The Political Economy of Local Vetoes

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I. Introduction

Political philosophers, welfare economists, and positive political theorists have long puzzled over a problem that the law is frequently called upon to resolve: namely, how to choose the "best" policy when a majority mildly prefers policy *X*, and a minority strongly prefers policy *not X*.[1] This is a frequent subtext of preemption litigation, when disputes between federal and state governments reflect the fact that popular preferences are geographically heterogeneous, and the majority preference in a state is in the minority nationally. Federal preemption doctrine establishes a conceptually straightforward way of addressing this issue, but doctrinal rules governing *state* law preemption of *local* zoning decisions are murkier. In addition, when local zoning rules restrict development, those rules can also trigger regulatory takings claims, further complicating the resolution of these state–local disputes.

According to the environmental group Food and Water Watch, within the last few years more than 400 local governments, from California to Texas to New York, have enacted ordinances restricting or banning within their borders the use of hydraulic fracturing (fracking) to produce natural gas or oil from shale formations;[2] indeed, there are more than 200 of these

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1. James Madison's discussion of geographic factions in Federalist No. 10 concerns this problem. THE FEDERALIST NO. 10 (James Madison). The nineteenth-century utilitarian philosophers, like Jeremy Bentham and John Stuart Mill, wrestled with the problem of accounting for different preference intensities. For a digestible summary of their approaches to this issue, see Robert Cavalier, *The British Utilitarians*, ONLINE GUIDE TO ETHICS & MORAL PHIL., http://caae.phil.cmu.edu/cavalier/80130/part1/sect4/BenandMill.html, *archived at* http://perma.cc/44EF-5F2V. The idea has loomed large in positive political theory as well. Kenneth Arrow's Impossibility Theorem employs what positive theorists call an "ordinality principle," the idea that the one-person-one-vote principle requires us to ignore preference intensities. Kenneth J. Arrow, *Values and Collective Decision-Making*, *in* PHILOSOPHY, POLITICS, AND SOCIETY (THIRD SERIES) 215, 227–30 (Peter Laslett & W.G. Runciman eds., 1978). Responses to Arrow's argument sometimes argue that preference intensity ought to matter. *See, e.g.*, Donald E. Campbell, *Social Choice and Intensity of Preference*, 81 J. POL. ECON. 211, 211 (1973) (proposing a modified form of Arrow's theorem that accounts for intensity of preference). And iconic works in American political theory address the issue. *See, e.g.*, ROBERT A. DAHL, A PREFACE TO DEMOCRATIC THEORY 119 (1956) ("[N]o solution to the intensity problem through constitutional or procedural rules is attainable.").

2. *Local Actions Against Fracking*, FOOD & WATER WATCH, http://www.foodandwaterwatch.org/water/fracking/fracking-action-center/local-action-documents/, *archived at* http://perma.cc/6L

ordinances in New York State alone.[3] These kinds of local vetoes of a state-regulated activity pose the potential for claims that the local ordinance is preempted by state oil and gas regulation, as well as regulatory takings claims by holders of mineral rights devalued by the local ban. In what seems likely to be only the tip of the litigation iceberg, state courts have recently begun to decide state–local preemption challenges to anti-fracking ordinances (rendering only a few opinions to date) and are facing the first few takings claims (none of which have yet been decided).[4] These attempts by local governments to veto local development are essentially fights over the distribution of the costs and benefits of development. This Article explores the distribution of those costs and benefits, how distributional concerns drive the politics that cause these conflicts in the first place, and how the decision rules courts use to resolve preemption and takings claims try to address those distributional concerns.

This analysis is self-consciously policy neutral. That is, it does not proceed by selecting a preferred policy for regulating fracking and then advocating a decision process most likely to produce that policy. Rather, because the risk profile of fracking is still being developed and because there is such disagreement about that profile, this analysis asks which level of government (state or local) is most likely to produce decisions that balance the costs and benefits of shale oil and gas production well. Thus, the focus is on the politics of welfare maximization (or of long-run utility maximization).[5] This analysis will consider the many and varied effects of fracking in terms of costs and benefits: not to quantify them or to suggest that they ought to be quantified but rather as a way of exploring how the distribution of impacts disposes people toward or against shale oil and gas production.[6]

85-KTFE. The website contains links to the local ordinances. *Id.* Some of these ordinances ban oil and gas production generally, some ban fracking, some ban only high-volume hydraulic fracturing (HVHF) (the pairing of fracking with horizontal drilling, requiring the use of larger volumes of water), and some impose regulation that falls short of an outright ban (though a subset of these are de facto bans). *Id.* The list includes ordinances enacted by overlapping jurisdictions. *Id.* For example, in New York State, the City of Ithaca and the Township of Ithaca both lie within Tompkins County. *See Living in Tomkins County*, TOMKINSCOUNTYNY.GOV, http://www.tompkinscountyny.gov/living, *archived at* http://perma.cc/HMH3-XVZL (listing the communities that lie within Tomkins County). All three local jurisdictions have enacted anti-fracking ordinances. *Local Actions Against Fracking*, *supra*.

3. *Local Actions Against Fracking*, *supra* note 2.

4. There are, of course, many older takings cases in the minerals context that predate the fracking era. For a discussion, see generally Bruce M. Kramer, *Local Land Use Regulation of Extractive Industries: Evolving Judicial and Regulatory Approaches*, 14 UCLA J. ENVTL. L. & POL'Y 41 (1996).

5. I use the term "utility" here broadly—the way welfare economists or utilitarian philosophers use it—to include not only the tangible (changes in money, wealth) but intangible (changes in happiness) as well.

6. This analysis does not require a background in economics or utilitarian philosophy, but will employ some common economic or utilitarian concepts, such as Kaldor–Hicks optimality, *see*

Part II describes the emerging conflicts between state law and local ordinances banning or restricting the use of fracking to produce oil and gas. This includes an examination of the risks that motivate these local vetoes, distinguishing scientific assessments of risk from popular perceptions. Part III focuses on state–local conflict over shale oil and gas production. Subpart III(A) examines the small but growing body of cases raising claims that state law preempts local anti-fracking ordinances, noting the lack of cohesion among the cases across and sometimes within state jurisdictions. Subpart III(B) examines the distribution of the costs and benefits of shale oil and gas production in an attempt to determine which jurisdiction (state or local) is best suited to make socially efficient decisions about where fracking occurs. The analysis shows that while most of the costs (especially the least speculative costs) and many of the benefits fall on locals, other significant costs and benefits of production extend beyond local-government boundaries. This suggests that since the state subsumes more of the impacts within its borders than the local jurisdiction, the state is better situated to produce regulation that balances the costs and benefits of fracking. That line of reasoning, however, does not account for differences in preference intensity between host communities and others. Locals and non-locals not only have different preferences over this issue, they also have different preference intensities; these differences influence the political psychology of the fracking debate. Hence most states' approval of regulated fossil-fuel production in the shale regions, coupled with intense local opposition to such production in many localities. Thus, if we want a decision process that accounts for preference intensities (rather than merely preference aggregation), then local-government decision making might do a better job of maximizing welfare *if* local governments can capture more of the benefits of production.

Where courts uphold local anti-fracking ordinances, takings claims are likely to follow. While there are not yet any judicial opinions resolving takings challenges to anti-fracking ordinances, subpart IV(A) explores the nascent and threatened regulatory takings claims that do exist and tries to anticipate the application of the familiar takings doctrine rules to those types of claims. Subpart IV(B) asks whether the right to compensation is likely to increase or decrease welfare, reviewing some of the scholarly thinking on takings and compensation along the way. While scholars have suggested compensation schemes that are *ex ante* efficient, it seems unlikely that the Supreme Court will adjust takings doctrine to permit their

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infra note 179, and Coasean bargaining, *see infra* notes 185–89 and accompanying text. However, it does not include the claim that welfare or utility maximization is the only valid criterion by which these conflicts can be resolved. To the contrary, it acknowledges implicitly Michael Dorff's argument that the choice of how to aggregate utility within a social welfare function implicates values. Michael B. Dorff, *Why Welfare Depends on Fairness: A Reply to Kaplow and Shavell*, 75 S. CAL. L. REV. 847, 850 (2002).

use; rather, it seems more likely that states would allow local governments to capture more of the benefits of fracking directly, which might be another path to efficiency. Part V concludes by acknowledging some of the possible limits of the analysis and with a final defense of the argument that local decision making over fracking can be welfare enhancing in the long run *if* local governments can capture more of the benefits of production.

II. Shale Oil and Gas Production: Risks and Risk Perceptions

A. Local Controversy

Fracking involves the injection of large volumes of water, mixed with sand and chemicals, deep into shale formations to fracture rock, thereby freeing formerly inaccessible natural gas, oil, and other liquid hydrocarbons, which (since they are under pressure at great depths) flow to the surface through the well.[7] The combination of fracking and advances in horizontal drilling[8] has transformed American energy markets, enabling drillers to produce natural gas and liquids from deep shale formations economically, sharply increasing the domestic supply of gas[9] and oil,[10] and driving domestic natural gas prices to record lows.[11] Low prices have

7. Thomas W. Merrill & David M. Schizer, *The Shale Oil and Gas Revolution, Hydraulic Fracturing, and Water Contamination: A Regulatory Strategy*, 98 MINN. L. REV. 145, 153 (2013). Most productive shale layers exist at depths of between one and two miles below the surface. *Id.*

8. As used here, "fracking" includes HVHF. Drillers have been fracking vertical wells for decades, but HVHF was first used widely in the Barnett Shale (Texas) and the Haynesville Shale (Louisiana), but quickly spread to other areas, including North Dakota's Bakken Shale, Arkansas's Fayetteville Shale, the Eagle Ford Shale in south Texas, and the Marcellus Shale in the northeastern United States. The development and spread of fracking is chronicled in RUSSELL GOLD, THE BOOM: HOW FRACKING IGNITED THE AMERICAN ENERGY REVOLUTION AND CHANGED THE WORLD (2014). There are several other largely untapped shale deposits, including the Monterrey Shale in California. Norimitsu Onishi, *Vast Oil Reserve May Now Be Within Reach, and Battle Heats Up*, N.Y. TIMES, Feb. 3, 2013, http://www.nytimes.com/2013/02/04/us/vast-oil-reserve-may-now-be-within-reach-and-battle-heats-up.html?pagewanted=all, *archived at* http://perma.cc/MMW9-KGFJ.

9. U.S. natural gas production has been increasing steadily since 2005. *U.S. Natural Gas Gross Withdrawals*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/dnav/ng/hist/n9010us2M.htm, *archived at* http://perma.cc/8BE4-SH9C.

10. The U.S. field production of crude oil in 2013 was 2,723,599 thousand barrels. *U.S. Field Production of Crude Oil*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRFPUS1&f=A, *archived at* http://perma.cc/KBU3-7F6F. This level of field production is significantly higher than what the United States produced in 2012 (2,377,806); 2011 (2,060,398); and the period 2004–2010 (ranging from 1,830,002 to 2,000,861). *Id.* Indeed, the closest match to the current levels of production can be found in the mid- to late 1980s (production in the high 2,000,000s and low 3,000,000s). *Id.*

11. Prices hit lows in 2012 of about $2 per million British thermal unit (MMBtu). *2012 Brief: Average Wholesale Natural Gas Prices Fell 31% in 2012*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/todayinenergy/detail.cfm?id=9490, *archived at* http://perma.cc/RM5D-BV99.

depressed exploration and production of dry gas,[12] but production of gas associated with higher priced oil or natural gas liquids continues apace.[13] This new supply is reinvigorating manufacturing investment in the United States[14] and bringing economic benefits (royalty payments to landowners, jobs, and local taxes, for example) to shale gas producing regions.[15] It has spawned plans to export inexpensive American natural gas in liquid form to hungry Asian and European markets willing to pay much more for the product,[16] and led the Federal Energy Regulatory Commission to authorize the construction of several liquefied natural gas (LNG) export terminals[17] and producers to call for the easing of legal restrictions on the export of gas and oil.[18] The U.S. Department of Energy,[19] most state regulators,[20] and a

12. *U.S. Dry Natural Gas Production Growth Levels Off Following Decline in Natural Gas Prices*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/todayinenergy/detail.cfm?id=6630, *archived at* http://perma.cc/SD6K-KJHM. Natural gas is a mixture that is mostly methane and is often found dissolved in or on top of oil deposits ("associated gas") or other liquid hydrocarbons. *Natural Gas* Explained, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/energyexplained/index.cfm?page=natural_gas_home, *archived at* http://perma.cc/RW9P-M45H. Dry gas refers to gas that is produced without coproduction of liquids. *Id.*

13. *High Value of Liquids Drives U.S. Producers to Target Wet Natural Gas Resources*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/todayinenergy/detail.cfm?id=16191, *archived at* http://perma.cc/U8JF-54UH. Some hydrocarbons that are chemically close to methane exist as liquids at normal surface pressures and temperatures and are sometimes produced with methane. *Id.* These include propane and ethane. *Id.*

14. *See, e.g.*, Kevin Bullis, *Shale Gas Will Fuel a U.S. Manufacturing Boom*, MIT TECH. REV., Jan. 9, 2013, http://www.technologyreview.com/news/509291/shale-gas-will-fuel-a-us-manufacturing-boom/, *archived at* http://perma.cc/PS6A-XMUB (ascribing increased investment in manufacturing in the United States to low natural gas prices); *Shale Gas Fuels U.S. Manufacturing Renaissance*, BUSINESS WIRE (Jan. 10, 2013, 11:18 AM), http://www.businesswire.com/news/home/20130110005889/en/Shale-Gas-Fuels-U.S.-Manufactuing-Renaissance#.VBSpufldXKx, *archived at* http://perma.cc/G8S8-R5EJ?type=source (describing ExxonMobil's projections of increased U.S. investment in chemicals manufacturing due to low gas prices).

15. Merrill & Schizer, *supra* note 7, at 157–61. *See infra* section III(B)(1) for further discussion of those economic impacts.

16. In November 2013, the spot price for LNG delivered to Asian markets in late December 2013 had increased from under $14/mmBtu in December 2012 to around $17.90/mmBtu. Eric Yep, *Asian LNG Prices Rise Sharply*, MONEYBEAT, WALL ST. J. (Nov. 8, 2013, 2:34 AM), http://blogs.wsj.com/moneybeat/2013/11/08/asian-lng-prices-rise-sharply, *archived at* http://perma.cc/89V5-APS2. Similarly, in December 2013 Europe prices were "at their highest since 2006" at about $11.50/mmBtu. Robert Tuttle & Anna Shiryaevskaya, *Qatar to Boost Europe LNG Sales as Gas Trades at 7-Year High*, BLOOMBERG NEWS (Dec. 23, 2013, 12:06 PM), http://www.bloomberg.com/news/2013-12-23/qatar-to-boost-european-lng-sales-as-gas-trades-at-7-year-high.html, *archived at* http://perma.cc/TUK8-PL5G. U.S. prices in October 2013 were about $3.80/mmBtu. *U.S. to Asia Gas Price Gap to Vanish Over Long Term -Exxon*, RETERS, Oct. 14, 2013, *archived at* http://perma.cc/5L9W-W9WK.

17. As of October 2014, three new export terminals had been approved, one of which was under construction. *North American LNG Import/Export Terminals Approved*, FED. ENERGY REG. COMMISSION (Oct. 14, 2014), https://www.ferc.gov/industries/gas/indus-act/lng/LNG-approved.pdf, *archived at* http://perma.cc/XQH3-KGSJ?type=pdf.

18. Zack Colman, *Oil Firms, Governors Urge DOE to Expand Natural-Gas Exports*, HILL, Jan. 28, 2013, http://thehill.com/policy/energy-environment/279609-oil-firms-governors-urge-natural-gas-export-expansion, *archived at* http://perma.cc/W5K9-MQL2; Jim Efstathiou Jr., *Oil*

minority of environmental groups[21] have endorsed the idea of properly regulated shale gas production as a domestic energy source, economic boon, environmental improvement over coal-fired electricity[22] and oil-based transportation fuels,[23] and a bridge to a cleaner energy future.

However, at the same time, fracking has generated intense opposition from local communities, particularly in the northeastern United States.[24] The Academy Award-nominated documentary *Gasland* helped to rally opposition to fracking[25] and attracted high-profile entertainment-industry

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Supply Surge Brings Calls to Ease U.S. Export Ban, BLOOMBERG (Dec. 16, 2013, 11:01 PM), http://www.bloomberg.com/news/2013-12-17/oil-supply-surge-brings-calls-to-ease-u-s-export-ban.html, *archived at* http://perma.cc/3RJ9-QMKH?type=source.

19. SHALE GAS PROD. SUBCOMM., SEC'Y OF ENERGY ADVISORY BD., SECOND NINETY DAY REPORT 1 (2011).

20. The Ground Water Protection Council (GWPC), an association of state regulators, has favored well-regulated shale gas development. *See* GROUND WATER PROT. COUNCIL, STATE OIL AND GAS REGULATIONS DESIGNED TO PROTECT WATER RESOURCES 24 (2014), http://www.gwpc.org/sites/default/files/files/Oil%20and%20Gas%20Regulation%20Report%20Hyperlinked%20Version%20Final-rfs.pdf, *archived at* http://perma.cc/4MNH-5TWM (noting that the alternatives to hydraulic fracturing in reservoirs with low permeability are "neither environmentally desirable nor economically viable"). With its indefinite moratorium on high-volume fracking, New York is an exception to this generalization. *See, e.g.*, N.Y. COMP. CODES R. & REGS. tit. 9, § 7.41 (2011) (requiring, through a 2010 executive order issued by former Governor David Paterson, further environmental review of high-volume fracking in the Marcellus Shale).

21. *See* RICHARD A. MULLER & ELIZABETH A. MULLER, CTR. FOR POLICY STUDIES, WHY EVERY SERIOUS ENVIRONMENTALIST SHOULD FAVOUR FRACKING 1 (2013) (arguing that "[e]nvironmentalists who oppose the development of shale gas and fracking are making a tragic mistake"); ALEX TREMBATH ET AL., BREAKTHROUGH INST., COAL KILLER: HOW NATURAL GAS FUELS THE CLEAN ENERGY REVOLUTION 4 (2013) (asserting that natural gas offers a way for the United States to accelerate the transition to zero-carbon energy); Mark Brownstein, *Industry and Environmentalists Make Progress on Fracking*, EDF VOICES: PEOPLE ON THE PLANET, ENVTL. DEF. FUND (Mar. 28, 2013), http://www.edf.org/blog/2013/03/28/industry-and-environmentalists-make-progress-fracking, *archived at* http://perma.cc/X4VQ-DHXG (noting that a coalition of environmental groups and industry executives agreed to fifteen standards related to shale gas development in the Appalachian Basin).

22. *See Why EDF Is Working on Natural Gas*, ENVTL. DEF. FUND (Sept. 10, 2012), http://blogs.edf.org/energyexchange/2012/09/10/why-edf-is-working-on-natural-gas/, *archived at* http://perma.cc/4PME-Q25Q (supporting fracking for three principle reasons, including the elimination of coal-powered electricity).

23. Michael Rubinkam, *Natural Gas Drillers Target U.S. Truck, Bus Market*, ASSOCIATED PRESS, Nov. 25, 2012, *available at* bigstory.ap.org/article/natural-gas-drillers-target-us-truck-bus-market, *archived at* http://perma.cc/E8DR-9ET8.

24. About three-fourths of the local ordinances listed on the Food & Water Watch website were enacted by local governments in the states of New York, New Jersey, Pennsylvania, and Ohio. *Local Actions Against Fracking*, *supra* note 2.

25. The film depicts a variety of environmental ills in gas-production regions and implies that fracking is responsible for those ills. GASLAND (International WOW Company 2010). For example, residents who live near natural gas drilling are shown lighting their tap water on fire, suggesting that drilling operations caused methane to leach into their well water. *Id.* at 23:00–24:00, 27:04–29:28. In the film Calvin Tillman, then the mayor of Dish, Texas, alleges that pollution associated with fracking operations has caused acute health problems among his constituents. *Id.* at 1:13:30–1:16:00.

figures into the anti-fracking movement, who then spearheaded the formation of a national group seeking a nationwide ban on fracking.[26] Higher profile environmental groups like the Sierra Club and the Natural Resources Defense Council have stopped short of advocating a total ban on the practice but have supported local opposition movements.[27] The divisions among national environmental groups[28] are mirrored at the local level, where a few local governments have enacted ordinances supporting fracking within their borders.[29] However, there are already more than 400 local anti-fracking ordinances in place—including a recent de facto ban imposed by the City of Dallas[30]—and the anti-fracking bandwagon seems to be gathering even more steam.[31] Local opposition stems mostly from

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26. A group called Americans Against Fracking has argued for a full fracking ban within the United States. *About the Coalition*, AMS. AGAINST FRACKING, http://www.americansagainstfracking.org/about-the-coalition/, *archived at* http://perma.cc/Y2Z5-RM6D. The group's board features *Gasland* director Josh Fox, actor Mark Ruffalo, and singer Natalie Merchant. *Advisory Board*, http://www.americansagainstfracking.org/about-the-coalition/advisory-board/, *archived at* http://perma.cc/QU49-4PS9.

27. *See Don't Get Fracked!*, NAT. RESOURCES DEF. COUNCIL, http://www.nrdc.org/health/drilling/, *archived at* http://perma.cc/NL9S-ZR93 (listing steps individuals can take to "limit the dangers" from drilling activity); *End Destructive Drilling*, SIERRA CLUB, http://content.sierraclub.org/naturalgas/clean-up-drilling, *archived at* http://perma.cc/R27X-4JQP ("We must also support local communities that wish to restrict gas development and ensure that gas development is not allowed in areas that are environmentally inappropriate."). The Environmental Defense Fund, by contrast, has been generally supportive of responsible shale gas production, though it continues to study the problem of methane leakage. *Why EDF Is Working on Natural Gas*, *supra* note 22.

28. *See* Adam Briggle, *Should Cities Ban Fracking?*, SLATE (Dec. 24, 2012, 9:00 AM), http://www.slate.com/articles/technology/future_tense/2012/12/longmont_co_has_banned_fracking_is_that_a_good_idea.html, *archived at* http://perma.cc/56GH-J7PY (describing the "divided heart of the anti-fracking movement" and distinguishing "pragmatists" seeking reform from "idealists" seeking to ban fracking); Susan Phillips, *Fractures in the Anti-Fracking Movement*, STATEIMPACT PA. (May 21, 2013, 6:19 PM), http://stateimpact.npr.org/pennsylvania/2013/05/21/fractures-in-the-anti-fracking-movement/, *archived at* http://perma.cc/5NE6-8N7A (reporting that other environmental groups are "shunning" the Environmental Defense Fund for its participation in the regulatory effort with the industry).

29. There are, for example, several pro-fracking jurisdictions in New York State's southern tier (regions that one anti-fracking group calls "Vichy, New York"). *See* Chip Northrup, *Leases Can't Vote. But Crooks Can*, NO FRACKING WAY (Aug. 16, 2012), http://www.nofrackingway.us/2012/08/16/leases-cant-vote-but-crooks-can/, *archived at* http://perma.cc/R7A3-R49Q (characterizing "Vichy, New York" as the towns that have "unilaterally surrendered their responsibilities" in favor of the "frackers" by passing resolutions in support of the practice).

30. Lindsay Abrams, *Dallas Passes De Facto Ban on Fracking*, SALON (Dec. 12, 2013, 1:23 PM), http://www.salon.com/2013/12/12/dallas_passes_de_facto_ban_on_fracking/, *archived at* http://perma.cc/9KZT-BL7J.

31. As of this writing, the City of Los Angeles is drafting an anti-fracking ordinance. Emily Alpert Reyes, *L.A. City Council Moves Toward Fracking Ban*, L.A. TIMES, Feb. 28, 2014, http://www.latimes.com/local/lanow/la-me-ln-fracking-ban-vote-20140228,0,6877842.story, *archived at* http://perma.cc/F46B-548S. In the November 2014 elections, voters passed ballot initiatives to ban or restrict fracking passed in Denton, Texas, Athens, Ohio, and two California counties. Michael Bastasch, *Fracking Bans Pass in California, Ohio, Texas Towns*, DAILY CALLER (Nov. 5, 2014, 1:16), http://dailycaller.com/2014/11/05/fracking-bans-pass-in-california-ohio-texas-towns/, *archived at* http://perma.cc/9R8H-9BEK. Similar indicatives failed in three

concerns about the impacts of fracking—on water, seismicity, air quality, and local quality of life (e.g., noise, truck traffic, sudden "boomtown" effects)—which are borne mostly (but not exclusively) by locals in producing areas. The remainder of this Part elaborates on each set of impacts briefly, summarizing the current scientific understanding to date of each.

