

RFF REPORT

Local Fiscal Effects of a Drilling Downturn

*Local Government Impacts of
Decreased Oil and Gas Activity
in Five US Shale Regions*

Daniel Raimi and Richard G. Newell

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Local Fiscal Effects of a Drilling Downturn: Local Government Impacts of Decreased Oil and Gas Activity in Five US Shale Regions

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Abstract

Oil and gas development in the United States dramatically increased between 2009 and 2014, then saw a steep downturn as commodity prices fell. This growth and subsequent contraction has affected local governments in dozens of regions. From 2013 to 2015, we conducted structured interviews with hundreds of local officials in 21 regions across 16 states, finding that most local governments had experienced net fiscal benefits from increased oil and gas development. We returned to five key regions (the Bakken, Denver-Julesburg, Eagle Ford, Marcellus, and Permian plays) in 2016 and 2017 to see whether and how the downturn had affected fiscal conditions for local governments. While effects varied depending on local factors, fiscal conditions have generally improved, with 82 percent of local governments reporting net positive fiscal effects, compared with 63 percent during our previous visits to these regions. However, managing revenue volatility has emerged as a major challenge for many local governments, and while economic diversification is a priority for most local officials, achieving this goal will be difficult, particularly for rural communities that are or have become heavily dependent on the oil and gas sector.

Key Words: shale gas, tight oil, hydraulic fracturing, local public finance, severance tax, property tax, resource taxation

JEL Codes: H25, H71, H72, H76, Q32, Q33, Q41, Q43, Q48

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1. Introduction

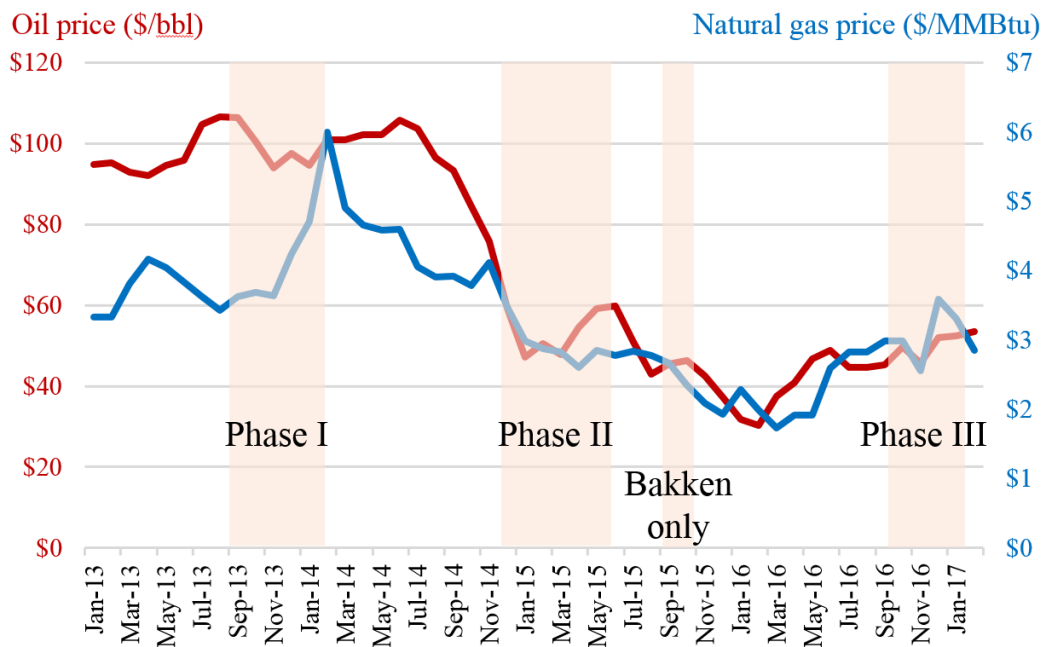
Technological advancements in the energy sector have led to rapid growth of domestic oil and natural gas production, particularly from shale and other “tight” rock formations. Partly as a result of this growth, domestic and international prices for natural gas and oil have decreased substantially in recent years. While these price changes have very important national and international consequences, many of the most acute impacts, including economic and environmental effects, are experienced at the local level.

