 Variable Descriptions

Variable	Expected Relationship	Definition	Source
		Dependent variables	
Number of policies adopted, 2008–12	Positive	Count of policies adopted, collapsed into five categories	Original
One or more policies adopted (2009, 2010, 2011, 2012)	Positive	Policy count variable by year, made binary	Original
		Independent variables	
City	Positive: Zirogiannis et al. (2015)	Whether the municipality is a city	NYS Department of State (2016)
Environmental policy, 2003–07	Positive (H1)	Count of the number of laws a jurisdiction passed containing the word "environmental," 2003–07, collapsed into 14 categories	NYS Department of State Local Laws Database (2017)
Fracking policy making by type: ban/road and mor/res, by year and summed across years	Positive (H3)	Whether a jurisdiction adopted at least one ban or road measure, or at least one moratorium or resolution, in the years considered	Original
Land-use tools (number in 2008)	Positive (H1)	Sum of five binary variables indicating existence of core land-use tools: comprehensive plan, zoning regulations, subdivision regulations, site plan review, planning board	NYS Commission on Rural Resources (2008)
Landowner coalition	Positive: cf. Jacquet and Stedman (2011)	Whether a landowner coalition was identified in the county	Original
Municipal revenue per capita (logged), by year starting in 2007	Positive: Feiock and West (1993); Krause (2011); Shipan and Volden (2008)	Own-source municipal revenue (excludes state and federal grants, aid)	NYS Comptroller (2017)
Neighbor action (unique policy types, by year and summed across years)	Positive (H2)	Number of contiguous neighbors adopting anti-fracking policies in previous years, normalized by a jurisdiction's total number of neighbors. A neighbor adopting multiple policies is counted each time it adopts a unique type (e.g., moratorium, resolution) but not when a subsequent policy duplicates a previous action	Original
Obama 2008 vote share	Positive: Barnes (2013); Dokshin (2016); Walsh, Bird, and Heintzelman (2015); Zirogiannis et al. (2015); Krause (2011); Ringquist (1994)	The proportion of the electorate selecting President Obama in 2008; for villages, the average proportion(s) of the town(s) surrounding them	Naigles (2014)
Oil/gas wells, 1990–2007	Negative: Davis (2012); Dokshin (2016); Walsh, Bird, and Heintzelman (2015); Zirogiannis et al. (2015)	The number of wells drilled within a 10-mile buffer of the jurisdiction in the noted period	NYS Department of Environmental Conservation (2014)
Population density (logged)	Negative: Barnes (2013); Walsh, Bird, and Heintzelman (2015); Zirogiannis et al. 2015	A jurisdiction's population divided by its land area	U.S. Census (2000)
Shales	Positive: Dokshin (2016); Walsh, Bird, and Heintzelman (2015); Zirogiannis et al. 2015	Whether a jurisdiction overlays the Marcellus or Utica Shales	GIS
Socioeconomic status	Positive: Barnes (2013); Berry and Berry (1992); Boehmke and Witmer (2004); Krause (2011); Shipan and Volden (2008); Ringquist (1994)	Sum of two standardized variables: per capita personal income and proportion of citizenry achieving a high school degree or equivalent by 25	U.S. Census (2000)
Tourism policy, 2003–07	Positive (H1)	Count of the number of laws a jurisdiction passed containing the word "tourism," 2003–07, made binary	NYS Department of State Local Laws Database (2017)
Unemployment	Negative: Barnes (2013)	Proportion of jobless citizens seeking/available for work	U.S. Census (2000)
Village	Negative: Walsh, Bird, and Heintzelman (2015); Zirogiannis et al. (2015)	Whether a municipality is a village	NYS Department of State (2016)

Notes: The second column notes expected coefficient valence and, for control variables, supporting literature. Fracking-specific studies are followed by representative citations to the wider adoption literature.

Previous environmental policy making does not seem to determine adoption or expansion significantly.

Land-use tools is always positively signed in the annual logits and is significant in one. *Tourism policy* is positively signed in three of the four annual models. *Environmental policy* is negatively signed in most years but never statistically significant. Table 3 suggests that both tourism and preexisting land-use infrastructure have greatest influence over policy adoption in 2011.