B. Risks

The risk profile of the shale oil and gas production industry is a matter of dispute. In places like Texas and Pennsylvania, the industry has grown rapidly, and systematic scientific study of its impacts (positive and negative) has lagged behind. Yet an army of academic and other researchers has begun to fill in that risk profile study by study. This subpart briefly summarizes what we know about those impacts that tend to motivate anti-fracking ordinances.

1. Water-Related Risks.—Water-related risks associated with fracking operations include risks to groundwater quality, risks to surface water quality, and consumption- or quantity-related risks to water supply. The former includes the risk that the groundwater table will be contaminated by chemicals in the fracking fluids, hydrocarbons, or contaminants in the so-called produced water.[32] Methane in drinking water is not particularly harmful to humans, while oil, fracking fluids, and produced water can be.[33]

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other Ohio towns and in Santa Barbara County in California. *Id.* In Colorado, efforts to put an anti-fracking measure on the statewide ballot failed after the Governor agreed to appoint a commission to recommend changes to state fracking rules. Mark Jaffe, *Hickenlooper Compromise Keeps Oil and Gas Measures Off Colorado Ballot*, DENVER POST, Aug. 4, 2014, http://www.denverpost.com/business/ci_26272493/hickenlooper-tries-broker-last-minute-deal-oil-gas-colorado, *archived at* http://perma.cc/8XSZ-KZJK.

32. "Produced water" is water that comes up through the well from underground containing contaminants that originate underground, such as radioactivity or salts. Erich Schramm, *What Is Flowback, and How Does It Differ from Produced Water?*, INST. FOR ENERGY & ENVTL. RES. FOR NORTHEASTERN PA., http://energy.wilkes.edu/pages/205.asp, *archived at* http://perma.cc/QE7T-CDA2. It is to be distinguished from "flowback water," which refers to fracking fluids that return to the surface through the well. *Id.*

33. Some fracking fluid constituents are carcinogenic or otherwise toxic. U.S. ENVTL. PROT. AGENCY, EPA 816-R-04-003, EVALUATION OF IMPACTS TO UNDERGROUND SOURCES OF DRINKING WATER BY HYDRAULIC FRACTURING OF COALBED METHANE RESERVOIRS 4-09 to -10 tbl.4-1 (2004). These chemicals appear in fracking fluids in extremely dilute concentrations, however. *Id.* at 4-17; *see also* Lara A. Haluszczak et al., *Geochemical Evaluation of Flowback Brine from Marcellus Gas Wells in Pennsylvania, USA*, 28 APPLIED GEOCHEMISTRY 55, 61 (2013) (finding that flowback waters contained levels of various potentially dangerous elements above acceptable limits for drinking water); R. Timothy Weston, *Water Supply and Wastewater Challenges in Marcellus Shale Development*, 30 ENERGY & MIN. L. INST. § 15.01, § 15.05, at 570–72 (2009). 55–56 (Dec. 6, 2010) (identifying the challenge presented by concentrations of salts, oil and gas, and potentially harmful chemicals in flowback water); *Environmental Impacts Associated with Disposal of Saline Water Produced During Petroleum Production*, U.S. GEOLOGICAL SURV., http://toxics.usgs.gov/photo_gallery/osage.html, *archived at* http://perma.cc/

Groundwater contamination could happen if the oil or gas well is improperly cased or sealed, allowing contaminants to escape the well near the surface at the groundwater layer;[34] if fracking chemicals are spilled at the surface; or if fracking somehow otherwise creates a conduit for thermogenic[35] (deep) methane to migrate toward the surface, encountering the groundwater layer. Alternatively, if producers fail to comply with wastewater storage rules such that wastewater seeps into the ground,[36] or if there are road accidents involving trucks hauling fracking fluids or wastewater to and from the site,[37] groundwater could become contaminated that way.

Fears that fracking will contaminate groundwater are prominent in the anti-fracking movement,[38] and the possibility of human error means that the

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6MXK-T3MX (cataloguing photographic evidence of environmental damage or sites being monitored for environmental damage caused by saline-water disposal).

34. U.S. ENVTL. PROT. AGENCY, *supra* note 33, at 6-1 to -2. The groundwater layer is typically much closer to the surface than the shale layer—typically within a few hundred feet of the surface. GROUND WATER PROT. COUNCIL & ALL CONSULTING, U.S. DEP'T OF ENERGY, MODERN SHALE GAS DEVELOPMENT IN THE UNITED STATES: A PRIMER 54 (2009) [hereinafter MODERN SHALE GAS PRIMER].

35. "Thermogenic" methane is methane produced deep underground by ancient decay processes. MICHAEL D. HOLLOWAY & OLIVER RUDD, FRACKING: THE OPERATIONS AND ENVIRONMENTAL CONSEQUENCES OF HYDRAULIC FRACTURING 71–72 (2013). This is the kind of methane that is typically produced by a natural gas well. It can be distinguished from "biogenic" methane, which resides closer to the surface, and is a much younger origin. *Id.*

36. *See, e.g.*, *Cases Where Pit Substances Contaminated New Mexico's Ground Water*, N.M. OIL CONSERVATION DIVISION, http://www.emnrd.state.nm.us/ocd/documents/GWImpactPublicRecordsSixColumns20081119.pdf, *archived at* http://perma.cc/L4VR-DYZK (listing examples of incidents where storage pits caused groundwater pollution).

37. For an example of this kind of incident, see Well ID: 37-125-24174, WELLWIKI (June 13, 2011), *available at* http://wellwiki.org/wiki/37-125-24174, *archived at* http://perma.cc/Q6ZY-XA4E.

38. Three high-profile water contamination incidents in shale gas production regions have fed concern about water pollution risks. The first involved the contamination of drinking-water wells with methane in Dimock, Pennsylvania, an incident featured in *Gasland*. *See Cabot Allowed to Resume Fracking in Dimock Twp.*, TIMES LEADER, Feb. 16, 2013, http://timesleader.com/stories/Cabot-allowed-to-resume-fracking-in-Dimock-Twp,194830, *archived at* http://perma.cc/9F8U-5XBJ (reporting that Dimock residents accused Cabot of polluting their water supply "with methane gas and toxic chemicals"); Michael Rubinkam, *Pennsylvania Regulators Suspend Cabot Oil and Gas Drilling Over Contamination of Wells in Pa.*, STAR TRIB., Apr. 15, 2010, http://www.startribune.com/templates/Print_This_Story?sid=90960344, *archived at* http://perma.cc/H5EZ-SAGX (describing the discolored, foul water that residents experienced after Cabot drilled in Dimock). The second incident, also in 2009, involved an algae bloom in Dunkard Creek in West Virginia that resulted in a massive fish kill. The EPA and the West Virginia Department of Environmental Protection concluded that drainage from a nearby coal mine caused the spill, but some fracking activists (and an EPA biologist) believe that wastewater from fracking operations may have been the cause. Mike Soroghan, *In Fish-Kill Mystery, EPA Scientist Points at Shale Drilling*, N.Y. TIMES, Oct. 12, 2011, http://www.nytimes.com/gwire/2011/10/12/12greenwire-in-fish-kill-mystery-epa-scientist-points-at-s-86563.html?pagewanted=all, *archived at* http://perma.cc/GWG6-J58E?type=live. Finally, in 2011, the EPA concluded that fracturing fluids had contaminated a drinking-water aquifer in the town of Pavilion, Wyoming, though the industry

risk of groundwater contamination is not zero.[39] Yet based upon the extant research, the risk that any particular production operation will contaminate groundwater seems likely to be small. Until recently, anecdotal evidence of confirmed groundwater contamination from published reports and litigation put the number of confirmed incidents in the low tens of incidents,[40] as compared to tens of thousands of hydraulically fractured wells and (at least) hundreds of thousands of truck trips to and from production sites in the last decade. In August of 2014, however, the Pennsylvania Department of Environmental Protection released a list of more than 200 examples of fracking-related well-contamination cases.[41] Academic studies of the impact of fracking on groundwater to date have not supported the existence of a causal link between fracturing and groundwater contamination. Some studies have found that methane concentrations are higher in wells located closer to natural gas production wells,[42] but no cause and effect relationship has been established,[43] nor have any systematic studies found evidence of

disputes that conclusion. *See* Chris Tucker, **Update XIII* Six — Actually, Seven — Questions for EPA on Pavilion*, ENERGY IN DEPTH (Feb. 20, 2013, 9:09 AM), http://www.energyindepth.org/six-questions-for-epa-on-pavillion/, *archived at* http://perma.cc/U574-T4VP (summarizing the EPA's finding that the drinking-water wells in Pavilion were "below established health and safety standards" and citing one industry actor's vocal opposition).

39. In 2012, researchers at the State University of New York at Stony Brook sought to quantify the risks of groundwater contamination by estimating the probabilities of various types of accidents that could result in a spill. The study found significant spill risks, even in the best-case scenario, and urged further study into the possibility of wastewater recycling. Daniel J. Rozell & Sheldon J. Reaven, *Water Pollution Risk Associated with Natural Gas Extraction from the Marcellus Shale*, 32 RISK ANALYSIS 1382, 1391 (2012).

40. *See* Barclay R. Nicholson & Stephen C. Dillard, *Analysis of Litigation Involving Shale and Hydraulic Fracturing*, FULBRIGHT & JAWORSKI L.L.P. 1 (Jan. 1, 2013), *available at* http://www.nortonrosefulbright.com/files/us/images/publications/20130228WhitePaperShaleandHydraulicFracturing.pdf, *archived at* http://perma.cc/3GWT-XEQS (explaining that more than thirty-five lawsuits complaining of groundwater contamination have been filed since August 2009).

41. Kevin Begos & Michael Rubinkam, *Online List IDs Water Wells Harmed By Drilling*, WASH. TIMES, Aug. 28, 2014, http://www.washingtontimes.com/news/2014/aug/28/pa-releases-list-of-wells-impacted-by-drilling/?page=all, *archived at* http://perma.cc/B8Y-6C49. For the complete list, see *Water Supply Determination Letters*, PA. DEP'T ENVTL. PROTECTION, http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/OilGasReports/Determination_Letters/Regional_Determination_Letters.pdf, *archived at* http://perma.cc/H7SU-2LGS.

42. The so-called Duke Study sampled well water before and after fracking and reached mixed conclusions, finding no evidence of groundwater contamination by fracking fluids or wastewater but evidence that levels of thermogenic methane were higher in shallow groundwater aquifers near natural gas production wells than elsewhere in the same aquifers. *See* Stephen G. Osborn et al., *Methane Contamination of Drinking Water Accompanying Gas-Well Drilling and Hydraulic Fracturing*, 108 PNAS 8172, 8174–75 (2011); *see also* Jackson et al., *Increased Stray Gas Abundance in a Subset of Drinking Water Wells Near Marcellus Shale Gas Extraction*, 110 PNAS 11250, 11251 (2013) (finding significantly higher concentrations of methane in the drinking water of homes near shale gas wells compared to homes farther away)

43. We can distinguish the number of cases of methane-contaminated groundwater from the number of cases of methane in groundwater caused by fracking. The former number is very large, as methane occurs naturally in groundwater in many places. *See* SEAMUS MCGRAW, THE END OF

contamination of groundwater by fracking fluids.[44] Moreover, as states have ratcheted up regulation of well-construction standards and reduced the use of riskier liquids-handling practices (like the use of unlined storage pits),[45] the number of contamination pathways should be decreasing. All of which suggests that the expected value of harm from groundwater contamination is small.[46]

Risks to surface waters, on the other hand, are different in nature. There is some evidence of surface water contamination from fracking wastewater, at least in the Marcellus Shale.[47] Second, these risks are more broadly distributed than those associated with groundwater because they are associated almost exclusively with disposal of wastewater, which sometimes occurs far from the production well site. Wastewater disposal options include injection of the wastewater into an underground injection well, disposal through a wastewater treatment facility, and recycling (that is, reusing the wastewater in other fracking operations).[48] However, in

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COUNTRY 31 (2011) (describing the story of a New York man in the 1820s building a chimney of stones to capture methane bubbling out of Canadaway Creek and setting fire to it); GREGORY ZUCKERMAN, THE FRACKERS: THE OUTRAGEOUS INSIDE STORY OF THE NEW BILLIONAIRE WILDCATTERS 376 (2013) (quoting a Dimock, Pennsylvania resident saying that "she and her friends regularly lit water afire in their grade school bathroom in the late 1960s, long before fracking came to her part of the state").

44. The U.S. Geological Survey compared concentrations of methane and other constituents in 127 water wells in the Fayetteville shale gas production region before and after shale gas production operations, finding no evidence of contamination of either methane or fracking fluid constituents. TIMOTHY M. KRESSE ET AL., U.S. GEOLOGICAL SURVEY, SHALLOW GROUNDWATER QUALITY AND GEOCHEMISTRY IN THE FAYETTEVILLE SHALE GAS-PRODUCTION AREA, NORTH-CENTRAL ARKANSAS, 2011, at 27–28 (2012), *available at* http://pubs.usgs.gov/sir/2012/5273/sir2012-5273.pdf, *archived at* http://perma.cc/2VZU-SN87. A 2011 Pennsylvania State University study sampled drinking-water wells before and after nearby fracking operations and found no significant increase in well contamination from either methane or fracking fluid constituents. ELIZABETH W. BOYER ET AL., THE IMPACT OF MARCELLUS GAS DRILLING ON RURAL DRINKING WATER SUPPLIES 21 (2011); *see also* ERNEST J. MONIZ ET AL., THE FUTURE OF NATURAL GAS: AN INTERDISCIPLINARY MIT STUDY 39–40 (2011) (reaching a similar conclusion by looking to widely reported drilling incidents and concluding that none "conclusively demonstrate[s] contamination of shallow water zones with fracture fluids").

45. *See* NATHAN RICHARDSON ET AL., RES. FOR THE FUTURE, THE STATE OF STATE SHALE GAS REGULATION 28, 46–50 (2013), *available at* http://www.rff.org/rff/documents/RFF-Rpt-StateofStateRegs_Report.pdf, *archived at* http://perma.cc/XBT7-K4YD (noting the rapid state regulatory changes regarding fracking).

46. *See* ZUCKERMAN, *supra* note 43, at 377 (quoting University of Pittsburgh environmental engineer Radisav Vidic: "I'll take my chances on winning the lottery over the chances of frack fluid in the groundwater").

47. *E.g.*, *id.*; Sheila M. Olmstead et al., *Shale Gas Development Impacts on Surface Water Quality in Pennsylvania*, 110 PNAS 4962, 4962, 4966 (2013) (finding elevated levels of chlorides but not suspended solids in streams near shale gas wastewater treatment facilities on the Marcellus Shale); Nathaniel R. Warner et al., *Impacts of Shale Gas Wastewater Disposal on Water Quality in Western Pennsylvania*, 47 ENVTL. SCI. & TECH. 11849, 11854–55 (2013) (finding elevated levels of contaminants downstream of a water treatment facility in the Marcellus Shale).

48. Kelly O. Maloney & David A. Yoxtheimer, *Production and Disposal of Waste Materials from Gas and Oil Extraction from the Marcellus Shale Play in Pennsylvania*, 14 ENVTL. PRAC.

much of the Marcellus Shale underground injection is neither easy nor available, which has led to surface water discharges in the past.[49] It appears that regulatory gaps (some of which have since been filled) are to blame for some of the early contamination of surface waters in the Marcellus region, though noncompliance with regulatory standards may have also contributed to the problem.[50] However, depending upon the characteristics of the produced water, it may be difficult or impossible to obtain the required Clean Water Act permission[51] to discharge the wastewater into surface waters. The expected harm of surface water contamination risks, then, appears to differ by location and is difficult to estimate in a changing regulatory environment. Risks to surface waters ought to be quite small in places where underground injection of wastewater is the norm and larger in areas like the Marcellus Shale where underground injection is less available.

Third, fracking uses a lot of water—typically between 2 and 4 million gallons of water per fracking operation[52]—posing the potential to strain water supplies in arid parts of the country. The significance of water supply

278, 278 (2012). Disposal through a wastewater treatment facility would be subject to Clean Water Act pretreatment standards, which prohibit discharges that "[i]nterfere with" the operation of the plant or cause pollutants to "[p]ass [t]hrough" to surface waters. 40 C.F.R. § 403.8(a) (2014).

49. *See* PA. DEP'T OF ENVTL. PROT., PA MARCELLUS SHALE GAS WELL DEVELOPMENT SUMMARY, *available at* http://www.nytimes.com/interactive/2011/02/27/us/natural-gas-documents-1.html?_r=0#document/p294/a9916, *archived at* http://perma.cc/Y53E-6LXF (explaining that "the geology and need for seasonal subsurface natural gas storage in Pennsylvania will allow only for the very limited application of deep well injection as a disposal pathway"); Ian Urbina, *Regulation Lax as Gas Wells' Tainted Water Hits Rivers*, N.Y. TIMES, Feb. 26, 2011, http://www.nytimes.com/2011/02/27/us/27gas.html, *archived at* http://perma.cc/87GF-UDLY (stating that drillers in Pennsylvania "discharge much of their waste through sewage treatment plants into rivers").

50. *See* Sally Entrekin et al., *Rapid Expansion of Natural Gas Development Poses a Threat to Surface Waters*, 9 FRONTIERS ECOLOGY ENV'T. 503, 506, 510 (2011) (noting approximately half of the 1,400 reported drilling violations in Pennsylvania between 2008 and 2010 dealt with surface water contamination, resulting in a need for regulation concerning the proximity of natural gas developments to surface water); Roger Real Drouin, *As Fracking Booms, Growing Concerns About Wastewater*, YALE ENV'T 360 (Feb. 18, 2014), http://e360.yale.edu/feature/as_fracking_booms_growing_concerns_about_wastewater/2740/, *archived at* http://perma.cc/75FP-L3PJ (recognizing that more stringent wastewater regulations enacted in 2012 may have contributed to improved Pennsylvania industry practices); *cf.* ZUCKERMAN, *supra* note 43, at 365 (quoting George Mitchell, a fracking pioneer, to the effect that fracking can be done safely "if they watch and patrol the wildcat guys . . . [who] don't give a damn about anything; the industry has to band together to stop the isolated incidents").

51. This kind of discharge would be subject to the requirement to obtain a National Pollutant Discharge Elimination System permit under the Clean Water Act. 33 U.S.C. § 1342 (2012).

52. MODERN SHALE GAS PRIMER, *supra* note 34, at 64. The New York State Department of Environmental Conservation estimates that a typical frack job would require "2.4 million to 7.8 million gallons of water." N.Y. STATE DEP'T OF ENVTL. CONSERVATION, SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM 5-93 (2011).

issues for fracking varies greatly by region. In the Eagle Ford and Barnett Shales of Texas, where drought is a problem, these issues may ultimately loom large.[53] In the Marcellus Shale, where water is more plentiful, water supply seems unlikely to constrain development. In any case, in the Marcellus region the Delaware River Basin Commission and the Susquehanna River Basin Commission now manage water withdrawals, requiring fracking operators to obtain permission to withdraw water.[54] Ironically, it appears that in arid states like Texas producers recycle less wastewater than in the Marcellus Shale, probably because of the greater availability of underground injection in Texas;[55] recently, the state legislature enacted legislation aimed at addressing water supply issues there.[56] Some commentators predict that water supply issues will become more contentious in the future as growth and the effects of climate change strain water supplies, particularly in the Southwest.[57]

2. Seismic Risks.—Underground injection of wastewater from fracking operations in the wrong location can trigger seismicity, or earthquakes.[58]

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53. Some climate-science researchers believe that climate change will tend to exacerbate drought in the southwestern United States. *See, e.g.*, Dan Huber & Jay Gulledge, *Global Warming Contributing to Texas Drought*, CENTER FOR CLIMATE & ENERGY SOLUTIONS (Oct. 14, 2011), http://www.c2es.org/blog/huberd/global-warming-contributing-texas-drought, *archived at* http://perma.cc/NS23-BX9J.

54. 18 C.F.R. § 401.35(b) (2014) (requiring permission from the Delaware River Basin Commission for projects that "may have a substantial effect on the water resources" in the area); *id.* § 806.4(a) (requiring a permit from the Susquehanna River Basin Commission for water consumption and withdrawal above specified amounts).

55. *See* Kate Galbraith & Terrence Henry, *As Fracking Proliferates in Texas, So Do Disposal Wells*, TEX. TRIB. (Mar. 29, 2013), http://www.texastribune.org/2013/03/29/disposal-wells-fracking-waste-stir-water-concerns/, *archived at* http://perma.cc/B47N-RC65 (addressing the issue that underground injection through wastewater disposal wells is becoming a "common landmark in the drilling regions of Texas" instead of reducing waste by recycling water). Texas water rights rules also discourage conservation of water and promote waste. Farmers and others who hold surface water rights under the prior appropriation doctrine must use them or lose them, while groundwater is governed by the rule of capture, which also promotes consumption. RONALD A. KAISER, TEX. PUB. POLICY FOUND., SOLVING THE TEXAS WATER PUZZLE: MARKET-BASED ALLOCATION OF WATER 18–19, 22 (2005).

56. The Texas Legislature created a new funding mechanism for water projects after successive years of drought. H.R. 4, 83d Leg., Reg. Sess. (Tex. 2013); Corrie MacLaggan, *Texas Governor Signs Bill Key to $2 Billion Water Plan*, REUTERS, May 28, 2013, http://www.reuters.com/article/2013/05/28/us-usa-texas-water-idUSBRE94R0ZF20130528, *archived at* http://perma.cc/8AGB-U4YY.

57. *See, e.g.*, Robin Kundis Craig, *Climate Change, Regulatory Fragmentation, and Water Triage*, 79 U. COLO. L. REV. 830 (2008) ("Tensions and conflicts in water management are only likely to increase as climate change alters the expected availability of water in many areas of the country."); Paul Faeth, *U.S. Energy Security and Water: The Challenges We Face*, 54 ENV'T: SCI. & POL'Y FOR SUSTAINABLE DEV., Jan. 2012, at 4, 10 (noting that water resources in the Southwest are some of the most likely to be impacted by climate change).

58. David J. Hayes, *Is the Recent Increase in Felt Earthquakes in the Central US Natural or Manmade?*, U.S. DEP'T INTERIOR (Apr. 11, 2012), http://www.doi.gov/news/doinews/Is-the-Recent-Increase-in-Felt-Earthquakes-in-the-Central-US-Natural-or-Manmade.cfm, *archived at*

Recent earthquakes linked in news reports to fracturing operations in Texas,[59] Ohio,[60] Oklahoma,[61] and Arkansas[62] appear to be the product of disposal of wastewater from gas-production operations. A minority of experts believe, however, that microseismicity can result directly from fracking operations under certain conditions,[63] and one study suggests that some earthquakes in Texas are associated with extraction of fluids in hydrocarbon production, regardless of whether fracking or more conventional production techniques are used.[64] Underground injection of fracking wastes requires a permit under the federal Safe Drinking Water Act (SDWA), but the SDWA criteria for these wells do not include a seismicity review.[65] At least one state (Ohio) has amended its underground-injection well regulations to address seismicity,[66] and Arkansas closed two

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http://perma.cc/V93-65VP (noting an increased number of earthquakes in areas where there is an injection of wastewater in deep disposal wells); Robert B. Jackson et al., *The Environmental Costs and Benefits of Fracking*, 39 ANN. REV. ENV'T & RESOURCES 327, 344–46 (2014).

59. Jim Efstathiou Jr., *Texas Earthquakes Tied to Extraction in Fracking*, BLOOMBERG (Aug. 27, 2013, 4:02 PM), http://www.bloomberg.com/news/2013-08-27/texas-earthquakes-linked-to-oil-extraction-by-fracking.html, *archived at* http://perma.cc/F5J-SU6T.

60. Pete Spotts, *How Fracking Might Have Led to an Ohio Earthquake*, CHRISTIAN SCI. MONITOR, Jan. 2, 2012, http://www.csmonitor.com/Science/2012/0102/How-fracking-might-have-led-to-an-Ohio-earthquake, *archived at* http://perma.cc/V7G6-RL57.

61. John Daly, *U.S. Government Confirms Link Between Earthquakes and Hydraulic Fracturing*, OILPRICE.COM (Nov. 8, 2011, 1:49 PM), http://oilprice.com/Energy/Natural-Gas/U.S.-Government-Confirms-Link-Between-Earthquakes-and-Hydraulic-Fracturing.html, *archived at* http://perma.cc/F8UU-8GF5; *see also* Katie M. Keranen et al., *Potentially Induced Earthquakes in Oklahoma, USA: Links Between Wastewater Injection and the 2011 M_W 5.7 Earthquake Sequence*, 41 GEOLOGY 699, 700 (2013) (analyzing seismic data and finding a relationship between seismic activity in Oklahoma and wastewater injection).

62. Alec Liu & Jeremy A. Kaplan, *Earthquakes in Arkansas May Be Man-Made, Experts Warn*, FOX NEWS (Mar. 1, 2011), http://www.foxnews.com/scitech/2011/03/01/fracking-earthquakes-arkansas-man-experts-warn/, *archived at* http://perma.cc/R2NX-ZBKC.