Building on previous research, this report seeks to understand whether and how these changes in prices have affected local

government services in the regions where production growth has been most pronounced. In particular, we assess changes in local fiscal conditions in five leading shale regions: west North Dakota (Bakken Shale), Colorado’s Front Range (Denver-Julesburg Basin), south Texas (Eagle Ford Shale), west Texas (Permian Basin), and southwest Pennsylvania (Marcellus Shale).

As part of a larger effort to assess local fiscal conditions in all major domestic oil and gas plays, we visited each of these regions in late 2013–early 2014, then again in late 2016–early 2017, after oil prices had fallen substantially (Figure 1). We also visited the Bakken region in late 2015.

FIGURE 1. OIL PRICES AND INTERVIEW TIMELINE



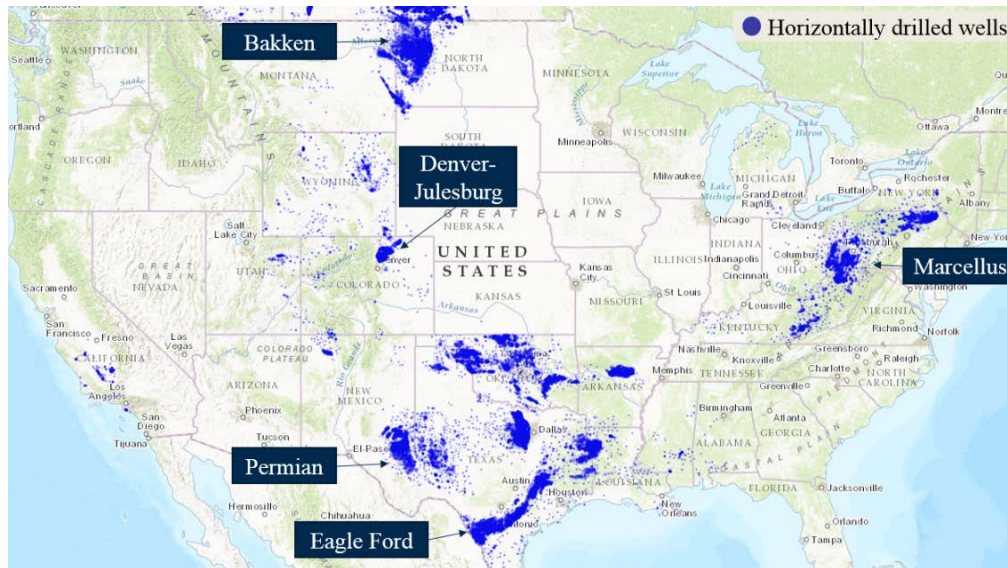
Data Source: US Energy Information Administration. WTI crude oil spot price (https://www.eia.gov/dnav/pet/pet_pri_spt_s1_m.htm) and Henry Hub spot price (https://www.eia.gov/dnav/ng/ng_pri_fut_s1_d.htm).

Figure 2 shows the regions we examined in this final round of interviews. While some of these plays straddle state lines, we focused on local governments from one state per play: Colorado (Denver-Julesburg), North Dakota (Bakken), Pennsylvania (Marcellus), and Texas (Eagle Ford and Permian).

Each blue dot on the map indicates an oil or natural gas well that has been drilled horizontally.

During this final round, we interviewed 42 local government officials representing 14 counties and 15 municipalities (Table 1).

FIGURE 2. REGIONS EXAMINED



Map Source: Drillinginfo, <https://info.drillinginfo.com/#explore>, captured May 8, 2017.