Consistent with hypothesis 2, neighbor effects are positively associated with adoption of anti-fracking policy innovations initially and over time. In the overall model, municipalities with no neighbors adopting anti-fracking policies (1st percentile on *neighbor action*) are expected to have a 4.6 percent chance of adopting. Jurisdictions whose neighbors all adopted anti-fracking policies, and at least some of which adopted more than one unique measure (99th percentile), are 24.1 percent more likely to adopt one anti-fracking policy, 17.6 percent more likely to adopt two, 9.7 percent more likely to adopt three, and 5 percent more likely to adopt four or more. *Neighbor action* is the only variable for which the 1st to 99th percentile shift yields a greater than 1 percent increase in predicted likelihood of adopting four or more policies.

Table 2 Negative Binomial Regression Predicting Anti-Fracking Policy Adoption, 2008–12

		Coefficient	SE
City		.583	(.411)
Environmental policy, 2003–07		–.021	(.028)
Land-use tools (number in 2008)		.128***	(.048)
Landowner coalition		.123	(.143)
Municipal revenue per capita (logged), 2007		–.204*	(.110)
Neighbor action, 2008–12		1.667***	(.136)
Obama 2008 vote share		.021***	(.008)
Oil/gas wells, 1990–2007		–.002	(.007)
Population density (logged)		–.159**	(.079)
Shales		1.352***	(.419)
Socioeconomic status		.076	(.060)
Tourism policy, 2003–07		.785***	(.259)
Unemployment		2.644	(.333)
Village		–1.992***	(.355)
Wald χ^2 (14)	396.73***		
R^2 (McFadden's)	0.226		

Notes: $N = 1{,}515$ because of missing data and listwise deletion. Constant is omitted and robust standard errors are used. Two-tailed *t*-tests of null hypothesis that parameter = 0:
*$p \leq 0.10$, **$p \leq 0.05$, ***$p \leq 0.01$.

Table 3 Logistic Regressions Predicting Anti-Fracking Policy Adoption by Year and Type of Previous Fracking Policy Adoption

	2009	2010	2011	2012
City	3.83**	–1.718	.823	.386
	(1.930)	(1.793)	(.754)	(.626)
Environmental policy, 2003–07	.054	–.057	–.041	–.021
	(.127)	(.086)	(.050)	(.036)
Land-use tools, 2008	.241	.180	.281**	.040
	(.239)	(.241)	(.117)	(.070)
Landowner coalition	1.652***	.315	.385	.048
	(.630)	(.542)	(.293)	(.220)
Municipal revenue per capita (logged) in prior year	–.897*	–.055	.286	–.290
	(.514)	(.459)	(.257)	(.184)
Neighbor action (cumulative prior years)	1.793	2.294*	1.701***	1.410***
	(3.965)	(1.327)	(.636)	(.314)
Obama 2008 vote share	.055*	.058**	.028*	.027**
	(.033)	(.025)	(.016)	(.012)
Oil/gas wells, 1990–2007	.014***	.009*	–.005	–.005
	(.005)	(.005)	(.015)	(.008)
Past moratorium or resolution (cumulative prior years)	3.482***	2.522***	2.635***	1.509***
	(1.001)	(.884)	(.515)	(.290)
Past ban or road measure (cumulative prior years)	1.510	.048	.932	–.624
	(1.588)	(1.726)	(.624)	(.414)
Population density (logged)	–.676*	–.003	–.153	–.168
	(.369)	(.236)	(.141)	(.105)
Shales	.912	2.970**	2.025***	2.099***
	(.972)	(1.490)	(.589)	(.406)
Socioeconomic status	.010	.388*	–.061	.075
	(.289)	(.234)	(.115)	(.083)
Tourism policy, 2003–07	–.420	.810	.739*	.589
	(1.514)	(.771)	(.442)	(.362)
Unemployment	10.101	–8.631	–6.934	1.457
	(6.756)	(9.786)	(4.826)	(3.001)
Village	1.562	–1.558	–1.918***	–1.767***
	(1.272)	(1.039)	(.709)	(.480)
Wald χ^2 (16)	37.71***	43.89***	104.80***	139.53***
R^2 (Tjur's)	.104	.126	.202	.190

Notes: $N = 1{,}514$–$1{,}516$ because of missing data and listwise deletion. Estimates produced using penalized maximum likelihood. Standard errors in parentheses. Constants are omitted. Two-tailed *t*-tests of null hypothesis that parameter = 0:
*$p \leq 0.10$, **$p \leq 0.05$, ***$p \leq 0.01$.