63. *See* AUSTIN A. HOLLAND, EXAMINATION OF POSSIBLY INDUCED SEISMICITY FROM HYDRAULIC FRACTURING IN THE EOLA FIELD, GARVIN COUNTY, OKLAHOMA 25 (2011), *available at* http://www.ogs.ou.edu/pubsscanned/openfile/OF1_2011.pdf, *archived at* http://perma.cc/M8PH-SPUE (hypothesizing that hydraulic fracturing could cause small tremors in surrounding areas); Garry White, *Cuadrilla Admits Drilling Caused Blackpool Earthquakes*, TELEGRAPH, Nov. 2, 2011, http://www.telegraph.co.uk/finance/newsbysector/energy/8864669/Cuadrilla-admits-drilling-caused-Blackpool-earthquakes.html, *archived at* http://perma.cc/J3XU-ELY8 (reporting that an oil and gas company admitted it is "highly probable" that several small tremors were caused by fracturing operations under a unique set of circumstances). *But see* Vicki Smith, *Texas Seismologist: Fracking Doesn't Cause Earthquakes*, FUELFIX (Sept. 9, 2013, 12:30 PM), http://fuelfix.com/blog/2013/09/09/texas-seismologist-fracking-doesnt-cause-earthquakes/, *archived at* http://perma.cc/7MTT-2W4E (positing that fracking itself is not the reason for an increase in earthquakes and laying the blame on wastewater disposal).

64. Efstathiou, *supra* note 59.

65. *See* 40 C.F.R. §§ 144.21–.22, .28, .60 (2013) (defining and regulating Class II wells (oil and gas) under the SDWA, and nowhere requiring seismicity review).

66. OHIO ADMIN. CODE 1501:9-1-02 (2014); *State of the State—Ohio Fracking Regulations*, VINSON & ELKINS (May 21, 2012), http://www.velaw.com/resources/OhioFrackingRegulations.aspx, *archived at* http://perma.cc/Z6AH-V3NH.

injection wells in 2011 due to seismicity concerns.[67] The vast majority of these tremors are small and localized, but tremors associated with underground injection of fracking wastewater have triggered mounting local opposition in areas where disposal wells are located, particularly in North Texas.[68]

3. Air Pollution Risks.—Critics contend that fracking poses direct risks to health from air pollution—the emissions of conventional and toxic pollutants by engines and compressors in the production area, as well as fugitive emissions of volatile organic compounds (VOCs). Anti-fracking activists have ascribed cancers and other health effects in the town of Dish, Texas, to natural gas production activities there.[69] One study focusing on air pollution near gas sites in Colorado indicates that airborne levels of VOCs at those sites exceeded national standards;[70] another study concluded that pollution levels were high enough in neighborhoods near fracking operations to warrant further investigation.[71] Industry critics, however,

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67. *Arkansas: Disposal Well Is Ordered Closed*, N.Y. TIMES, July 27, 2011, http://www.nytimes.com/2011/07/28/us/28brfs-DISPOSALWELL_BRF.html?_r=0, *archived at* http://perma.cc/T9ZB-3FQJ; Ben Casselman, *Quakes Push Arkansas to Limit Gas-Waste Wells*, WALL ST. J., July 26, 2011, http://online.wsj.com/news/articles/SB10001424053111904772304576468430846341882, *archived at* http://perma.cc/NLX8-NULS.

68. *See* Erica Greider, *Shaken and Stirred: How the Earthquakes in the Barnett Shale Turned Some Small-town Folks into Environmentalists*, TEX. MONTHLY, March 2014, *available at* http://www.texasmonthly.com/story/how-barnett-shale-earthquakes-turned-folks-into-environmentalists, *archived at* http://perma.cc/6AUT-QMQ3 (describing the activism of Azle, Texas residents in response to frequent wastewater-disposal-related earthquakes); Jason Allen, *North Texans Protest Fracking, Earthquakes at Railroad Commission Meeting*, CBS DFW (Jan. 22, 2014, 5:51 PM), http://dfw.cbslocal.com/2014/01/21/north-texans-protest-fracking-earthquakes-at-railroad-commission-meeting/, *archived at* http://perma.cc/HF3S-JR2X (reporting on North Texas residents' efforts to urge the Texas Railroad Commission to shut down wastewater disposal wells following a "swarm of earthquakes").

69. *See supra* note 25.

70. Lisa M. McKenzie et al., *Human Health Risk Assessment of Air Emissions from Development of Unconventional Natural Gas Resources*, 424 SCI. TOTAL ENV'T 79, 82–83 & tbl.1 (2012); Mark Jaffe, *CU Denver Study Links Fracking to Higher Concentration of Air Pollutants*, DENVER POST, Mar. 20, 2012, http://www.denverpost.com/breakingnews/ci_20210720/cu-denver-study-links-fracking-higher-concentration-air, *archived at* http://perma.cc/AXW8-3MGV; *see also* Lisa Song, *Hazardous Air Pollutants Detected Near Fracking Sites*, BLOOMBERG (Dec. 3, 2012, 6:02 PM), http://www.bloomberg.com/news/2012-12-03/hazardous-air-pollutants-detected-near-fracking-sites.html, *archived at* http://perma.cc/84KJ-TF8T (reporting on an air quality study near Colorado gas wells that detected airborne contaminants at harmful levels).

71. Theo Colborn et al., *An Exploratory Study of Air Quality Near Natural Gas Operations*, 20 HUM. & ECOLOGICAL RISK ASSESSMENT 86, 98–99 (2014) ("[T]hese findings suggest that the concentrations of [pollutants] in rural neighborhoods near natural gas operations deserve further investigation, regardless of the source."); *see also* Cathy Proctor, *Colorado to Study Air Pollution from Oil and Gas Operations*, DENVER BUS. J., Jan. 9, 2013, http://www.bizjournals.com/denver/news/2013/01/09/colorado-to-study-air-pollution-from.html?page=all, *available at* http://perma.cc/GJR6-5XR9 (announcing the launch of a new, three-year study by the Colorado health department that aims to determine the effects of oil and gas activity on air pollution and public

dispute those studies' conclusions, claiming that neither study measures the relative contribution to fracking operations of other nearby sources, such as interstate highway traffic.[72] However, regardless of whether these emissions are significant enough to trigger violations of National Ambient Air Quality Standards, they add to airborne pollution in ways that may seem significant to locals, and these impacts are a part of every fracking operation.

Furthermore, depending on the rate of fugitive methane emissions from natural gas production and distribution facilities, fugitive emissions could exacerbate global warming problems, since methane is a greenhouse gas. This claim is contested, however, among researchers. One early study estimated that almost as much as 8% of the methane produced from natural gas wells escapes into the atmosphere as the result of leaks or venting, an amount that could undermine the climate change advantages of substituting natural gas for coal in the energy mix.[73] That study, however, has attracted considerable criticism.[74] Subsequent studies have been mixed in their results, with some challenging the EPA's conclusion that methane leakage rates are low enough that the natural-gas boom will yield a net climate benefit and others supporting that conclusion.[75] A 2014 study found

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health); *cf.* ZUCKERMAN, *supra* note 43, at 378 (documenting complaints by residents of Pinedale, Wyoming, of "watery eyes" and "shortness of breath" due to elevated ozone levels associated with natural gas production).

72. *E.g.*, Steve Everley, **UPDATE IV* Eight Worst Inputs Used in Colorado Health Study*, ENERGY IN DEPTH (May 16, 2012, 9:09 AM), http://www.energyindepth.org/non-elite-eight-worst-inputs-used-in-new-colorado-health-study/, *archived at* http://perma.cc/H5J4-FQRW.

73. Robert W. Howarth et al., *Methane and the Greenhouse-Gas Footprint of Natural Gas from Shale Formations*, 106 CLIMATIC CHANGE 679, 685, 687(2011).

74. The alleged errors include failing to distinguish between methane emission rates from venting versus flaring of gas, failing to account for the standard industry practice of capturing methane in flowback water, and more. *E.g.*, MARY LASHLEY BARCELLA ET AL., IHIS CERA, MISMEASURING METHANE: ESTIMATING GREENHOUSE GAS EMISSIONS FROM UPSTREAM NATURAL GAS DEVELOPMENT 9–10 (2011), *available at* http://www.cred.org/wp-content/uploads/2014/07/Mismeasuring-Methane-.pdf, *archived at* http://perma.cc/9Q9K-2FVS (criticizing the study's misuse of well data and flawed methane emission estimates); *cf.* David A. Kirchgessner et al., *Estimate of Methane Emissions from the U.S. Natural Gas Industry*, 35 CHEMOSPHERE 1365, 1365–66 (1997) (noting the "poor quality of methane emissions estimates" in the oil and gas industry).

75. *Compare* Scot M. Miller et al., *Anthropogenic Emissions of Methane in the United States*, 110 PNAS 20018, 20018 (2013) (suggesting leakage rates higher than EPA estimates), *and* Gabrielle Pétron et al., *Hydrocarbon Emissions Characterization in the Colorado Front Range—A Pilot Study*, J. GEOPHYSICAL RES.: ATMOSPHERES, Feb. 2012, at 1, 17–18 (suggesting that existing estimates of fugitive methane emissions from gas operations are underestimates and that the real percentage of total methane emissions caused by gas operations is closer to 30%), *with* David T. Allen et al., *Measurements of Methane Emissions at Natural Gas Production Sites in the United States*, 110 PNAS 17768, 17768 (2013) (suggesting leakage rates lower than the EPA's estimates). *But see* Michael Levi, *Yellow Flags on a New Methane Study*, COUNCIL ON FOREIGN REL. (Feb. 13, 2012), http://blogs.cfr.org/levi/2012/02/13/yellow-flags-on-a-new-methane-study, *archived at* http://perma.cc/A7DC-PGHD (identifying methodological problems with the Pétron study). Recently, the National Oceanic and Atmospheric Administration group announced results

leakage rates that suggest climate benefits for the displacement of coal by natural gas but not for the displacement of transportation fuels by natural gas.[76] In any case, methane leakage represents lost revenue for producers, and leakage seems a technically tractable problem; indeed, the EPA has proposed recent rules under its Clean Air Act authority aimed at reducing leakage.[77]

4. Risks to Local Quality of Life.—Finally, locals are certain to experience changes in local quality of life (neighborhood character) during the drilling and fracking process. During drilling and fracking, the well pad houses industrial equipment, including compressors and generators that create the kind of noise, local air emissions, and other activities associated with industrial land uses.[78] The creation of new roads and gathering pipelines alters the land and may disrupt rural ecosystems. Truck traffic can destroy local roads built for smaller vehicles and smaller traffic volumes, a problem that is sometimes beyond the capacity of local governments to address, depending on the vagaries of local finance and how the state allocates responsibility for road maintenance.[79] The boom in people and traffic can burden other local infrastructure as well. The sudden creation of job opportunities in a production region can change local

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from a study of methane emissions in Utah that are consistent with the Howarth et al., *supra* note 73, data. Jeff Tollefson, *Methane Leaks Erode Green Credentials of Natural Gas*, NATURE, Jan. 3, 2013, at 12, 12. For a discussion of the EPA's calculations, see generally KELSI BRACMORT ET AL., CONG. RESEARCH SERV., 7-5700, METHANE CAPTURE: OPTIONS FOR GREENHOUSE GAS EMISSION REDUCTION 7 (2011) and Ramón A. Alvarez et al., *Greater Focus Needed on Methane Leakage from Natural Gas Infrastructure*, 109 PNAS 6435 (2012). The EPA's calculations were compiled from information obtained in the U.S. Greenhouse Gas Inventory Report. U.S. ENVTL. PROT. AGENCY, EPA 430-R-14-003, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2012 (2014).

76. A.R. Brandt et al., *Methane Leaks from American Natural Gas Systems*, 343 SCIENCE 733, 735 (2014).

77. Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 77 Fed. Reg. 49,490 (Aug. 16, 2012) (to be codified at 40 C.F.R. pts. 60, 63); *see also EPA to Regulate Air Emissions from Hydraulic Fracturing as Industry Comes Under Scrutiny*, MARTEN L. (May 29, 2012), http://www.martenlaw.com/newsletter/20120529-air-emissions-from-hydraulic-fracturing, *archived at* http://perma.cc/7RNZ-TNH5 (discussing the EPA's new regulations in detail).

78. *See* MCGRAW, *supra* note 43, at 96–97 (describing the transformation of a "quiet mountain scene" into "an industrial site, crammed with equipment and men and thundering with the deafening roar of drills and generators and trucks").

79. *See* Jim Efstathiou Jr., *Taxpayers Pay ss Fracking Trucks Overwhelm Rural Cow Paths*, BLOOMBERG (May 15, 2012, 11:19 AM), http://www.bloomberg.com/news/2012-05-15/taxpayers-pay-as-fracking-trucks-overwhelm-rural-cow-paths-1-.html, *archived at* http://perma.cc/GB4M-USFR (describing how officials in various states are considering how to fix the road damage caused by the increased traffic of the fracking trucks). In Texas's Eagle Ford Shale, one county spent 90% of its 2013 budget on road repair, administration, and public safety. Ann Choi & Michael Marks, *Eagle Ford Windfall Goes to Fix What the Boom Broke*, AUSTIN AM.-STATESMAN, Feb. 22, 2014, http://www.statesman.com/news/news/eagle-ford-windfall-goes-to-fix-what-the-boom-brok/ndYjw/, *archived at* http://perma.cc/ASR9-CG9W.

economies, and the presence of more (relatively) highly paid workers in significant numbers can cause inflation, rendering goods and services unaffordable (or less affordable) to locals, some of whom do not benefit financially from the production boom.[80] Some of these quality of life impacts may be addressed by local zoning rules (noise); others are addressed by federal or state law (air pollution). These impacts are not permanent: things are much quieter during the production phase following well completion.[81] However, though drilling and fracking a well may consume only a few months, companies may drill multiple wells from the same pad and may periodically return to drill or frack from a single pad over a period of years. And within a local community, companies may drill and frack from multiple pads, thereby lengthening the impact period to one of years rather than months. In sum, while these effects are mostly temporary, they are sizeable in the eyes of locals and (unlike water contamination or seismicity) certain to occur.

III. State–Local Conflict

Thus, concerns about health, safety, and environmental risk are motivating local bans and restrictions on shale oil and gas production,[82] provoking conflict between locals and state regulatory regimes that explicitly authorize shale oil and gas production (under specified conditions). As of this writing, courts have decided a handful of cases involving fracking-related preemption claims, but we can reasonably expect

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80. *See* MCGRAW, *supra* note 43, at 79–85 (recounting how some residents of the Marcellus Shale in Pennsylvania are reaping great rewards from shale gas production, while others gain nothing because they do not own either property or businesses that benefit from the shale boom); Choi & Marks, *supra* note 79 (quoting a teacher in the Eagle Ford Shale region of Texas: "I have rental property so I am benefiting from the boom, but for other people, the only change they see are roads getting more dangerous"); *North Dakota Boomtown Suffers Growing Pains Trying to Keep Up with Demand*, PBS NEWSHOUR (Aug. 7, 2012, 12:00 AM), http://www.pbs.org/newshour/bb/business-july-dec12-boomtown_08-07/, *archived at* http://perma.cc/4WDR-NP6A (stating that the cost of managing a small town increased by almost $3 million due to nearby fracking activities and residents are frustrated that "[t]here's not enough anything"); *cf.* Deon Daugherty, *A Look Inside an Eagle Ford Boomtown—and its Traffic*, HOUS. BUS. J., Oct. 28, 2011, http://www.bizjournals.com/houston/blog/2011/10/a-look-inside-an-eagle-ford-boomtown--.html?page=all, *archived at* http://perma.cc/P65D-WUZU ("Workers at a standard 40-person fracking site with a high school education can command as much as $2,000 per week.").

81. The cleared land is eventually reclaimed but for the piping at the wellhead. Seamus McGraw describes the recovery process from the perspective of a local resident in a rural portion of the Marcellus Shale: "Sooner or later [drilling and fracking] would be finished. Yes, the land would be altered . . . but the land has a way of camouflaging such things. . . . [And] of reclaiming what is taken from it." MCGRAW, *supra* note 43, at 130.

82. Robert Cheren has calculated the percentage of land covered by local bans in the Marcellus Shale states, finding it to be more than 16% in New York but a very small percentage elsewhere. Robert D. Cheren, *Fracking Bans, Taxation, and Environmental Policy*, 64 CASE W. RES. L. REV. (forthcoming 2014) (manuscript at 8–9 & tbl.1), *available at* http://ssrn.com/abstract=2370534, *archived at* http://perma.cc/Y5AY-W8BY.

more preemption litigation in the future. How are courts likely to decide these cases? How should they decide these cases? The next two subparts take up these questions in order.

A. Preemption Cases

Regulation of onshore oil and gas production has traditionally been a state matter, and producing states have statutes in place to regulate oil and gas production. Most of these were enacted originally as "conservation" statutes that authorized state regulators to organize oil and gas production so as to promote production efficiencies—that is, to control production rates from a common oil and gas field in order to avoid waste of the resource.[83] Over time many conservation statutes were amended to include mandates aimed at safety and environmental protection, and some states now charge the state environmental agency (rather than an oil and gas commission) with responsibility for managing production, as in New York, Pennsylvania, Ohio, and West Virginia.[84] Federal regulation is light-handed, and the oil and gas industry enjoys exemptions from parts of some federal environmental laws.[85] Thus, states carry the lion's share of the regulatory burden and have been adapting to the shale oil and gas production boom over the last five years, updating their regulatory regimes to address these new risks.[86] Virtually every state where shale oil and gas is produced has revised its oil and gas regulatory regimes recently to address the particular

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83. For a brief history of the early proration orders issued by the Texas and Oklahoma commissions, see generally STEPHEN L. MCDONALD, PETROLEUM CONSERVATION IN THE UNITED STATES: AN ECONOMIC ANALYSIS 36–38 (1971).

84. *2013 Oil and Gas Annual Report*, PA. DEPARTMENT ENVTL. PROTECTION OFF. OIL & GAS MGMT., http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-100389/2013%20Oil%20and%20Gas%20Annual%20Report%20with%20cover.pdf, *archived at* http://perma.cc/TKT8-UDE3; *About Us*, ODNR DIVISION MIN. RESOURCES, http://minerals.ohiodnr.gov/contacts-about-us/about-us, *archived at* http://perma.cc/46YR-LJ7C; *Division of Mineral Resource Mission*, DEPARTMENT ENVTL. CONSERVATION, http://www.dec.ny.gov/about/636.html, *archived at* http://perma.cc/MUD7-G9VM; *Office of Oil and Gas*, W. VA. DEPARTMENT OF ENVTL. PROTECTION, http://www.dep.wv.gov/oil-and-gas/Pages/default.aspx, *archived at* http://perma.cc/AG8Z-J9J2. For a good discussion of the state commissions' various approaches to regulation, see generally Richard J. Pierce, Jr., *State Regulation of Natural Gas in a Federally Deregulated Market: The Tragedy of the Commons Revisited*, 73 CORNELL L. REV. 15, 30–52 (1987).

85. For a discussion of the scope of these exemptions, see David B. Spence, *Federalism, Regulatory Lags, and the Political Economy of Energy Production*, 161 U. PA. L. REV. 431, 449–52 (2013) and Hannah Wiseman, *Untested Waters: The Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation*, 20 FORDHAM ENVTL. L. REV. 115, 142–46 (2009).

86. *See* RICHARDSON ET AL., *supra* note 45, at 22–23 (summarizing the regulatory responses of states and municipalities implemented at various stages of the fracking process); Christopher S. Kulander, *Shale Oil and Gas State Regulatory Issues and Trends*, 63 CASE W. RES. L. REV. 1101, 1111–40 (2013) (detailing recent legislative developments related to fracking in six states); Wiseman, *supra* note 85, at 157–67 (describing a range of state regulatory options for numerous fracking activities).

issues posed by fracking,[87] and in 2013 California and Illinois proposed or enacted new regulatory regimes specifically to address the risks posed by fracking.[88] Consequently, most state oil and gas regimes now regulate (via permitting) things like well-construction standards (casing and cementing requirements); the handling, storage, and disposal of fracking fluids and wastewater; disclosure of fracking fluid constituents; setback requirements from structures; and more.[89]

It is against this backdrop of state regulation that local governments are enacting de facto or de jure fracking bans in rapidly increasing numbers. State oil and gas statutes often contain language addressing the preemption of local law,[90] and Dillon's Rule states that as creations of the states, local governments may act only in accordance with the powers granted to them by the states.[91] At the same time, many states grant local governments varying degrees of home rule,[92] raising the prospect that local governments

87. *See* RICHARDSON ET AL., *supra* note 45, at 23 & nn.20–27 (summarizing recent state regulatory changes related to shale oil and gas production). Pennsylvania amended its code several times to address fracking issues, most recently with the enactment of "Act 13," 58 PA. STAT. ANN. §§ 2301–3504 (West Supp. 2014), parts of which were struck down by Pennsylvania's highest court in January 2013, Robinson Twp. v. Pennsylvania, 83 A.3d 901, 913 (Pa. 2013). *See infra* notes 114–15 and accompanying text. Texas enacted legislation in 2011 to require disclosure of fracking fluid constituents and address water quality issues. TEX. NAT. RES. CODE ANN. § 91.851 (West 2011 & Supp. 2014). Ohio revised its oil and gas code to address fracking issues in 2010 and again in 2012. Kulander, *supra* note 86, at 1119, 1122. For a detailed description of the new Ohio and Texas rules, see *id.* at 1119–25, 1129–36. By the governor's executive order, Maryland is studying fracking before formulating new rules. 38 Md. Reg. 782 (July 1, 2011). Michigan's legislature recently considered additional rules for water withdrawals to accommodate new fracking projects. H.R. 4899–4906, 97th Leg., Reg. Sess. (Mich. 2013). The State's Department of Environmental Quality has proposed several rule changes that are now awaiting approval. Oil and Gas Operations, Dep't of Envt'l Quality, R.324.201–.1406 (proposed Nov. 1, 2013), *available at* http://www7.dleg.state.mi.us/orr/Files/ORR/1298_2013-101EQ_orr-draft.pdf, *archived at* http://perma.cc/D9G8-A275. North Carolina's governor signed a permanent moratorium on fracking permits until regulations and a permitting process are developed and approved. Act of July 29, 2013, pt. 1, § 1.(c), 2013 N.C. Sess. Laws 2013-365.

88. In 2013, California passed regulations involving increased regulation and notice provisions for fracking, which will go into effect by January 2015. 2013 Cal. Stat. 2525 (codified at. CAL. WATER CODE § 10783 and scattered sections of the CAL. PUB. RES. CODE). In November 2013, Illinois enacted Public Act 098-0022, or the Hydraulic Fracturing Regulatory Act, which created various feeds, permits, and restrictions to the process. Hydraulic Fracturing Regulatory Act, 2013 Ill. Laws 22 (codified at 225 ILL. COMP. STAT. 732).

89. *See* RICHARDSON ET AL., *supra* note 45, at 24, 32, 40, 43.

90. For some recent doctrinal analyses of state–local preemption jurisprudence, see generally Paul Diller, *Intrastate Preemption*, 87 B.U. L. REV. 1113 (2007); Blake Hudson & Jonathan Rosenbloom, *Uncommon Approaches to Common Problems: Nested Governance Commons and Climate Change*, 64 HASTINGS L.J. 1273 (2013); and Jay P. Syverson, Note, *The Inconsistent State of Municipal Home Rule in Iowa*, 57 DRAKE L. REV. 263 (2008).

91. Syverson, *supra* note 90, at 266. The rule is named after 19th century Iowa Judge Forest Dillon, who enunciated the rule in the case of *Clinton v. Cedar Rapids & Mo. River R. R. Co.*, 24 Iowa 455, 475 (1868).

92. For an extended discussion of home rule in the energy context, see Jarit C. Polley, Comment, *Uncertainty for the Energy Industry: A Fractured Look at Home Rule*, 34 ENERGY L.J.

may be able to exercise independent regulatory jurisdiction irrespective of preemption language in the state's oil and gas statute. Thus, resolving state–local preemption disputes involves the interaction of state oil and gas statutes with home rule provisions, something that courts seem to struggle with in the fracking context—at least, so far. Even though the relevant statutory provisions share similarities across states, different state courts interpret the language differently, making it difficult to generalize about the likely outcome of these disputes. Nevertheless, there are some points of comparison across jurisdictions that are worth noting.