TABLE 1. LOCAL GOVERNMENTS EXAMINED, 2016–2017

Region	Counties examined	Municipalities examined	Local officials interviewed
Bakken	3	3	7
Denver-Julesburg	2	5	12
Eagle Ford	3	2	8
Marcellus	2	3	7
Permian	4	2	8
Total	14	15	42

2. Previous Research and Related Literature

Several growing areas of research have examined topics related to the local fiscal impacts of oil and gas development. Only a few studies have explicitly examined local government impacts, and these often focus on oil and gas revenue sharing between state and local governments, as reviewed in Krupnick *et al.* (2017). A smaller subset of work that examines both revenues and costs for local governments finds increased revenues for local governments, along with increased demand for services such as law enforcement and road damage (e.g., Newell & Raimi 2015; Raimi & Newell 2016b; Bartik *et al.* 2017).

One closely linked research area that has received more attention is the local and regional economic impacts of oil and gas development, reviewed in Krupnick and Echarte (2017). During the early years of shale development, researchers relied primarily on input-output modeling to forecast the economic impact of development in shale plays including Texas's Barnett (Perryman Group 2011), Arkansas's Fayetteville (Univ. of AR Center for Business and Economic Research 2012), the Marcellus (Considine *et al.* 2011), Eagle Ford (Tunstall & Oyakawa 2014), Permian (Tunstall & Oyakawa 2013), and more. These studies generally found large positive economic and associated fiscal impacts. However, the nature of input-output modeling tends to overestimate these effects because it does not account for potential crowding-out effects in other economic sectors and in some cases uses unrealistic economic impact multipliers (Hoy *et al.* 2017; Krupnick & Echarte 2017).

More recently, a number of studies have used empirical data and econometric techniques to estimate the economic and employment effects of the recent boom. Broadly speaking, this work has consistently found positive economic effects of shale development, though they tend to be smaller than those identified in the earlier input-output

based work. One series of numerical studies from Pennsylvania finds substantial economic benefits in counties with large-scale shale development compared with other Pennsylvania counties, due largely to growth in leasing revenues for landowners (Costanzo & Kelsey 2012; Hardy & Kelsey 2015; Kelsey & Hardy 2015). Another study estimates that private revenues from oil and gas leases equaled roughly \$39 billion in 2014 alone (Brown *et al.* 2016).

In some regions, particularly those with little recent experience with large-scale oil and gas development, economic benefits may accrue in large part to individuals and firms living outside the local community (Hardy & Kelsey 2014). However, this leakage typically does not negate the positive local effects, with one nationwide study estimating that communities within 100 miles of shale development experience more than \$500,000 in increased wages, royalties, and business income for every \$1 million invested in shale development (Feyrer *et al.* 2017). One particularly detailed 2017 study examined nine shale regions and found substantial local economic benefits. In most regions, these economic benefits outweighed negative social impacts such as increased vehicle traffic and higher crime rates (Bartik *et al.* 2017).

Other research has examined the impact of shale development on property values, which in turn could affect local government revenues. This work has found that for homes reliant on well water in parts of Pennsylvania, proximity to new oil and gas development resulted in a 10–16.5 percent decline in property values, likely caused by perceived risks to groundwater from shale development (Muehlenbachs *et al.* 2016). While declining property values may occur for individual landowners, the broader effects of increased population, economic activity, and mineral values tend to increase property values regionally, though volatility in these valuations can be large as commodity prices fluctuate (Weber *et al.* 2014; Newell & Raimi 2015).

Another related research area explores methods for measuring the fiscal well-being of local governments. State governments and scholars have worked to develop metrics that can accurately and succinctly summarize the fiscal condition of local governments. However, there is little agreement among these different techniques, and no standard metric currently allows for easy comparison across states (e.g., Plerhoples & Scorsone 2011; DiNapoli 2014; McFarland & Pagano 2014). Instead, experts recommend a combination of techniques, including case studies, to capture a holistic sense of local fiscal conditions (Justice & Scorsone 2013). Based on this research, our work relies on results reported during interviews, along with detailed analysis of local financial data as a basic check to ensure that key fiscal indicators match the interviewee’s assessment.

