Columbia | SIPA
Center on Global Energy Policy

Resources for the Future

ECONOMIC VOLATILITY IN OIL PRODUCING REGIONS: IMPACTS AND FEDERAL POLICY OPTIONS

BY DANIEL RAIMI, RONALD MINSK, JAKE HIGDON, AND ALAN KRUPNICK

OCTOBER 2019

ABOUT THE CENTER ON GLOBAL ENERGY POLICY

The Center on Global Energy Policy provides independent, balanced, data-driven analysis to help policymakers navigate the complex world of energy. We approach energy as an economic, security, and environmental concern. And we draw on the resources of a world-class institution, faculty with real-world experience, and a location in the world's finance and media capital.

Visit us at www.energypolicy.columbia.edu

@ColumbiaUenergy

ABOUT THE SCHOOL OF INTERNATIONAL AND PUBLIC AFFAIRS

SIPA's mission is to empower people to serve the global public interest. Our goal is to foster economic growth, sustainable development, social progress, and democratic governance by educating public policy professionals, producing policy-related research, and conveying the results to the world. Based in New York City, with a student body that is 50 percent international and educational partners in cities around the world, SIPA is the most global of public policy schools.

For more information, please visit www.sipa.columbia.edu

COLUMBIA | SIPA
Center on Global Energy Policy

RESOURCES *for the* FUTURE

ECONOMIC VOLATILITY IN OIL PRODUCING REGIONS: IMPACTS AND FEDERAL POLICY OPTIONS

BY DANIEL RAIMI, RONALD MINSK, JAKE HIGDON, AND ALAN KRUPNICK

OCTOBER 2019

1255 Amsterdam Ave
New York NY 10027

www.energypolicy.columbia.edu

@ColumbiaUenergy

ACKNOWLEDGMENTS

The authors are grateful to those who participated in two workshops held in Golden, Colorado, and Washington, DC. In particular, we would like to thank Morgan Bazilian of the Payne Institute for Public Policy at the Colorado School of Mines and Kate Gordon, director of the California governor's Office of Planning and Research and senior advisor to the governor on climate.

We would also like to thank the speakers at these events: Derek Burns of IBEW Local 111; Daryl Dukart of Dunn County, ND; Timothy Fitzgerald of Texas Tech University; Will Fleckenstein of the Credit Union of Colorado and the Colorado School of Mines; Sue Gander of the National Governors Association; Chris Hansen of the Colorado House of Representatives; Ian Lange of the Colorado School of Mines; Mike Leonard of the Colorado Oil and Gas Conservation Commission; Doug Lynott and Nancy Gilbert of the US Department of Commerce's Economic Development Administration; Mary Alice McCarthy of New America; Adele Morris of the Brookings Institution; Patrick O'Brien of the US Department of Defense's Office of Economic Adjustment; Roy Otto of Greeley, Colorado; Diane Rahm of Texas State University; Deb Ryan of MHA Petroleum Consultants; Chantal Unfug of the Colorado Department of Local Affairs' Division of Local Government; Jeremy Weber of Pittsburgh University; and Kirby Wynn of Garfield County, Colorado.

We would also like to thank Jason Bordoff, Jesse McCormick, Christina Nelson, and Matthew Robinson at the Columbia University Center on Global Energy Policy; Kristin Hayes and Christine Tolentino at Resources for the Future; Gregory Clough at the Colorado School of Mines; and Marilu Hastings at the Cynthia and George Mitchell Foundation.

This policy paper represents the research and views of the authors. It does not necessarily represent the views of the Center on Global Energy Policy or Resources for the Future. The paper may be subject to further revision.

This work was made possible, in part, by support from the Cynthia and George Mitchell Foundation. More information is available at https://energypolicy.columbia.edu/about/partners.

ABOUT THE AUTHORS

Daniel Raimi is a senior research associate at Resources for the Future and a lecturer at the Gerald R. Ford School of Public Policy at the University of Michigan. He works on a range of energy policy issues with a focus on oil and gas regulation and taxation and climate change policy. He received his master's degree in public policy from Duke University's Sanford School of Public Policy and his bachelor's degree in music from Wesleyan University.

Ronald Minsk is an attorney, policy consultant, and fellow at the Columbia University SIPA Center on Global Energy Policy. He has worked on energy, environment, and climate change policy in both the private and public sectors, including at the National Economic Council at the White House for Presidents Clinton and Obama. Ron received his BS in accounting and economics from New York University, his MPP from the Kennedy School at Harvard, and his JD from the University of Pennsylvania Law School.

Jake Higdon is an analyst, US climate policy, at Environmental Defense Fund and a former research assistant at the Center on Global Energy Policy. He previously worked in data analytics and as a policy assistant in the White House Office of Energy and Climate Change. Jake holds an MPA in Environmental Science and Policy from Columbia University and a bachelor's degree from the University of North Carolina at Chapel Hill.

Alan Krupnick is a senior fellow at Resources for the Future. His research focuses on analyzing environmental and energy issues, in particular, the benefits, costs, and design of pollution and energy policies both in the United States and abroad. Alan previously served as senior economist on President Clinton's Council of Economic Advisers, advising the administration on environmental and natural resource policy issues. He received a PhD in economics from the University of Maryland and a BS in finance from Pennsylvania State University.

PREFACE

This report reflects the culmination of more than a year of collaborative research and stakeholder engagement, including workshops in Golden, Colorado, and Washington, DC, with researchers, representatives of the oil and gas industry, environmental nongovernmental organizations, and policy makers from the local, state, and federal level. While there are many opportunities and challenges stemming from recent growth in US oil and natural gas production, these two full-day workshops featured discussions of two narrow questions: (1) should the federal government play a role in addressing the local effects of economic volatility driven by volatility in oil prices, and (2) if the federal government should play a role, what programs or mechanisms would be most appropriate? The authors deliberately limited this discussion to the effects of *volatility*, rather than long-term decline, and to *oil*, rather than both oil and natural gas. The authors describe the rationale for these decisions in the body of the text that follows.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Growth in US oil production has created substantial economic and energy security benefits for the nation. Over the course of a decade, new oil production has virtually eliminated the US trade deficit in petroleum and, in 2020, the Congressional Budget Office projects that US GDP will be 0.7 percent higher than it would have been without shale development. However, the rise in oil output has also expanded the number of communities closely tied to swings in crude prices—the boom and bust cycles that have confounded producers since the first commercial wells were spudded in the mid-19th century.

US oil producing regions enjoy significant economic growth during boom times, boosting state and local investment, employment, and household income. This growth often comes with its own challenges—such as strains on local housing, schools, and infrastructure—which are amplified by uncertainty over when, and to what extent, prices and production will fall. When oil prices drop, local and state economies can face sharp declines, and decisions or investments made during the boom period may become obsolete. This volatility creates planning challenges for both the public and private sectors, along with substantial risks for residents of oil producing regions.

In this report for Columbia University's Center on Global Energy Policy, the authors address whether the federal government can and should intervene to reduce the challenges associated with this volatility. In their research, the authors convened two expert workshops, reviewed the existing evidence, and analyzed a range of potential policy options. The report recommends a modest intervention: establishing a federal interagency Oil Volatility Advisory Board. The board would synthesize data on local economic, fiscal, and social conditions in producing communities. With this information, the board would play a coordinating role by connecting public and private institutions in producing regions with existing federal programs designed to manage near-term challenges and diversify local economies over the longer term. While this proposal is unlikely to eliminate all of the local challenges associated with oil price volatility, it could help smooth fluctuations, providing the basis for a higher quality of life along with more stable economic growth in producing regions.

The paper finds that:

- The experience of booms and busts in oil producing regions is distinct from other regional economic challenges, as local businesses, governments, and residents must prepare for—and respond to—large, rapid, and unpredictable changes in local economic conditions. While the federal government has established programs to assist with long-term economic decline in some coal, military, and trade-impacted communities, no analogous program exists for supporting oil producing communities experiencing economic volatility.
- State governments in Texas, North Dakota, Colorado, and elsewhere have shown varying levels of interest in assisting localities manage the challenges of volatility.

Where they exist, these efforts have mostly focused on managing infrastructure demand during boom periods. However, some states have done little to address local impacts during booms, and no states have taken major steps to support economic diversification or other efforts that could soften the local impacts of busts. In some states—particularly Texas—existing tax policy exacerbates, rather than smooths out, revenue volatility for local governments.

- Several existing federal offices and programs can provide a base of knowledge to support oil producing communities. These include the U.S. Economic Development Administration (EDA), the Department of Defense's Office of Economic Adjustment, and federal Trade Adjustment Assistance. We believe that EDA offers the clearest model to support long-term economic diversification in oil producing communities. If Congress were to fund EDA to support oil producing communities, clear guidelines would need to be established to determine eligibility criteria.
- In the absence of new, devoted federal funding, a federal Oil Volatility Advisory Board may provide the best option to mobilize and align federal resources to meet the needs of oil producing communities. This interagency body would synthesize data to identify communities most in need of support, conduct outreach efforts to these communities, and assist them in accessing available federal resources.

1. INTRODUCTION

Cycles of boom and bust are nothing new to the oil patch. Since "Colonel" Edwin Drake successfully drilled the first commercial oil well in Pennsylvania in 1859, boomtowns have sprung up when new resource opportunities were discovered, followed by busts when oil prices or resources declined. In 2018, on the back of decades of innovation in the production of shale gas and tight oil, the United States became the world's top crude oil producer.[1] Between 1998 and 2014, oil and gas extraction grew from 0.4–1.7 percent of gross domestic product (GDP), representing hundreds of billions of dollars in economic growth.[2] However, from mid-2014 to early 2016, oil prices dropped by 70 percent in the longest-lasting collapse since 1986, generating economic shock waves in regions that have grown increasingly reliant on the energy sector to sustain infrastructure, jobs, and public services. Currently, low levels of global spare capacity, high levels of geopolitical risk, and other factors create the potential for further volatility.[3]

While the economic benefits of surging production are largely celebrated by policy makers at the federal level, the challenges of booms along with the weight of busts fall acutely on producing communities. Many of these communities, such as those in North Dakota's Bakken or South Texas's Eagle Ford Shale regions, had little oil production merely a decade earlier. As these often-rural regions grow, they experience significant economic benefits, including growth of state level GDP,[4] employment,[5] and household income.[6] Those benefits, however, are accompanied by challenges during both booms and busts, exacerbated by uncertainty over the timing and scale of the next cycle. This volatility creates planning challenges for both the public and private sectors: uncertain demand for housing, schooling, and infrastructure is accompanied by uncertainty in future revenues.

Oil price volatility will continue to affect the United States, given its position as the world's largest producer and consumer of oil, along with its major role as an importer and—increasingly—exporter of crude and refined products. Even in states with established extraction sectors and energy-based savings funds, the fallout from the 2014 price collapse raised questions about the ability of existing policies to address the scale of volatility in this rapidly evolving industry. There is opportunity, therefore, for further examination of the tools that can mitigate the adverse effects of oil price volatility on communities, businesses, and governments.

Volatility has received intense focus at state and local levels but has attracted little federal attention. Although the federal government has intervened in numerous ways to support cities, counties, or larger regions experiencing long-term economic decline (discussed in detail in section 5), it has focused less on the economic effects of market volatility on communities. One could reasonably argue, however, that it is appropriate for the federal government to support the communities that bear the negative impacts of this volatility, as the nation has broadly reaped substantial economic and geopolitical benefits from the shale revolution.[7]

1.1. Recent Effects of Oil Production Growth

In 2019, the United States produced approximately 14.2 percent of global crude oil, up from 6.9 percent 10 years earlier.[8] The US trade deficit in petroleum fell from $265 billion in 2010 (42 percent of the total deficit in trade in goods) to $50 billion in 2018 (less than 6 percent) and could turn to a trade surplus if the United States becomes a consistent net exporter of crude and petroleum products in the years to come.[9] For the economy as a whole, the Congressional Budget Office estimated that real GDP will be 0.7 percent higher in 2020 and 0.9 percent higher in 2040 than it would have been without shale development.[10]

Shale development has also increased domestic employment. Employment in upstream oil and gas extraction and support services for mining (North American Industry Classification System [NAICS] codes 211 and 213) rose from 420,000 in January 2010 to 629,000 in January 2015, before declining to about 416,000 by the start of 2017. It is once again on the rise, though still well below 2014 and 2015 levels.[11]

In addition to direct economic benefits, the oil boom has geopolitical benefits for the nation.[12] New production strengthens the United States' position within global oil markets, moderating the market power of the Organization of the Petroleum Exporting Countries (OPEC) producers and those who cooperate with them.[13] OPEC members have had to reevaluate their approach to global oil markets with lower prices, which reflect in part the growth of tight oil production in the United States.[14] Additional production from the United States and lower oil prices also creates additional space in the market for the US to impose sanctions on Iran and absorb losses from nations such as Venezuela.[15]

In the sections that follow, the authors address the scope of and motivation for this study, including the economic drivers of oil price volatility, metrics for assessing volatility, and the challenge of managing both booms and busts. Then, the authors outline the impacts of oil price volatility and their private sector, public sector, and social dimensions as seen in communities in the Bakken, Eagle Ford Shale, Permian Basin, and other regions. Finally, the authors examine the policy mechanisms that could ease the burdens of volatility, first analyzing techniques at the state and local levels, then exploring whether there is a proper role for new federal interventions. The authors conclude with recommendations on the appropriate federal role.

1.2. Scope of Analysis

Increased domestic oil production has had a variety of positive and negative effects. This analysis focuses on the discrete questions of whether it is appropriate for the federal government to support oil producing communities affected by price volatility and, if so, which tools or programs might be best suited to perform this role. This section describes the scope of the authors' analysis.

First, the authors focus on the effects of *oil* price volatility, as natural gas prices since 2010 have been relatively stable and low. For example, natural gas spot prices at Henry Hub, a common US benchmark, spiked above $10/Million British thermal units (MMBtu) four times from 2000 to 2008. Since that time, as shale gas has entered the market in large quantities,

no such spikes have occurred. In fact, prices have exceeded $5/MMBtu just three times, reaching a peak of roughly $6.50/MMBtu briefly in 2010 and 2014.[16] Oil prices, on the other hand, have exhibited more volatility, particularly the late 2014 price collapse. Moreover, the low levels of global spare capacity coupled with geopolitical risk in major oil producing nations such as Iran, Saudi Arabia, and Venezuela raise the prospect of continued crude price volatility in the years to come.[17]

Second, the authors define volatility based on the standard Oxford definition that begins with "liability to change rapidly and unpredictably." Oil prices do indeed meet this definition, as demonstrated most recently by the September 2019 attack on Saudi Arabian oil facilities that spurred a one-day price spike of more than 10 percent for global benchmarks.[18] As the authors describe in more detail below, this price volatility affects the timing and scale of investment in oil producing regions, which in turn affects regional economic activity, population levels, infrastructure demand, and much more.

A related—but distinct—topic is the risk of long-term economic decline for oil producing regions, whether from resource depletion or public policy decisions (i.e., climate policies) that also raise important questions. However, the effects of volatility differ from the effects of long-term decline in a variety of ways. Most importantly, addressing the effects of volatility requires managing the impacts of contraction *and* growth, which differ markedly from strategies to address contraction alone.