Table 3 indicates that neighbor effects begin affecting adoption and expansion likelihood in 2010. The number of neighbors taking action in 2008 appears to have been too low to generate a discernable trend in 2009. Alternatively, officials may need time to recognize and act on exemplars of neighbors. While the annual models cannot be directly compared because some covariates vary, the fact that the predicted probabilities for *neighbor action* increase in each annual model when this variable is significant (see figure 3) suggests that the influence of neighbors may increase over time. This trend is sensible because the exemplars and social pressures offered by other jurisdictions accumulate over time.

The annual analyses support hypothesis 3. Table 3 shows that prior adoption of a moratorium or resolution positively influences expansion in 2009, the first year this effect could exist, and remains a positive, statistically significant driver in each successive year. However, previous adoption of a ban road measure does not significantly predict subsequent policy adoption in any annual model.

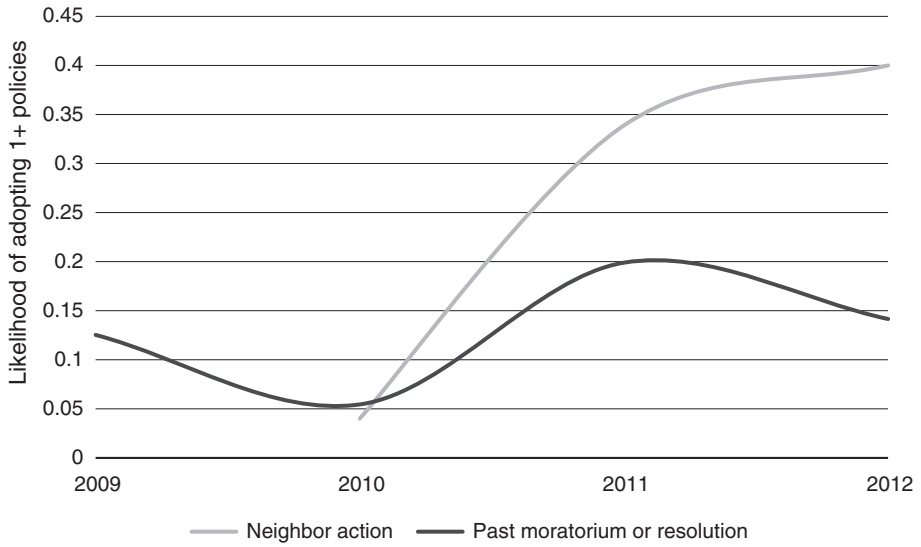
Figure 3 presents predicted probabilities for *neighbor action* and *past moratorium or resolution,* calculated from the table 3 annual logits when these variables are significant. These predictions suggest that once neighbor effects begin, they have a larger impact on adoption and expansion than the type of first policy a jurisdiction adopts.

In the overall model, all the control variables are signed as expected except municipal revenue and unemployment. Municipal revenue, 2008 presidential vote share, population density, and village status are the only statistically significant controls. While greater municipal revenue was expected to predict adoption and expansion, in this analysis it does not: more poorly resourced municipalities are actually more likely to tackle fracking through policy. The nature of policies themselves, as well as the location of poorer municipalities, may help explain this result. Model anti-fracking policies were distributed to jurisdictions by neighboring jurisdictions, legal experts, and advocacy groups (Arnold, Long, and Gottlieb 2017). This assistance may have allowed poorer municipalities to adopt despite deficits of expertise and manpower. Moreover, location over the shales and municipal revenue are significantly negatively correlated ($\sigma = -0.260$, $p \leq .000$), suggesting that poorer jurisdictions faced greater likelihood of experiencing drilling and potentially had greater incentive to address the issue. Finally, the negative expectation for unemployment was rather weak; only one of four studies of New York municipal fracking policy adoption found unemployment dissuasive (Barnes 2013).