3. Methods

In our first round of interviews in 2013–14, we selected cases by determining the counties with the highest levels of drilling activity since 2005, then visiting as many of those counties as possible across the leading 16 oil- and gas-producing states. We also visited a range of municipalities within those counties, along with a number of neighboring counties and municipalities (for details, see Newell and Raimi (2015)). To understand how local fiscal conditions have changed over the course of the last several years, we returned to five regions that have been among the most productive: the Bakken, Denver-Julesburg, Eagle Ford, Marcellus, and Permian.

We also chose these five plays because they vary across a range of dynamics. In the Permian Basin, for example, oil production has actually increased despite the decline in commodity prices, even while rig counts and completions have dropped. Other plays, such as the Bakken and Eagle Ford, have seen more substantial declines in both production and drilling activity. These regions also vary substantially across a number of other important dynamics, such as population density, historical experience with the industry, tax policies, and the liquids content of production.

From September 2016 through January 2017, we traveled to these regions to conduct structured interviews identical to those conducted in 2013 and 2015. Travel was necessary to fully engage local government officials and to gather local fiscal data available only through hard copies of government records. To determine how fiscal effects had changed over time, we attempted to return to each of the jurisdictions examined in our previous work. In addition, we examined several new counties or municipalities that we had not been able to visit during previous years.

We contacted each of the local government officials in these regions that we had interviewed from 2013 to 2015. Many of our interview subjects were the same, but numerous elected officials had left office, and several appointed officials had changed positions or moved to new jurisdictions. As Table 2 shows, we examined 29 local governments in 2016 and 2017. We had previously examined 19 of these jurisdictions, and 10 were new to the analysis.

TABLE 2. COUNT OF NEW AND PREVIOUSLY EXAMINED LOCAL GOVERNMENTS

Region	No. of local governments examined in 2016–17		
	Previously examined	New to analysis	Total
Bakken	6	0	6
Denver-Julesburg	3	4	7
Eagle Ford	5	0	5
Marcellus	3	2	5
Permian	2	4	6
Total	19	10	29

4. Results

Table 3 summarizes the net fiscal impacts to local governments examined over time, indicating that net fiscal impacts have improved over time for most regions. In 2013, 22 percent of local governments reported net negative fiscal effects, compared with 11 percent from 2015 to 2017. Moreover, the magnitude of any negative fiscal effects have declined, with no local governments reporting large or medium net negative fiscal impacts from 2015 to 2017. The number of local governments reporting net positive fiscal effects increased from 63 percent in 2013 to 82 percent in 2015–17. Those reporting roughly neutral effects fell from 15 to 7 percent over the same period of time.

As we discuss in detail below, fiscal effects have varied across time and across regions. In the Marcellus region, fiscal effects have deteriorated somewhat, as revenues to local governments from the state’s Impact Fee

have declined, while service demands remain high. In the Bakken region, fiscal conditions have improved substantially, as reduced drilling activity has reduced service demands, while increased transfers from the state to local governments have supported revenues. Changes in other regions have been less pronounced but generally tend toward improved fiscal conditions.

Importantly, these findings highlight near-term impacts and do not capture risks associated with future dependence on volatile oil- and gas-related revenue streams. In many interviews, local officials expressed concerns that increased reliance on property taxes, sales taxes, and transfers tied directly or indirectly to volatile oil and gas prices increased fiscal risks for the future. In particular, a number of rural local governments that have experienced rapid growth (e.g., the Bakken region) have assumed new long-term debt obligations that would be difficult to manage should a prolonged downturn in drilling activity occur.