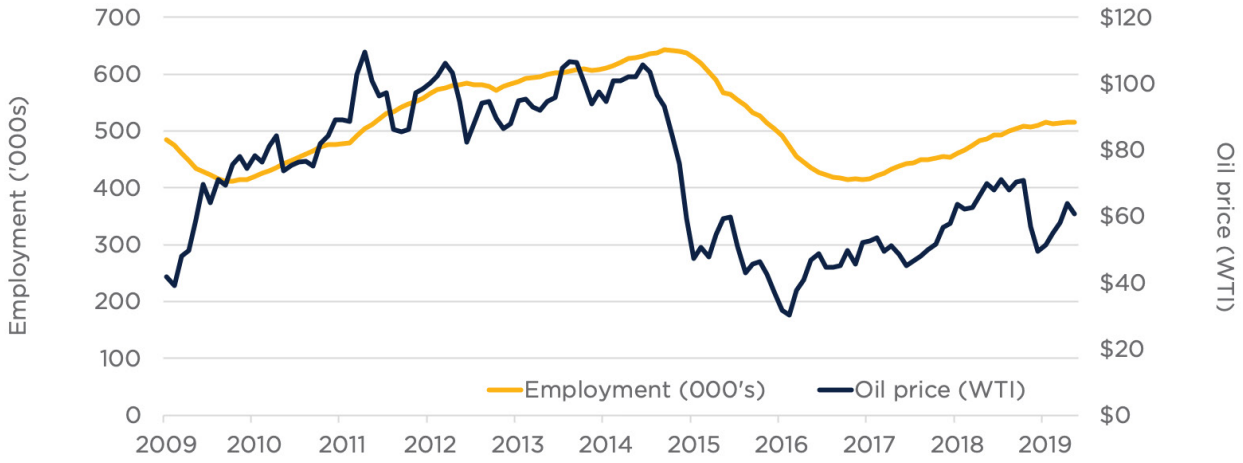
Third, the authors focus on the potential role of the federal government rather than state or local governments, as oil producing states and localities have already taken numerous steps to address the effects of price volatility. The authors discuss some of these efforts in the analysis that follows, including the ways in which they have fallen short. As noted above, the federal government has not taken substantial steps to address these issues.

Finally, the authors recognize the importance of environmental and health concerns associated with shale gas and tight oil development. This includes national and global damages through increased greenhouse gas emissions,[19] local environmental and health related damages,[20] and much more. However, the authors' focus in this analysis is on the local economic and social impacts of volatility, a topic that has received relatively little attention from federal policy makers.

2. UNDERSTANDING OIL PRICE VOLATILITY

The shale revolution, driven by advances in horizontal drilling and hydraulic fracturing, has generated excitement at the federal level around the economic and energy security benefits of surging production. At the local level, however, the benefits of the boom are accompanied by new economic vulnerabilities driven by oil price volatility. For instance, by the end of 2014, oil and gas producers employed more than 600,000 workers, only to lay off nearly one-third of their labor force in the three years following the price crash (see figure 1).

Figure 1: US oil and gas employment and oil prices



Sources: US Bureau of Labor Statistics; includes NAICS codes 211 and 213. US EIA for WTI (spot) price.

These cyclical patterns are well known in the oil industry, but their pace and scale are difficult to predict, creating challenges for local governments and businesses seeking to plan for and manage their effects. In periods of growth, public and private sector actors must make significant investments to provide infrastructure and services, even as an almost inevitable downturn could render those investments obsolete.

2.1. What Are Oil Price Booms and Busts?

As far back as 1860, there is a well-documented pattern of significant, cyclical deviations in oil prices, ranging from long-term trends to short episodes.[21] Despite a dramatically changed world market, US policy and rhetoric around energy security continues to be influenced by oil price spikes, such as those occurring in 1973, 1979, and 2008—a testament to the long-standing economic and political sensitivity to petroleum price volatility.[22]

Oil prices respond to observed and expected changes in global demand and supply. Recent analyses have pointed to the importance of weak global demand in the oil price crash of

2014, though increased supplies from the United States also played a role.[23] This cyclicality occurs across all commodities, but the oil industry is particularly vulnerable because both the demand for and supply of oil are price inelastic in the short term.

Oil supply is inelastic because most producers require years to bring large volumes of new supply online. In addition, the low marginal cost of producing a barrel of oil from a well that has already been drilled and completed means that most producers continue pumping even when prices fall. While the growth of US tight oil, which can be scaled more quickly than most "conventional" supplies, has injected a new dynamic into the market, few analysts see US tight oil as providing a true "swing" supplier capable of fully moderating price volatility. The only producer that maintains such capacity at relevant scale is Saudi Arabia, which may produce more or less based on policy objectives rather than simply maximizing profits.[24]

Demand for crude oil is also inelastic in the short term, as most consumers cannot quickly adjust their demand for gasoline, diesel, jet fuel, and other products in response to a price increase. Individuals, families, and businesses often have no alternative to petroleum when fueling their cars, trucks, or airplanes; chemicals and plastics manufacturers have few alternative feedstocks; and adopting new, more energy-efficient technologies typically takes years (in the case of personal transport) or decades (in the case of airplanes or manufacturing).

In recent decades, US policy has focused not on oil price volatility, per se, but instead on keeping prices low for consumers, particularly transportation fuels. The Strategic Petroleum Reserve, born out of the Arab oil embargo of 1973 and 1974, is a stockpile of crude oil designed to inject additional supplies into the market during supply emergencies. These releases are typically coordinated with other major oil-consuming nations, softening global price spikes. In practice, the Strategic Petroleum Reserve is rarely used, with US presidents directing only three major releases since 1975.[25]

Another relevant federal policy is the Corporate Average Fuel Economy (CAFE) standard. This policy was intended to decrease aggregate oil demand in the United States, in part to moderate the economic effects of gasoline price spikes for consumers. During the Obama administration, CAFE standards were aligned with the US Environmental Protection Agency's greenhouse gas emission standards for vehicles in response to concerns about climate change.

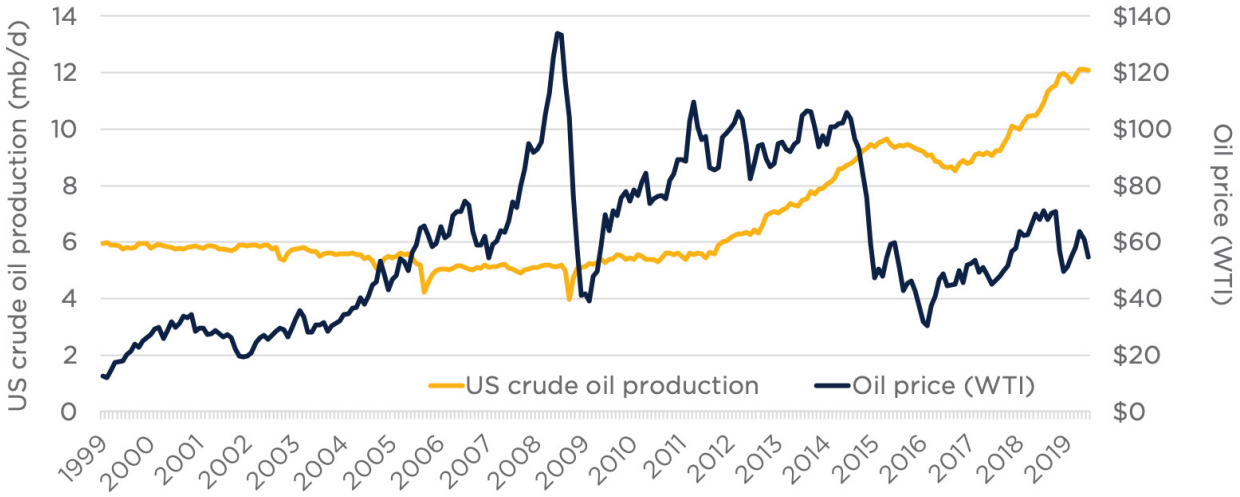
These policies view price volatility from the perspective of the consumer rather than the oil producing community. This focus on consumers rather than producers reflects several factors. First, until recently, the United States was a declining producer and the world's largest consumer, leading US economic interests to align more closely with consumer interests. Second, the effects on consumers are felt across the nation, while the effects on producers are concentrated in producing regions. As a result, the effects of booms and busts on producing communities have been addressed at the local and state level. With the United States recently regaining the role of the world's largest producer, and potentially becoming a net exporter in the years to come, this dynamic has the potential to shift policy objectives.

2.2. Measuring Volatility

Oil price volatility can be measured directly by observing changes in crude oil prices on the global market. Current prices, along with expected future prices, affect investment decisions that can be observed through drilling rig counts or hydraulic fracturing activity. The local economic and community effects of these activities, in turn, can be seen through socioeconomic indicators, including regional GDP, employment, public revenues, population, and other outcomes.

Over the first oil price cycle in the age of shale, the boom-bust pattern is evident in price and production data. With prices rising between 2009 and 2011 and then holding steady for several years, US oil production nearly doubled between 2009 and 2014 (see figure 2). North Dakota and Texas, the two states at the forefront of the boom, registered the fastest GDP growth within the United States in 2014, outpacing the national average by a factor of 2.9 and 2.4, respectively.[26] North Dakota and Texas also recorded some of the fastest growth in employment between 2008 and the 2014, at 29 percent and 11 percent, respectively.[27]

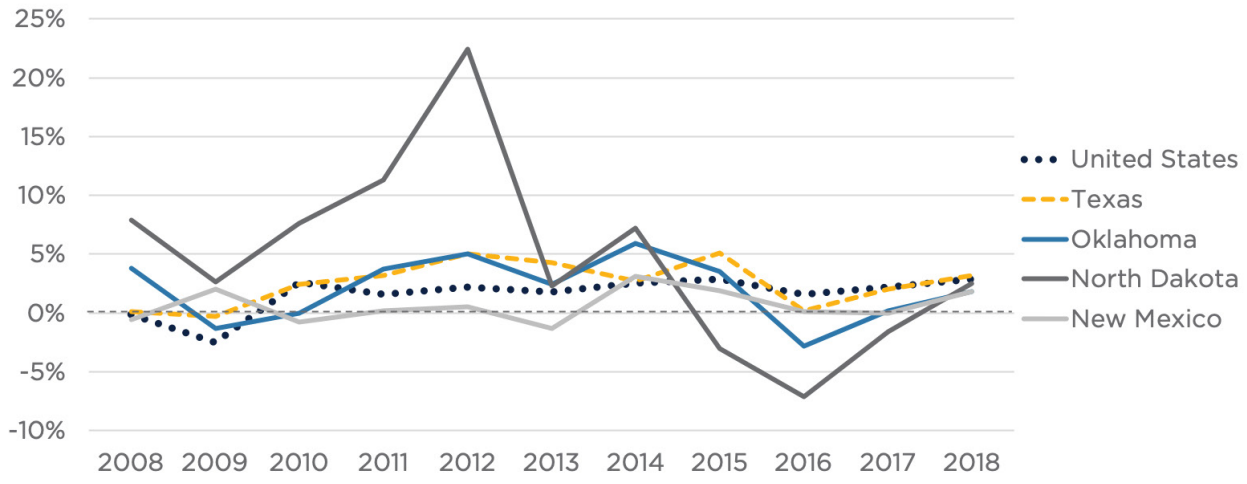
Figure 2: US crude oil production and oil prices



Source: US Energy Information Administration

Soon after prices collapsed in late 2014, US oil production declined, falling by more than 1 million barrels per day from April 2015 to September 2016. Of the four main tight oil producing states, North Dakota, Oklahoma, and New Mexico were in recession by 2016, while Texas—with its larger and more diverse economy—saw growth slow to near zero that year.[28] North Dakota went from the fastest growing state in 2014 to the worst economic performer in the nation for both 2015 and 2016 (see figure 3).

Figure 3: Annual change in GDP for the US and key oil producing states



Source: US Bureau of Economic Analysis

More recently, GDP growth in these states has resumed as oil prices have recovered, though prices remain well below the $100 per barrel levels seen in the early 2010s.

2.3. The Need to Manage Volatility

Oil price volatility and uncertainty create a variety of planning challenges for governments, businesses, and individuals.

In the public sector, some governments have developed strategies to manage these challenges, while others do little to insulate themselves from booms and busts. States such as Alaska, North Dakota, and Wyoming deploy long-term savings funds endowed by energy production revenue to support future spending, while Texas and Oklahoma do not.[29]

Families and businesses in oil producing communities have also learned to save during boom periods and to remain flexible and mobile to accommodate the industry's inevitable shifts. Just as crop diversification can provide resilience for agricultural communities,[30] economic diversification can help promote long-term, sustainable growth in oil-rich regions. For instance, Texas's transition toward a larger services industry after the oil bust of the 1980s helped to reduce the state's dependence on oil and gas development. However, the state's leading oil producing regions (e.g., the Permian Basin and the Eagle Ford Shale regions) are less economically diverse and remain highly exposed to volatility.[31]

It is conceivable that states could manage boom periods by capping the number of new wells that may be drilled or completed within a given time frame (in most cases, neither the federal government nor localities have the authority to issue permits for new wells and would thus be unable to take such an approach). They could also moderate booms and busts by adjusting their tax structures to encourage more drilling when oil prices are low and less drilling when

prices are high. However, the economic and political dynamics at play in major oil producing states make such approaches unlikely, and the authors are unaware of any states that have taken such steps to address volatility.[32]

In the following two sections, the authors examine the local effects of oil price volatility and discuss in more detail some of the strategies to manage the negative impacts while benefiting from the economic upside.

3. LOCAL EFFECTS OF OIL PRICE VOLATILITY

The scale and timing of local economic volatility varies across regions due to local factors, including the resource base, infrastructure, technological development, and more. The authors describe below how the local effects of oil price volatility manifest in the private sector, local and state governments, and communities.

3.1. Private Sector Effects of Volatility

Oil price changes have a large and direct effect on drilling, completion, and other industry activities. For example, the number of drilling rigs operating in the Eagle Ford Shale and Williston Basin regions has varied by a factor of roughly 10 since 2011, with less relative volatility in the Denver-Julesburg/Niobrara and Permian Basin regions. Other regions, such as the Granite Wash (western Oklahoma-Texas Panhandle) and Mississippian (northern Oklahoma-southern Kansas), have seen variation from nearly 100 rigs at their peak to almost zero at their trough.

While drilling activity for most regions reached its low point in mid-2016, the peak of drilling activity occurred at different times for different regions, highlighting the notion that local geological, economic, and technological factors, along with global prices, affect the timing of booms. Table 1 highlights these differences across major US tight oil producing regions.