Discussion

These results provide important insights into when, why, and how jurisdictions pursue policy expansion, the adoption of multiple policy innovations tackling the same issue. This phenomenon can manifest when a policy dilemma is "pressurized" by political conflict, public contestation, uncertainty, and public officials' policy responses to these pressures maintain or increase rather than defuse their impact.

Jurisdictions with a preexisting commitment to quality-of-life standards and development patterns inimical to fracking—as



Note: The predicted probabilities are based on the annual logistic regressions in table 3. Other variables are held at their means. Neighbor action is not significant in 2009.

Figure 3 Predicted Percent Increase in Adoption Likelihood, 1st to 99th Percentile

indicated by a more comprehensive land-use regulatory apparatus and tourism-oriented laws—are more likely to adopt and expand on anti-fracking policies. This finding is consistent with Moynihan and Soss's (2014) contention that previous policies influence subsequent ones by shaping the motivations, capacities, and opportunity structures of public servants. In these jurisdictions, officials already have tools to address concerns raised by fracking and precedent for and experience with such action.

In the annual analyses, *land-use tools* and *tourism policy* are only significant in 2011. This may have occurred because in 2011, policy making shifted toward bans and moratoriums (figure 1), measures likely to leverage land-use authorities, and away from nonbinding resolutions and road measures (which typically draw authority from vehicle and traffic laws in addition to land-use authorities). The return to nonsignificance of *land-use tools* in 2012 may be explained by jurisdictions with preexisting land-use infrastructure being particularly likely to adopt land-use-reliant measures earlier (in 2011), and other jurisdictions following them (in 2012), in some cases adopting land-use authorities along with measures targeting fracking. *Tourism policy* exhibits the same trend, potentially because it is correlated with *land-use tools* (Spearman's $\sigma = 0.119$, $p \leq .000$). Jurisdictions interested in promoting tourism may use land-use tools to do so (e.g., designating historic districts).

It is also interesting that past environmental policy making (*environmental policy*) frequently yielded negative, nonsignificant coefficients. This is inconsistent with findings that cities adopt more climate change policies when they already have a sustainability office (Bae and Feiock 2011) and are more likely to adopt recycling programs when they already run solid waste collection programs (Feiock and West 1993). Since "environmental" can be used in a variety of contexts, counts of its use may result in a great deal of statistical noise. Alternately, wealthier municipalities, which are significantly less likely to overlay New York's shales and to pass anti-fracking policies, are modestly but significantly more likely to have adopted environmental policies, 2003–07 (point-biserial $\sigma = 0.097$, $p \leq .000$). Fracking's lower salience in these jurisdictions may have limited the feed-forward effects of past environmental policy making.

A jurisdiction's own past policy making can sustain or amplify pressure for additional policy action. The design of the policy itself can affect the likelihood of subsequent action by creating or forestalling opportunities for stakeholder engagement, as well as by offering policy solutions that are temporary or incomplete (resolutions, moratoriums) versus comprehensive and permanent (bans, road measures). The latter dissipate pressure for expansion; the former foment it.

The policy making of neighbors appears an important catalyst for adopting and expanding on anti-fracking policies. The neighbor effects detected in this analysis and others in New York (e.g., Dokshin 2016; Walsh, Bird, and Heintzelman 2015) hints at possible information sharing between officials and stakeholders in neighboring jurisdictions and/or to policy entrepreneurs offering policy solutions across multiple venues. Future research could investigate whether information exchange and policy entrepreneur activity vary with policy type.

The control variables are generally signed as anticipated, with the above-noted exceptions. Results for the controls differ from previous analyses in failing to find significant effects for oil and gas well proximity (Dokshin 2016; Walsh, Bird, and Heintzelman 2015) and socioeconomic status (Barnes 2013; Walsh, Bird, and Heintzelman 2015; Zirogiannis et al. 2015). Proximity to drilling and personal income are measured differently in each study, potentially explaining the divergence. The fact that our larger, more nuanced data set includes policy types that require fewer resources to adopt (resolutions) and that stood to limit fracking without halting it (road measures) also may help explain the divergent results.