TABLE 3. COUNT OF LOCAL GOVERNMENT FISCAL IMPACTS OF OIL AND GAS DEVELOPMENT

		Net fiscal impacts						
		Negative			Roughly neutral	Positive		
Region	Year	Lg.	Med.	Sm.		Sm.	Med.	Lg.
Marcellus	2013					2	5	1
	2016				2	1	1	1
Bakken	2013	4	2					
	2015			2		2	1	
	2016					5	1	
Denver-Julesburg	2013					2		1
	2016					4	2	1
Eagle Ford	2013				2	1		4
	2017			1		1	3	
Permian	2013				2			1
	2016					5	1	
Total	2013	4	2		4	5	5	7
	2015–17			3	2	13	8	2
Shares of total	2013		22%		15%		63%	
	2015–17		11%		7%		82%	

4.1. Major Revenue Sources for Local Governments

Major revenue sources for local governments vary by state and government type. In most states, county governments collect property taxes on oil and gas properties. However, under state law, counties in Pennsylvania and North Dakota cannot collect these taxes and instead receive transfers from state government taxes or fees on oil and gas production. While property taxes on equipment and infrastructure are substantial, larger sources of revenue are the mill levies applied to the value of production in Colorado or the value of reserves in Texas. Although these revenue sources can be quite volatile, property tax revenues for the majority of counties examined in this report are substantially higher than they were before shale development began in earnest.

Cities in most states rely primarily on sales taxes, which are often driven up by economic activity spurred by the oil and gas sector. However, sales tax revenues can just as quickly turn downward during a slowdown in drilling activity, as they have for most cities examined in this report. Similarly to property taxes for counties, sales taxes for most cities examined here are higher than they were before the onset of shale development.

For some cities and counties, notably those in the Marcellus and Bakken regions, transfers from state-collected taxes or fees are the largest oil- and gas-related revenue source. For many smaller local governments in these regions, such transfers have led to revenues more than doubling in recent years.

Many local governments also collect revenue by leasing local government land for energy development underneath airports, wastewater treatment facilities, roadways, or other large parcels. While these revenues are typically smaller than other sources described above, they have provided helpful fiscal boosts for numerous local governments in producing regions.

Finally, in-kind contributions from oil and gas operators to local governments, typically for road maintenance or repair, are an important avoided cost in some regions. These in-kind contributions have expanded to more local governments since our initial interviews in 2013. While contributions for road repair were common only in the Marcellus in 2013, they have become more common in North Dakota, Texas, and Colorado. Table 4 summarizes key revenue sources driven by oil and gas development for the local governments examined in this report.

TABLE 4. MAJOR OIL- AND GAS-DRIVEN REVENUE SOURCES FOR LOCAL GOVERNMENTS

		Property tax	Sales tax	Transfer	Lease	In-kind	Other
Marcellus	Counties			\$	\$		
	Municipalities			\$	\$	\$	\$
Bakken	Counties			\$	\$	\$	
	Municipalities		\$	\$			
Denver-Julesburg	Counties	\$			\$	\$	
	Municipalities		\$	\$	\$		
Eagle Ford	Counties	\$			\$		\$
	Municipalities		\$		\$		
Permian	Counties	\$			\$		\$
	Municipalities		\$		\$		

4.2. Major Service Demands for Local Governments

Similar to our findings in previous reports, the largest costs for local governments experiencing large-scale oil and gas development are related to roads, followed by the need to increase staff, particularly in law enforcement. Although strain on these services has lessened for most local governments as a result of lower commodity prices, demand remains strong.

As noted in Section 4.1, in-kind contributions from operators to local governments for road repair have lessened the need for transportation expenditures. However, many local governments report that demand for law enforcement has stayed higher than they had expected following the decline in population and drilling activity, with many officials attributing this demand primarily to issues involving drugs or domestic violence.

In addition to continued current costs, the lasting fiscal effects of the boom are still felt by a number of local governments. In particular, most rural municipalities in the Bakken and Eagle Ford regions have taken on

new debt to finance new infrastructure. In some cases, these debts exceed \$100 million for small cities. While local officials in these cities do not expect this will be a major challenge, they acknowledge that a prolonged downturn in prices would force them to reduce services to finance these obligations.