Table 1: Maximum and minimum number of drilling rigs by US basin

Basin	Maximum	Date	Minimum	Date
Denver-Julesburg/Niobrara	64	10/3/14	12	5/13/16
Eagle Ford	259	5/25/12	29	5/27/16
Granite Wash	99	4/20/12	3	4/29/16
Mississippian	92	2/15/13	2	9/2/16, 4/16/18
Permian	568	10/24/14	134	4/29/16
Williston	224	6/1/12	22	5/27/16

Source: Baker Hughes; data from February 4, 2011, to March 22, 2019

Driven by changes in drilling, completion, pipeline availability, and other factors, labor markets in the oil and gas sector as well as in sectors supplying the industry are also affected by volatility. By definition, boom periods involve the rapid scale-up of industry investment, with a corresponding demand for workers to drill wells, drive trucks, construct pipelines, and much more. While improved technologies such as automation, longer laterals, and multiwell pads have improved efficiencies for operators, at least one recent survey showed expected labor demand will remain constant or increase, assuming stable oil prices.[33] Depending on the scale and skills

of the local labor pool, workers may be sourced from the local region or migrate in temporarily.[34]

A growing labor force creates multiplier effects, spurring additional investment and employment in service sectors such as housing, food service, and retail. Some research has also indicated that boom periods may spur additional investment in nonenergy manufacturing and industrial activities.[35]

Over the short term, studies consistently find positive local and regional economic effects of the shale boom, though the magnitude of those effects varies widely. For employment, studies using input-output modeling assume each job in oil and gas leads to more than two jobs in other sectors, while statistical, ex post analyses estimate smaller multipliers of between 1.25 and 1.7 jobs. Local and regional wages and earnings also tend to increase: estimates range from near zero to more than 15 percent.[36]

During bust periods, investment in new wells slows though usually does not come to a halt (see Table 1). As a result, employment opportunities shrink, as any multiplier effect operates in reverse (though research on the economic effects of the recent bust is limited, the effects may not be symmetric).

Over the longer term, the evidence is mixed as to whether local specialization in the oil and gas sector leads to better or worse outcomes for local and regional economies. This research builds on the theory of the "resource curse," which was primarily applied to the context of developing countries[37] and proposes that a variety of negative effects flow from heavy reliance on resource extraction, including corruption, weak public institutions, crowding out of nonresource sectors (which can lead to Dutch disease), lower educational attainment, and more.

Research in the United States has primarily focused on the crowding out effect and educational outcomes. Some studies have found potential evidence of a resource curse during the recent boom[38] or during previous decades,[39] while other studies have found little or no evidence of an emerging resource curse in shale regions.[40]

Of course, boom periods can have salutary effects on local communities that had previously been in decline. Research has examined these benefits in natural gas producing regions of Australia,[41] finding that rural communities facing long-term decline were boosted by the influx of a younger population with better economic prospects.

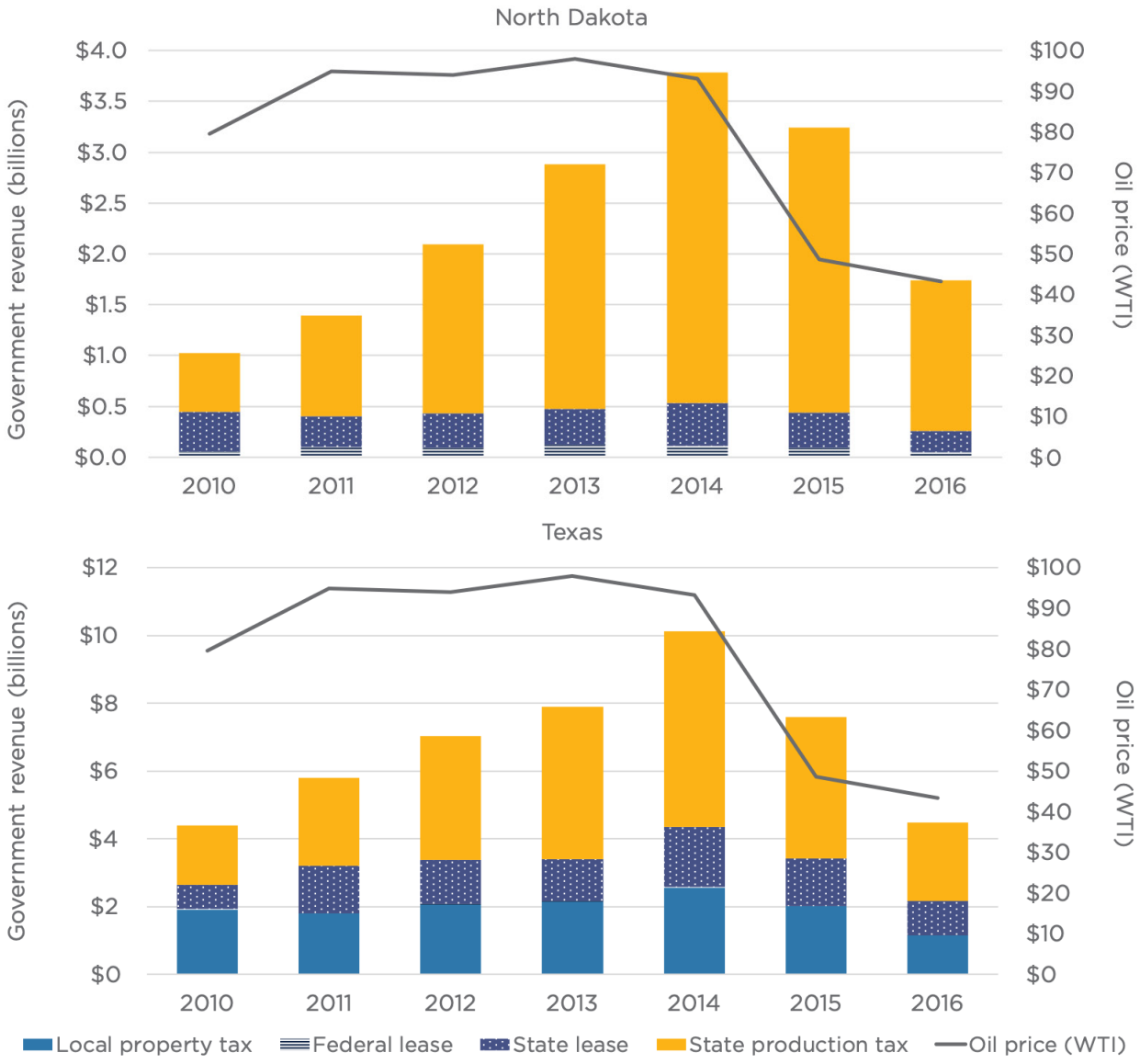
3.2. Public Sector Effects of Volatility

In the public sector, growth in oil and natural gas production has large-scale effects at the state and local levels, with volatility again playing a prominent role. One of the clearest of these effects has been to state and local budgets, which receive revenue from a variety of sources associated both directly and indirectly with industry activity.

As described by Newell and Raimi,[42] policies vary widely between states, but some of the leading oil- and gas-related revenue sources for state and local governments are production or "severance" taxes levied on the value or volume of produced oil and gas; lease revenue, such as bonuses and royalties from oil and gas leases on state lands (or federal lands located within a given state); and local property taxes levied on the assessed value of oil and natural gas production or reserves. As shown in Figure 4, these revenue sources grew dramatically

from 2010 to 2014, as sustained high oil prices led to production growth, which turned downward in 2015 following lower oil prices.

Figure 4: Key oil and gas revenues and oil prices in North Dakota and Texas

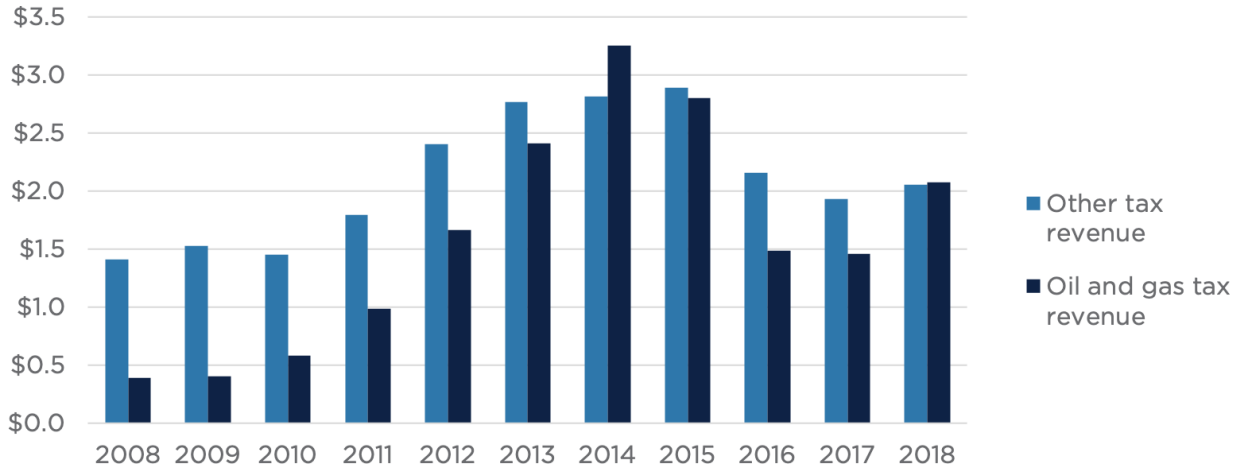


Sources: Federal revenue data from the US Department of the Interior Office of Natural Resource Revenue,[43] North Dakota state lease data from the North Dakota Department of Trust Lands,[44] North Dakota production tax data from the North Dakota Office of State Tax Commissioner,[45] Texas state lease and production tax data from the Texas Comptroller of Public Accounts,[46] Texas property tax data from the Texas Comptroller of Accounts.[47]
Note: North Dakota does not allow local governments to apply property taxes to oil and gas property.

State and local governments may also receive substantial revenues through sales taxes associated with oil- and gas-related economic activity, personal and corporate income taxes levied on industry employees or companies, and more.

Combining each of these revenue sources, state and local government budgets have experienced significant volatility, particularly in more rural regions with few other large-scale sources of revenue. For example, annual state tax revenue in North Dakota has grown by up to 34 percent (2011 to 2012) and declined by as much as 25 percent (2015 to 2016), driven primarily by oil and gas taxes, as shown in figure 5.

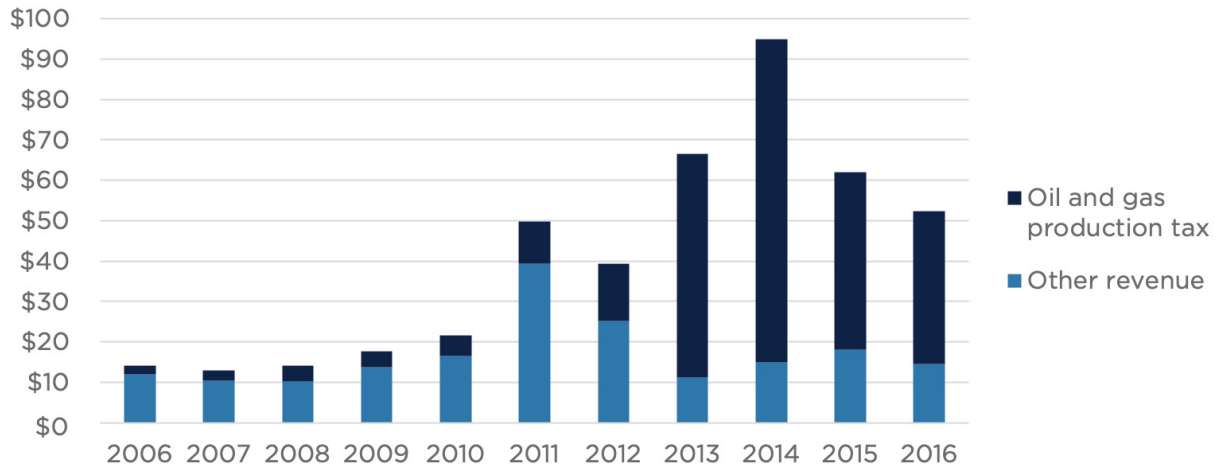
Figure 5: North Dakota state tax revenue ($ billions)



Source: North Dakota production tax data from the North Dakota Office of State Tax Commissioner[48]

Because they are less economically diverse than the state as a whole, local governments such as counties, cities, and school districts, particularly in rural regions, have experienced even greater revenue volatility. For example, McKenzie County, North Dakota, one of the most active counties in the Bakken region, has experienced annual revenue growth of as much as 129 percent (2010 to 2011) and annual revenue decreases of up to 35 percent (2014 to 2015), as shown in Figure 6.

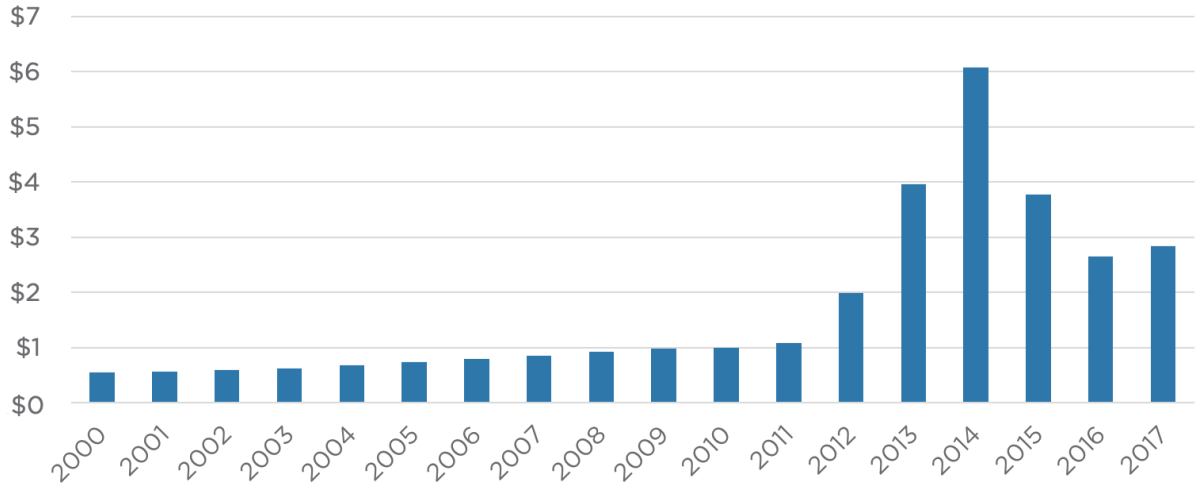
Figure 6: Government revenue in McKenzie County, North Dakota ($ millions)



Source: McKenzie County Comprehensive Annual Financial Reports[49]

Similarly, in parts of Texas, where county governments and school districts primarily rely on property taxes, local property tax bases have fluctuated with commodity prices. In Gonzales County, a major producing county in the Eagle Ford Shale region, property values have increased by as much as 99 percent (2012 to 2013) and fallen by up to 38 percent (2014 to 2015), as shown in Figure 7.

Figure 7: Taxable property value in Gonzales County, Texas ($ billions)



Source: 2000–2015 data via the Texas Comptroller of Public Accounts,[50] *2016–2017 data via the Texas Comptroller of Public Accounts*[51]

Along with changes in revenue flows, state and local governments have experienced volatility in demand for public services.[52] For local governments, the largest and most common issue has been impacts on locally maintained roads, which are rarely designed to handle the volume of heavy vehicle traffic associated with large-scale oil and gas development. Population growth in rural regions experiencing booms may also require towns and cities to invest tens or hundreds of millions of dollars in new water and wastewater infrastructure, often relying on a combination of new debt and increases to public water and wastewater rates to pay for the upgrades.[53]

Education systems in oil producing regions may also experience challenges driven by shifting populations and economic dynamics. In some regions, such as the Permian Basin and Bakken, news reports have described overcrowded classrooms as families relocate to the region seeking employment in the oil industry.[54] These reports suggest that, at least in some cases, school districts have been unable to hire teachers or expand facilities quickly enough to meet demand. This anecdotal evidence is supported by research findings showing that in some regions, boom periods have led to increased strains on the education system measured across a variety of metrics.[55]

Volatility and uncertainty contribute substantially to these challenges. For example, school districts may be reluctant to make long-term investments in facilities because a downturn in oil prices could quickly reduce the property tax base required to comfortably finance major projects as well as reduce the number of students.