Courts' analyses of state–local preemption conflicts appears doctrinally similar to federal preemption cases, in which courts ask first whether the higher level statute (in this case, the state oil and gas law) expressly preempts the lower level law (the local ordinance), and if not, whether it impliedly does so—either by "occupying the field" or because the two conflict.[93] Express preemption examines the text of the oil and gas statute to discern the legislature's intent and asks whether the state's oil and gas law was intended to circumscribe or preempt the use of local zoning to ban or restrict fracking. That question is complicated by the presence of a separate statutory or constitutional home rule provision,[94] but in some state regimes there is a circularity to the interaction between the oil and gas statute and the home rule provision: the home rule provision carves out a sphere of control for local government but may require that home rule powers be exercised subject to the limits imposed by state law.[95] This may also help explain some of the inconsistency in the state–local preemption decisions issued by state courts.[96]

Some courts interpret preemption provisions in oil and gas statutes broadly, while other courts seem unwilling to overturn local ordinances even in the presence of statutory expressions of intent to preempt. For example, the dearth of local bans in Louisiana is probably a function of unusually strong preemptive language in that state's oil and gas law;[97] and

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261 (2013). For a survey of home rule in the United States, see generally Kenneth E. Vanlandingham, *Municipal Home Rule in the United States*, 10 WM. & MARY L. REV. 269 (1968).

93. *See, e.g.*, Cipollone v. Liggett Grp., 505 U.S. 504, 516 (1992).

94. For a discussion of the distinction between constitutional and legislative home rule, see Polley, *supra* note 92, at 268, 272–85.

95. See, for example, the Ohio home rule provision, which requires that home rule powers not conflict with the state's general laws. OHIO CONST. art. XVIII, § 7. Similarly, the New York home rule provision grants home rule municipalities the power to adopt "local laws not inconsistent with the provisions of any general law . . . ." N.Y. CONST. art. IX, § 2(c). This is also true of the Texas home rule provision. TEX. CONST. art. 11, § 5.

96. *See* Vanlandingham, *supra* note 92, at 279–81 (noting the somewhat imprecise legal meaning of home rule).

97. The Louisiana statute says that if a person has a state permit to drill, the permit "shall be sufficient authorization to the holder of the permit to . . . drill in search of minerals." LA. REV. STAT. ANN. § 30:28(f) (2007).

an Ohio court recently held that a local ordinance was preempted by the state oil and gas statute based upon language in the statute giving the state "sole and exclusive authority to regulate" oil and gas development.[98] But such broad preemption language has not always led to similar outcomes. For example, the New York oil and gas statute "supersede[s] all local laws or ordinances relating to the regulation of [] oil [and] gas."[99] However, New York's highest court refused to read this provision as expressly preempting local zoning ordinances restricting fracking,[100] concluding instead that the word "regulation" in the preemption provision referred to rules specifying *how* drilling is done, leaving to local governments the power to specify *where* drilling is done.[101] Presumably, when courts read preemption provisions narrowly in this way, it is in deference to traditional local powers over land use[102] or perhaps because they view fracking's

98. OHIO REV. CODE ANN. § 1509.02 (West 2013); State *ex rel.* Morrison v. Beck Energy Corp., 989 N.E.2d 85, 97–98 (Ohio Ct. App. 2013).

99. N.Y. ENVTL. CONSERV. LAW § 23-0303(2) (McKinney 2007); *see also* John R. Nolon & Steven E. Gavin, *Hydrofracking: State Preemption, Local Power and Cooperative Governance*, 63 CASE W. RES. L. REV. 995, 1013 (2013) (observing that the New York law "at first blush seems to preclude the regulation of hydrofracking under local land use authority").

100. Wallach v. Town of Dryden, 16 N.E.3d 1188, 1195–98 (N.Y. App. Div. 2014). The decision affirmed similarly reasoned lower court decisions in *In re Norse Energy Corp. v. Town of Dryden*, 964 N.Y.S.2d 714, 719–23 (App. Div. 2013) and *Cooperstown Holstein Corp. v. Town of Middlefield*, 964 N.Y.S.2d 431, 432 (App. Div. 2013). The Court of Appeals decision relied in part on precedent finding that the state's mining law, which the courts said contained a similar preemption provision, did not preempt local law. Wallach, 16 N.E.3d at 1195–97. For an argument that the mining case precedent is a weak one, see generally Gregory R. Nearpass & Robert J. Brenner, *High Volume Hydraulic Fracturing and Home Rule: The Struggle for Control*, 76 ALB. L. REV. 167, 184–90 (2013) and Jon A. Czas, Note, *New York's Hydraulic Problem: How the Dryden Court's Failure to Apply State Preemption Illustrates the Need for New York to Reach a Decision Regarding Hydraulic Fracturing*, 11 GEO. J. L. & PUB. POL'Y 627, 634–39 (2013). *But see* Michelle L. Kennedy, Essay, *The Exercise of Local Control Over Gas Extraction*, 22 FORDHAM ENVTL. L. REV. 375, 390–92 (2011) (supporting the New York court's use of mining precedent). In a third and unreported New York case, *Jeffrey v. Ryan*, the trial court concluded that a local moratorium was preempted because the emergency condition that supposedly motivated the moratorium was mitigated by state regulation of oil and gas production. No. CA2012-001254, 2012 WL 4513348, at *7 (N.Y. Sup. Ct. Oct. 2, 2012).

101. *Wallach*, 16 N.E.3d at 1196–98. That court also rejected arguments that setback and spacing requirements in the state regime regulate well location and therefore preempt local well location regulation. *Id.* at 1201–02.

102. Several commentators have stressed the importance of this consideration. *See, e.g.*, Robert H. Freilich & Neil M. Popowitz, *Oil and Gas Fracking: State and Federal Regulation Does Not Preempt Needed Local Government Regulation: Examining the Santa Fe County Oil and Gas Plan and Ordinance as a Model*, 44 URB. LAW. 533, 568–69 (2012) (stressing the need for local zoning to address impact fees and adequate public facilities critical to maintaining health, welfare, and quality of life); Nolon & Gavin, *supra* note 99, at 1016–36 (surveying cases suggesting that courts are reluctant to usurp local prerogatives in the absence of very explicit legislative intent); Nancy Perkins, *The Fracturing of Place: The Regulation of Marcellus Shale Development and the Subordination of Local Experience*, 23 FORDHAM ENVTL. L. REV. 44, 47 (2012) ("[L]oss of local control is an affront to a feminist understanding of sustainable development that is skeptical of science, embraces intersectionality and situatedness, and encourages coalition-building and solidarity.").

impacts as more disruptive than standard oil and gas drilling (more like the kind of nuisance local governments ought to be able to prohibit).[103]

Like express preemption, field preemption entails discerning the intent of the legislature but infers that intent from the comprehensiveness of the regulatory scheme rather than the statutory language. A West Virginia court used field preemption recently to overturn a city ordinance purporting to ban drilling within a city, concluding that while "the City has an interest in the control of its land," the comprehensiveness of the state oil and gas regulatory regime indicates that "this area of law is exclusively in the hands" of the state.[104] The idea of field preemption contradicts the reasoning of the New York courts, which would reserve to the local governments the power to determine where development can occur, and sees the state's interest in managing production of the state's oil and gas resources stopping short of regulating where development can or must occur. However, courts making the "how/where" distinction are basing their decisions on legislative intent,[105] raising the question of whether state regimes that regulate setback requirements and other land use aspects of oil and gas signify a legislative intent to preempt local zoning designations of where drilling can occur.

Furthermore, there is disagreement among the courts about whether an outright ban (as opposed to limiting fracking to designated zoning districts) is a valid exercise of local governments' power to control land use within their borders.[106] Indeed, the third form of preemption, conflict preemption, focuses most directly on this question of whether a local ban conflicts with state law when the local ban prohibits what the state permits.[107] On the one hand, bans are a form of location regulation ("not here"); on the other hand, *too* many local bans could frustrate the state's objective of managing

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103. *But cf.* Ne. Natural Energy, LLC v. City of Morgantown, No. 11-C-411, 2011 WL 3584376 (W. Va. Cir. Ct. Aug. 12, 2011) (finding that there was no statutory basis for allowing the city to regulate or prohibit fracking regardless of the fact that the city defined fracking as a nuisance).

104. *Id.* For an argument that the West Virginia court should have followed the reasoning of the New York and Pennsylvania courts, see generally Emery L. Lyon, Comment, Northeast Natural Energy, LLC v. City of Morgantown, 57 N.Y.L. SCH. L. REV. 971 (2013). *Cf.* Polley, *supra* note 92, at 272 (describing West Virginia's adherence to Dillon's Rule).

105. *See supra* note 101 and accompanying text.

106. *See* Polley, *supra* note 92, at 274–80 (surveying courts' approaches to local fracking bans in various states); W. Devin Wagstaff, Student Essay, *Fractured Pennsylvania: An Analysis of Hydraulic Fracturing, Municipal Ordinances, and the Pennsylvania Oil and Gas Act*, 20 N.Y.U. ENVTL. L.J. 327, 338 (2013) (noting that most local ordinances in Pennsylvania do not ban fracking outright because bans likely "will not be defensible"). After the Pennsylvania Supreme Court's decision in *Robinson Township v. Commonwealth* that assertion may no longer be true. *See infra* notes 115–19 and accompanying text.

107. *Cf.* David Giller, *Implied Preemption and Its Effect on Local Hydrofracking Bans in New York*, 21 J.L. & POL'Y 631, 657 (2013) (arguing that "local law is not preempted simply because it prohibits an activity that is allowed under state law").

development of the resource.[108] Two recent lower court decisions in Colorado were the first to address local fracking bans in that state, one in Longmont and another in Fort Collins. Both concluded that local bans conflicted with the state's interest in ensuring efficient oil and gas production.[109] One of the Colorado courts treated the ban on fracking as an attempt to regulate *how* oil and gas is extracted from the ground, which is within the state's purview.[110] The other concluded that a local moratorium interfered with, and conflicted with, the state regulatory regime.[111] These stand in contrast to the New York courts, which (as noted above) found no conflict between state oil and gas law and a local ban.[112]

A recent Pennsylvania Supreme Court decision has turned that state into a bit of an outlier in this field. Prior to 2012, some Pennsylvania courts seemed reluctant (like their New York counterparts) to interpret preemptive language in the Pennsylvania oil and gas statute as an expression of intent to preempt local ordinances.[113] In 2012, the Pennsylvania legislature

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108. Czas, *supra* note 100, at 641 (contending that by putting some production areas off limits, local bans undermine the statutory objective of promoting efficient exploitation of resources).

109. Colo. Oil & Gas Ass'n v. City of Fort Collins, No. 13CV31385, slip op. at 9 (Colo. Dist. Ct. Aug. 7, 2014); Colo. Oil & Gas Ass'n v. City of Longmont, No. 13CV63, slip op. at 16–17 (Colo. Dist. Ct. July 24, 2014). Both courts relied in part on *Voss v. Lundvall Bros.*, which articulated a per se rule that municipal bans are preempted. 830 P.2d 1061, 1068 (Colo. 1992).

110. Colo. Oil & Gas Ass'n v. City of Longmont, No. 13CV63, slip op. at 14–17 (Colo. Dist. Ct. July 24, 2014).

111. Colo. Oil & Gas Ass'n v. City of Fort Collins, No. 13CV31385, slip op. at 9 (Colo. Dist. Ct. Aug. 7, 2014).

112. *See supra* text accompanying notes 99–101. However, in *Jeffrey v. Ryan*, the court concluded that the state oil and gas statute preempted a local two-year moratorium. No. CA2012-001254, 2012 WL 4513348, at *5–7 (N.Y. Sup. Ct. Oct. 2, 2012). A federal court applying Pennsylvania law in 2009 concluded that there is a conflict when the local ordinance "forbids what [the state statute] permits" because a flat out prohibition "stands as an obstacle to the accomplishment and execution of the full purposes and objectives of [the statute]." Range Resources-Appalachia, LLC v. Blaine Twp., No. 09-355, 2009 WL 3515845, at *8–9 (W.D. Pa. Oct. 29, 2009). The Pennsylvania statute has been struck down on other grounds, but the relatively recent prior case law illustrates the difficulty courts have with these local preemption questions. *See infra* note 115 and accompanying text.

113. The Pennsylvania statute superseded "all local ordinances and enactments purporting to regulate oil and gas well operations regulated by this act." 58 PA. STAT. ANN. § 601.602 (West 1996). As with the New York decisions, the Pennsylvania courts interpreted this language to exclude regulation of the location of wells, including ordinances that ban drilling throughout the town. *See* Huntley & Huntley, Inc. v. Borough Council, 964 A.2d 855, 864, 869 (Pa. 2009) (upholding a ban on drilling within the borough); Penneco Oil Co. v. Cnty. of Fayette, 4 A.3d 722, 733 (Pa. Commw. Ct. 2010) (upholding an ordinance that regulated the location of wells, but did not ban them). *But cf.* Range Resources-Appalachia, LLC v. Salem Twp., 964 A.2d 869, 877 (Pa. 2009) (overturning a local ordinance regulating oil and gas land development on field preemption grounds); *Blaine Twp.*, 2009 WL 3515845, at *8 (holding that a city's disclosure ordinance was preempted because it "forbids what the Oil and Gas Act permits").

enacted a law (known as "Act 13")[114] that would have strengthened the preemption provisions of that state's oil and gas statute, effectively removing local governments' zoning discretion with respect to fracking; but that law was struck down by the Pennsylvania Supreme Court in 2013.[115] Though the court was divided in its rationale, a plurality found Act 13—particularly its circumscription of local zoning discretion—to be in conflict with the state's constitutional guarantee of citizens' right to "clean air, pure water, and the preservation of [environmental] values."[116] In so doing, the court interpreted the legislature's power to make general laws (like the oil and gas law) narrowly,[117] noting in particular that the constitutional right to a clean environment "delineates limitations on the Commonwealth's power to act as trustee of the public natural resources."[118] This decision is likely to change the way courts analyze state–local preemption claims in Pennsylvania going forward, though its effects on state–local preemption doctrine elsewhere remain to be seen.[119]

So there is variation in state approaches to the state–local preemption question, despite some superficial similarities in statutory preemption provisions and case law doctrine across states. The relative dearth of cases challenging local attempts to discourage fracking means that preemption doctrine, at least as it applies to fracking, is in its infancy. A pending appeal in Ohio[120] and the ongoing challenges to local bans in Colorado[121]

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114. *See supra* note 87. Chapter 33 of the law would prohibit any local regulation of oil and gas operations and would require statewide uniformity among local zoning ordinances governing oil and gas activities. 58 PA. STAT. ANN. §§ 3301–3309 (West Supp. 2014).

115. Robinson Twp. v. Commonwealth, 83 A.3d 901, 913 (Pa. 2013).

116. PA. CONST. art. I, § 27; *Robinson Twp.*, 8h3 A.3d at 913.

117. The court explained:

> Specifically, ours is a government in which the people have delegated general powers to the General Assembly, but with the express exception of certain fundamental rights reserved to the people in Article I of our Constitution. . . . Accordingly, Article I . . . is not a discrete textual source of police power delegated to the General Assembly by the people pursuant to which legislation is enacted.

Robinson Twp., 83 A.3d at 947 (citations omitted).

118. *Id.* at 974.

119. The *Robinson Township* court notes that no other shale-producing state (indeed, no other state) enshrines popular environmental rights in their constitution as firmly distinct from legislative power, as does Pennsylvania. *Id.* at 962–63. However, other states do enshrine certain environmental rights into their constitutions, and some of them may yet become shale oil and gas producers. For a summary of these provisions, see Barton H. Thompson, Jr., *Constitutionalizing the Environment: The History and Future of Montana's Environmental Provisions*, 64 MONT. L. REV. 157, 160–65 (2003).

120. Brief of Appellant, State *ex rel*. Morrison v. Beck Energy Corp., No. 2013-0465 (filed Sept. 8, 2013).

121. Plaintiffs in *Longmont* have already indicated their intent to appeal the Boulder County District Court decision. Juan Carlos Rodriguez, *Enviros Take Fracking Ban Fight to Colo. Appeals Court*, LAW360 (Sept. 11, 2014, 4:01 PM) http://www.law360.com/environmental/articles/576276/enviros-take-fracking-ban-fight-to-colo-appeals-court, *archived at* http://perma.cc/CQ69-DW8P.

may help to clarify preemption doctrine in those states. No doubt, these kinds of conflicts will bubble to the surface in other states as well. The day after voters endorsed a fracking ban in Denton, Texas, in November 2014, the Texas Oil and Gas Association filed a suit claiming the Denton ban is preempted by the state's oil and gas statutes.[122] As of this writing, no fracking preemption cases have been filed in California against local bans there, despite state rules that contemplate development of the Monterrey Shale region.[123]

Curiously, courts reviewing anti-fracking ordinances have not delved terribly deeply into the questions one might expect to see examined as part of this analysis. Does the state's oil and gas law's original objective—preventing a tragedy of the commons in oil and gas production and ensuring the maximum efficient recovery of oil and gas resources[124]—even apply to producing oil and gas from shale? Hydrocarbons in shale do not flow freely (or *as* freely as in conventional formations) until the rock is fractured, so one person's production of shale oil or gas has much less of an effect on the recoverability of oil or gas nearby (unless fractures cross property lines or connect with another's fractures). Do the states' inclusion of environmental criteria, setback rules, or other siting criteria in their oil and gas regulatory regimes imply a state interest in regulating *where* development occurs and thereby preempt local zoning? What exactly are the boundaries of home rule power? Can local governments ban any land use that the people don't want, or must the unwanted use rise to the level of a nuisance? If the latter, in determining whether fracking constitutes a nuisance, how will courts weigh the significant disruptions caused by fracking against their temporary nature? Will courts focus on the real (measurable or quantifiable) risk or the perceived risk? Oddly, most of the case law to date buries those sorts of considerations behind an ostensibly mechanical application of the statutory (and, where applicable, constitutional) rules.

B. The Merits of Local vs. State Control

So how might we decide whether state or local power ought to prevail in these disputes? One might begin by identifying a policy objective or cherished value and asking which level of government is most likely to choose that policy or further that value. One can imagine a variety of analyses that begin by establishing the preferred principle (such as the

122. Jim Malewitz, *First Lawsuits Filed over Denton's New Fracking Ban*, TEX. TRIB. (Nov. 5, 2014), http://www.texastribune.org/2014/11/05/denton-fracking-ban-sees-first-lawsuit/, *archived at* http://perma.cc/YKS9-657E.

123. *See* Sharon Bernstein, *California Law to Regulate Fracking Signed by Governor*, REUTERS, Sept. 20, 2013, http://www.reuters.com/article/2013/09/21/us-usa-california-fracking-idUSBRE98K00C20130921, *archived at* http://perma.cc/FR4G-FP7W (reporting that the "hotly contested bill drew strong opposition from many environmentalists").

124. *See supra* note 83 and accompanying text.

precautionary principle, the state's interest in managing development of mineral resources, the right to a clean environment, or economic development) and then reasoning through the preemption problem in ways that are most likely to produce policy choices consistent with that principle. However, since different people balance fracking's costs and benefits differently, we might better explore policy-neutral ways to resolve this jurisdictional question. That is, we might ask, what sort of decision process is likely to produce a policy that aggregates those different preferences fairly or well?

Accordingly, we can conceive of these preemption disputes as political conflicts over allocating the costs and benefits of fracking, broadly speaking.[125] Indeed, framing the problem in that way can shed light on the political roots of these conflicts and help identify the essential elements of a solution. There is a long tradition in economics, positive theory, and other quasi-utilitarian traditions of examining jurisdictional conflicts like these using the matching principle,[126] which would house regulatory authority at the lowest level of government that encompasses (geographically) the costs and benefits of the regulated activity.[127] Applying the matching principle to federal–state conflict over shale oil and gas production is relatively straightforward, since the vast majority of costs and benefits are subsumed within state boundaries, and the federal government already has ample

125. In the federal preemption literature, this is just one of several policy-neutral ways of addressing the problem. Perhaps most prominent is the idea of "dynamic federalism," which stresses the value of overlapping state and federal jurisdiction. *See generally* William W. Buzbee, Essay, *Contextual Environmental Federalism*, 14 N.Y.U. ENVTL. L.J. 108 (2005) (arguing in support of "regulatory overlap" between state and federal environmental law); Robert A. Schapiro, *Toward a Theory of Interactive Federalism*, 91 IOWA L. REV. 243 (2005) ("Federalism . . . achieves its goals not through the separation of state and national power, but through their interaction.").

126. *See, e.g.*, Henry N. Butler & Jonathan R. Macey, *Externalities and the Matching Principle: The Case for Reallocating Environmental Regulatory Authority*, 14 YALE L. & POL'Y REV. 23, 25 (1996) (describing the development of the matching principle and describing its development as a means of determining the efficiency of environmental regulations); William N. Eskridge, Jr. & John Ferejohn, *The Elastic Commerce Clause: A Political Theory of American Federalism*, 47 VAND. L. REV. 1355, 1363–64 (1994) (addressing the efficiency of state and local distribution of power in redistribution policies); Wallace E. Oates, *Thinking About Environmental Federalism*, RESOURCES, Winter 1998, at 14 ("[T]he central idea emerging from the literature in public economics is that the responsibility for providing a particular public service should be assigned to the smallest jurisdiction whose geographical scope encompasses the relevant benefits and costs associated with the provision of the service.").

127. Butler & Macey, *supra* note 126, at 25. This analysis is not intended to be an application of the so-called "Tiebout Model," which assumes that people are costlessly able to move between jurisdictions in order to find the jurisdiction that balances economic and social net benefits in ways that are to their liking. *See* Charles M. Tiebout, *A Pure Theory of Local Expenditures*, 64 J. POL. ECON. 416, 418 (1956) ("[T]he consumer-voter moves to that community whose local government best satisfies his set of preferences."). Rather, per Oates, *supra* note 126, I am employing the matching principle as a useful starting point for determining the level of government at which decisions involving externalities ought to be made.

authority to address those few impacts that reach beyond state boundaries.[128] The question is not so clear in the case of state–local conflict over shale oil and gas production, however, for two reasons.

First, as described in this subpart, while the costs and benefits of fracking extend beyond local borders, both tend to be more concentrated within the locality than beyond its borders—the costs more so than the benefits. As a consequence, locals care far more about the impacts of fracking than non-locals do, making them more likely to mobilize politically around fracking issues. In the parlance of positive theory, locals have greater preference intensities over these issues than non-locals do, raising the question of how or whether to account for that greater intensity in political and legal decision making. Second, popular perceptions of risk (and of the costs of fracking) differ from demonstrable risks, also in ways that affect political decisions. With these phenomena in mind, we can ask how states and localities, respectively, are likely to translate popular preferences into policy choices that reflect an appreciation of both the costs and benefits associated with shale oil and gas production.

1. The Distribution of Costs and Benefits.—For reference, we can use Figure 1, which depicts a hypothetical state from which shale gas, oil, or both can be produced economically. In the figure, the boundary of the shale formation is shown by the dotted line. For simplicity, the state contains only nine local subdivisions, A through I. The shaded local subdivisions have enacted anti-fracking ordinances banning the practice within their borders. Assume that as one moves southeast within the state, population density and income increase.[129] The heavy solid lines in the figure depict major highways and the small circles the location of pads from which horizontal wells are being drilled and fracked. Finally, assume that trucks and other vehicles move between the well pads and the highways on

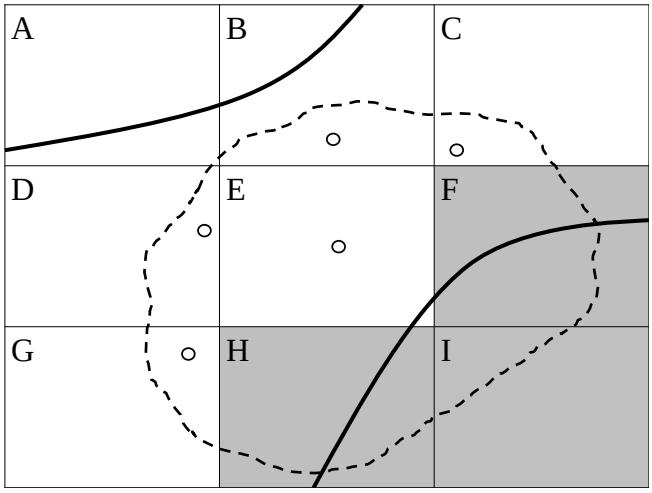
128. *See* Spence, *supra* note 85, at 492–93 (concluding that states subsume most of the impacts of shale gas production, and that existing federal authority addresses those that spill across state lines). *But cf.* Michael Burger, *Fracking and Federalism Choice*, 161 U. PA. REV. ONLINE 150, 153 (2013) (arguing that "fracking gives rise to interstate, and even national, problems that must be addressed accordingly").