Conclusion

The dominant approach to studying policy innovation obscures the interplay between politics and policy, and particularly how policy outcomes are shaped by public officials iteratively responding to political pressures. The literature's focus on initial policy choices ignores features of innovativeness that are properties of a jurisdiction's policy trajectory on a given issue, where trajectory is defined by the number, type, and nature of measures the jurisdiction deploys. We demonstrate that policy trajectories are shaped by path dependence, neighbor effects, and policy design, in addition to jurisdiction-specific tendencies. Policy adoption can open a window for additional policy making that officials and stakeholders can leverage to strengthen or expand the scope of the initial action.

This study raises questions for future research. Only 28 jurisdictions adopted three or more policies. A data set wherein more jurisdictions repeatedly adopt would allow a deeper investigation of expansion, probing (for example) whether a jurisdiction's approach grows more comprehensive and stringent as it is revised over time (e.g., Glick and Hays 1991; Mooney and Lee 1999). This analysis also focuses on positive policy feed-forward effects and does not address circumstances under which jurisdictions may dismantle, defund, or otherwise sideline previous policies (see Karch and Cravens 2014). These dynamics merit investigation.

Finally, this research has clear importance for public officials and policy advocates. Policy choices can establish policy trajectories by increasing issue visibility and legitimacy, building institutional capacity, creating and empowering constituencies (including public administrators themselves), and activating stakeholders. An initial policy "win" can make subsequent wins more likely, both in the same jurisdiction and in neighbors. That initial win need not be an apogee; symbolic or temporary policy actions can create opportunities for additional policy making even more powerfully than comprehensive or permanent measures. Public officials and stakeholders seeking particular policy outcomes should expect politics to be a long game and play accordingly—while remaining alert for windows of opportunity afforded by pressurized policy dilemmas.

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Notes

1. Path dependency describes the tendency of previous policy actions to feed forward, shaping future policy outcomes.
2. See the Supporting Information in the online version of this article for discussion of home rule in New York.
3. In 2008, zoning boards existed in all New York cities, 89 percent of villages, and 71 percent of towns (NYS Commission on Rural Resources 2008).
4. Town of Alfred, New York, Regular Meeting Minutes, June 9, 2011, http://townofalfred.com/files/town-meeting-minutes/Town-of-Alfred-minutes_2011609.pdf (accessed December 20, 2017).
5. New Lisbon Town Board, Public Hearing on 2009 Preliminary Budget, October 14, 2008. Minutes obtained by the authors through a freedom of information request.
6. Town of Augusta, New York, Local Law #1 of 2011, Moratorium Law on Hydraulic Fracturing and/or Hydrofracking of the Town of Augusta, sec. 2. Obtained by the authors through a freedom of information request.
7. Minutes, Town of Augusta, New York, June 27, 2012. Minutes obtained by the authors through a freedom of information request.
8. We excluded villages dissolved before or during the study period. New York City was omitted because its characteristics are not comparable with those of lower-profile municipalities. A few towns and villages were treated as one because they are administered jointly.
9. The Supporting Information online discusses policies passed between January 1, 2013, and the December 2014 state ban.
10. The mean of the count dependent variable is 0.227 and its variance is 0.623.
11. The Supporting Information online assesses the accuracy of the policy counts.
12. We include moratorium extensions, which add time to previous moratoriums, usually without modifying the original language.
13. There is no official database of landowner coalitions. We began with the most comprehensive online listing, from the Tioga County Landowners Group. We excluded coalitions that lacked an independent online presence and/or advertised services to landowners outside New York. Since many coalitions served landowners county-wide, municipalities in a county with a coalition took a 1 on this variable.
14. The Supporting Information online presents a bootstrapped version of the negative binomial regression, where samples of the data were randomly drawn 500 times (with replacement) to assess the accuracy of results based on a relatively small number of positive cases (78 instances of expansion). All variables statistically significant in the original model remain so except *shales* ($p \leq .113$).
15. In all calculations of predicted probabilities, other variables are held at their means.

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Supporting Information

A supplementary appendix may be found in the online version of this article at http://onlinelibrary.wiley.com/doi/10.1111/puar.12905/full.