In addition, some research has suggested that older students may forgo higher education opportunities, opting for high-paying employment in the oil and gas industry, which could reduce regional human capital over the longer term if these students do not return to higher education later in life.[56]

Finally, volatility creates challenges for local governments seeking to retain or hire employees. During boom times, labor moves to the higher-paying jobs in the oil sector or in ancillary businesses, forcing local governments to either raise compensation or lose workers. This drain is particularly problematic as it occurs when demand for public services is rising. However, expanding the workforce to meet demand raises new risks, as a bust reduces revenue, sometimes forcing governments to freeze wages, cut staff, or both.[57]

Despite these challenges, evidence on the net effects of shale development for local governments finds positive fiscal effects in most regions, though infrastructure challenges—particularly in rural regions—can be substantial.[58]

State governments also face new service demands associated with the industry, particularly related to state highways and roads. In Texas, for example, a 2012 report commissioned by the state Department of Transportation estimated that damage to state roads and highways from energy development totaled roughly $2 billion annually.[59] A 2017 report from a panel of state experts in Texas estimated annual costs of $1.5 billion to $2 billion for state and local roads, along with costs from damage and slower driving speeds of $1.5 to $3 billion.[60]

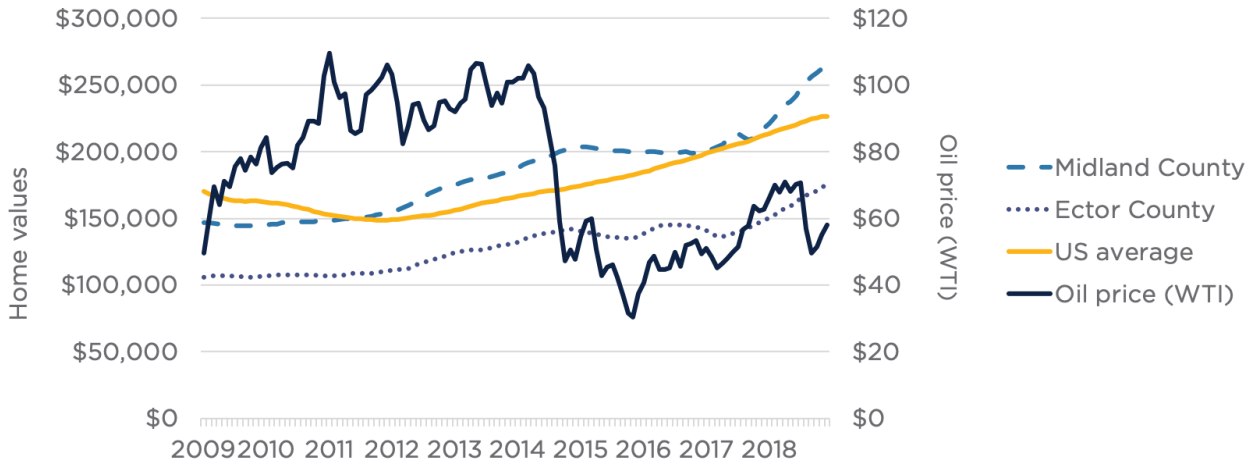
3.3. Social Impacts of Volatility

Along with the economic issues discussed above, volatility in energy development can create a variety of social challenges at the local level.

One substantial challenge for a number of regions has been housing. During boom periods, a growing population tends to strain the existing housing stock, increasing rental rates and property values. While some studies have shown that property values for individual homes may decline based on their proximity to oil and gas wells,[61] the community-wide effects of economic growth and increased tax revenues have the potential to boost home values more broadly.[62]

In the Permian Basin, anecdotal evidence from news reports describes rapid growth in home values,[63] supported by data from private services such as Zillow, which show regional home values growing substantially faster but with far more volatility than the US average. As shown in figure 8, property values have grown rapidly during boom periods (2012 to 2015 and 2017 through today) but have fallen during periods of low prices (late 2014 to 2016).

Figure 8: Home values in Midland and Ector Counties, Texas; US average; and oil price



Sources: Zillow average home price index for all home types, accessed April 25, 2019; US Energy Information Administration for nominal West Texas Intermediate spot price, accessed July 27, 2019

Along with higher home values, rapid population growth can strain rental housing stock, putting upward pressure on rents. A recent assessment of housing affordability and availability in the Bakken region projects rapidly growing demand and substantial pressure on affordability.[64] Concerns over local economic volatility (particularly the bust period) also have the potential to deter investors from making long-term investments in new housing stock. For those that do make such investments, a downturn in prices raises the risk of abandoned housing and blight.

The increase in housing values and rental rates during a boom has asymmetric effects in the

community. Growth in home values creates substantial benefits for property owners who sell, while those who do not own property, whether those attracted to the area by the boom or longtime residents, face higher rents. Individuals living on fixed incomes or others who are not able to benefit from the growth of private sector opportunities (e.g., retirees, those with physical or mental disabilities, and others) are particularly vulnerable.

These distributional effects are potentially related to concerns about prejudicial treatment of certain residents. For example, Vissing[65] found that negotiated drilling leases are of lower quality (e.g., include fewer environmental protections) in areas with a greater proportion of minority residents in the Barnett Shale region in north Texas. Limited research from the Eagle Ford Shale region also suggests that wastewater disposal locations are disproportionately located in areas with higher concentrations of minority residents.[66] If these cases are indicative of broader environmental justice issues in producing regions, it would suggest that boom periods result in additional risks without commensurate benefits for minority communities. Kroepsch et al. provided a recent review.[67]

Along with these issues related to housing and distributional impacts, studies have consistently found increased crime rates associated with increased oil and natural gas development, including in parts of Colorado,[68] the Bakken region,[69] and Texas.[70] It is unclear whether downturns result in equivalent decreases in crime rates.

Overall, community life can be disrupted by the boom and bust cycle. While there is little research to examine from oil producing regions, one stream of work from Schafft et al.[71] describes complex local responses to the shale gas boom in Pennsylvania. These include the local social impacts of an unequal distribution of benefits, unexpected community changes, and a changing sense of place. Other research has examined whether high levels of oil and gas development may reduce individuals' perceived quality of life.[72] Again, there is little research on the effects of industry slowdowns.

4. STATE AND LOCAL POLICY APPROACHES AND CHALLENGES

State and local approaches to mitigate the negative impacts of volatility vary widely across jurisdictions. Policies tend to focus on either (1) public finances, where governments use oil-related revenues to smooth fiscal volatility, or (2) private sector economic development, where governments take steps that promote economic diversification. However, certain policies may in fact exacerbate economic volatility generated by commodity price cycles.

4.1. Protecting Public Finances and Services

Some oil producing states and communities make substantial efforts to manage the volatility of government revenues, some do relatively little, and some have the effect of exacerbating revenue volatility. Most of these policies do not directly address volatility but instead seek to reduce the negative effects of booms.

In Colorado, North Dakota, Utah, and other states, a substantial portion of state-collected severance taxes and/or federal leasing revenues are allocated to local governments, providing additional revenue during boom periods.[73] These allocations mostly have supported local infrastructure and municipal services, such as law enforcement, with relatively little directed to school districts, which rely on local property taxes and state allocations not directly tied to oil and gas activity.

In Texas and Oklahoma, local governments rely primarily on local revenue sources such as property and sales taxes. These sources are highly exposed to oil price swings, and state policies can exacerbate revenue volatility. In Texas, for example, state policy stipulates that local property tax revenues cannot grow by more than 8 percent in a given year without voter approval.[74] However, oil- and gas-producing counties regularly see property tax base changes of far more than 8 percent (see Figure 7), meaning local officials often reduce property tax rates when oil prices surge. In the following years, when oil prices decline and the local property tax base shrinks, local leaders are faced with the choice of whether to raise property tax rates or reduce services to match reduced revenues.[75]

To plan for the risks associated with busts, some state governments allocate a substantial share of revenue from oil production to long-term trust funds;[76] states such as North Dakota and Utah deployed constitutional amendments and new legislation to implement new trust funds in the 2010s.[77] In most cases, these trust funds are designed to support future government operations, cushioning the effects of industry downturns. A notable exception is Alaska: its Permanent Fund generates revenue that in part is distributed to residents and in part supports current state expenditures.

4.2. Strengthening the Private Sector

Governments have taken fewer actions to address private sector impacts such as housing affordability. However, some creative measures emerged in the previous decade. In North Dakota, legislators created the Housing Incentive Fund in the early 2010s—a $30 million fund

used to support investments in affordable housing. The fund is capitalized by contributions from individuals and corporations, who receive an income tax credit equal to the amount of their donation.[78] Similarly, Pennsylvania allocates a modest portion of its natural gas "impact fee" to affordable housing programs implemented by local governments.[79]

Public-private partnerships can also play a constructive role in managing impacts. For example, operators in some oil- and gas-producing regions work closely with local government officials to maintain roads impacted by their operations. In major natural gas producing states such as Pennsylvania and Ohio, operators typically develop Road Use Maintenance Agreements. In other states such as Colorado and North Dakota, agreements are less common and often informal. In Texas, operators in some counties donate road construction materials on an ad hoc basis, with little in the way of formal agreements.[80]

In the Permian Basin, a consortium of private groups recently formed the Permian Strategic Partnership,[81] which has committed to investing $100 million over a number of years in local services, including education, infrastructure, housing, and workforce development. However, the partnership was established in 2018, making it impossible to evaluate its effects to date.

Beyond partnerships, most existing government programs targeted at energy producing regions take the form of workforce development, often focused on training workers to enter the industry. During boom periods, such an approach can help local workers participate in a sector with high wages and provide needed workers for the industry. However, if a growing share of the local labor force moves into the energy sector, this heightens a region's economic reliance on oil and gas development, exacerbating the local economic fallout from any future bust.

The North Dakota Department of Commerce administers multiple workforce development programs funded by state and federal sources. Two of the four relevant, major workforce development programs focus either largely or exclusively on training for the energy sector (see table 2), with the bulk of that focus in oil and gas.

Table 2: 2017–2019 funding for major North Dakota workforce development programs

Workforce development program	Funder	Major focus	Funding
TrainND	State	Energy, health	$2,000,000
New Jobs Training	State	General	$2,500,000
Workforce Innovation and Opportunity Act	Federal	General	$4,883,896
Training for Regional Energy North Dakota	Federal	Energy	$9,900,000

Source: North Dakota Department of Commerce.[82]
Notes: (1) Excludes programs focused on remedial education, programs developed for individuals with physical or mental challenges, and all programs with less than $1 million in 2017–2019 funding. (2) Based on a review of TrainND Summer 2019 course offerings available at https://willistonstate.augusoft.net/.

The largest of these programs, Training for Regional Energy North Dakota (TREND), was initially funded in 2012 with a $14.6 million grant from the US Department of Labor under the Trade Adjustment Assistance (TAA) program. The program provides training through regional colleges offering courses in several key areas of study, and "oil and gas development is the primary targeted industry for TREND."[83]

Other state and local policy makers have made efforts to expand workforce training in energy development. In West Texas, the Permian Basin Workforce Development Board, which consists of business leaders from the energy industry and other sectors, community organizations, education professionals, and others, issued a report in 2019 projecting that labor demand will grow most rapidly in the oil and gas sector, followed by sectors that provide services for these workers and their families, led by education, health care, and food services (see table 3).

Table 3: Projected employment in the Permian Basin by sector

		Average annual employment		
NAICS code	**Industry**	**2016**	**2026**	**Projected growth**
2131	Support activities for mining	20,779	29,367	8,588
7225	Restaurants and other eating places	16,013	20,529	4,516
6111	Elementary and secondary schools	14,321	16,750	2,429
2111	Oil and gas extraction	12,528	14,616	2,088
6221	General medical and surgical hospitals	7,118	9,042	1,924
7211	Traveler accommodation	2,456	3,306	850
9211	Local government (excluding education and hospitals)	7,397	8,220	823
2371	Utility system construction	4,311	5,050	739

Source: Permian Basin Workforce Development Board[84]
Note: NAICS is the North American Industry Classification System.

In response to these projections, the board identified "target industries" for workforce development, the large majority of which are either directly tied to oil and gas development (e.g., oil and gas extraction, support activities for mining) or service sectors heavily reliant on the industry workforce (e.g., elementary and secondary schools, general medical and surgical hospitals). Workforce training for these professions is then supported by state and federal programs such as the US Department of Labor American Job Centers network.

Efforts to diversify regional economies appear to be less common—only a few programs in major oil producing regions focus explicitly on enhancing long-term economic resilience.

One effort, called Vision West North Dakota, began work in 2012 and brings together local

elected officials, economic development officers, university researchers, and others to identify key economic development goals that can serve as the foundation of more economically diverse communities and to coordinate efforts across jurisdictional boundaries. In its most recent report, the group focused on improving local childcare and primary education, expanding access to affordable housing and mental health services, and supporting local businesses through a promotional campaign that encourages residents to shop locally.[85]

Another example comes from Kern County, California—the state's leading oil producing county—where production has generally declined over the last several decades. The county's economic development office provides grants to businesses considering new operations in the county with the explicit goal "to assist in, grow, and diversify the county's economic base."[86] However, one of several priority sectors eligible to receive financial incentives under the program is energy and chemicals, which includes support services for mining (NAICS 213) and other activities such as manufacturing petroleum products, chemicals, and plastics.

In the Eagle Ford Shale region, some local governments have developed initiatives to enhance diversification,[87] though a leading local expert reports there has been little coordination of these efforts across jurisdictions.[88]

5. FEDERAL ROLE IN ASSISTING OIL PRODUCING COMMUNITIES

The local effects of oil price volatility have not garnered significant attention from federal policy makers. Some existing programs, however, provide options for federal assistance in this area. This section examines programs and/or mechanisms that could potentially play such a role and assesses whether each is well suited to the task.

The authors examine the US Department of Defense Office of Economic Adjustment (OEA), various programs under the US Department of Agriculture, the TAA under the US Department of Labor, and the US Department of Commerce Economic Development Administration (EDA).