129. This assumption is consistent with the literature on NIMBY (not in my backyard) movements, which documents the correlation between income and opposition to locally unwanted land uses. *See, e.g.*, EDWARD J. WALSH ET AL., DON'T BURN IT HERE: GRASSROOTS CHALLENGES TO TRASH INCINERATORS 131 (1997) (indicating that companies utilize income level as one factor for determining where to place trash incinerators); Carol Mansfield et al., *The Efficiency of Political Mechanisms for Siting Nuisance Facilities: Are Opponents More Likely to Participate than Supporters?*, 22 J. REAL ESTATE FIN. & ECON. 141, 156 (2001) (finding that individuals with higher income and education levels are more likely to oppose undesirable land-use developments). Of course, the rural poor may sometimes oppose fracking based on the desire to preserve a quiet way of life or for other reasons; similarly, rich urbanites (and suburbanites) may sometimes decide that they can tolerate the disruptions associated with fracking in order to reap the financial rewards. For a comparison of income levels in New York State jurisdictions with pro- and anti-fracking ordinances, see *infra* note 156.

connecting roads, the quality and carrying capacity of which is greater in the more densely populated portions of the state to the southeast than in the less densely populated and more rural portions of the state to the north and west.

It should be evident from the review of the impacts and risks associated with shale oil and gas production in Part II that some of the costs of production fall beyond the boundaries of the localities in which drilling takes place. The risks associated with disposal of wastewater, for example, may fall far from the producing areas, depending upon how far producers must travel to dispose of wastewater in underground injection wells, wastewater treatment facilities, or elsewhere. It is not uncommon for producers to travel outside the producing localities to obtain water supplies, or to dispose of wastewater, or even to cross state lines for those purposes. If wastewater from the production well in local subdivision B is disposed of in an underground injection well in local subdivision H, the people of local subdivision H bear the risk of any seismicity (which tends to be highly localized), and those living on the roads between the two bear some of the risk of a spill. Indeed, if local governments within a state draw their water supply from a common source, and that source is strained by shale oil and gas production, the problem is inherently a regional one. As noted in Part II, air pollution from fracking operations can and does cross local jurisdictional boundaries, even if much of it is experienced locally. Fugitive methane from natural gas facilities is a greenhouse gas and so exerts its incremental effects (whatever the magnitude of those effects) on climate globally. Even the impacts of truck traffic are felt beyond local borders, as trucks travel to and from drilling sites across jurisdictional lines.

Figure 1: Hypothetical State with Nine Local Government Subdivisions



Other impacts, however, are mostly local. Given that the well pad is the center of the operation, the risk of a spill ought to be highest in close proximity to the well pad. The changes to local quality of life—noise and visual impact of the drilling rig and well pad; the road damage, noise, and fumes associated with truck traffic, compressors and engines; and all the other indicia of industrialization that accompany the drilling and fracking process—are centered at the production site. The negative boomtown effects—economic and social—will be centered in the production areas. Fluids and wastewater are handled at the drilling site: spills, if they occur, will likely occur there. Likewise, if a well is improperly cased or sealed, any resulting damage to water quality will be felt at or near the production site. In Figure 1, these risks will be borne mostly by people living near the well sites in local subdivisions B, C, D, E, and G. Of course, groundwater contamination can migrate, and truck traffic to and from those sites may take vehicles through other local subdivisions. But most of these risks seem to be concentrated around the well pad.

Furthermore, if we measure risk in terms of expected harm (probability of harm times magnitude of harm), one can make a strong argument that the majority of the real costs of shale production fall on locals who live near the well pad. This is because the more geographically dispersed impacts are also the most uncertain and disputed, while the local quality-of-life impacts are virtually certain to occur and are most tangible and disruptive for those who experience them. By contrast, the probability that any particular fracking operation will produce water contamination seems very low (even

if the fear of contamination may be very real).[130] Similarly, as unnerving as it is for people, the actual harm done by seismicity from fracking activities is very small.[131] Other risks—such as wastewater disposal issues and fugitive methane emissions—seem like tractable problems amenable to technical and regulatory solutions. In sum, for any given shale oil or gas production operation, it is extremely unlikely that emissions to air, emissions to water, or seismicity will produce harm, but virtually certain that locals will experience the noise, smells, boomtown effects, and inconvenience that come with drilling and fracking a well.

As for the benefits of fracking, we can divide them along two dimensions: those that accrue to the private sector versus the public sector and direct versus indirect impacts. The private sector benefits of shale oil and gas production will extend beyond the drilling localities, but they too are centered in the producing regions. Oil and gas industry jobs and wage gains center on the producing areas as do some of the secondary economic effects. Production injects investment dollars, royalty capital (payments to landowners), and well-paid workers into the local economy, though some of these effects are temporary.[132] Other economic effects fall more broadly across the region or the state. According to the Marcellus Shale Advisory Committee, Pennsylvania employment in the oil and gas industry increased from about 9,500 jobs to more than 18,000 jobs between 2007 and 2010, with the average worker earning approximately 60% more than the statewide average salary.[133] The University of Texas at San Antonio puts oil- and gas-related employment in the Eagle Ford Shale region at 116,000 jobs.[134] Lease payments to Pennsylvania landowners in 2010 totaled over $1.5 billion.[135] According to the Bureau of Labor Statistics, while national employment decreased by 4.4% between 2007 to 2011, employment in the Bakken Shale increased 35.9%, and average annual pay rose from $33,040 to $50,553, for an increase of 53.1%.[136] According to published reports,

130. *See supra* notes 38–44 and accompanying text.

131. *See supra* notes 63–68 and accompanying text.

132. *Cf.* ZUCKERMAN, *supra* note 43, at 358–59 (describing the career trajectory of a man and woman who moved from Oregon to the Bakken Shale in North Dakota to work, a story that ended with their return to Oregon after earning opportunities shrunk and housing costs grew).

133. GOVERNOR'S MARCELLUS SHALE ADVISORY COMMISSION REPORT 88–89 (2011), http://files.dep.state.pa.us/PublicParticipation/MarcellusShaleAdvisoryCommission/MarcellusShaleAdvisoryPortalFiles/MSAC_Final_Report.pdf, *archived at* http://perma.cc/P44L-KTCU.

134. Choi & Marks, *supra* note 79.

135. TIMOTHY J. CONSIDINE ET AL., THE PENNSYLVANIA MARCELLUS NATURAL GAS INDUSTRY: STATUS, ECONOMIC IMPACTS AND FUTURE POTENTIAL 2 (2011), *available at* http://marcelluscoalition.org/wp-content/uploads/2011/07/Final-2011-PA-Marcellus-Economic-Impacts.pdf, *archived at* http://perma.cc/WD3M-4ULP?type=pdf.

136. PAUL FERREE & PETER W. SMITH, BUREAU OF LABOR STATISTICS, EMPLOYMENT AND WAGE CHANGES IN OIL-PRODUCING COUNTIES IN THE BAKKEN FORMATION, 2007–2011, at 2 (2013), *available at* http://www.bls.gov/opub/btn/volume-2/employment-wages-bakken-shale-region.htm, *archived at* http://perma.cc/UUH6-8LAR.

employment in the town of Williston, North Dakota, the center of that state's shale oil boom, increased by 14,000 between 2010 and 2012, an amount roughly equal to the prior population of the town.[137] In North Dakota, the unemployment rate is at about 3%, less than half the national average.[138] Between the first quarter of 2010 and the third quarter of 2011, seasonally adjusted retail sales in the five counties at the heart of the Eagle Ford Shale in South Texas grew by 55% (more than $100 million).[139] And of course, shale oil and gas production is lowering energy costs,[140] which provides an incentive for more investment in manufacturing anywhere gas supply is reliable.[141]

Shale oil and gas production brings increased revenue to governments as well. State revenues may come from taxes on production, income, or property, depending upon the state. As incomes and property values grow, revenues from taxes on income and property grow with them. In 2010, drilling in the Marcellus Shale brought an estimated $1 billion in revenue to the state of Pennsylvania,[142] and it has been widely reported that North Dakota is enjoying a $1 billion surplus largely due to the shale oil and gas boom there.[143] Unlike private-sector economic benefits, which we can think of as concentrated most heavily in the producing regions (even if they also spread beyond them), revenues to state governments represent benefits spread across the state. Assuming that these revenues are not returned disproportionately to the producing regions, they may go into the state's general fund and be distributed like other state spending; or, they may defer

137. Blaire Briody, *11 Shocking Facts About the North Dakota Oil Boom*, FISCAL TIMES (June 6, 2013), http://www.thefiscaltimes.com/Articles/2013/06/06/11-Shocking-Facts-about-the-North-Dakota-Oil-Boom, *archived at* http://perma.cc/M4L-ZSGQ.

138. Press Release, Bureau of Labor Statistics, U.S. Dep't of Labor, Regional and State Employment and Unemployment—April 2013 (May 17, 2013), *available at* http://www.bls.gov/news.release/archives/laus_05172013.pdf, *archived at* http://perma.cc/WF5K-RG4Y; Briody, *supra* note 137.

139. Robert W. Gilmer et al., *Oil Boom in Eagle Ford Shale Brings New Wealth to South Texas*, SOUTHWEST ECON., Second Quarter 2012, at 3, 6, *available at* http://www.dallasfed.org/assets/documents/research/swe/2012/swe1202b.pdf, *archived at* http://perma.cc/5RLB-XGHH?type=pdf.

140. According to one estimate, shale gas production in the Marcellus region has lowered energy costs by 13%. Naureen S. Malik, *Marcellus Gas Cuts Price Premiums to Decade Lows*, WORCHESTER TELEGRAM & GAZETTE, June 21, 2012, http://www.telegram.com/article/20120621/NEWS/106219795/1002, *archived at* http://perma.cc/XQ8T-CMSW.

141. According to PricewaterhouseCoopers, inexpensive shale gas could increase manufacturing employment in the United States by 1 million workers by 2025. *Shale Gas: A Renaissance in US Manufacturing?*, PRICEWATERHOUSECOOPERS 1 (Dec. 2011), http://www.pwc.com/en_US/us/industrial-products/assets/pwc-shale-gas-us-manufacturing-renaissance.pdf, *archived at* http://perma.cc/XW7S-SHKW; *see also* Bullis, *supra* note 14 (discussing the positive impact the shale gas boom will have on the U.S. manufacturing economy).

142. CONSIDINE ET AL., *supra* note 135, at iv.

143. Larry Oakes, *North Dakota's Great Oil Rush*, STAR TRIB., Oct. 17, 2011, http://www.startribune.com/local/131923403.html, *archived at* http://perma.cc/VUJ2-4KP9.

other taxes, thereby benefiting those whose tax liability is reduced as a result. A minority of local governments can capture a segment of the private-sector economic benefits of fracking directly because they have the power to assess income taxes or property taxes on minerals (including oil and gas); but this is the exception rather than the rule. Interestingly, Robert Cheren finds that local governments with this taxing power are much less likely to ban fracking than governments that lack these powers.[144]

Finally, as we have already noted, shale oil and gas production may also bring other benefits that spread not only beyond the local community but beyond the state line as well. As noted previously,[145] the effect on climate change of substituting natural gas for coal in the electric generation mix is disputed, but the other beneficial effects of this substitution are not. As inexpensive, cleaner-burning natural gas replaces coal as a fuel for electric generation,[146] the net reduction in emissions of conventional and toxic pollutants (greenhouse gas emissions aside) brings large reductions in premature deaths, as well as other health benefits.[147] We can also ascribe significant (but hard to quantify) benefits to the national security effects of the United States' growing supply of oil and gas.

It should be clear from this discussion that local governments do not capture all of the important costs and benefits of fracking within their borders, while states capture most of those impacts. A straightforward application of the matching principle, then, yields the conclusion that states are best suited to the task of balancing the costs and benefits of shale oil and gas production, implying perhaps that preemption of local ordinances

144. Cheren, *supra* note 82 (manuscript at 2).

145. *See supra* text accompanying notes 73–77.

146. Since 2005, coal's market share of electricity production has fallen, while that of natural gas has risen. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2014: WITH PROJECTIONS TO 2040, at ES-4 fig.ES-5 (2014), *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2014).pdf, *archived at* http://perma.cc/3D5S-VP9N. The U.S. Energy Information Administration predicts that by 2035, natural gas will have completely outpaced coal as the leading electricity-producing fuel, though low coal prices have decreased the strength of the trend recently. *Id.* at ES-4.

147. *See* Paul R. Epstein et al., *Full Cost Accounting for the Life Cycle of Coal*, 1219 ANNALS N.Y. ACAD. SCI. 73, 76, 93 (2011) (estimating that over the full lifecycle of coal, coal-related externalities, including harms to public health and even death, could cost the American public as much as half a trillion dollars each year); Nicholas Z. Muller et al., *Environmental Accounting for Pollution in the United States Economy*, 101 AM. ECON. REV. 1649, 1667–69 & tbl.4 (2011) (placing the non-GHG environmental costs of coal combustion, including mortality-related risks, at more than $50 billion, and the increase in electricity prices from internalizing those costs at 2.8 cents per kwh); Press Release, Nat'l Acads., Report Examines Hidden Health and Environmental Costs of Energy Production and Consumption in U.S. (Oct. 19, 2009), *available at* http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12794, *archived at* http://perma.cc/S5E9-YM53 (estimating the annual *non-climate* related external damages, including damages to human health, from 406 coal-fired power plants to be $62 billion, or about 3.2 cents per kwh).

would be efficient.[148] However, it is also evident from the foregoing discussion that costs and benefits are not distributed homogenously across the state:[149] in particular, the most certain and tangible costs of fracking fall most heavily on locals. While benefits are also centered on the producing region, their distribution seems more diffuse than the distribution of costs. All of which gives rise to the inference that the costs (and, to a lesser degree, the benefits) of fracking may be much more salient to local voters than to non-local voters. We can expect this cost heterogeneity and the geographic mismatch between costs and benefits to influence political decision making in predictable ways.

2. Political Decision Making About Fracking.—Charles Tiebout's famous model of local decision making suggests that local governments do a better job of providing the optimal level of regulation, in part because voters are mobile.[150] Each voter and each employer can seek out the local jurisdiction that provides the best mix of economic opportunity and regulatory protection. However, neither employers nor voters are perfectly mobile in the ways suggested by Tiebout's model; in particular, prospective investors in long-lived or immobile assets cannot move those assets once the investment is made and so may be dissuaded from investing in the first place but for the right to be compensated if the property is taken.[151] However, even if the actors in this drama are not perfectly mobile, that does not mean that local governments don't do a better job than states (or the federal government) of balancing the (local) costs and benefits of their policy choices. Therefore, if local impacts do have an outsized impact on collective utility, then we should examine carefully the local politics of fracking in order to properly assess the likely welfare effects of local vetoes.

The interest group politics of the fracking debate are fairly straightforward: the supporters and opponents of development are predictable, particularly once we understand the distribution of the costs and benefits of

148. Indeed, a strict application of the Tiebout model illustrates that point. The model assumes that in the long run, people are perfectly mobile, and can move freely between local jurisdictions, enabling us to therefore apply the matching principle straightforwardly. Tiebout, *supra* note 127, at 419.

149. This is a familiar problem in the federalism literature. Mismatch problems exist whenever the distribution of costs and impacts is imperfect, even when all costs and benefits remain within a single jurisdiction. *See* Daniel E. Ingberman, *Siting Noxious Facilities: Are Markets Efficient?*, 29 J. ENVTL. ECON. & MGT. S-20, S-21 to -25 (1995) (explaining that if impacts are concentrated on those closest to the noxious facility, a majority of voters within that boundary will suffer less-than-average impacts).

150. Tiebout, *supra* note 127, at 424 ("If consumer-voters are fully mobile, the appropriate local governments, whose revenue-expenditure patterns are set, are adopted by the consumer-voter.").

151. This is the problem of asset specificity, and others have raised this objection to the Tiebout model in the context of takings claims. *See infra* note 257 and accompanying text.

production. The supporters group may include local constituencies such as (1) current and prospective workers in industries that will benefit from development; (2) property owners who can earn sizable bonus and royalty payments by leasing their mineral rights; (3) local business groups (such as the Chamber of Commerce) and others who place a premium on local economic development; and (4) local governments that capture some of the economic benefits of fracking through increased tax revenues. Non-local supporters include the oil and gas industry, other current and prospective workers in industries elsewhere in the state that will capture the economic ripple effects of production in the shale regions, and state governments whose coffers will grow with additional revenue due to shale oil and gas production. Some beneficiaries are so distant (in time and space) from the producing regions that they will not be represented in the policy process at all. For example, the people whose premature deaths are avoided by the United States' reduced reliance on coal cannot even identify themselves as beneficiaries in the first place, let alone be heard in the local (or state) policy-making process.[152] As for the opponents of fracking, they comprise two groups: people in and near the production area who bear the social and environmental costs of drilling and fracking, and regional and national environmental groups opposed to fracking or to fossil-fuel development generally.[153]

How effectively is each of these groups likely to be in the contest to influence state and local policies toward fracking? It is not uncommon for political scientists to posit that business groups enjoy certain advantages in the contest to shape policy: they typically have more to gain from political rent-seeking behavior, they face fewer collective action problems (fewer members, fewer transaction costs to organizing), and they often have more financial and other resources than their opponents.[154] If organized group

152. That is, those who will not die prematurely because of reduced exposure to the harmful by-products of coal mining, processing, and combustion will never know that they benefited in this way. Even if the beneficiaries of reduced reliance on coal could identify themselves, they are too diffuse and disinterested to organize and press their positions on state or local policy makers in shale oil and gas producing regions. For a more detailed analysis of this point, see David B. Spence, *Backyard Politics, National Policies: Understanding the Opportunity Costs of National Fracking Bans*, 30 YALE J. ON REG. ONLINE 30, 37–38 (2013).

153. For groups representing both local and national environmental interests, see *Don't Get Fracked!*, *supra* note 27 and *Moving Beyond Coal in Wisconsin - The Promise of Great Lakes Wind*, BEYOND COAL, SIERRA CLUB (Nov. 25, 2012), http://content.sierraclub.org/coal/update/25-nov-2012/moving-wisconsin-promise-great-lakes-wind, *archived at* http://perma.cc/BD4U-PLCM.

154. There is a large and diverse literature supporting this conclusion and a substantial literature disputing it as well. Perhaps the most famous work in this canon is Mancur Olson's *The Logic of Collective Action*, which argues that broader mass interests are less effective than business interests in the group pressure game. MANCUR OLSON, THE LOGIC OF COLLECTIVE ACTION: PUBLIC GOODS AND THE THEORY OF GROUPS 58, 127–28 (1965). For a more recent treatment of this issue, see generally KAY L. SCHLOZMAN, *Who Sings in the Heavenly Chorus?:*

pressure determines policy outcomes, then business interests will tend to be overrepresented in the policy process (compared to less organized or unorganized mass interests). However, there are good reasons to expect that business interests may not dominate *local* government decision making about local shale oil and gas production. Those particular local choices are not likely to be the product simply of organized group pressure; rather, this is the kind of very high-salience decision for which elected leaders are most responsive to the larger mass of voters and most likely to produce a decision consistent with the wishes of the median voter.[155] There are few issues today over which local voters in shale regions feel more strongly than the question of whether and how to restrict fracking.[156] Farmers and other landowners hoping to extract value from their land, and their neighbors who fear for their health and worry about the destruction of their way of life, have every bit as much of an incentive to press their interests on local politicians as oil and gas business interests do.[157] In that situation, the rational politician, perceiving the electoral risk in the decision, should respond to whichever group (supporters or opponents) is the more numerous. When even the unorganized interests are paying attention, and the politician's decision is likely to weigh heavily in most voters' minds at the next election, then organized interest groups lose their relative advantage in the contest over policy.[158] Indeed, this sense that the issue

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The Shape of the Organized Interest System, *in* THE OXFORD HANDBOOK OF AMERICAN POLITICAL PARTIES AND INTEREST GROUPS 425 (L. Sandy Maisel & Jeffrey M. Berry eds., 2010).

155. For explanations and applications of the idea that salience trumps organizational advantages, see generally Anthony Downs, *Up and Down with Ecology—The "Issue-Attention Cycle,"* PUB. INT., Summer 1972, at 38; Daniel A. Farber, *Politics and Procedure in Environmental Law*, 8 J.L. ECON. & ORG. 59 (1992); and James Gray Pope, *Republican Moments: The Role of Direct Popular Power in the American Constitutional Order*, 139 U. PA. L. REV. 287 (1990).

156. *See, e.g.*, *Broomfield Passes Fracking Ban While Pro-Fracking Groups Sue*, HUFFINGTON POST (Dec. 4, 2013, 4:43 PM), http://www.huffingtonpost.com/2013/12/04/colorado-anti-fracking-broomfield_n_4385210.html, *archived at* http://perma.cc/87DW-E68D (reporting on the contentious passage of a five-year fracking moratorium by a Denver suburb); Freeman Klopott, *New York Decision on Fracking Regulations Delayed*, BLOOMBERG (Jan. 29, 2014, 2:41 PM), http://www.bloomberg.com/news/2014-01-29/new-york-decision-on-fracking-regulations-delayed.html, *archived at* http://perma.cc/D6MG-UZL3 (describing calls for Governor Cuomo to make a quicker decision on whether to pass or ban fracking); *supra* notes 28–30 and accompanying text.

157. Accordingly, in New York State's southern tier counties, sparsely populated by struggling farmers, many local government units have enacted pro-fracking ordinances. *See supra* note 29. Elsewhere in New York, where opponents of development outnumber supporters, anti-fracking ordinances are more common. *Fracking Bans and Moratoria in NY: Movements Against HVHF*, FRACTRACKER ALLIANCE, http://www.fractracker.org/map/ny-moratoria/, *archived at* http://perma.cc/D2ER-3MSV.

158. Indeed, this is one issue in which businesses may enjoy more of an advantage at the state level if we assume that fracking is less salient to the average voter in state elections than the average voter in local elections. Some commentators explain the strong preemption provisions of Pennsylvania's now-overturned Act 13 as the product of business influence over the state legislature. *See, e.g.*, *Tide of Public Opinion Has Turned Against Fracking - 2/3 of PA Citizens*

matters much more to locals may be one reason why states created home rule provisions in the first place and why some judges defer to local zoning power in conflicts with state oil and gas statutes: that deference (and home rule generally) may reflect an awareness of the fact that locals have more at stake in all local-land-use disputes.[159] Paradoxically, then, local-government decisions on this issue ought to be *less* susceptible to businesses' organizational advantages than state-government decisions because the issue is much more salient at the local level.[160]

This phenomenon also decreases the risk of a race to the bottom among local governments in which they compete for shale-development dollars and jobs by lowering environmental standards.[161] Indeed, for a variety of other reasons, shale oil and gas production is not like the typical race-to-the-bottom scenario. In the usual race-to-the-bottom scenario, multiple jurisdictions compete for a limited number of investment opportunities, such as when local governments compete for a new manufacturing facility. The factory can be built anywhere, and one locality

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Support a Moratorium, W. OHIO FRACKING AWARENESS COALITION (Jan. 2, 2014), http://www.wofac.org/2014/01/tide-of-public-opinion-has-turned.html, *archived at* http://perma.cc/4HCA-QYEL (alleging that Act 13 was a "gift bag for the frackers" and that government was choosing "the side of oil and gas company profits over public safety").

159. *See* Vanlandingham, *supra* note 92, at 270 (including among the reasons for adopting home rule the desire to decrease state interference in cities' "internal affairs" and to allow local governments to manage "peculiarly local problems"). More generally, the home rule movement was part of the good government response to party rule in the late 19th century Populist movement and early 20th century Progressive movement. However, part of that impulse included the desire to stop state legislatures from "meddl[ing] in purely local affairs." FRANK MANN STEWART, A HALF CENTURY OF MUNICIPAL REFORM: THE HISTORY OF THE NATIONAL MUNICIPAL LEAGUE 38 (1950).

160. For accusations that Pennylvania's recently overturned Act 13 was written by business interests, see *supra* note 158. The idea here is that state legislators outside the producing regions will care more about interest group pressure because their constituents are not activated about the issue the way voters in the producing regions are. Interestingly, one could also argue that federal policy making is less susceptible to capture than state policy making because more public attention is paid to the former than the latter.