5.1. Precedents for Federal Countercyclical Assistance

The federal government has a long history of programs or spending to mitigate the effects of unemployment and economic downturns. In the postwar era, Congress has passed the Public Works Acceleration Act of 1962, the Public Employment Program (authorized by the Employment Act of 1971), the Emergency Jobs and Unemployment Assistance Act of 1974,[89] the Local Public Works Capital Development and Investment Act of 1976, the Public Works Employment Act of 1977, the Emergency Jobs Appropriations Act of 1983,[90] and the American Recovery and Reinvestment Act of 2009,[91] each supporting public works employment in periods of a weakening economy and higher unemployment. The federal government also has a history of countercyclical revenue sharing and employment subsidy programs.[92]

While these programs were designed to provide assistance across the nation, there is precedent for the federal government providing assistance to narrower segments of the economy that are facing distinct sectoral or regional challenges. The object of this paper is not to evaluate the effectiveness of such programs, but existing research suggests that on the whole, these programs have not been particularly effective in fostering long-term economic resilience.[93]

5.1.1. Department of Defense: Office of Economic Adjustment

Secretary Robert McNamara established the OEA at the Department of Defense in 1961. He had previously served as CEO of Ford Motor Company, which had a small office that assisted communities affected by Ford plant closures.[94]

OEA provides technical assistance and grants to communities affected by defense cuts, including base closures or realignments and defense contractor contractions or closures. OEA offers affected communities assistance to plan and implement strategies to offset local economic impacts, assisting displaced workers and affected businesses. It works to streamline information exchanges between communities and other federal agencies that may have relevant programs of assistance while helping communities develop plans that meet their own needs. OEA's approach varies considerably depending on local factors, though its general strategy focuses on job creation through business development, workforce development, and economic diversification.[95] OEA's assistance is limited to planning, advising, and coordinating activities to promote economic development; it does not provide direct financial assistance for programs, training, or infrastructure.

The primary difference between OEA's mission and the local challenges of oil price volatility is that the communities working with OEA are typically facing a single transformative event that permanently eliminates a significant source of economic activity as a direct result of a government decision (e.g., the closure of a military base). Moreover, those communities are often left with significant assets or infrastructure, such as a base or factory, that might serve as a seed for future economic growth. For example, assistance from OEA helped create the Grand Sky unmanned aerial systems technology park—the country's first unmanned aerial systems business and aviation park—on part of what was once Grand Forks Air Force Base in eastern North Dakota.[96] By contrast, oil producing communities face volatility rather than long-term decline[97] and may not have infrastructure or other assets that could catalyze future economic growth.

5.1.2. Department of Agriculture

The agricultural sector faces crop price volatility arising from a long list of risks, including unpredictable weather, infestations, and trade policy, among other factors.[98] In response to these challenges, and because of the critical role farms play in feeding the nation, the federal government has supported the agricultural sector for nearly a century.[99]

The specific nature of the assistance evolves as new farm bills are enacted.[100] Under the current farm bill, a wide range of programs is available to mitigate risks farmers face, including crop failure and low prices, and support land management and conservation practices, which provide longer-term and more geographically dispersed benefits.[101] In the aggregate, however, the overwhelming portion of assistance flows directly to farmers and protects farm income.[102]

The delivery of assistance directly to individual farmers rather than local governments or other organizations reflects the fact that farmers bear the brunt of the financial risk of farming. Of course, local economies and public revenues will experience the downstream effects of volatile farm income, particularly in regions where agriculture is the largest economic sector.[103]

Unlike oil booms, however, the population in agricultural communities does not appear to change sharply in response to volatile market prices.[104] While farming communities can face substantial changes in population from inflows and outflows of seasonal workers, these changes are largely predictable, driven by (predictable) planting and harvesting schedules rather than (unpredictable) commodity prices.

Although demand for public services may not be heavily shaped by agricultural commodity prices, the *supply* of those services may be more substantially affected. In many states, local property taxes are assessed based on the use value of agricultural land, calculated as the revenue a property owner is expected to earn in a given year. Because these revenues can be highly volatile, local property taxes can be volatile as well. For example, assessed valuation of agricultural land in Nebraska increased statewide by nearly 30 percent from 2014 to 2015 but declined by 3 percent from 2017 to 2018 (volatility at the substate level would be even more pronounced).[105] The authors are unaware of any federal government programs that directly support local governments facing this type of volatility.

As noted above, volatility in oil prices affects not just individual workers but also the

counties and cities where production occurs. While heavy equipment has a large effect on infrastructure (e.g., state and county roads) across a wide geography, population flows introduce volatility in demand for services (e.g., city streets, water systems, schools) in regional cities such as Midland and Odessa, Texas, or Williston, North Dakota.

Compared with agricultural communities, oil producing regions experience less predictable population flows. In regions such as North Dakota, a substantial portion of the energy workforce arrives when employment opportunities arise and departs as demand declines.[106] These workers are generally eligible for unemployment insurance,[107] unlike many farmers who are sole proprietors,[108] enhancing the mobility of the energy workforce.

Finally, the federal government is able to disburse assistance directly to farmers due to the availability of detailed farm-level data such as production volumes, yields, prices, and more.[109] In the oil sector, it is not clear what metrics would serve as useful proxies to provide a base for compensation, particularly for local governments and businesses indirectly affected by more readily measurable data such as drilling, production, or prices.

5.1.3. Department of Labor: Trade Adjustment Assistance

The Trade Act of 1974 established an array of programs to assist workers affected by foreign trade.[110] When workers lose or are threatened with the loss of employment as the result of foreign trade, a group of stakeholders may file a petition for assistance at the Department of Labor.[111] If the petition is certified, a company's employees are eligible for a range of services, including information about employment and training opportunities, skills assessments, job placement, job counseling, and other supportive services.[112] One defining feature of TAA is its presumption that the economic changes associated with trade are permanent. This varies substantially from the oil sector, where volatility—rather than long-term decline—is the key challenge in the present day.

5.1.4. Department of Commerce: Economic Development Administration

The EDA offers a clear mechanism through which the federal government could address volatility in oil producing regions and offers the strongest precedent for such intervention. The primary mission of the EDA is to promote regional economic development in communities across the nation.[113] It pursues its mission by helping communities build capacity for economic growth through planning, technical assistance, and infrastructure grants.[114] When it awards infrastructure grants, they tend to be relatively modest. In fiscal year 2017, it awarded approximately $290 million in 815 grants for an average award of about $355,000.[115] A summary of the awards by category is included in Table 4.

Table 4: Summary of EDA grants awarded in fiscal year 2017

Program	Number of grants	Award total
Assistance to coal communities	37	$31,170,681
Disaster relief	13	$8,514,744
Economic adjustment assistance	64	$36,977,044
Planning	430	$32,161,041
Public works	84	$121,311,536
Regional Innovation Program	77	$32,100,691
Research and evaluation	5	$2,591,881
Technical assistance	94	$10,977,633
Trade Adjustment Assistance	11	$13,309,066
Total	**815**	**$289,114,317**

EDA's awards to assist coal communities are of interest because they are directed to communities suffering from economic challenges related to declining fossil fuel production. Assistance to coal communities is carved out in EDA's annual appropriations,[116] but the economic circumstances in those communities, which are dealing with long-term structural decline, differ substantially from oil producing communities facing volatility. Typical examples are funding of a fiber-optic line to bring broadband to rural Colorado,[117] funding for a cardiac catheterization lab in a hospital whose Kentucky community is trying to become a regional medical center,[118] or funding for a new product distribution center in West Virginia.[119]

EDA also has awarded a small number of grants to communities that have experienced recent declines in oil and/or gas production. The authors identified eight grants between 2013 and 2017 in which EDA noted the decline of oil or gas production in a region in its summary discussion of the grant.[120] Of these eight grants, six went to regions with substantial shale gas and/or tight oil development, though none went to the most active tight oil producing regions in Texas, North Dakota, or New Mexico.

In every instance except one, the grants were intended to either build infrastructure or train workers in nonenergy industries, supporting economic diversification. The exception was for a grant to Ohio State University and four economic development districts in eastern Ohio "to develop a strategic plan to effectively manage the immediate impacts of shale development while leveraging the current economic boom to build a plan which supports long-term economic viability and community sustainability."[121] The researchers were examining, for example, whether local businesses could "increase their business by marketing their products to other regions or states, such as Illinois, that are just beginning to explore shale development."[122] A summary of the relevant grants is included in Table 5.

Table 5: Recent EDA grants in oil producing regions

Grantee region	Year	Description
Oklahoma City, OK	2017	EDA provided $2 million in Public Works funds to the Oklahoma City Airport to assist the local aviation industry by improving airport facilities in light of "an economic downturn in Oklahoma City, caused in part by the decrease in oil prices."
Shelby, MT	2017	Shelby relies heavily on agriculture and oil and gas development, but the decline of oil production has led to "economic distress" and few job opportunities. As a result, EDA granted $620,000 to the city to build water infrastructure that will support agriculture and attract new business.
Sheridan and Gillette, WY	2017	EDA provided $3 million in Economic Adjustment Assistance to expand workforce development in community colleges and support a more diversified economy. The grant cited the need for job training due to the "recent decline in the oil and gas activity" in a region "economically dependent on the energy industry."
South Louisiana	2016	EDA invested $1.04 million to support a new welding facility at two partner community colleges due to job needs derived from "shifts in the oil and gas/petrochemical industries."
Oklahoma	2016	EDA invested $1 million in a project to help oil and gas supply chain companies across 38 Oklahoma counties "most affected by the recent downturn in the energy industry." One function of the project is to repurpose oil and gas technology and manufacturing assets.
Durant, OK	2015	Due to the "slowdown in the oil and gas industry," EDA provided Durant with $1.5 million to attract new companies to the region.
Tulsa, OK	2014	Stating that "Tulsa's economic reliance on the oil and gas industry has left the city vulnerable," EDA provided $1.9 million in assistance for infrastructure improvements to attract companies and create jobs.
Eastern Ohio	2013	Citing the "boom-bust cycle" in natural gas and oil development, EDA granted Ohio State University and four economic development districts $200,000 to develop a plan for long-term economic sustainability in the face of cyclical energy revenue.

In summary, EDA offers the clearest precedent for federal support to communities facing economic challenges, along with an administrative infrastructure designed to work with them. If policy makers believe stronger intervention is warranted, EDA could provide more targeted assistance to oil producing communities.

5.2. Is the Federal Government Well Situated to Intervene?

Below, the authors discuss the feasibility of federal government intervention in the private and public sectors, along with the potential to address social issues.

5.2.1. Intervention in the Private Sector

For communities facing one-time or long-term economic challenges, a common response by federal programs such as the OEA is to offer job training to displaced workers while at the same time working with local governments and businesses to support economic diversification.[123] But it takes time to diversify any economy. Many of the redevelopment efforts supported by the OEA have taken years,[124] while the boom-bust cycle of activity driven by oil prices often occurs at a faster pace. With change occurring rapidly and unpredictably, a substantial share of the transient oil-related workforce may leave the sector and/or relocate long before regions create opportunities in new sectors.[125]

Second, local organizations—whether public or private—may not have the capacity or resources to catalyze growth in new economic sectors. Communities that experience a military base or defense contractor closure are often left with useable land and infrastructure that can form the foundation of new opportunities.[126] Dedicated oil and gas infrastructure, however, does not provide such a foundation. While production will likely continue for decades after the last new well is drilled, relatively little investment is required to support the continued operation of well sites, pipelines, and other associated infrastructure, and this infrastructure generally will be decommissioned when it reaches the end of its useful life.

What may be left behind is the capacity to support a larger population, including roads, housing, water infrastructure, and more. That, however, may not be sufficient to generate increased opportunity without other factors that typically support economic development, such as other natural resources, strong educational pipelines, transportation networks, or business clusters in other economic sectors.[127]

Although there is some precedent for federal government intervention to manage private sector economic volatility in select industries (e.g., agriculture), the sectors are not analogous. For laid-off oil workers, federal unemployment insurance provides temporary assistance to support relocation or retraining.

For businesses and the broader local economy, grants from the EDA may support economic diversification efforts, but these grants to date have not focused on the oil producing regions most heavily affected by volatility. The EDA, in partnership with experts from other federal agencies, may be able to play an enhanced role in mitigating the effects of economic volatility in oil producing sectors (the authors explore this possibility in section 5.3.1).

5.2.2. Intervention in the Public Sector

Volatility has significant effects on demand for public services along with state and local revenues, which makes it difficult for those governments to plan from year to year and to offer a relatively consistent level of services, particularly when state and local governments do not (or, in some cases, cannot) establish trust funds or build surpluses to be used in subsequent years.

It is difficult to determine how much to invest in infrastructure that will last for decades but for which demand might contract with the next downturn in oil prices. Indeed, local officials are unlikely to be able to anticipate the precise—or even approximate—scale and duration of a given boom or bust.

Some needs can be addressed by investing in modular infrastructure, such as expanding school space by adding trailers rather than constructing permanent structures. Likewise, some services may be provided by temporary personnel or contractors, particularly when they do not need long-lived infrastructure to support their missions.

Where increased demand for infrastructure is directly tied to the industry's activity, such as road damage, communities could look to secure industry contributions to fund the infrastructure it needs to operate.

Is the federal government well suited to intervene in these challenges? The authors are not aware of any precedent for systematically addressing these public sector issues. The federal government has intervened in one-off circumstances, such as in New York City during a budgetary crisis in the 1970s or in other extraordinary cases.[128] Each of these cases, however, has been limited in time and scope and does not map easily onto the ongoing challenges of volatility.

If federal policy makers were to assist state or local governments in oil producing regions, a major challenge would be establishing the appropriate criteria for what type and level of assistance might be appropriate. Policy makers would also need to distinguish issues specific to oil producing regions that differ from other rural communities with economic hardships. Existing guidelines for grant selection at EDA, such as those for coal communities, could provide useful guideposts.

Finally, while there is little reason to believe the federal government would be better able to anticipate booms and busts than state or local governments, it does retain one substantial advantage: access to greater financial resources (e.g., lower borrowing costs, greater capacity for debt). Policy makers could decide that, given the benefits the nation has enjoyed as a result of the burdens born by these communities, the greater access to resources justifies federal assistance, directed either to local governments or perhaps to states. The authors describe a limited approach for doing so in section 5.3.1.

5.2.3. Intervention on Social Issues

Economic volatility in oil producing regions has substantial implications for social issues, perhaps led by the affordability of housing. Existing federal housing programs primarily focus on rent support for low-income households. To the extent that rising demand for housing increases rents, low-income households may become eligible for federal assistance. However, as discussed above, demand for housing may be shorter-lived than the useful life of new homes, deterring investment in new stock.

One challenge in federal programs addressing housing affordability in regions with rapidly changing populations and economic conditions is that federal data may lag conditions on the ground, slowing the distribution of aid to eligible individuals. Accelerated data collection

in these volatile regions would help mitigate this issue, though the authors recognize the difficulty of making such a change.

Oil producing communities have also experienced increased rates of crime. An existing federal program, known as the COPS Hiring Program, awards grants to law enforcement agencies to hire and rehire entry level career law enforcement officers to preserve jobs, increase community policing capacities, and support crime prevention efforts.[129] The US Department of Justice may also have law enforcement funding available to communities dealing with any crime associated with methamphetamine or heroin problems.[130]

5.3. Proposed Role for the Federal Government

The issues oil producing communities face as the result of price volatility have to date been addressed primarily by local or state governments or by the private sector. This support has often been too little and too late. An ideal option would be for state governments, which typically collect substantial revenues from oil and gas production, to adapt existing policies to help producing communities manage volatility. In the absence of such reforms, however, the authors believe there is justification for a modest federal role.

Directly supporting local schools, hospitals, public safety, utilities, and retail services is generally outside the realm of federal responsibilities. Although the federal government does contribute almost 10 percent of funding for elementary and secondary education expenditures, they are funded predominantly at the state and local levels.[131] And though there is indirect federal funding for hospitals through Medicare and Medicaid, those programs are not intended to serve primarily as economic development tools.[132] The federal government also does not typically offer unrestricted assistance to state or local governments that simply are short of revenue.

Federal policy makers could, of course, decide that the current situation in oil producing communities is unique and that the benefits for the nation generated by these communities justifies national assistance (as in coal communities). Indeed, an examination of that very question was what initially motivated this work.

If policy makers reach such a conclusion and are interested in providing a modest level of support for oil producing regions, they could look to existing EDA grant-making guidelines to provide a template for addressing challenges specific to oil producing communities and could even choose to appropriate dedicated funding for this purpose, similar to the funding available to coal communities.

If policy makers prefer a more robust level of support, they would have to identify criteria to target the assistance to communities most in need. Such criteria could include activity and intensity metrics such as levels of oil production or drilling, share of the workforce directly participating in the industry, or other measures to transparently identify those communities experiencing the effects of oil price volatility most acutely.

5.3.1. The Oil Volatility Advisory Board

If policy makers prefer not to direct the EDA to provide additional support to oil producing communities, or to make a more substantial financial commitment to them, there may still

be an opportunity for a useful federal role. Several federal agencies have either interests or expertise relevant to the needs of oil producing regions. Policy makers could establish an interagency Oil Volatility Advisory Board (OVAB) composed of experts from the relevant offices, including OEA, EDA, the Office of the Chief Economist at the Department of Agriculture, the Federal Reserve, the Department of Energy, and perhaps other agencies or offices. OVAB could be located and staffed within the Department of Energy.

OVAB could monitor the economic conditions and outlook in major producing regions. This step is an essential prerequisite to any further action, as understanding local conditions is essential before any consideration of federal assistance might be appropriate. OVAB could collect data, analyses, and projections from the US Energy Information Administration, Bureau of Labor Statistics, Bureau of Economic Analysis, Federal Reserve, state and local sources, and more to develop an interdisciplinary understanding of local economic trends in the relevant regions.

Most importantly, OVAB would serve as a resource for oil producing communities that are working to address challenges posed by oil price volatility. OVAB staff could develop not only an understanding of the local economic conditions but also a knowledge base about the problems regions have faced in the past and potentially promising avenues to address them. This would include an in-depth understanding of existing federal programs, informational resources, and private sector experts who could support local economic diversification.

It could use this expertise to connect oil producing communities with the relevant federal assistance program (via EDA) or to other communities that have faced similar situations. In other circumstances, if communities choose to undertake efforts to diversify their economies, the experience at the OEA may help.

It is the authors' observation that many local government officials are either unaware of existing assistance programs, such as those at EDA, or lack the resources to develop competitive grant proposals. To help address this issue, OVAB could conduct outreach programs in regions such as the Permian Basin, Eagle Ford Shale, and Bakken regions to make them aware of existing opportunities and to connect them with experts.

The authors recognize that the recommendation regarding OVAB does not include a full accounting of the organization's duties, staffing requirements, and other details. In one sense, OVAB would continue the work that the authors have begun in this analysis, seeking to understand local needs and connect local stakeholders with relevant federal resources. In addition, OVAB might identify other meaningful roles for the federal government to play that are not obvious at this time. If it does so, OVAB could recommend more robust federal intervention, such as dedicated funding from EDA or elsewhere.

While its precise duties are not fully clear at this time, the authors believe this relatively small investment from the federal government could provide substantial benefits, primarily in the form of additional information and access to resources, for oil producing communities facing the challenges of economic volatility.

6. CONCLUSION

The development of tight oil over the past decade has created tectonic shifts in the energy landscape. The United States has shifted from being a declining producer to the largest oil producer in the world. This shift has strengthened the domestic economy by stimulating economic growth and creating new high-paying jobs. It has also shifted the geopolitical landscape, enhancing US power and reducing that of other large oil producing nations.

While these benefits have accrued to the entire nation, the burdens have been more highly concentrated in a small number of producing regions. Volatile prices, which lead to volatile levels of local economic activity, create challenges in producing communities as they endure the economic and social challenges associated with boom-bust cycles. This suggests there may be a proper federal role to assist these communities.

Many of the relevant challenges have historically but inadequately been addressed by state or local governments or the private sector. While there may be reasonable justification for federal intervention, it is far more difficult to identify what that role might be outside of directing the EDA to dedicate funding for oil producing communities. Moreover, unlike targets of existing federal programs, these communities are not in long-term decline but instead face unpredictable cycles of economic activity that create planning challenges for the public and private sectors alike.

At two workshops—one at the Colorado School of Mines in Golden, Colorado, and one at Resources for the Future in Washington, DC—a group of roughly two dozen experts from industry; environmental nongovernmental organizations; and local, state, and federal government did not identify a clear productive role for the federal government.

Nevertheless, the authors believe there may be an appropriate, if limited, role for federal support that relies on the government's role as information provider and network builder. Policy makers could establish an interagency OVAB composed of experts from federal agencies with relevant knowledge, staffed by DOE. OVAB could monitor the economic, social, and fiscal conditions in key producing regions by aggregating data from public and private sources and develop a strong understanding of local challenges and opportunities.

Using that knowledge, OVAB could conduct outreach to local governments in key oil producing regions, directing them to federal government resources at EDA or elsewhere, and connecting them with experts or other communities that have faced similar challenges. As the energy landscape evolves, OVAB might identify other meaningful roles for the federal government to assist affected regions, advising both federal and local policy makers as to the best options for managing the benefits and challenges of oil-price-driven economic volatility.

NOTES

1. US Energy Information Administration, "The United States Is Now the Largest Global Crude Oil Producer," Today in Energy (blog), September 12, 2018, https://www.eia.gov/todayinenergy/detail.php?id=37053.

2. Daniel Raimi, "The Economic Impacts of the Shale Revolution," Resources for the Future Issue Brief, April 2018, https://www.rff.org/publications/issue-briefs/the-economic-impacts-of-the-shale-revolution/#targetText=For%20the%20US%20economy%20as,domestic%20oil%20and%20gas%20industry.&targetText=These%20lower%20prices%20have%2C%20on,%2C%20and%20transpor%2D%20tation%20costs.

3. For a discussion of the factors that may contribute to future volatility, see Robert McNally, *Crude Volatility: The History and the Future of Boom-Bust Oil Prices* (New York: Columbia University Press, 2017): 15.

4. "Regional Data: GDP and Personal Income: Annual Gross Domestic Product (GDP) by State," US Department of Commerce Bureau of Economic Analysis, accessed July 2019, https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1#reqid=70&step=1&isuri=1.

5. "BLS Data Viewer: Employed and Office of Employment and Unemployment Statistics: Total Nonfarm - Total Nonfarm," US Department of Labor Bureau of Labor Statistics, accessed July 2019, https://beta.bls.gov/dataViewer/view/timeseries/SMS48000000000000001 (Texas), https://beta.bls.gov/dataViewer/view/timeseries/SMS38000000000000001 (North Dakota).

6. Alexander Bartik, Janet Currie, Michael Greenstone, and Chris Knittel, "The Local Economic and Welfare Consequences of Hydraulic Fracturing," (working paper, National Bureau of Economic Research, Cambridge, Massachusetts, January 2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2903707##.

7. Alan Krupnick and Isabel Echarte, "Economic Impacts of Unconventional Oil and Gas Development," Resources for the Future, June 2017, https://www.rff.org/publications/reports/economic-impacts-of-unconventional-oil-and-gas-development/; Meghan O'Sullivan, *Windfall: How the New Energy Abundance Upends Global Politics and Strengthens America's Power* (New York: Simon & Schuster, 2017).

8. US Energy Information Administration, "World Crude Oil Production: Persian Gulf Nations, Non-OPEC, and World," Monthly Energy Review, Table 11.1b, May 2019, 195,.https://www.eia.gov/totalenergy/data/monthly/archive/00351905.pdf.

9. US Census Bureau, "Exports, Imports, and Balance of Goods, Petroleum and Non-Petroleum End-Use Category," 2019, www.census.gov/foreign-trade/statistics/historical/petro.pdf.

10. Congressional Budget Office, *The Economic and Budgetary Effects of Producing Oil and Natural Gas from Shale*, December 2014, 14, https://www.cbo.gov/sites/default/files/113th-

congress-2013-2014/reports/49815-effectsofshaleproduction.pdf.

11. "Industries at a Glance: Industries by Supersector and NAICS Code," US Department of Labor Bureau of Labor Statistics, accessed July 2019, www.bls.gov/iag/tgs/iag_index_naics.htm.

12. See Robert D. Blackwill and Meghan L. O'Sullivan, "America's Energy Edge: The Geopolitical Consequences of the Shale Revolution," *Foreign Affairs* 93, no. 2 (March/April 2014): 102, https://www.foreignaffairs.com/articles/united-states/2014-02-12/americas-energy-edge; *Hearings on Geopolitics of U.S. Oil and Gas Competitiveness, before the Subcommittee on Terrorism, Nonproliferation, and Trade of the Committee on Foreign Affairs*, 115th Cong. (2018), https://www.gpo.gov/fdsys/pkg/CHRG-115hhrg30173/pdf/CHRG-115hhrg30173.pdf.

13. See Blackwill, "America's Energy Edge."

14. See Oxford Institute for Energy Studies, Oil Price Paths in 2018: The Interplay between OPEC, US Shale and Supply Interruptions, February 2018, https://www.oxfordenergy.org/wpcms/wp-content/uploads/2018/02/Oil-Price-Paths-in-2018-The-Interplay-between-OPEC-US-Shale-and-Supply-Interruptions-Insight-28.pdf; Afees A. Salisu and Lateef O. Akanni, "Shale Oil Revolution: Implications For Oil Dependent Countries" (working paper, Centre for Econometric and Allied Research, University of Ibadan, 2018) https://ideas.repec.org/p/cui/wpaper/0043.html; Benoît Faucon, Sarah Kent, and Hassan Hafidh, "U.S. Oil Boom Divides OPEC: Cartel Struggles to Respond to Rise of Shale Drilling," *Wall Street Journal*, May 27, 2013, https://www.wsj.com/articles/SB10001424127887323855804578508871186460986.

15. Robert S. Kaplan, "A Perspective on Oil," Federal Reserve Bank of Dallas, June 19, 2018, https://www.dallasfed.org/news/speeches/kaplan/2018/rsk180619.aspx; Jim Krane and Kenneth B. Medlock, "Geopolitical Dimensions of US Oil Security," *Energy Policy* 114(C), (March 2018): 558–565, https://ideas.repec.org/a/eee/enepol/v114y2018icp558-565.html.

16. "Natural Gas Spot and Futures Prices (NYMEX)," US Energy Information Administration, 2019, https://www.eia.gov/dnav/ng/ng_pri_fut_s1_w.htm.

17. For a discussion of the factors that may contribute to future volatility, see Robert McNally, *Crude Volatility*.

18. US Energy Information Administration, "Saudi Arabia Crude Oil Production Outage Affects Global Crude Oil and Gasoline Prices," *Today in Energy* (blog), September 23, 2019, https://www.eia.gov/todayinenergy/detail.php?id=41413.

19. See Daniel Raimi, "The Greenhouse Gas Impacts of Increased US Oil and Gas Production" (working paper, Resources for the Future, February 2019), https://www.rff.org/publications/working-papers/greenhouse-gas-impacts-increased-us-oil-and-gas-production/.

20. See Alexander Bartik, Janet Currie, Michael Greenstone, and Chris Knittel, "The Local Economic and Welfare Consequences of Hydraulic Fracturing," (working paper, National

Bureau of Economic Research, Cambridge, Massachusetts, January 2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2903707#; Janet Currie, Michael Greenstone, and Katherine Meckel, "Hydraulic Fracturing and Infant Health: New Evidence from Pennsylvania," *Science Advances* 3, no. 12 (December 13, 2017), https://advances.sciencemag.org/content/3/12/e1603021.

21. Robert McNally, *Crude Volatility*.

22. See Council on Foreign Relations, "Oil Price Volatility: Causes, Effects, and Policy Implications," June 13, 2016, https://www.cfr.org/report/oil-price-volatility-causes-effects-and-policy-implications.

23. Lutz Kilian, "Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market," *American Economic Review* 99, no. 3 (June 2019): 1053–69, https://www.aeaweb.org/articles?id=10.1257/aer.99.3.1053; Brian C. Prest, "Explanations for the 2014 Oil Price Decline: Supply or Demand?" *Energy Economics* 74 (August 2018): 63–75.

24. See Jason Bordoff and Trevor Houser, "Navigating the U.S. Oil Export Debate," Columbia SIPA Center on Global Energy Policy, January 2015, https://energypolicy.columbia.edu/sites/default/files/Navigating%20the%20US%20Oil%20Export%20Debate_January%202015.pdf.

25. Jason Bordoff, Antoine Halff, and Akos Losz, "New Realities, New Risks: Rethinking the Strategic Petroleum Reserve," Columbia SIPA Center on Global Energy Policy, May 2018, https://energypolicy.columbia.edu/research/report/new-realities-new-risks-rethinking-strategic-petroleum-reserve.

26. "Regional Data: GDP and Personal Income: Annual Gross Domestic Product (GDP) by State," US Department of Commerce Bureau of Economic Analysis, accessed July 2019, https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1#reqid=70&step=1&isuri=1.

27. "BLS Data Viewer: Employed and Office of Employment and Unemployment Statistics: Total Nonfarm - Total Nonfarm," US Department of Labor Bureau of Labor Statistics, accessed July 2019, https://beta.bls.gov/dataViewer/view/timeseries/SMS48000000000000001 (Texas), https://beta.bls.gov/dataViewer/view/timeseries/SMS38000000000000001 (North Dakota).

28. "Regional Data: GDP and Personal Income: Annual Gross Domestic Product (GDP) by State," US Department of Commerce Bureau of Economic Analysis, accessed July 2019, https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1#reqid=70&step=1&isuri=1.

29. See Richard G. Newell and Daniel Raimi, "US State and Local Oil and Gas Revenue Sources and Uses," *Energy Policy* 112 (January 2018): 12–18, https://www.sciencedirect.com/science/article/pii/S0301421517306250; Barry G. Rabe and Rachel L. Hampton, "Taxing Fracking: The Politics of State Severance Taxes in the Shale Era," *Review of Policy Research* 32, No. 4 (2015): 389–412, https://deepblue.lib.umich.edu/bitstream/handle/2027.42/112282/ropr12127.pdf?sequence=1&isAllowed=y.

30. Brenda B. Lin, "Resilience in Agriculture through Crop Diversification: Adaptive Management for Environmental Change," *BioScience* 61, no. 3 (March 2011): 183–193, https://academic.oup.com/bioscience/article/61/3/183/238071.

31. Navi Dhaliwal, Soojin Jo, and Mine Yücel, "Texas Job Growth Swings More with Services than Oil," *Economic Letter*, Federal Reserve Bank of Dallas, 13, no. 1 (January 2018), https://www.dallasfed.org/~/media/documents/research/eclett/2018/el1801.pdf.

32. Some states, such as New York, have banned hydraulic fracturing. However, policy makers justified this decision based on concerns over environmental and health impacts rather than any concerns about economic volatility. The federal government could potentially take these approaches on public lands, but the vast majority of US tight oil production currently occurs on private or state lands.