161. *See* Richard B. Stewart, *Pyramids of Sacrifice?: Problems of Federalism in Mandating State Implementation of National Environmental Policy*, 86 YALE L.J. 1196, 1212 (1977) (explaining the race to the bottom as influenced by communities' reasonable "fear that the resulting environmental gains will be more than offset by movement of capital to other areas with lower standards"). For commentary on this hypothesis, see generally Henry N. Butler & Jonathan R. Macey, *Externalities and the Matching Principle: The Case for Reallocating Environmental Regulatory Authority*, 14 YALE L. & POL'Y REV. 23, 31 (1996) and Richard L. Revesz, *Rehabilitating Interstate Competition: Rethinking the "Race-to-the-Bottom" Rationale for Federal Environmental Regulation*, 67 N.Y.U. L. REV. 1210 (1992). *But cf.* Kirsten H. Engel, *State Environmental Standard-Setting: Is There a "Race" and Is It "To the Bottom"?*, 48 HASTINGS L.J. 271, 278 (1997) (advancing the race-to-the-bottom in support of an argument favoring federal environmental regulation); Joshua D. Sarnoff, *The Continuing Imperative (but Only from a National Perspective) for Federal Environmental Protection*, 7 DUKE ENVTL. L. & POL'Y F. 225, 318 (1997) (arguing that "it defies credulity to believe [states] will achieve the goals on their own" given states' inability to achieve environmental goals both before and after passage of the major federal environmental laws).

will win those investment dollars, while the others will lose out. In the case of shale oil and gas production, the resource will be produced wherever it is found. In Figure 1, production in local subdivision D does not preclude production in any of the other local subdivisions within the shale play. To the contrary, shale oil and gas production can occur simultaneously in multiple locations and will occur wherever natural gas prices make it productive to do so. This is consistent with the spread of local fracking bans in the shale regions, which imply more of a race to the top than a race to the bottom.[162]

So if underregulation of fracking by local governments is not likely, what about overregulation? Is it likely that by giving local governments the authority to veto fracking within their borders, we stop energy development that increases utility or increases welfare? That is a possibility, since it appears that in many places more benefits than costs spill beyond local boundaries. There is no definitive analysis that attempts to quantify the full costs and benefits of fracking,[163] but there are data on how people feel about the issue. Those data indicate that there is considerable public support for fracking nationally and in many states, which stands in stark contrast to the rapid spread of local fracking bans. Consistent pluralities nationally—and in shale-producing states except New York—support fracking.[164]

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162. The only way in which local jurisdictions could "lose out" later by failing to permit shale oil or gas production now is tied to changes in the price of oil or gas. If the price falls precipitously, as it can at the end of a boom cycle, then those property owners, businesses, and tax collectors whose jurisdictions permitted production before the price fell will make more in royalties, secondary economic effects, and tax revenue, respectively, than jurisdictions that proceeded more cautiously. Natural gas prices are set nationally (and regionally), while oil prices are set globally. STEVEN LEVINE ET AL., AM. PETROLEUM INST., UNDERSTANDING NATURAL GAS MARKETS 15 (2014); MICHAEL RATNER ET AL., CONG. RESEARCH SERV., R42074, U.S. NATURAL GAS EXPORTS: NEW OPPORTUNITIES, UNCERTAIN OUTCOMES 5 (2013). Thus, for example, the economic benefit of production in 2006 in the Barnett, Haynesville, and Marcellus Shales was greater, per unit of energy produced, than production in 2012 because the 2006 price of gas was several times the 2012 price. *See Henry Hub Natural Gas Spot Price*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/dnav/ng/hist/rngwhhdA.htm, *archived at* http://perma.cc/9Z4E-DPN5 (stating that the U.S. price of natural gas was $8.69/mmBtu in January 2006 and $2.67/mmBtu in January 2012). By comparison, production of shale oil in North Dakota's Bakken Shale or Texas's Eagle Ford Shale is more profitable now, per unit of energy produced, than it was in 2006 because the price of oil is slightly higher now than it was then. *See Cushing, OK WTI Spot Price, FOB*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=D, *archived at* http://perma.cc/CK3L-5M2Q (demonstrating that the U.S. price of West Texas Intermediate crude oil, the main index crude, hovered between $60/bbl and $70/bbl during most of 2006, but was about $82/bbl at the time of this writing).

163. Nicholas Z. Muller, Robert Mendelsohn, and William Nordhaus conclude that the net benefits of natural gas production are positive, but their 2011 analysis does not attempt to incorporate or evaluate the literature addressing the air and climate impacts of fracking discussed in subpart II(B). Muller et al., *supra* note 147, at 1669–71.

164. *See* ERICA BROWN ET AL., CTR. FOR LOCAL, STATE & URBAN POLICY, PUBLIC OPINION ON FRACKING: PERSPECTIVES FROM MICHIGAN AND PENNSYLVANIA 10 tbl.7 (2013), *available at* http://closup.umich.edu/files/nsee-fracking-fall-2012.pdf, *archived at* http://perma.cc/V9PZ-7YZN (finding that a majority of residents in Michigan and Pennsylvania believe that the industry

Interestingly, a recent Siena College poll found that "downstate" New Yorkers (who live outside the Marcellus Shale) expressed much more support for fracking than upstate New Yorkers (who live within the Marcellus).[165] In other words, where state regulation authorizes fracking, that may reflect a higher level of public approval of the shale oil and gas industry at the state level.[166]

Therefore, by enabling locals to frustrate the will of the broader majority, do local vetoes yield a policy that fails to maximize utility or welfare? Not necessarily. *If* our goal is to maximize collective utility, a policy that makes *N* people happy may produce lower levels of utility than a policy that makes *N/2* people deliriously happy. By this logic, providing locals with a veto option may indeed maximize utility if we take preference intensities into account. By letting locals decide, we allocate the decision to those who care the most and who experience most of the impacts of fracking. Note that maximizing utility (by catering to voters' current preferences) is not the same thing as maximizing welfare or long-run utility. The reason is that voters form preferences over policies in the absence of full information about the likely outcomes that result from policy choices.[167]

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brings more benefits than costs to their state); TEX. RESEARCH INST., TEXAS STATEWIDE SURVEY 16 (2014), *available at* http://s3.amazonaws.com/static.texastribune.org/media/documents/utttpoll-201402-fullsummary.pdf, *archived at* http://perma.cc/Z63A-REFP (finding that 49% of Texans surveyed believe the benefits of fracking outweigh the costs); *Poll: Majority in Pa. Support Gas Drilling*, WASH. TIMES, Jan. 30, 2014, http://www.washingtontimes.com/news/2014/jan/30/poll-majority-in-pa-support-gas-drilling/, *archived at* http://perma.cc/L4F4-WSYK (reporting that 64% of Pennsylvanians polled support drilling in the Marcellus Shale); Press Release, Robert Morris Univ. Polling Inst., Fracking Sees Support in New National Poll by RMU (Nov. 18, 2013), *available at* http://www.rmu.edu/PollingInstitute/Fracing, *archived at* http://perma.cc/X5XM-BQAG (concluding that among those with an opinion on fracking, a national majority supports the practice). *But cf.* Press Release, Quinnipiac Univ., Little Love for Recreational Marijuana in New York, Quinnipiac University Poll Finds; Opposition to Fracking Inches Up (Aug. 22, 2014), *available at* http://www.quinnipiac.edu/images/polling/ny/ny08222014_ncke582m.pdf, *archived at* http://perma.cc/WF-K8LE (finding that 48% of New Yorkers do not support fracking in their state, while 43% do).

165. Kevin Begos & Mary Esch, *Fracking Surveys Find Support in Unexpected Places*, YAHOO! NEWS (Dec. 9, 2012, 11:47 AM), http://news.yahoo.com/fracking-surveys-support-unexpected-places-164308887.html, *archived at* http://perma.cc/7KFG-Y3K8?type=image. *But see* Press Release, Quinnipiac Univ., *supra* note 164 (finding greater support for fracking in upstate New York).

166. These polling data tend to belie claims by litigants in preemption cases that state regulation is not "democratic" because state oil and gas regulators are not elected while local government leaders are. *See, e.g.*, Brief of Amici Curiae Professors Vicki Been et al. at 6, 9–10, Norse Energy Corp. v. Dryden, 964 N.Y.S.2d 714 (App. Div. 2013) (No. 515227) ("If the state legislature has expressed no clear view on some local law, then judicial preemption of such a law under the aegis of the ambiguous state statute deprives local voters of the benefits of local democracy without advancing any democratically ratified policy of state lawmakers.").

167. In the words of economist Anthony Downs, voters are rationally ignorant, since they lack the time, resources, and inclination to become fully informed on most issues. *See* ANTHONY DOWNS, AN ECONOMIC THEORY OF DEMOCRACY 259 (1957) ("[I]t is irrational to be politically well-informed because the low returns from data simply do not justify their cost in time and other scarce resources.").

That is, the policies we want right now may not be the policies that are best for us in the long run. It might be best if our representatives made policy decisions that fully informed voters would make were they able to become fully informed.[168]

There are several reasons why we might expect voters in shale regions to overestimate the risks associated with shale oil and gas development and therefore to prefer policies that do not maximize their welfare. As noted in subpart II(A), the shale oil and gas industry has grown rapidly, while regulation and scientific study of the risks of fracking has lagged behind that growth.[169] Uncertainty about the risk profile of fracking, and fear of those risks, has fed the anti-fracking movement. As a consequence, there are two debates over fracking's risks: the relatively careful and circumspect scientific debate, aimed at identifying and measuring specific risks; and the more polarized and shrill popular debate, dominated by interest groups whose aim is to promote or stop shale oil and gas production.[170] Indeed, pro- and anti-fracking groups routinely use the scientific literature on the risks of fracking selectively, and sometimes disingenuously, to influence public perception of risk.[171] As part of that process, anti-fracking groups have focused their public campaigns on the low-probability, higher magnitude risks that generate fear,[172] such as the risk of drinking-water

168. Of course, British philosopher and peer Edmund Burke articulated this model of representation, which bears his name. It emphasizes that the elected representative is a trustee, making decisions on behalf of constituents, rather than acting on their specific instructions. 3 EDMUND BURKE, *Speech at the Conclusion of the Poll*, *in* THE WRITINGS AND SPEECHES OF EDMUND BURKE 63, 68–70 (W.M. Elofson & John A. Woods eds., 1996).

169. Wiseman, *supra* note 85, at 168.

170. For an explanation of the psychological and cultural roots of these centrifugal forces at work in the debate over shale oil and gas production, see generally David B. Spence, *Responsible Shale Gas Production: Moral Outrage vs. Cool Analysis*, 25 FORDHAM ENVTL L. REV. 141 (2013).

171. The best known pro-fracking industry group is Energy In Depth, an organization that highlights the scientific studies that support the case for fracking (and criticizes studies that undermine that case). *About EID*, ENERGY IN DEPTH, http://energyindepth.org/about/, *archived at* http://perma.cc/UT6-TJ2U; *see also* AM. PETROLEUM INST., THE FACTS ABOUT HYDRAULIC FRACTURING AND SEISMIC ACTIVITY (2014), http://www.api.org/~/media/Files/Policy/Hydraulic_Fracturing/HF-and-Seismic-Activity-Report-v2.pdf, *archived at* http://perma.cc/5G25-SXAC (downplaying the connection between hydraulic fracturing and seismic activity by presenting fracturing as "a safe, proven technology"); Raymond G. Mullady, Jr., *Fracking Chemicals Not Harmful*, POWER ENGINEERING, May 9, 2011, http://www.power-eng.com/articles/2011/05/fracking-chemicals-not-harmful.html, *archived at* http://perma.cc/445U-FH8Q (condemning a congressional report critical of fracking). For a discussion of the misuse of science by fracking's critics, see Kevin Begos, *Experts: Some Fracking Critics Use Bad Science*, ASSOCIATED PRESS, July 22, 2012, http://bigstory.ap.org/article/experts-some-fracking-critics-use-bad-science, *archived at* http://perma.cc/J6U-AVT5.

172. This can be a particularly effective technique because the brain's fear circuitry, centered in the amygdala, can override reason. Neurobiologist Dean Buonomano calls this dynamic "amygdala politics" and warns that "we should be most concerned about how vulnerabilities in our fear circuits are exploited by others." DEAN BUONOMANO, BRAIN BUGS: HOW THE BRAIN'S FLAWS SHAPE OUR LIVES 138 (2011).

contamination[173]—a risk that seems remote in the usual case. If one accepts the notion that perceived risks of fracking currently exceed demonstrable risks, then this kind of overheated rhetoric makes it difficult for voters to weigh the costs and benefits of fracking accurately.[174] Thus, in addition to ignoring impacts beyond their borders, the local populace may overestimate the magnitude of the risks and thereby choose a level of regulation that fails to maximize their welfare.[175]

However, there are two rejoinders to this line of thinking. The first is that while locals may overvalue immediate risks, so may non-locals undervalue remote risks. For example, if I live far from the shale oil and gas production regions and know that fracking brings inexpensive natural gas, higher employment, and potentially lower taxes, I may be motivated to discount evidence of the risks that accompany those benefits because they fall on others. Second, even if locals tend to overvalue risks, this is an explanation only for *short-term* local overregulation. It is not uncommon for people to overestimate the long-term risks associated with new technology or to prudently favor caution pending the development of a sufficient record of the risks. In the early days of electricity, many people opposed the extension of distribution lines in their neighborhoods after poorly insulated wires started fires or delivered electric shocks to people.[176]

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173. *See supra* note 25. Seamus McGraw, whose family struggled with the decision whether to lease mineral rights to the family farm in Pennsylvania, describes one anti-fracking activist's approach this way:

> She made it her life's work to collect and disseminate a vast collection of horrifying anecdotes, nightmare accidents, and stunning examples of the environmental damage that natural gas drilling can cause . . . . Taken together, these accounts painted a picture of an industry run amok, supported with a wink and a nod by conspiratorial politicos in Washington and in state capitals across the country . . . that, she believed, were all part of a vast conspiracy of greed to rape the land and keep secret their nefarious machinations.

MCGRAW, *supra* note 43, at 160.

174. The fracking debate seems likely to trigger some well-known psychological and cultural biases that can influence how people assimilate new information about fracking's risks. More specifically, confirmation bias can affect how we assess the credibility of new information about risk, leading us to discredit studies or other evidence that contradicts our initial beliefs. Raymond S. Nickerson, *Confirmation Bias: A Ubiquitous Phenomenon in Many Guises*, 2 REV. GEN. PSYCHOL. 175, 175–76 (1988). Similarly, cultural identities can also bias assimilation of new information about risk in comparable ways. Dan M. Kahan & Donald Braman, *Cultural Cognition and Public Policy*, 24 YALE L. & POL'Y REV. 149, 149–50 (2006). For a fuller description of these phenomena, see generally Spence, *supra* note 170, at 174–85.

175. This idea requires a distinction between voters' preferences and their welfare, a distinction that sometimes gets conflated when discussing utility maximization in the voting context.

176. *See* JILL JONNES, EMPIRES OF LIGHT: EDISON, TESLA, WESTINGHOUSE, AND THE RACE TO ELECTRIFY THE WORLD 198–200 (2003) (describing deadly fires and electrocutions associated with distribution wires in electricity's early days).

The automobile provoked a similarly cautious public response.[177] With these and other technological transitions, early fears gave way to acceptance, in part because of improved understanding (and regulation) of the risks. The previously mentioned polling data reflect a similar caution. Respondents to a poll of Pennsylvania and Michigan residents supported fracking, but also expressed support for moratoria while the risks of the technology are studied.[178] In a 2013 national poll, support for fracking jumped significantly after respondents listened to "a balanced presentation from energy and environmental groups" about the technology.[179] Thus, we might conclude that any misunderstanding of the risks is unlikely to persist for too long, as the communities that welcome shale oil and gas production continue to produce a record of the costs and benefits of the practice. In the long run, then, if there is any overregulation at the local level, it will likely be because locals capture a larger share of the costs of shale gas production than the benefits, not because they misunderstand those costs.

In sum, the question of whether preemption of local vetoes is efficient depends upon our decision criteria. If we conceive of the efficient regulation of shale oil and gas production as that which best translates into policy the current popular preferences (irrespective of their intensity) of voters who collectively bear all (or almost all) of the costs and benefits of production, then the matching principle points us toward state decision making and preemption of local vetoes. If, on the other hand, we conceive of efficient regulation as that which takes preference intensity into account and seeks to maximize collective utility, there is a case for allowing local governments to retain their power to veto or regulate shale oil and gas production because they experience the effects of fracking most intensely and profoundly and so care more about the issue. In the short run, risk

177. *See* BRIAN LADD, AUTOPHOBIA: LOVE AND HATE IN THE AUTOMOTIVE AGE 18 (2008) (quoting one English critic as saying that "the car, unlike the train, does not clot its horrors at the journey's end but smears them along the way").

178. BROWN ET AL., *supra* note 164, at 23. Ironically, the lone case in our study in which a local government imposed a temporary moratorium on fracking was struck down by the New York Courts. *See* Jeffrey v. Ryan, No. CA2012-001254, 2012 WL 4513348, at *7 (N.Y. Sup. Ct. Oct. 2, 2012) (holding that a local moratorium was preempted because the emergency condition that supposedly motivated the moratorium was mitigated by state regulation of oil and gas production). The court pointed to the State of New York's moratorium (which has been in place for more than four years, with no end in sight) as well as the state-permitting regime to justify preempting the ordinance. *Id.*

179. Paul J. Gough, *Fracking Sees Widespread Support in New Poll*, PITTSBURGH BUS. TIMES, Nov. 18, 2013, http://www.bizjournals.com/pittsburgh/blog/morning-edition/2013/11/fracking-sees-widespread-support.html, *archived at* http://perma.cc/4CTD-NJLT. Theories of deliberative democracy also support the notion that despite cognitive and cultural biases, preferences change as voters absorb more and more information. *See* James S. Fishkin & Robert C. Luskin, *Experimenting with a Democratic Ideal: Deliberative Polling and Public Opinion*, 40 ACTA POLITICA 284, 291–93 (2005) (observing that, in deliberative polling experiments, participants' preference changes are information driven and are largely unaffected by sociodemographic variables).

aversion may lead local voters to overestimate the environmental, health, and safety risks of fracking; however, in the long run, voters will develop a relatively clear understanding of the risks of fracking over time, meaning that the case for not preempting local vetoes is stronger—that is, more likely to maximize welfare (long-run aggregate utility). Even then, however, locals may still overregulate if they experience more of the costs of production than the benefits.

3. A Bargaining Solution?—Given the potential for mismatches at both the state and local government levels, are there ways to facilitate policy making that better comport with the matching principle? To the extent that development winners can compensate development losers, the matching problems and political dynamics described in this section are less likely to get in the way of policy that provides Kaldor–Hicks improvements.[180] Specifically, provisions that allow winners (mineral-rights holders, the state) to compensate the losers (local citizens) ought to reduce any distortions in local decision making owing to the concentrated costs–diffuse benefits problem.[181] One idea is to provide local governments with the power to capture more of the economic rewards associated with shale oil and gas production that would otherwise flow out of the producing region through property taxation of the mineral estate or income taxation.[182] Alternatively, states can devise compensation schemes that redirect money from winners to losers—from the state to the local level. These can take the form of payments to individuals, as with the annual royalty payments made to Alaskan citizens,[183] or payments to local governments, sometimes called

180. In welfare economics, Kaldor–Hicks improvements are changes in the status quo that would produce a Pareto superior outcome (that is, they would increase the welfare of some without decreasing the welfare of any) assuming the winners can compensate the losers. RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW 14 (9th ed. 2014). Note that this concept is a way of measuring the welfare effects of changes from the status quo. The objections or challenges to this view posed by the Coase Theorem are discussed later. *See infra* notes 189–90 and accompanying text.

181. There is an enormous scholarly literature on compensation schemes as a response to NIMBY problems, dating back at least four decades. A review of that literature is beyond the scope of this article. Portions of that literature challenge the morality of compensation, likening it to bribery or to exploitation. This analysis proceeds on the assumption that for those who disproportionately capture the benefits of fracking to compensate those who disproportionately bear the costs is both fair and likely to produce local policy choices that better reflect the costs and benefits of development. For an excellent discussion of compensation schemes and the compensation literature, see generally Vicki Been, *Compensated Siting Proposals: Is it Time to Pay Attention?*, 21 FORDHAM URB. L.J. 787 (1994).

182. As Robert Cheren has shown, this power seems to temper the incentive to ban fracking. Cheren, *supra* note 82 (manuscript at 2).

183. This payment takes the form of a dividend paid from the so-called Alaska Permanent Fund, which is fed by oil and gas royalty payments. *What is the Alaska Permanent Fund?*, ALASKA PERMANENT FUND, http://www.apfc.org/home/Content/aboutFund/aboutPermFund.cfm, *archived at* http://perma.cc/WL5A-3KR3.

"impact fees." The provision of Pennsylvania's Act 13 by which local governments in shale regions were authorized to receive impact fees[184] is one example; however, because it was coupled with the destruction of local-zoning discretion over fracking,[185] some local jurisdictions saw it as too heavy-handed. Compensation can also take less pecuniary forms, such as construction of environmental amenities or other investment in local communities.[186] Indeed, these sorts of social investments are a fairly common form of compensation "paid" directly to host communities by oil and gas companies doing business in developing countries. All of these ideas are ways of mimicking a Coasean bargaining process[187]: if the winners are willing to meet the losers' price of acceptance, development will go forward; if not, locals will veto development.[188]

In the absence of local taxation or some sort of state-mandated transfer from winners to losers, we might ask which outcome—providing locals with a veto right or preempting local vetoes—is more likely to trigger the kind of bargaining from which a Kaldor–Hicks improvement might emerge? Ronald Coase demonstrated that, under certain conditions, bargaining between the parties will produce an efficient solution and that the initial distribution of rights (for example, to develop or to stop development) does not matter.[189] Thus, if the net benefits of production are

184. 58 PA. STAT. ANN. §§ 2302, 2314 (West Supp. 2014). Under Act 13, Pennsylvania became the leading state in impact fees; although Boulder, Colorado instituted impact fees to help cover road repair costs from fracking activity. Jennifer Oldham & Jim Snyder, *Energy-Rich Colorado Becomes Setting for Fracking Fight*, BLOOMBERG (May 22, 2013, 11:00 PM), http://www.bloomberg.com/news/2013-05-23/energy-rich-colorado-becomes-setting-for-fracking-fight.html, *archived at* http://perma.cc/6B94-84Q8?type=image.

185. *See supra* notes 114–18 and accompanying text.

186. Vicki Been, *"Exit" as a Constraint on Land Use Exactions: Rethinking the Unconstitutional Conditions Doctrine*, 91 COLUM. L. REV. 473, 478–79 (1991).

187. *See* R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 4–5 (1960) (demonstrating that in the absence of transaction costs to bargaining, the most efficient solution to externality problems is not regulation but a compensation agreement produced by private bargaining among the affected parties).

188. Of course, there is irony in the notion of governments attempting to mimic Coasean bargaining, since Coase's point was that only bargaining can reveal the parties' true preferences. *See id.* (illustrating the bargaining process). Note that some object to compensation on the ground that one cannot put a price on safety. *See* Bradford C. Mank, *The Two-Headed Dragon of Siting and Cleaning Up Hazardous Waste Dumps: Can Economic Incentives or Mediation Slay the Monster?*, 19 B.C. ENVTL. AFF. L. REV. 239, 277 (1991) ("Some commentators have criticized the Massachusetts negotiated compensation model on the grounds that it is coercive, does not adequately represent local citizens, and fails to address safety concerns.").

189. Of course, the Coase Theorem suggests that the allocation of the property right (the right to develop or the right to veto development) should not matter, assuming perfect information and no transaction costs to bargaining. *See* Coase, *supra* note 187, at 15 ("It is always possible to modify by transactions on the market the initial legal delimination of rights . . . if such market transactions are costless."). As many commentators have noted, the assumptions on which Coase's argument relies rarely apply, something Coase acknowledged many times during his lifetime. *E.g.*, *id.* at 15.

negative and state law preempts local vetoes, then neighbors and others who bear the costs of production should be able to compensate producers, landowners, and other beneficiaries of production in sufficient amounts to prevent production. If they cannot, then the net benefits of production must not have been negative, said Coase. If, on the other hand, the net benefits of production are positive and state law does not preempt local vetoes, then producers, landowners, and other beneficiaries should be able to compensate all those who bear the costs in amounts sufficient to prevent or overturn the local ban. Bargaining will produce an efficient result regardless.[190]

This element of the Coasean analysis offends some people's sense of fairness but does so in different ways to different people. In the fight over fracking, some will see the introduction of noise, truck traffic, air emissions, and other by-products of fracking in Pigovian terms,[191] as attempts to shift costs of production to society, costs that *ought* to be internalized. Others might be offended by the notion that government can deny property owners the right to extract value from their land. Each side may invoke concepts of Rawlsian justice[192] and other notions of fairness in support of their positions. Another critique of Coasean solutions focuses on the effect of wealth disparities on bargaining: in any bargaining process the parties' willingness to pay (in order to get their way) will be a function of their ability to pay, such that the dollar amounts the parties are willing to pay and accept do not accurately reflect their actual utility over outcomes. However, in the fracking context, it is not clear that wealth disparities point us toward a solution because there are rich and poor on both sides of fracking disputes. Among the beneficiaries of production, some producers are large, wealthy multinational corporations, while others are highly

190. This is sometimes known as the "invariance" property in Coase's analysis, and Coase called it "reciprocal." *Id.* at 2. It suggests that there is no *ex ante* legitimacy to the status quo distribution, and that the choice to whom to assign the property right is therefore arbitrary, in a sense. *See id.* ("The real question . . . is: should A be allowed to harm B or should B be allowed to harm A?").