33. Federal Reserve Bank of Dallas, "Oil and Gas Activity Grows Modestly as Oil Price Jumps," Dallas Fed Energy Survey: First Quarter, March 27, 2019, https://www.dallasfed.org/-/media/Documents/research/surveys/des/2019/1901/des1901.pdf.

34. Riley Wilson, "Moving to Economic Opportunity: The Migration Response to the Fracking Boom," Social Science Research Network, July 25, 2016, http://papers.ssrn.com/abstract=2814147.

35. Hunt Allcott and Daniel Keniston, "Dutch Disease or Agglomeration? The Local Economic Effects of Natural Resource Booms in Modern America," *The Review of Economic Studies* 85, no. 2 (April 2018): 695–731, https://doi.org/10.1093/restud/rdx042.

36. Krupnick, "Economic Impacts."

37. Jeffrey D. Sachs and Andrew M. Warner, "The Curse of Natural Resources," *European Economic Review* 45 (2001): 827–38, https://www.earth.columbia.edu/sitefiles/file/about/director/pubs/EuroEconReview2001.pdf.

38. Alexandra Tsvetkova and Mark D. Partridge, "Economics of Modern Energy Boomtowns: Do Oil and Gas Shocks Differ from Shocks in the Rest of the Economy?" *Energy Economics* 59 (September 2016): 81–95, https://doi.org/10.1016/j.eneco.2016.07.015; Peter Maniloff and Ralph Mastromonaco, "Local Employment Impacts of Fracking: A National Study," *Resource and Energy Economics* 49 (August 2017): 62–85, https://doi.org/10.1016/j.reseneeco.2017.04.005; Mark Partridge, Shawn M. Rohlin, and Amanda L. Weinstein, "Firm Formation and Survival in the Shale Boom," *Small Business Economics* (April 4, 2019): 1–22, https://doi.org/10.1007/s11187-019-00162-9.

39. Alex James and David Aadland, "The Curse of Natural Resources: An Empirical Investigation of U.S. Counties," *Resource and Energy Economics* 33, no. 2 (May 2011): 440–453, https://doi.org/10.1016/j.reseneeco.2010.05.006; Julia Haggerty, Patricia H. Gude, Mark Delorey, and Ray Rasker, "Long-Term Effects of Income Specialization in Oil and Gas Extraction: The U.S. West, 1980–2011," *Energy Economics* 45 (September 2014): 186–195, https://doi.org/10.1016/j.eneco.2014.06.020.

40. Jeremy G. Weber, "A Decade of Natural Gas Development: The Makings of a Resource Curse?" *Resource and Energy Economics* 37 (August 2014): 168–183, https://doi.org/10.1016/j.reseneeco.2013.11.013; Timothy M. Komarek, "Labor Market Dynamics and the Unconventional Natural Gas Boom: Evidence from the Marcellus Region," *Resource and Energy Economics* 45 (August 2016): 1–17, https://doi.org/10.1016/j.reseneeco.2016.03.004; Dragan Miljkovic and David Ripplinger, "Labor Market Impacts of U.S. Tight Oil Development: The Case of the Bakken," *Energy Economics* 60 (November 2016): 306–312, https://doi.org/10.1016/j.eneco.2016.10.007; Allcott, "Dutch Disease or Agglomeration?"

41. Thomas G. Measham and David A. Fleming, "Impacts of Unconventional Gas Development on Rural Community Decline," *Journal of Rural Studies* 36 (October 2014): 376–385, https://doi.org/10.1016/j.jrurstud.2014.04.003.

42. Newell, "US State and Local Oil."

43. "Natural Resources Revenue Data: Disbursements," US Department of the Interior Office of Natural Resources Revenue, accessed October 2019, http://statistics.onrr.gov/ReportTool.aspx.

44. "Finance: Annual Financial Statements," North Dakota Department of Trust Lands, accessed October 2019, https://land.nd.gov/AccountingAndInvestments.

45. North Dakota Office of State Tax Commissioner, "2018 State and Local Taxes: An Overview and Comparative Guide," 2018, https://www.nd.gov/tax/data/upfiles/media/2018-red-book-web.pdf.

46. Texas Comptroller of Public Accounts, "Annual Cash Report: Revenues and Expenditures of State Funds for the Year Ended August 31, 2018," 2018, https://comptroller.texas.gov/transparency/reports/cash-report/2018/96-368.pdf.

47. Texas Comptroller of Public Accounts, "County Self Reported Property Tax Data," information provided via email May 10, 2017; and Texas Comptroller of Public Accounts, "Property Tax Survey Data and Reports," 2019, https://comptroller.texas.gov/taxes/property-tax/reports/index.php.

48. North Dakota Office of State Tax Commissioner.

49. McKenzie County, North Dakota Auditor's Office, "Comprehensive Annual Financial Reports," Watford City, ND, 2016. Accessed via hard copy in Watford City, ND, 2016.

50. Texas Comptroller of Public Accounts, "County Self Reported Property Tax Data," information provided via email May 10, 2017.

51. Texas Comptroller of Public Accounts, "Property Tax Survey Data and Reports," 2019, https://comptroller.texas.gov/taxes/property-tax/reports/index.php.

52. Richard G. Newell and Daniel Raimi, "The Fiscal Impacts of Increased U.S. Oil and Gas Development on Local Governments," *Energy Policy* 117 (June 2018): 14–24. https://doi.org/10.1016/j.enpol.2018.02.042.

53. Daniel Raimi and Richard G. Newell, "Colorado's Piceance Basin: Variation in the Local Public Finance Effects of Oil and Gas Development," Duke University Energy Initiative, May 2016, https://energy.duke.edu/sites/default/files/attachments/Colorado's%20Piceance%20basin%20shale%20finance%20case%20study%20FINAL.pdf; Daniel Raimi and Richard G. Newell, "Dunn County and Watford City, North Dakota: A Case Study of the Fiscal Effects of Bakken Shale Development," Duke University Energy Initiative, May 2016, https://www.rff.org/documents/550/Duke-Rpt-DunnCountyWatfordCityNDCaseStudy.pdf.

54. Sally Beauvais, "This Texas School That Inspired 'Friday Night Lights' Is Overcrowded amid Oil Boom. One Class Has 63 Kids," *The Texas Tribune*, April 5, 2018, https://www.texastribune.org/2018/04/05/texas-school-inspired-friday-night-lights-overcrowded-amid-oil-boom-on/; Jamie Kelly, "Why Is Williston High School Overcrowded Already?" *Williston Herald*, January 25, 2019, https://www.willistonherald.com/news/why-is-williston-high-school-overcrowded-already/article_bf06fb8e-2027-11e9-a7ea-178dfd8c4a80.html.

55. Nathan Ratledge and Laura Zachary, "Impacts of Unconventional Oil and Gas Booms on Public Education: A Mixed-Methods Analysis of Six Producing States," Resources for the Future, August 2017, http://www.rff.org/research/publications/impacts-unconventional-oil-and-gas-booms-public-education-mixed-methods.

56. Elizabeth U. Cascio and Ayushi Narayan, "Who Needs a Fracking Education? The Educational Response to Low-Skill Biased Technological Change" (working paper, National Bureau of Economic Research, revised February 2019), http://www.nber.org/papers/w21359; Dan S. Rickman, Hongbo Wang, and John V. Winters, "Is Shale Development Drilling Holes in the Human Capital Pipeline?" *Energy Economics* 62 (February 2017): 283–290, https://doi.org/10.1016/j.eneco.2016.12.013; Na Zuo, Jack Schieffer, and Steven Buck, "The Effect of the Oil and Gas Boom on Schooling Decisions in the U.S.," *Resource and Energy Economics* 55 (February 2019): 1–23), https://doi.org/10.1016/j.reseneeco.2018.10.002.

57. Newell, "The Fiscal Impacts."

58. Newell.

59. Cesar Quiroga, Emmanuel Fernando, and Jeongho Oh, "Energy Developments and the Transportation Infrastructure in Texas: Impacts and Strategies," Texas Department of Transportation, March 2012, https://static.tti.tamu.edu/tti.tamu.edu/documents/0-6498-1.pdf.

60. The Academy of Medicine, Engineering and Science of Texas, *Environmental and Community Impacts of Shale Development in Texas*, 2017, https://tamest.org/shale-task-force/.

61. Ashley Bennett and John Loomis, "Are Housing Prices Pulled Down or Pushed Up by Fracked Oil and Gas Wells? A Hedonic Price Analysis of Housing Values in Weld County, Colorado," *Society & Natural Resources* 28, no. 11 (July 1, 2015): 1,168–1,186, https://doi.org/10.1080/08941920.2015.1024810; Lucija Muehlenbachs, Elisheba Spiller, and Christopher Timmins, "The Housing Market Impacts of Shale Gas Development: Corrigendum,"

American Economic Review 106, no. 2 (February 2016): 475, https://ideas.repec.org/a/aea/aecrev/v106y2016i2p475.html.

62. Jeremy Weber, James Burnett, and Irene Xiarchos, "Shale Gas Development and Housing Values over a Decade: Evidence from the Barnett Shale" (working paper, USAEE, July 17, 2014), https://dx.doi.org/10.2139/ssrn.2467622.

63. Valerie Jones, "Home Prices Shoot Up in West Texas as Oil Activity Barrels On," *Rigzone*, July 25, 2018, https://www.rigzone.com/news/home_prices_shoot_up_in_west_texas_as_oil_activity_barrels_on-25-jul-2018-156396-article/.

64. Nancy Hodur et al., "2016 North Dakota Statewide Housing Needs Assessment," North Dakota State University, August 2016, https://www.visionwestnd.com/s/NDSHNA_2016_Component1.pdf.

65. Ashley Vissing, "Private Contracts as Regulation: A Study of Private Lease Negotiations Using the Texas Natural Gas Industry," *Agricultural and Resource Economics Review* 44, no. 2 (2015): 120–137, https://doi.org/10.1017/S106828050001025X.

66. Jill E. Johnston, Emily Werder, and Daniel Sebastian, "Wastewater Disposal Wells, Fracking, and Environmental Injustice in Southern Texas," *American Journal of Public Health* 106, no. 3 (March 1, 2016): 550–556, https://doi.org/10.2105/AJPH.2015.303000.

67. Adrianne C. Kroepsch et al., "Environmental Justice in Unconventional Oil and Natural Gas Drilling and Production: A Critical Review and Research Agenda," *Environmental Science & Technology* 53, no. 12 (May 22, 2019): 6,601–6,615, https://doi.org/10.1021/acs.est.9b00209.

68. Patrick Gourley and Greg Madonia, "Resource Booms and Crime: Evidence from Oil and Gas Production in Colorado," *Resource and Energy Economics* 54 (November 2018): 37–52, https://doi.org/10.1016/j.reseneeco.2018.07.001.

69. Carol A. Archbold, Thorvald Dahle, and Rachel Jordan, "Policing 'The Patch': Police Response to Rapid Population Growth in Oil Boomtowns in Western North Dakota," *Police Quarterly* 17, no. 4 (October 7, 2014): 386–413, https://doi.org/10.1177/1098611114549629; Thorvald O. Dahle and Carol A. Archbold, "'Just Do What You Can [...] Make It Work!' Exploring the Impact of Rapid Population Growth on Police Organizations in Western North Dakota," *Policing: An International Journal* 38, no. 4 (November 16, 2015): 805–819, https://doi.org/10.1108/PIJPSM-03-2015-0037; Thomas Mrozla et al., "Fear of Crime in an Oil Boomtown in Western North Dakota," *Journal of Crime and Justice* 41, no. 4 (February 1, 2018): 364–381, https://doi.org/10.1080/0735648X.2018.1429297.

70. Rodney J. Andrews and Monica Deza, "Local Natural Resources and Crime: Evidence from Oil Price Fluctuations in Texas," *Journal of Economic Behavior & Organization* 151 (July 2018): 123–142, https://doi.org/10.1016/j.jebo.2018.02.011.

71. Kai A. Schafft, Leland L. Glenna, Brandn Green, and Yetkin Borlu, "Local Impacts of Unconventional Gas Development within Pennsylvania's Marcellus Shale Region: Gauging

Boomtown Development through the Perspectives of Educational Administrators," *Society & Natural Resources* 27, no. 4 (February 14, 2014): 389–404, https://doi.org/10.1080/08941920.2013.861561; Kai A. Schafft, Erin McHenry-Sorber, Daniella Hall, and Ian Burfoot-Rochford, "Busted amidst the Boom: The Creation of New Insecurities and Inequalities within Pennsylvania's Shale Gas Boomtowns," *Rural Sociology* 83, no. 3 (September 2018): 503–531, https://doi.org/10.1111/ruso.12196; Kai Schafft and Catharine Biddle, "Opportunity, Ambivalence, and Youth Perspectives on Community Change in Pennsylvania's Marcellus Shale Region," *Human Organization* 74, no. 1 (Spring 2015): 74–85, https://doi.org/10.17730/humo.74.1.6543u2613xx23678.

72. Karen Maguire and John V. Winters, "Energy Boom and Gloom? Local Effects of Oil and Natural Gas Drilling on Subjective Well-Being," *Growth and Change* 48, no. 4 (December 2017): 590–610, https://doi.org/10.1111/grow.12204.

73. Newell, "US State and Local Oil."

74. Recently proposed legislation would lower this figure to 2.5 percent.

75. Daniel Raimi, "Local Revenue Volatility and Oil and Gas Development in Texas," *Common Resources* (blog), Resources for the Future, May 17, 2017, https://www.resourcesmag.org/common-resources/local-revenue-volatility-and-oil-and-gas-development-in-texas/.

76. Newell, "US State and Local Oil."

77. Barry G. Rabe and Rachel L. Hampton, "Trusting in the Future: The Re-Emergence of State Trust Funds in the Shale Era," *Energy Research & Social Science* 20 (October 2016): 117–127, https://doi.org/10.1016/j.erss.2016.06.011.

78. "Housing Incentive Fund," North Dakota Housing Finance Agency, accessed October 2019, https://www.ndhfa.org/Development/HIF.html.

79. "Act 13 (Impact Fee)," Pennsylvania Public Utility Commission, accessed October 2019, http://www.puc.state.pa.us/filing_resources/issues_laws_regulations/act_13_impact_fee_.aspx.

80. Richard G. Newell and Daniel Raimi, "Shale Public Finance: Local Government Revenues and Costs Associated with Oil and Gas Development," (working paper, National Bureau of Economic Research, September 2015), https://www.nber.org/papers/w21542.pdf; Daniel Raimi and Richard G. Newell, "Net Fiscal Impacts of Oil and Gas Development for Local Governments in Eight States," (working paper, Duke University Energy Initiative, May 2016), https://energy.duke.edu/sites/default/files/attachments/2a.%20Local%20fiscal%20effects%20of%20oil%20and%20gas%20development%20in%20eight%20states%20FINAL.pdf; Daniel Raimi and Richard G. Newell, "Local Fiscal Effects of a Drilling Downturn: Local Government Impacts of Decreased Oil and Gas Activity in Five US Shale Regions," Resources for the Future, 2017, http://www.rff.org/research/publications/local-fiscal-effects-drilling-downturn-local-government-impacts-decreased-oil.