191. Coase's argument was a direct response to economist A.C. Pigou's argument that pollution and other externalities shift costs to society, costs that ought to be internalized through the imposition of a tax on the externality. A.C. PIGOU, THE ECONOMICS OF WELFARE 185–203 (AMS Press 4th ed. 1978) (1932).

192. Rawls' central idea is that distributive justice requires that social decision rules be decided upon from behind a "veil of ignorance" that prevents each of us from knowing the economic circumstances into which we will be born. JOHN RAWLS, A THEORY OF JUSTICE 18–19 (1971). This approach shares with welfare economics a focus on individual decision making and on the prospective effects of decision rules, but differs from economic analyses by focusing on distributional fairness. *Compare* PIGOU, *supra* note 191, at 129 ("We are not here concerned with those deficiencies of organisation which sometimes cause higher non-economic interests to be sacrificed to less important economic interests."), *with* RAWLS, *supra*, at 61 ("[T]he distribution of wealth and income . . . must be consistent with both the liberties of equal citizenship and equality of opportunity.").

leveraged wildcatters.[193] Some of the landowners who hold mineral rights will become very wealthy from bonus payments and royalties if production moves forward; if production is stopped by a local ban, some of those same landowners will face continuing economic struggle. Similarly, some of the opponents of fracking are relatively wealthy, but others are not. Thus, while the social efficiency of bargaining is distorted by wealth disparities, the direction and extent of those distortions depend upon the particular situation.

Another effect that can distort bargaining is the disparity in the transaction costs of organizing (in order to bargain). We might ask if it will be more difficult for proponents or opponents of fracking to organize or whether one side or the other will suffer more from free-rider problems. Producers and landowners are typically (though not always) fewer in number than local opponents, have more tangible financial interests at stake,[194] and already coordinate with one another because of preexisting business relationships. This suggests that opponents might face greater transaction costs to bargaining. But as noted above, for very high salience issues like this one, free-riding problems ought to be reduced. People are motivated to organize to avoid risks, so we should not expect local opponents of fracking to suffer from the usual organizational disadvantages and collective-action problems.

However, there is a reason to conclude that upholding local vetoes is more likely to provoke productive bargaining than preempting them. Status quo bias makes human beings more likely to accept (as fair) the initial distribution of rights , such that bargaining to share gains will be easier than bargaining to share losses.[195] Decision makers tend to frame choices with respect to the status quo—that is, to "anchor" on the status quo.[196] In so doing we tend to treat the status quo—in this case, life before fracking—as a legitimate distribution of net benefits. Unlike Coase, we tend therefore to judge the fairness of departures from this (legitimate) status quo,[197] which produces the characterization of those who gain from fracking as "winners," and those who stand to lose as "losers." Kaldor–Hicks improvements over

193. ZUCKERMAN, *supra* note 43, at 6; Wendy Koch, *Exxon and Chevron Trailing in U.S. Fracking Boom*, USA TODAY, May 4, 2014, http://www.usatoday.com/story/money/business/2014/05/04/big-oil-exon-chevron-frackfing-boom/8610951, *archived at* http://perma.cc/33P2-DGEJ.

194. These are the characteristics of a group that Mancur Olson argues will be most likely to organize efficiently. OLSON, *supra* note 154, at 33–34, 53.

195. *See* William Samuelson & Richard Zeckhauser, *Status Quo Bias in Decision Making*, 1 J. RISK & UNCERTAINTY 7, 8 (1988) (finding that individuals adhere to the status quo at a disproportionate rate).

196. *Id.* at 8–12.

197. *See, e.g.*, Scott Eidelman & Christian S. Crandall, *A Psychological Advantage for the Status Quo*, *in* SOCIAL AND PSYCHOLOGICAL BASES OF IDEOLOGY AND SYSTEM JUSTIFICATION 85, 88 (John T. Jost et al. eds., 2009) ("[E]xisting states will serve as an arbitrary anchor, and one with greater underlying legitimacy . . . .").

the status quo require that winners be able to compensate losers: framed by the status quo, then, it will be easier for producers and landowners to compensate neighbors because neighbors (perceiving themselves to be the losers) will be disinclined to want to compensate the producers and landowners. In this way, local vetoes will provide an incentive for landowners and producers to share the gains from production with those who bear the costs; if the winners can compensate a sufficient number of the losers, then they ought to be able to overturn or prevent the local veto.[198] In this way, a rule against preemption will stimulate bargaining in ways that a rule permitting preemption probably would not. Thus, in the absence of preemption we might expect to see producers and landowners lobbying for impact fees or other forms of transfers in states that uphold local vetoes against preemption claims.

IV. Regulatory Takings and Local Vetoes

In jurisdictions where local fracking bans survive preemption challenges, regulators can expect to face claims that the local ban amounts to a "regulatory taking" of the owner's property rights, entitling the owner to just compensation under the Fifth and Fourteenth Amendments.[199] Indeed, plaintiffs in New York[200] and Colorado[201] have indicated their

198. Note that compensating a sufficient number of the losers is not the same thing as compensating the losers efficiently. The latter refers to payments to the losers that compensate them for their losses. The former refers to payments to a sufficient number of the losers so that a majority no longer supports the local ban.

199. The Fifth Amendment prohibits government from taking private property for public use without paying just compensation, and the Fourteenth Amendment applies that prohibition to state government action. U.S. CONST. amend. V; U.S. CONST. amend. XIV, § 1. For an interesting argument that only the Fourteenth Amendment (and not the Fifth) protects against regulatory takings, see generally Michael B. Rappaport, *Originalism and Regulatory Takings: Why the Fifth Amendment May Not Protect Against Regulatory Takings, but the Fourteenth Amendment May*, 45 SAN DIEGO L. REV. 729 (2008).

200. A New York nonprofit has publicly circulated a draft complaint on behalf of the owners of mineral rights and certain other landowners contending that New York's moratorium constitutes a taking of their property interests under both the U.S. and the New York constitutions. Complaint/Petition at paras. 1–8, Plaintiff "A"–Plaintiff "E" v. New York (2013), *available at* http://www.jlcny.org/site/index.php/nys-landowner-defense-donation-information/1826-jlcny-complaint-against-new-york-state-and-governor-cuomo, *archived at* http://perma.cc/BBW3-KCSF; *cf.* Steven C. Russo, *New York Landowners Circulate Draft Complaint Challenging New York Fracking Moratorium and Solicit Funds for the Effort*, E2 LAW BLOG, GREENBERGTRAURIG (Nov. 14, 2014), http://www.environmentalandenergylawblog.com/2013/11/articles/oil-gas/new-york-landowners-circulate-draft-complaint-challenging-new-york-fracking-moratorium-and-solicit-funds-for-the-effort, *archived at* http://perma.cc/36GV-LCTR (explaining that the complaint was drafted in response to frustration over the state's prolonged review of its fracking moratorium). In some cases, the owner of natural gas drilling rights is the landowner of the fee simple estate; in other circumstances, that landowner has sold or leased extraction rights to an energy firm. According to the draft complaint, many of the potential plaintiff energy firms, including "Fortuna Energy (now Talisman Energy), Chesapeake Energy, Hess Corporation, and Nornew, Inc. (Nornew) (now known as Norse Energy Corp. USA (Norse))," among others, purchased five-year lease rights for gas extraction from the fee simple owners. *Id.* at paras. 3, 19.

intention to bring takings claims against local governments imposing such bans should their preemption claims fail,[202] and plaintiffs in Texas recently filed a takings challenge to a City of Dallas ordinance.[203] Shale oil and gas production rights can be very valuable, so we might expect that if courts side with property owners in these takings cases, many local governments will be unable to pay just compensation and therefore be unable to enforce the local ban. That kind of outcome is functionally equivalent to a decision finding that state oil and gas law preempts the local ban.

In a sense, local vetoes and takings claims are two sides of the same coin. Just as home rule and local vetoes can force developers to bargain with those who bear most of the costs of development, a constitutional right to be compensated for a regulatory taking forces proponents of local development bans to face the costs of withholding land from development. Each conflict pits the interests of a wider group against the opposing interests of a subset of the group—a subset of one, often, in takings cases. The two analyses privilege different interests, however: home rule privileges locals' collective right to control land-use decisions, while the Fifth and Fourteenth Amendments privilege the individual property owner's right to control the use of her property. Despite the absence of case law addressing takings claims in the context of local fracking bans, subparts IV(A) and (B) explore how these cases might be resolved under current takings doctrine and the possible welfare effects of those outcomes.

A. Takings Doctrine and Shale Oil and Gas Production

In the seminal case of *Pennsylvania Coal Co. v. Mahon*,[204] the Supreme Court recognized that regulation that "goes too far" can effect a

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201. The preemption complaint filed by the Colorado Oil & Gas Association (COGA) against the City of Longmont included a claim that the city's ban constituted a taking of private property in violation of article II § 5 of the Colorado Constitution. Complaint at 7, Colo. Oil & Gas Ass'n v. City of Longmont, No. 13CV63 (Colo. Dist. Ct. July 24, 2014). However, COGA voluntarily dismissed the takings claim, noting that the law was unclear as to whether a trade association, as opposed to owners of mineral rights, could assert it. Jefferson Dodge, *COGA Agrees to Drop 'Takings' Claim in Fracking Suit Against Longmont*, BOULDER WKLY, June 13, 2013, http://www.boulderweekly.com/article-11257-coga-agrees-to-drop-takings-claim-in-fracking-suit-against-longmont.html, *archived at* http://perma.cc/3UP-P5UG.

202. *See supra* subpart III(A).

203. The case is *Trinity East Energy, LLC v. City of Dallas*. As of this writing, the case has been scheduled for a bench trial in January 2015. *Register of Actions: Case No. DC-14-01443*, DALL. COUNTY & DISTRICT COURTS INFO., http://courts.dallascounty.org/CaseDetail.aspx?CaseID=4871691#MainContent, *archived at* http://perma.cc/A8EN-AN8A?type=source. Because the producer, Trinity, leased mineral rights directly from the City of Dallas, its primary claim for relief is a breach of contract claim. *See* Plaintiff's Original Petition at paras. 8, 21–22, Trinity E. Energy, LLC v. City of Dallas, No. DC-14-01443 (Tex. Dist. Ct. filed Feb. 13, 2014).

204. 260 U.S. 393 (1922). In *Mahon*, the Court ruled that Pennsylvania's Kohler Act, designed to protect surface owners against subsidence damages caused by mining underneath their land, effected a taking of property rights owned by holders of the mineral interest. *Id.* at 412–16.

taking of property requiring compensation.[205] In the nearly 100 years since the *Mahon* decision, the Court has tried to articulate when a regulation does indeed "go too far," triggering the right to compensation. Prior to the 1970s, takings cases often focused on the question of whether the regulation at issue was aimed at preventing harm or extracting public benefits from the owners' land.[206] If the former, the regulation did not effect a taking; if the latter, it did, requiring compensation.[207] Since 1978, the default standard is that specified in *Penn Central Transportation Co. v. New York City*,[208] which directed courts to balance three factors in evaluating takings claims: (1) the nature of the governmental interest at stake; (2) the magnitude of the economic impact on the property owner; and (3) the degree to which the regulation interferes with the reasonable investment-backed expectations of the property owner.[209] The Court has since specified other, secondary takings tests that apply in limited subsets of cases, including tests governing regulation that authorizes physical invasions of private property[210] and regulation that exacts public easements as part of a permitting process.[211] Another secondary takings test, more applicable to our analysis, is the test articulated by the Court in *Lucas v. South Carolina Coastal Council*.[212] In that case, the Court said that, irrespective of the *Penn Central* test, regulation that removes all (or nearly all) of the "economically beneficial use" of a property amounts to a virtual per se taking,[213] so long as the use prohibited by the regulation was not already prohibited by background principles of state property law (including nuisance law).[214] Thus, the

205. *Id.* at 415.

206. *E.g.*, *id.* at 414.

207. Of course, as commentators have noted, one person's harm prevention is another's benefit extraction, and there is no policy-neutral way to distinguish the two. *E.g.*, Robert L. Glicksman, *Making a Nuisance of Takings Law*, 3 WASH. U. J.L. & POL'Y 149, 153–54 (2000).

208. 438 U.S. 104 (1978). In *Penn Central*, the Court rejected a claim that historic preservation regulations that prohibited the owners of Grand Central Station in New York City from using or selling air rights above the terminal constituted a regulatory taking. *Id.* at 116–19, 138.

209. *Id.* at 124.

210. *See* Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419, 432, 435–38 (1982) (establishing that government action consisting of a permanent physical presence constitutes a regulatory taking to the extent of the occupation).

211. *See* Dolan v. City of Tigard, 512 U.S. 374 (1994) (applying the "unconstitutional conditions" test to a construction permit approval requiring the creation of a public easement unrelated to the proposed development); Nollan v. Cal. Coastal Comm'n, 483 U.S. 825, 836–37 (1987) (requiring that an "essential nexus" must exist between a "legitimate state interest" and a permit condition that required creation of a public easement).

212. 505 U.S. 1003 (1992).

213. *Id.* at 1015, 1027–30.

214. While nuisance law is tort law, it bears on the owner's expectations about the use of property. This is the so-called "nuisance exception" to the categorical *Lucas* rule. Footnote 7 of the *Lucas* opinion specifies that "the 'property interest' against which the loss of value is to be measured . . . may lie in how the owner's reasonable expectations have been shaped by the State's

Lucas test, where it applies, forgoes the part of the *Penn Central* test that focuses on the character of the governmental action, much to the displeasure of some commentators.[215]

However conceptually straightforward these tests appear at first blush, their application can be difficult and arbitrary in practice. For present purposes, the claim that a local fracking restriction or ban has taken property commonly raises two interpretive problems. The first is what has come to be known in the regulatory takings literature as "the denominator problem,"[216] and the second is how the court defines the nature of the property interest at stake. The answer to that threshold question can determine whether the *Penn Central* or *Lucas* test applies to the case. Second, regardless of whether the *Penn Central* or *Lucas* test applies, the court will include as part of its analysis an examination of whether the property owner could have reasonably expected to engage in the now-prohibited use in the first place: either as part of the court's attempt to determine the owner's reasonable investment-backed expectations under the *Penn Central* test, or as part of the court's effort to determine whether the nuisance exception applies in the *Lucas* analysis.

1. The Denominator Problem.—If the claimant is the holder of a severed mineral interest, such as an oil and gas producer who has secured mineral rights, she may claim that the ban effects a total *Lucas*-type taking of her property, and that the mineral rights are valueless without the ability to produce the oil or gas.[217] In that case, the economically beneficial use of the mineral estate has been destroyed, and the only remaining question for the court will be whether the nuisance exception to the *Lucas* test applies.[218]

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law of property," and whether state law acknowledges and protects the particular property interest alleged to have been destroyed. *Id.* at 1016 n.7 (citations omitted).

215. *See, e.g.*, Daniel R. Mandelker, *Of Mice and Missiles: A True Account of* Lucas v. South Carolina Coastal Council, 8 J. LAND USE & ENVTL. L. 285, 285–87 (1993) (arguing that by adopting a per se rule in *Lucas*, rather than a balancing test that considers the character of governmental action, the Court improperly enhanced the protection of property under the Takings Clause by allocating significant authority to address conflicting land use from the legislature to the courts). *But cf.* Glicksman, *supra* note 207, at 169 (concluding that *Lucas* did not narrow the expectations prong of the *Penn Central* test as significantly as scholars feared).

216. *See* Frank I. Michelman, *Property, Utility, and Fairness: Comments on the Ethical Foundations of "Just Compensation" Law*, 80 HARV. L. REV. 1165, 1192 (1967) (exploring the difficulties, when calculating compensability of takings, in defining the "denominator" in a fractional comparison of the loss in value in the affected property and the pre-taking value of the property).

217. Patrick McGinley has argued that the *Lucas* test ought never to apply to holders of severed mineral interests because the history of that severance suggests that holders of those interests ought not necessarily to have expected to be able to develop them. Patrick C. McGinley, *Bundled Rights and Reasonable Expectations: Applying the* Lucas *Categorical Taking Rule to Severed Mineral Property Interests*, 11 VT. J. ENVTL. L. 525, 575–76 (2010).

218. *See supra* section III(B)(2). Some local bans are fashioned as moratoria—temporary bans. After *Suitum v. Tahoe Regional Planning Agency*, it is clear that the *Penn Central* analysis,

Even if the claimant is the holder of a fee simple interest, such as a farmer or rancher whose mineral interest is devalued by a fracking ban, the court may nevertheless apply the *Lucas* test if it deems the property interest being devalued to be the mineral interest only (rather than the fee interest). This is the idea of "conceptual severance," the notion that the court may focus on one strand in the bundle of rights the claimant owns in determining the economic impact on the claimant.[219] In *Mahon*, for example, the Pennsylvania statute required mining companies to leave in place enough coal to prevent subsidence; referring to the coal left in place as "the support estate," the Court noted that the statute destroyed that property interest.[220] While the fee simple interest can be severed in any number of ways, in the context of shale oil and gas production, the key question is whether the court might conceptually sever the mineral estate from the remainder of the landowner's fee simple interest in determining the economic impact of the ban.[221] This happened in a 2002 Ohio case involving mining rights[222] and a 2001 case involving a royalty interest.[223]

For some plaintiffs there may be a question as to whether some other economically beneficial uses of that mineral estate remain after a fracking ban. One might argue that a ban on fracking does not destroy the mineral estate if there are minerals other than oil and gas to be exploited from that estate; hence, no *Lucas*-type taking. The New York State fracking moratorium outlaws high-volume hydraulic fracturing—that is fracking coupled with horizontal drilling—but does not prohibit fracking of vertical

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rather than the *Lucas* analysis, applies where a moratorium temporarily removes all economically beneficial use of a property. 520 U.S. 725, 748–50 (1997) (Scalia, J., concurring) (applying the *Penn Central* analysis to a regulatory takings claim prohibiting a landowner from developing their land).

219. Margaret Jane Radin, *The Liberal Conception of Property: Cross Currents in the Jurisprudence of Takings*, 88 COLUM. L. REV. 1667, 1676 (1988).

220. Pa. Coal Co. v. Mahon, 260 U.S. 393, 414 (1922). However, in *Keystone Bituminous Coal Ass'n v. DeBenedictis*, facing a fact pattern virtually identical to that it faced in *Mahon*, the Court declined to conceptually sever the mining companies' mineral interests from the fee estate and rejected the claim that an anti-subsidence law took the mining companies' property. 480 U.S. 470, 500–01 (1987).

221. Depending upon how much value the mineral interest is to the fee estate, the destruction of that value could nevertheless constitute a taking under the *Penn Central* analysis, at least conceptually.

222. State *ex rel.* RTG, Inc. v. State, 780 N.E.2d 998, 1008 (Ohio 2002); *see also* Fla. Rock Indus., Inc. v. United States, 18 F.3d 1560, 1562–63 (Fed. Cir. 1994) (accepting the claimant's argument that the value of land used for mining was destroyed through the passage of the Clean Water Act because mining was the "only viable economic use" for the land). *But cf.* Cane Tenn., Inc. v. United States, 57 Fed. Cl. 115, 131 (2003) (refusing to sever mineral interests when mineral rights devalued by regulation resulted in only a 28% diminution in land value).

223. *See* Wyatt v. United States, 271 F.3d 1090, 1093–97 (Fed. Cir. 2001) (isolating a leasehold mineral interest and a royalty interest in deciding whether a taking occurred due to an untimely permit approval).

wells.[224] If the owner could reasonably expect to drill wells and produce gas that way, the state might argue that no *Lucas*-type taking has occurred. The success of this argument seems likely to turn on the extent to which the local ordinance has diminished the value of the severed mineral estate. Since production of oil and gas from shale is economical only because fracking and horizontal drilling are used together, a ban on those activities may indeed destroy the economically beneficial use of the mineral estate.

If the court were to decline to sever the mineral interest from the claimant's fee simple interest, it ought to revert back to the *Penn Central* analysis, balancing the economic impact against the other two factors in the *Penn Central* test: the character of the governmental action and the effect of the action on the reasonable investment-backed expectations of the property owner. Thus, if a farmer cannot sell his formerly valuable rights to produce oil and gas from shale beneath his land because of the recently enacted local ban on shale oil and gas production, he continues to own the fee simple interest, and the economic impact on his land ought to be significantly less than 100%, since it retains value for farming or other purposes.

2. Reasonable Expectations.—The *Penn Central* test requires courts to examine the degree to which regulation defeats the reasonable investment-backed expectations of the owner (and to balance those considerations against the other two factors in the *Penn Central* test), and the *Lucas* test asks whether the owner had constructive notice that the production of shale oil and gas was likely barred by background principles of state property law, or public or private nuisance rules. The *Lucas* opinion narrowed the scope of the inquiry into owner expectations when regulation destroys the economically beneficial use of property by confining that inquiry to "background principles" of state property law, drawing the ire of both the dissent[225] and subsequent commentators.[226] Under the *Penn Central* test, a property owner's reasonable expectations about the use of property are shaped not only by background principles of state property law but by regulation. Prior to *Lucas*, if a local government decided that oil and gas production is a nuisance, and outlawed it within its jurisdiction, the *Penn*

224. A fracking moratorium has been in place in New York since 2010. N.Y. COMP. CODES R. & REGS. tit. 9, § 7.41 (2014). Pursuant to the Executive Order, the New York State Department of Environmental Conservation is prohibited from issuing permits for projects using "high-volume hydraulic fracturing combined with horizontal drilling" until it has completed a Supplemental Generic Environmental Impact Statement (SGEIS). *Id.* While drafts of the SGEIS have been released, the moratorium remains in place. *Marcellus Shale*, N.Y. STATE DEPARTMENT ENVTL. CONSERVATION, http://www.dec.ny.gov/energy/46288.html, *archived at* http://perma.cc/GH3X-8JQ4.

225. *See* Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1060 (1992) (Blackmun, J., dissenting) (arguing that the majority's reliance on "background principles" fails to reconcile Supreme Court precedent and historical fact).

226. *See supra* note 215.

Central test held out the possibility that the importance of nuisance prevention might outweigh the impacts on the property owner, obviating the need for compensation.[227] Under the plain terms of the *Lucas* test, legislative decisions do not define the boundaries of nuisance where *Lucas*-type takings are concerned.[228] Rather, what matters is whether the claimant could reasonably have expected to produce shale oil or gas before the regulation prohibited it. Thus, *Lucas* seems to direct the reviewing court's attention to common law principles of nuisance.[229]

Of course, the set of activities that fall within common law nuisance definitions change over time. A public nuisance offends or interferes with public rights.[230] Courts have recognized a wide variety of different kinds of public nuisances over time, including liquor stores,[231] lottery tickets,[232] and other businesses catering to social vices, as well as activities that pose a danger to the public.[233] Indeed, a Pennsylvania statute designed to prevent subsidence from coal mining was a regulatory taking of the support estate in 1922 but by 1987 was a valid exercise of governmental power to protect against a public nuisance.[234] A private nuisance, by contrast, interferes with others' use and enjoyment of their property.[235] This idea has also evolved over time: courts may consider the maintenance of noisy, smelly livestock on one's property to be a nuisance once that property is surrounded by a suburban neighborhood, even if they did not consider it a nuisance twenty years prior, when the neighborhood was rural in character.[236] Thus, nuisance concepts are context dependent in time and space, and the *Lucas* opinion calls into question the ability of governments to regulate newly

227. If the property owner understands the state oil and gas regulatory regime to preempt local zoning, that understanding may influence the owner's reasonable expectations.

228. *Lucas*, 505 U.S. at 1031–32; *see also* Fla. Rock Indus., Inc. v. United States, 45 Fed. Cl. 21, 28–29 (1999) ("Nuisance law for purposes of the Takings Clause is not simply defined by Congress, whenever it declares that a use should not occur.").

229. However, some post-*Lucas* lower court decisions applying the *Lucas* test have considered preexisting regulatory regimes which might bear on the new owner's expectations. *See* Glicksman, *supra* note 207, at 183 (surveying post-*Lucas* case law and finding that the majority of courts consider "restrictions derived from legislation and administrative regulation" and nuisance law).

230. RESTATEMENT (SECOND) OF TORTS § 821B (1979).

231. Mugler v. Kansas, 123 U.S. 623, 670, 674 (1887).

232. Champion v. Ames (The Lottery Case), 188 U.S. 321, 356–57 (1903).

233. For a good discussion of the evolving conception of public nuisances, see generally Todd D. Brody, Comment, *Examining the Nuisance Exception to the Takings Clause: Is There Life for Environmental Regulation After* Lucas*?*, 4 FORDHAM ENVTL. L. REV. 287, 293 (2011).

234. This is the implication of the Court's decisions in *Mahon* and *Keystone*, both of which reviewed the constitutionality of Pennsylvania statutes limiting mining rights in order to prevent surface subsidence. *See supra* notes 204, 220 and accompanying text.