81. See "Energizing Our Local Communities," Permian Strategic Partnership, accessed October 2019, https://www.permianpartnership.org.

82. North Dakota Department of Commerce, "Workforce Projects/Programs 2017–2019 Biennium," 2017.

83. "Trade Adjustment Assistance, Community College and Career Training Grant Program: Round Two—Grantee Summaries and Project Descriptions by State," US Department of Labor Employment and Training Administration, 2012, https://doleta.gov/taaccct/applicantinfo.cfm.

84. Permian Basin Workforce Development Board, *Permian Basin Workforce Development Board Local Plan Program Years 2017–2020*, 2019, http://workforcepb.org/wp-content/uploads/2019/03/2019-Permian-Basin-Board-Plan-Amendment.pdf.

85. Vision West ND, *Priority Update: Regional Plan for Sustainable Development*, 2018, http://book.designrr.co/?id=1364&token=537928210&type=FP.

86. Kern County Board of Supervisors, *County of Kern: Economic Development Incentive Policy*, November 7, 2017, https://www.kerncounty.com/econdev/pdf/econdev-incentive-program.pdf.

87. Javier Oyakawa and Thomas Tunstall, *Economic Impact of the Eagle Ford Shale: Business Opportunities and the New Normal*, University of Texas at San Antonio Center for Community and Business Research, 2014–2016, https://ccbr.iedtexas.org/wp-content/uploads/2017/06/efs-report-19-june-2017.pdf.

88. Personal communication with Thomas Tunstall, April 2019.

89. *Countercyclical Job Creation Programs*, Congressional Research Service, Sept. 7, 2010, 2–4, https://www.everycrsreport.com/files/20100907_92-939_2312aac7ecf6d95e5477cb51b153b99d71c62370.pdf.

90. *Countercyclical Job Creation Programs*, Congressional Research Service, Sept. 7, 2010, 2–3.

91. American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115, 516 (February 19, 2009).

92. *Countercyclical Job Creation Programs*, Congressional Research Service, Sept. 7, 2010, 1.

93. See Government Accountability Office, "Economic Development: Economic Development Programs (2011–09)," 2011, https://www.gao.gov/duplication/action_tracker/Economic_Development_Programs_%282011-09%29/action1; Patrick E. Poppert and Henry W. Herzog Jr., "Force Reduction, Base Closure, and the Indirect Effects of Military Installations on Local Employment Growth," *Journal of Regional Science* 43, no. 3 (August 2003): 459–482, https://doi.org/10.1111/1467-9787.00307; 1961–1990, *Civilian Reuse of Former Military Bases: Summary of Completed Military Base Economic Adjustment Projects*, Office of Economic Adjustment, April–June 1990, https://apps.dtic.mil/dtic/tr/fulltext/u2/a229443.pdf; Joanne Guth and Jean Lee, "Evaluations of the Trade Adjustment Assistance Program for Workers: A Literature Review," US International Trade Commission, May 2017, https://www.usitc.gov/publications/332/executive_briefings/ebot_taaevaluationsguthlee.pdf.

94. Personal communication with Dorothy Robyn, December 2018.

95. "What We Do," US Department of Defense Office of Economic Assistance, www.oea.gov/what-we-do.

96. "Grand Forks Air Force Base, North Dakota," US Department of Defense Office of Economic Assistance, www.oea.gov/project/grand-forks-air-force-base.

97. As noted earlier, federal climate change policies, resource depletion, or other factors could create concerns over long-term decline in these communities.

98. Dennis A. Shields, *Federal Crop Insurance: Background*, Congressional Research Service, Aug. 13, 2015, https://fas.org/sgp/crs/misc/R40532.pdf.

99. What Is the Farm Bill? Congressional Research Service, September 26, 2019, https://fas.org/sgp/crs/misc/RS22131.pdf; *Farm Commodity Legislation: Chronology*, 1933–2002, Congressional Research Service, May 31, 2002, https://nationalaglawcenter.org/wp-content/uploads/assets/crs/96-900.pdf.

100. *Farm Bills: Major Legislative Actions*, 1965–2018, Congressional Research Service, December 21, 2018, https://fas.org/sgp/crs/misc/R45210.pdf.

101. "Agriculture Improvement Act of 2018: Highlights and Implications: Conservation," US Department of Agriculture Economic Research Service, accessed October 2019, www.ers.usda.gov/agriculture-improvement-act-of-2018-highlights-and-implications/conservation/.

102. *The 2018 Farm Bill* (P.L. 115-334): *Summary and Side-by-Side Comparison*, Congressional Research Service, February 22, 2019, https://crsreports.congress.gov/product/pdf/R/R45525.

103. See Nevada Department of Agriculture, *An Economic Analysis of the Food and Agriculture Sector in Nevada*, 2017, http://agri.nv.gov/uploadedFiles/agrinvgov/Content/Resources/Data_and_Reports/econ_analysis_final.pdf#targetText=The%20beef%20cattle%20ranching%20and,integral%20part%20of%20Nevada's%20economy; Todd M. Schmit, *The Economic Contributions of Agriculture in New York State*, Dyson School of Applied Economics and Management, College of Agriculture and Life Sciences, Cornell University, 2014, http://publications.dyson.cornell.edu/outreach/extensionpdf/2016/Cornell-Dyson-eb1609.pdf#targetText=In%202014%2C%20agricultural%20industries%2C%20including,the%20New%20York%20State%20economy; *Food System Multipliers for Specialty Crops: Executive Summary*, Sacramento Area Council of Governments, July 25, 2016, https://www.sacog.org/sites/main/files/file-attachments/executive_summary_webdisplay.pdf.

104. See "Rural Economy & Population, Population & Migration, Overview," US Department of Agriculture Economic Research Service, accessed October 2019, https://www.ers.usda.gov/topics/rural-economy-population/population-migration/; "U.S. Gross Cash Farm Income Relatively Stable Since 2016," United States Department of Agriculture Economic Research Service, accessed October 2019, https://www.ers.usda.gov/data-products/chart-

gallery/gallery/chart-detail/?chartId=76943.

105. "Valuation, Taxes Levied, and Tax Rate Data: History Value and Taxes by Property Type 2008–2018," Nebraska Department of Revenue, Property Assessment Division, accessed July 2019, http://www.revenue.nebraska.gov/PAD/research/valuation.html.

106. See Nancy M. Hodur and Dean A. Bangsund, *Population Estimates for City of Williston*, City of Williston and North Dakota State University Department of Agribusiness and Applied Economics, August 2013, 7, https://www.cityofwilliston.com/departments/city_auditor/docs/City%20Auditor/Population%20Study/CityofWillistonComprehensiveReport062520132.pdf.

107. Dean A. Bangsund and Nancy M. Hodur, *Petroleum Industry's Economic Contribution to North Dakota in 2015*, North Dakota State University, May 2017, 17, https://www.ndoil.org/wp-content/uploads/Petroleum-Industry-Contribution-in-2015.pdf.

108. Conor McKay, Ethan Pollack, and Alastair Fitzpayne, *Modernizing Unemployment Insurance for the Changing Nature of Work*, Aspen Institute Future of Work Initiative, January 2018, 2, 5, https://assets.aspeninstitute.org/content/uploads/2018/01/Modernizing-Unemployment-Insurance_Report_Aspen-Future-of-Work.pdf?_ga=2.200987566.1499292359.1569982020-352181668.1569982020.

109. See Jonathan Coppess et al., "The Agriculture Improvement Act of 2018: Initial Review," Farm Doc Daily 8, no. 227 (December 12, 2018), https://farmdocdaily.illinois.edu/2018/12/the-agriculture-improvement-act-of-2018-initial-review.html; American Farm Bureau Federation, "Reviewing Price Loss Coverage and Agriculture Risk Coverage for Seed Cotton," *Market Intel* blog, December 3, 2018, https://www.fb.org/market-intel/reviewing-price-loss-coverage-and-agriculture-risk-coverage-for-seed-cotton.

110. Trade Act of 1974, Pub. L. No. 93-618, 88 Stat. 1978 (1975).

111. US Department of Labor Employment And Training Administration, "Investing in Trade-Affected Workers: Petition Process Overview," accessed October 2019, https://www.doleta.gov/tradeact/petitioners/petitionprocess.cfm.

112. Benjamin Collins, "Trade Adjustment Assistance for Workers and TAA Reauthorization Act of 2015," Congressional Research Service, at 6-10 (Aug., 14, 2018).

113. "Economic Development Administration: Fiscal Year 2017 Annual Report," US Department of Commerce, June 2017, 3, https://www.eda.gov/annual-reports/fy2017/.

114. "Overview: EDA's Role," US Department of Commerce Economic Development Administration, accessed October 2019, www.eda.gov/about/.

115. EDA 2017 Annual Report, 84.

116. "Explanation of the Consolidated Appropriations Act, 2018," *Congressional Record* 164, no. 50, book 2 (March 22, 2018): H2085, https://www.govinfo.gov/content/pkg/CREC-2018-03-22/html/CREC-2018-03-22-pt2-PgH2045-2.htm.

117. EDA 2017 Annual Report, 14.

118. EDA 2017 Annual Report. at 30.

119. EDA 2017 Annual Report. at 74.

120. EDA 2017 Annual Report. at 44, 58, 79; "Economic Development Administration: Fiscal Year 2016 Annual Report," US Department of Commerce, accessed October 2019, 23, 41, https://www.eda.gov/annual-reports/fy2016/; "Economic Development Administration: Fiscal Year 2015 Annual Report," US Department of Commerce, accessed October 2019, 50, https://www.eda.gov/annual-reports/fy2015/; "Economic Development Administration: Fiscal Year 2014 Annual Report," US Department of Commerce, accessed October 2019, 46, 55, 56, https://www.eda.gov/annual-reports/fy2014/; "Economic Development Administration: Fiscal Year 2013 Annual Report," US Department of Commerce, accessed October 2019, 68 https://www.eda.gov/annual-reports/fy2013/.

121. EDA 2013 Annual Report, 68.

122. Martha Flipic, "Project Helping Ohio Communities Avert Bust after Shale Boom," Ohio State University College of Food, Agricultural, and Environmental Sciences, July 1, 2014, https://cfaes.osu.edu/news/articles/project-helping-ohio-communities-avert-bust-after-shale-boom.

123. See Howard F. Rosen, "Designing a National Strategy for Responding to Economic Dislocation," Peterson Institute for International Economics, Testimony before the Subcommittee on Investigation and Oversight House Science and Technology Committee, June 24, 2008, https://www.piie.com/commentary/testimonies/designing-national-strategy-responding-economic-dislocation; Elena Foshay, Jill Kubit, and Lara Skinner, *Making the Transition: Helping Workers and Communities Retool for the Clean Energy Economy*, Cornell University, ILR School, Global Labor Institute, and the Apollo Alliance, 2009, http://www.climatechange.ca.gov/eaac/comments/2009-12-11_California_Labor_Federation_attachment_2.pdf; Jeffey Selingo, "The False Promises of Worker Retraining," *Atlantic*, January 8, 2018, https://www.theatlantic.com/education/archive/2018/01/the-false-promises-of-worker-retraining/549398/.

124. "OEA Project Profiles," US Department of Defense Office of Economic Adjustment, 2019, www.oea.gov/how-we-do-it/projects. For example, after Cameron Station in Alexandria, Virginia, closed in 1995, it took until 1999 before structures were removed and redevelopment began.

125. Jason P. Brown and Andres Kodaka, "The Reallocation of Energy-Sector Workers after Oil Price Booms and Busts," *Macro Bulletin*, Federal Reserve Bank of Kansas City (March 3, 2016): 1–3, https://ideas.repec.org/a/fip/fedkmb/00037.html.

126. "Community Guide to Base Reuse," US Department of Defense Office of Economic Adjustment, accessed October 2019, www.oea.gov/resource/community-guide-base-reuse.

127. See Richard M. McGahey and Jennifer S. Vey, eds., *Retooling for Growth: Building a*

21st Century Economy in America's Older Industrial Areas (Washington, DC: Brookings Institution Press, 2008); Michael E. Porter, "Clusters and the New Economics of Competition," *Harvard Business Review*, November–December 1998, https://hbr.org/1998/11/clusters-and-the-new-economics-of-competition; Terence G. Murphy, "An Analysis of the Factors That Influence Regional Economic Development Cooperation," (PhD diss., Florida International University, March 21, 2013), https://pdfs.semanticscholar.org/ded9/958b9e0b377790dc933e912a582fe248e7d7.pdf?_ga=2.34160481.1519438127.1569984356-1004517374.1569984356; Barry W. Holman, "Military Base Closures: Overview of Economic Recovery, Property Transfer, and Environmental Cleanup," US General Accounting Office, Testimony before the Subcommittee on Government Efficiency, Financial Management, and Intergovernmental Relations, Committee on Government Reform, House of Representatives, August 28, 2001, https://www.gao.gov/new.items/d011054t.pdf; Sebrina Owens-Wilson and Kathleen Mulligan-Hansel, *Organizing for Community Benefits in the Reuse of Closed Military Installations*, Partnership for Working Families, July 2008, https://www.forworkingfamilies.org/sites/default/files/publications/2008.07_Base_Building.pdf.

128. See New York City Seasonal Financing Act, Pub. L. No 94-143, 89 Stat. 797 (1975); New York City Loan Guarantee Act of 1978, Pub. L. No. 95-339, 92 Stat. 460 (1978); Air Transportation Safety and System Stabilization Act, Pub. L. No. 107-42, 115 Stat. 230 (2001); Baird Webel, N. Eric Weiss, and Marc Labonte, The Cost of Government Financial Interventions, Past and Present, Congressional Research Service, January 8, 2009, https://digital.library.unt.edu/ark:/67531/metadc795671/m1/1/high_res_d/RS22956_2009Jan08.pdf; Executive Office of the President, *Building And Restoring Civic Capacity: The Obama Administration's Federal-Local Partnership With Detroit (2011–2016)*, December 3, 2016, https://obamawhitehouse.archives.gov/sites/obamawhitehouse.archives.gov/files/documents/DFWG_Report_Final_120216.pdf; "Flint Drinking Water Response," US Environmental Protection Agency, accessed October 2019, www.epa.gov/flint.

129. "COPS Hiring Program (CHP)," US Department of Justice Community Oriented Policing Services, accessed October 2019, https://cops.usdoj.gov/chp.

130. "Grants," US Department of Justice Community Oriented Policing Services, accessed October 2019, https://cops.usdoj.gov/grants.

131. Michael Leachman and Eric Figueroa, "K–12 School Funding Up in Most 2018 Teacher-Protest States, But Still Well Below Decade Ago," Center on Budget and Policy Priorities, March 6, 2019, https://www.cbpp.org/research/state-budget-and-tax/k-12-school-funding-up-in-most-2018-teacher-protest-states-but-still.

132. See "What's Medicare," US Centers for Medicare & Medicaid Services, accessed October 2019, www.medicare.gov/what-medicare-covers/your-medicare-coverage-choices/whats-medicare; "Medicaid," US Centers for Medicare & Medicaid Services, accessed October 2019, www.medicaid.gov/medicaid/index.html.

COLUMBIA | SIPA
Center on Global Energy Policy

RESOURCES *for the* FUTURE