235. RESTATEMENT (SECOND) OF TORTS § 822 (1979).

236. *See, e.g.*, Spur Indus., Inc. v. Del E. Webb Dev. Co., 494 P.2d 700, 707–08 (Ariz. 1972) (granting a developer an injunction against a cattle feeding operation as a nuisance even though the feeding operation existed prior to the residential development).

understood nuisances in ways that destroy the economically beneficial use of property, at least without paying compensation.[237] For a claimant holding a severed mineral interest devalued by a local fracking ban, the question becomes whether the owner could have reasonably expected to use fracking to produce oil or gas at that location under principles of property law in place at the time of the regulation.

Is fracking a nuisance? Fracking presents disruptions to the local community that are significantly different in magnitude from those associated with conventional drilling. Drilling a vertical well creates noise and other disruptions for a shorter period of time than drilling multiple horizontal wells from a single pad. Fracking horizontal wells requires more water and more truck trips than conventional production and sometimes creates temporary industrial zones among nonindustrial properties. Since courts have often characterized similar unwanted land uses as nuisances,[238] local governments will argue they should accept the characterization of fracking as a nuisance. The government may also argue that fracking presents risks to public safety and health, such as the risk of groundwater contamination and health impacts from local air pollution. This is a claim that implicates the gap between public understanding of the risks of fracking and current scientific understanding, and so the resolution of this aspect of the local government's defense against such will depend upon how the court understands those risks.[239] The resolution of these arguments may well turn, then, on the court's view of the magnitude of the risks posed by shale gas development and whether the court adopts a narrow or a broad definition of nuisance: does it encompass the broad set of undesirable activities courts have recognized in the past, or, under the narrower

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237. Even before *Lucas*, Justice Rehnquist's dissent in the *Keystone* decision argued that the nuisance exception is not coterminous with state police power. Keystone Bituminous Coal Ass'n v. Debenedictis, 480 U.S. 470, 512 (1987) (Rehnquist, C.J., dissenting). To some commentators, *Lucas* reversed the presumption that regulation devaluing property was valid if it addressed a valid governmental purpose. Glicksman, *supra* note 207, at 162–64; Mandelker, *supra* note 215, at 285–87; Brody, *supra* note 233, at 301 & n.78. Explaining this presumption, Brody cites the example of *Miller v. Schoene*, 276 U.S. 272 (1928), in which the court rejected the claim that a Virginia statute outlawing the growth of cedar trees as a nuisance amounted to taking. Brody, *supra* note 233, at 293–94. Even though growing cedar was common and legal before the statute, the statute was aimed at preventing the spread of a tree disease. *Id.* at 293.

238. In *Rith Energy, Inc. v. United States*, the court concluded that the denial of a federal mining permit to thenh plaintiff by the Office of Surface Mining did not constitute a regulatory taking because acid mine drainage, a form of water pollution associated with mining, would constitute a nuisance under applicable state law. 44 Fed. Cl. 108, 110, 113–14 (1999). The rejoinder to this analogy is that while mines represent a long-term (decades long) industrial activity, fracking is temporary. On the other hand, both present the risk of harm, which is what the *Rith* court determined was the nuisance.

239. Presumably, the Pennsylvania Supreme Court's recent decision that local fracking bans protect the public right to a clean environment reflects an acceptance of the argument that the risks it poses to health and safety are real and significant. *See supra* notes 115–18 and accompanying text.

definition Justice Rehnquist employed in his *Keystone* dissent, is it limited to activities that pose a risk to health or welfare.[240] If the latter, how does the presence of state and federal regulation of shale oil and gas production affect the court's assessment of the risks to health and welfare posed by fracking? Will courts treat the presence of regulation as evidence that the activity poses risks or that regulation will minimize that risk?

Of course, whether fracking is a nuisance bears on the reasonableness of the owner's expectations under the *Penn Central* analysis as well. Moreover, nuisance questions aside, the owner's reasonable expectations might vary over time for other reasons. Prior to 2005, when producers began to use fracking and horizontal drilling to produce significant amounts of hydrocarbons from shales, owners of mineral rights had little expectation that they might be able to produce oil and gas because it was not commercially practicable given technical capabilities at the time.[241] This kind of technical uncertainty affects value over time and poses the question of what values to compare when calculating the diminution in value of the claimant's interest. Should changing technology also be part of the court's evaluation of the claimant's reasonable expectations? Consider the holder of mineral rights to a productive shale formation who bought those rights in 1995 for $100 per acre, saw their value soar to $2,500 per acre in 2007, and then fall to $100 per acre after the local jurisdiction in which they sit imposed a ban on shale oil and gas production in 2012. Were the owner's reasonable *investment-backed* expectations destroyed by the ban? If we assume all three values are expressed in real dollar terms, the rights in 2012 are worth what the owner paid for them in 1995. More to the point, she had no expectation in 1995 to be able to produce oil and gas from shale when she invested in the property. The ban sharply diminished the value of the rights, but might the government plausibly argue that it did not defeat the owner's investment-backed expectations because the owner never expected to produce oil or gas from those rights at the time the property was acquired? If so, this scenario also shows how the *Lucas* decision changed the analysis of takings claims. If the owner holds a severed mineral interest, such that after the enactment of the 2012 ban there remains little or no economically beneficial use for the mineral interest, the question before the court is not whether the owner's reasonable investment-backed expectations were defeated. Rather, under the *Lucas* analysis, the question

240. *See supra* notes 230–38 and accompanying text. Patrick McGinley says that the "mere allegation" that fracking will cause harm is not sufficient; rather, one must show "evidence of a risk or probable risk of the occurrence of harm." Patrick C. McGinley, *Regulatory Takings in the Shale Gas Patch*, 19 PENN. ST. ENVTL. L. REV. 193, 225 (2011).

241. Howard Rogers, *Sale Gas—The Unfolding Story*, 27 OXFORD REV. ECON. POL'Y 117, 123 (2011).

is whether well-established principles of state property law would have prevented the use, a much narrower inquiry.[242]

Of course, political and legal uncertainty also affects expectations. Mineral-rights holders know that production requires a state-issued permit and compliance with evolving regulatory requirements. Should owners think of the investment in oil and gas rights as speculative, such that it is not reasonable to expect to be able to produce oil and gas from a particular holding in a particular location? To some commentators, the answer is yes.[243] On the other hand, if the state regulatory regime permits fracking at the time a local ban is enacted, then the owner can argue that her expectation to use fracking to produce oil or gas was "reasonable."[244] In places where a local ban is enacted before the state has permitted fracking, perhaps that argument carries less weight; but if the *state* permits shale oil and gas production, the question of whether the local ordinance is likely to be preempted influences the investor's reasonable expectations, meaning that preemption and takings analyses are intertwined. And in some states there may be other constitutional or property law rules that temper the expectation to produce, such as Pennsylvania's environmental rights provision.[245] In states where the public trust doctrine protects surface waters or groundwater, a judge who believes fracking threatens either resource may conclude that the mineral-rights holder could not reasonably have expected to produce oil or gas.[246]

Thus, takings doctrine appears sufficiently elastic that it is difficult to predict how courts will resolve claims by landowners or developers that fracking bans take their property. There is no shortage of advice in the academic literature on how courts *ought* to resolve takings claims, however. Portions of that literature address the sort of "politics of distribution" concerns that have been the focus of this Article; we turn to that analysis now.

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242. Hence the first line of Justice Blackmun's dissent: "Today the Court launches a missile to kill a mouse." Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1036 (1992) (Blackmun, J., dissenting); *cf.* Glicksman, *supra* note 207, at 183 (concluding that lower courts have softened the difference between the *Lucas* test and the harm–benefit balancing test).

243. *E.g.*, McGinley, *supra* note 217, at 570–72.

244. However, this argument has been undermined by the Pennsylvania Supreme Court's recent conclusion that doing so compromises Pennsylvania residents' right to a clean environment under the state constitution. *See supra* notes 114–19 and accompanying text.

245. *See supra* note 116 and accompanying text.

246. *See* Alexandra B. Klass, *Modern Public Trust Principles: Recognizing Rights and Integrating Standards*, 82 NOTRE DAME L. REV. 699, 740–41 (2006) ("[H]istoric common law doctrines such as the public trust doctrine have played a central role in the regulatory takings debate as a result of the Supreme Court's 1992 decision in *Lucas v. South Carolina Coastal Council*.").

B. The Political Economy of Takings Rules

We routinely conceive of property rights as welfare-enhancing mechanisms: without them, owners would underinvest in property, forgoing all the direct and indirect benefits that investment would otherwise generate.[247] Of course, the law also recognizes that property rights are qualified, at least in certain ways, by community needs.[248] However, there is a large academic literature that moves beyond this generalization and addresses in more nuanced ways the question of whether takings compensation—and more broadly, compensation as relief from the effects of legal transitions—is *ex ante* efficient.[249] One strain of this literature argues that (1) compensation is not efficient because it creates a moral hazard problem by which landowners overinvest in land in reliance on the compensation right, and (2) the absence of a right to compensation should lead landowners to anticipate legal change (such as fracking bans) and insure against it.[250] The mirror image view is that a compensation requirement is efficient because it forces governments to balance both the costs and benefits of their policy choices.[251] These kinds of purely economic analyses are often light on the politics of local decision making, however. Rather than focus on *ex ante* efficiency, perhaps the better question is whether a compensation requirement alleviates or exacerbates the matching problem. Does compensation facilitate local government decisions that do a better job of balancing the important costs and benefits of shale oil and gas production? Which rule is more likely to stimulate bargaining that produces Kaldor–Hicks improvements?

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247. More specifically, for an exploration of the argument that property rights enhance human values, and that regulation that takes property without compensation undermines those values, see generally Radin, *supra* note 219, at 1684–96.

248. For analyses of takings disputes emphasizing this principle, see Hanoch Dagan, *Takings and Distributive Justice*, 85 VA. L. REV. 741, 792–801 (1999) and John E. Fee, *The Takings Clause as a Comparative Right*, 76 S. CAL. L. REV. 1003, 1049–60 (2003). Danaya Wright argues for the application of an inverse golden rule in takings cases, one that would deny compensation to prohibited land uses that "impose harm on neighbors" and "threaten or limit the equivalent or dependent rights of others." Danaya C. Wright, *A New Time for Denominators: Toward a Dynamic Theory of Property in the Regulatory Takings Relevant Parcel Analysis*, 34 ENVTL. L. 175, 225–26 (2004).

249. For a review of this literature, see Jonathan S. Masur & Jonathan Remy Nash, *The Institutional Dynamics of Transition Relief*, 85 N.Y.U. L. REV. 391, 396–405 (2010).

250. *See, e.g.*, Louis Kaplow, *An Economic Analysis of Legal Transitions*, 99 HARV. L. REV. 509, 536–41 (1986) ("[T]he level of compensation accompanying changes in government policy . . . distorts the investment decisions of potential recipients of such compensation."); Thomas W. Merrill, *Rent Seeking and the Compensation Principle*, 80 NW. U. L. REV. 1561, 1580–81 (1986) (book review) (critiquing the insurance theory of takings compensation, which views the practice as a consolidation of risk in order to reduce costs).

251. Lawrence Blume & Daniel L. Rubinfeld, *Compensation for Takings: An Economic Analysis*, 72 CALIF. L. REV. 569, 582–83 (1984); Robert C. Ellickson, *Suburban Growth Controls: An Economic and Legal Analysis*, 86 YALE L.J. 385, 420–21 (1977).

Local fracking bans represent decisions by the local governments to forgo both the costs and the benefits of development. As noted in Part III, there are good reasons to characterize local government decision making on fracking issues as majoritarian, and therefore more likely to internalize the local costs of their decisions.[252] If so, say some scholars, courts ought to apply the Takings Clause differently (read: more deferentially) to local governments' actions. Christopher Serkin argues that since local governments will be disciplined by voters to avoid regulation that decreases collective utility, smaller takings judgments are appropriate in the local government context.[253] Vicki Been, using Albert Hirschman's notions of "exit" and "voice,"[254] argues that courts ought to consider property owners' ability to exit the jurisdiction when resolving compensation claims.[255] Thus, while Serkin stresses the likelihood that local-government decisions will maximize collective utility, Been stresses the ability of property owners to avoid or minimize the costs of regulation via exit. Certainly, large oil and gas producers are mobile in the sense that they can and do produce in multiple locations, moving their drilling rigs constantly in response to changing economic incentives. (The industry also includes smaller companies with fewer mineral holdings.) However, the mineral rights they own are immobile: they are fixed in place, limiting the force of exit as a way to minimize or avoid costs. For this reason, William Fischel argues that local government action warrants greater judicial scrutiny (not less) because local land-use regulations tend to affect assets, such as land, that cannot exit the jurisdiction the way individual voters can.[256] In other words,

252. Christopher Serkin, *Big Differences for Small Governments: Local Governments and the Takings Clause*, 81 N.Y.U. L. REV. 1624, 1661 (2006) (arguing that, more so than other levels of government, local governments are largely majoritarian because they must balance the costs and benefits of their actions on property values); *cf.* Michael A. Heller & James E. Krier, Commentary, *Deterrence and Distribution in the Law of Takings*, 112 HARV. L. REV. 997, 1018 (1999) (arguing that compensation rights prevent overuse, because they require considering costs and benefits before asserting the takings power). Saul Levmore's formal analysis concludes that if the ban will increase welfare, but is a minority viewpoint (or a viewpoint with less political power) within the jurisdiction, then compensation is the preferable rule because it will enable the welfare-enhancing ban to take effect. Saul Levmore, *Changes, Anticipations, and Reparations*, 99 COLUM. L. REV. 1657, 1665–66 (1999); *cf.* Nestor M. Davidson, *The Problem of Equality in Takings*, 102 NW. U. L. REV. 1, 41–48 (2008) (arguing that the "inverted political economy of regulatory takings claims" is "troubling" because it offers the greatest judicial protection to those most able to protect themselves in the political process).

253. Serkin, *supra* note 252, at 1697–98.

254. In Hirschman's paradigm, a person who is dissatisfied with a policy may either "exit," meaning leave the jurisdiction, or use "voice" to protest the policy in a number of ways, or do both. ALBERT O. HIRSCHMAN, EXIT, VOICE, AND LOYALTY 3–5 (1970).

255. Vicki Been, *"Exit" as a Constraint on Land Use Exactions: Rethinking the Unconstitutional Conditions Doctrine*, 91 COLUM. L. REV. 473, 476 & n.18 (1991).

256. WILLIAM A. FISCHEL, REGULATORY TAKINGS: LAW, ECONOMICS, AND POLITICS 101 (1995). *But cf.* Carol M. Rose, *Takings, Federalism, Norms*, 105 YALE L.J. 1121, 1131, 1138–39 (1996) (book review) (disputing Fischel's analysis of the difference between local governments and state and federal governments but conceding that the majoritarian nature of local governments

because property owners cannot take their property with them across local boundaries, exit does not discipline a local majoritarian tendency to overregulate by ignoring minority interests.

Frank Michelman's prescription tries to address some of these nuances by melding Rawlsian notions of justice with economic approaches to welfare maximization.[257] Michelman argues that courts can provide incentives for efficiency by focusing on the reasonableness of the property holder's investment-backed expectations. According to Michelman, courts should focus on "prior warning of possible collective action, which obviates any need for compensation when such action materializes" because such prior warning would render any investment-backed expectations unreasonable.[258] Thus, owners contemplating land uses that may shift costs to neighbors should anticipate the potential for others to be bothered[259] and should purchase surrounding lands to create a buffer zone around their activities, anticipating that residential development could encroach upon their industrial activities.[260] However, Michelman also argues for decision rules that take into account the long-run costs of a rule denying compensation as well. These would include the disutility other owners might derive from the knowledge that the no-compensation rule could apply to their property, something Michelman calls "demoralization costs."[261]

All of these approaches represent attempts to employ compensation rules that will induce efficient behavior over the long run. Theoretically, if the net benefits of a development ban are negative, a compensation requirement can prevent the local government from making the inefficient choice; if the net benefits of a ban are positive, a compensation requirement would enable the court to mimic Coasean bargaining, in which the local government pays the property owner an amount less than or equal to the utility the community derives from banning fracking and greater than or

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may mean that stable minority interests are treated unfairly when exit and voice fail in certain ways).

257. Frank I. Michelman, *Property, Utility, and Fairness: Comments on the Ethical Foundations of "Just Compensation" Law*, 80 HARV. L. REV. 1165, 1219–22 (1967).

258. *Id.* at 1239.

259. *Id.* at 1242–43. Michelman does recognize the counterargument that residential property owners should likewise have to purchase additional land to create a buffer zone. *Id.* at 1243.

260. *Id.* at 1241–43. Michelman argues:

> Utilitarian property theory, then, for all its emphasis on security of expectations, easily allows that compensation need not be paid in respect of investments which, when they were made, either (a) interrupted someone else's enjoyment of an economic good, as should have been apparent; or (b) were of a sort which society had adequately made known should not become the object of expectations of continuing enjoyment.

Id. at 1241.

261. *Id.* at 1214. *But cf.* Nestor M. Davidson, *Property's Morale*, 110 MICH. L. REV. 437, 471–73 (2011) (arguing that property owners also derive utility from the knowledge that government will regulate to protect the value of their property).

equal to the owner's lost utility from the ban. However, this is just Coase's reciprocity problem revisited: we could make the mirror image claims about compensation flowing from landowners and developers to the local government as well.

In practice, however, for reasons outlined in section III(B)(3), local governments are likely to be unwilling to compensate property owners who they perceive to be imposing costs on others. Nor does takings doctrine seem to contemplate compensation that mimics a Coasean solution when a taking has occurred. Instead, the *Penn Central* and *Lucas* rules seem to imply a winner-take-all approach unlikely to yield a solution that shares the net benefits of engaging in (or of forgoing) shale oil and gas production among all the affected parties. The compensation issue is a particularly thorny one in the shale oil and gas context because the local benefits are often unevenly distributed: some property owners may gain enormous benefits from shale oil and gas production while their neighbors gain nothing. A blanket right to compensation protects that distribution; a blanket denial of that right not only upsets the distribution, it denies the investor the benefits of her investment and forgoes all the benefits and costs of production. Instead, the legislative solutions described in section III(B)(3) seem more likely to create the conditions for Kaldor–Hicks efficiency.[262] If local jurisdictions can anticipate receiving impact fees from the state, or if they have the power to tax in ways that capture a share of the benefits of production, their decisions ought to do a better job of balancing the costs and benefits of a prospective ban—at least those costs and benefits that fall within the local jurisdiction.

In sum, optimal compensation rules are difficult to devise and seem unlikely to be incorporated into takings doctrine, which instead favors either full compensation or zero compensation, depending upon whether an unconstitutional taking has occurred. Because voters' sense of fairness is anchored on the status quo, requiring compensation seems unlikely to produce the kind of bargaining that will yield a more efficient distribution

262. Some commentators have urged a remedy for this problem in the form of transferable development rights (TDRs), marketable development rights, (1) ownership of which accrues by government fiat to property owners who are precluded by zoning or other regulation from developing their property, and (2) which developers must purchase in order to engage in permitted development. MARGARET WALLS, RES. FOR THE FUTURE, MARKETS FOR DEVELOPMENT RIGHTS: LESSONS LEARNED FROM THREE DECADES OF A TDR PROGRAM 1 (2012). In *Suitum v. Tahoe Regional Planning Agency*, regulators prohibited development on a piece of property, which generated marketable TDRs for the owner. 520 U.S. 725, 730–71 (1997). The Court majority found the owner's takings claim unripe, but the minority opined that the availability of TDRs have no bearing on whether a taking has occurred, casting doubt on their use to solve this problem. *Id.* at 747–50 (Scalia, J., concurring). For a review of the literature on TDRs, see generally WALLS, *supra*.

of the costs and benefits of fracking.[263] Those who must *now* endure the various impacts of fracking perceive themselves to be losing something, and will be unlikely to accept the notion that they ought to compensate developers for forgoing development. It is much more likely that a no-compensation rule will produce the kind of bargaining that leads to landowners and producers sharing the gains of production with locals.

V. Conclusion

Jeremy Bentham, the father of utilitarianism, advocated a decision rule that provided for "the greatest happiness of the greatest number."[264] Stated that way, however, Bentham's rule does not specify which is the higher value: maximizing total utility or maximizing the number of people whose utility is increased. State–local conflict over the regulation of shale oil and gas production illustrates the difficulty of reconciling these two notions of welfare maximization. The shale oil and gas boom presents policy makers with a series of recurring conflicts between majority preferences and minority preferences. Even within political jurisdictions, some people capture enormous benefits from production while others capture none. Should the last word about where fracking may or may not occur fall to the state or to local governments? And if local regulation bars development, should the holders of mineral rights be compensated for the value destroyed by the development ban?

This analysis has focused on how to allocate responsibility for these decisions in ways that are most likely to maximize utility, welfare, or both given the distributional impacts of fracking and the politics of the issue. A common criticism of these economic or utilitarian approaches to legal or policy questions is that they ignore the role that values play in driving political decision making. Alternatively, one could ground an analysis of local preemption and takings doctrine in, say, Kantian philosophy by asking which decision rules we would prefer if the rules operated as "universal maxims."[265] That is a logically valid way to approach these issues, but not exactly the one I have taken here. This analysis asks how best to serve the

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263. Moreover, such a rule would set a troubling precedent if one accepts the idea that humanity must adhere to a "carbon budget" in order to avoid catastrophic climate change. A carbon budget suggests the need for more stringent legal limits on carbon emissions, which will devalue mineral rights in coal and oil, as well as natural gas. The Intergovernmental Panel on Climate Change has endorsed such a budget. Justin Gillis, *U.N. Climate Panel Endorses Ceiling on Global Emissions*, N.Y. TIMES, Sept. 27, 2013, http://www.nytimes.com/2013/09/28/science/global-climate-change-report.html?pagewanted=all&_r=0, *archived at* http://perma.cc/9UA2-QNCD.

264. JEREMY BENTHAM, A FRAGMENT ON GOVERNMENT 3 (C.H. Wilson & R.C. McCallum eds., Basil Blackwell 1948) (1776).

265. IMMANUEL KANT, FUNDAMENTAL PRINCIPLES OF THE METAPHYSIC OF MORALS 20 (Thomas K. Abbott trans., The Liberal Arts Press 1949) (1785). Kant advised people to "[a]ct as if the maxim of thy action were to become by thy will a universal law of nature." *Id.* at 38.

goals of utility- and welfare-maximization in resolving preemption and takings challenges to local fracking restrictions. I ask that question (rather than the question of which rules are normatively best) because the debate over shale oil and gas production is fraught with uncertainty and emotion, making it difficult to undertake any normative analysis that demands objectivity.[266]

As we have seen, using the welfare-maximization approach, the "best" preemption rule depends upon our decision criterion. If we want regulation that aggregates the preferences of voters who collectively bear all (or almost all) of the costs and benefits of production, then states should control the regulation of shale oil and gas production, implying the preemption of local vetoes. If, on the other hand, we want regulation that takes preference intensity into account and seeks to maximize collective utility, then there may be a case for allowing local vetoes to stand because locals experience the effects of fracking most intensely and profoundly and so care more about the issue.

This conclusion comes with the caveat that locals may overregulate because they often tend to experience more of the costs of fracking than the benefits, and because, in the short run, risk aversion may lead local voters to overestimate the environmental, health, and safety risks of fracking. However, in the long run, voters will develop a relatively clear understanding of the risks of fracking, and there are ways to allow local governments to capture more of the benefits of fracking. Allowing local governments to tax mineral estates, income, or both, or using impact fees and other transfers to help them capture more of the positive effects of the shale boom, makes the case for upholding local vetoes stronger because, where these instruments are present, local governments will be more likely to make decisions that maximize welfare (that is, long-run aggregate utility). Alternatively, developers and landowners may employ their own compensation schemes to share the gains from fracking. Where these transfers are absent, the risk of local overregulation remains.

Nor does concern for the rights of affected property owners change the analysis—not because withholding compensation is fair, in some objective sense. To the contrary, one's sense of fairness seems to depend upon how one weighs the value of securing property rights against the value of local land-use control. Rather, the problem is that requiring compensation seems less likely to lead to efficiency than a no-compensation rule, which may stimulate the kind of bargaining that will lead the winners in shale oil and gas production to share their gains with the losers. That bargaining, in turn, ought to produce more efficient local government decision making in the first place.

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266. At least, I would be uncomfortable undertaking that kind of analysis of this issue.

Shale oil and gas production holds out the prospect of great benefits and great costs, particularly for locals. It offers an example of an age-old political problem that the law is called upon to solve: the conflict between an intensely held minority viewpoint and a less intense, contrary view held by the majority. The proliferation of local ordinances restricting fracking suggests that we may well be on the cusp of an explosion of preemption and takings litigation in states containing shale oil and gas. Ideally, courts will resolve these conflicts in ways that encourage states and local governments to regulate in ways that weigh both the costs and the benefits of shale oil and gas production fairly and fully.