Along with these “hard” costs, local officials in numerous regions report challenges that are difficult to quantify. First among these challenges is managing volatility, particularly in the Bakken, Eagle Ford, and Permian Basin regions, where swings in commodity prices have led to peaks and troughs in revenues. In these regions, economies and government revenues are heavily dependent on the oil and gas sector, with unpredictable commodity price cycles making it difficult for local governments to plan for and invest in the future. Local officials in every region we examined speak to the importance of a diversified economy, a desirable goal that is often difficult to achieve, particularly in rural oil- and gas-dependent communities. Table 5 summarizes major costs and demand for services by region and government type.

TABLE 5. MAJOR OIL- AND GAS-DRIVEN COSTS FOR LOCAL GOVERNMENTS

		Roads	Water/ wastewater	Staff	Law enforcement	Debt	Other
Marcellus	Counties	\$		\$	\$		\$
	Municipalities			\$			\$
Bakken	Counties	\$		\$	\$		\$
	Municipalities	\$	\$	\$	\$	\$	
Denver-Julesburg	Counties	\$					
	Municipalities			\$			\$
Eagle Ford	Counties	\$		\$	\$		
	Municipalities	\$		\$	\$	\$	
Permian	Counties	\$		\$	\$		
	Municipalities			\$	\$		

4.3. Key Observations

State-level revenue policies are the strongest tools available to decision-makers to affect the near-term fiscal impacts of oil and gas development on local governments. Below, we highlight several of these policies and briefly discuss their implications.

4.3.1 Texas Property Tax Laws Exacerbate Volatility

In Texas, local governments' ability to raise revenue through property taxes is constrained by state policies that pressure tax rates downward when property values rise, as they do when oil and gas prices rise. When property values fall, as they do when oil and gas prices fall, local elected officials are faced with the choice of either raising tax rates, a difficult political proposition, or decreasing expenditures. While these state policies tend to keep property tax rates low for residents and other property owners, they create substantial budgeting challenges for local governments.

An analysis of property tax data shows that counties relying more heavily on oil and gas revenues experience greater volatility in both tax revenues and tax rates than those that rely less on oil and gas property in their tax base (Table 6).

Analyzing data from 2000 through 2015, we find that counties where oil and gas

property accounts for 50 percent or more of the tax base experienced on average a 20–22 percent annual change in countywide taxable value, while counties where oil and gas accounted for less than 25 percent of property values saw annual changes of just 7 percent. These swings in valuation in turn lead to volatility in property tax revenues. For counties where oil and gas property accounts for 50 percent or more of the tax base, revenues within each county changed by an annual average of 13–15 percent, compared with 8 percent for counties where oil and gas accounts for less than 25 percent of total valuations.

This revenue volatility occurs despite the fact that oil- and gas-dependent counties are more likely to see large swings in property tax rates to account for changes in valuation. Counties where oil and gas property accounts for 50 percent or more of total taxable property have experienced average annual tax rate changes of 12–13 percent, while counties where oil and gas property account for less than 25 percent of total valuations experienced average annual tax rate changes of just 4 percent. If counties had more flexibility in setting property tax rates, they could reduce volatility in tax rates, providing increased certainty for investors and more latitude for local governments seeking to budget through volatile commodity price cycles.

TABLE 6. PROPERTY VALUATION AND TAX VOLATILITY IN TEXAS COUNTIES, 2000–2015

Oil and gas as share of property values	Observations	Avg. annual change in taxable value	Avg. annual change in tax rate	Avg. annual change in taxes levied
0–25%	2,700	7%	4%	8%
25–50%	489	13%	7%	11%
50–75%	351	20%	12%	13%
75–100%	270	22%	13%	15%

Data Source: Texas Comptroller of Public Accounts, county self-reported property tax data, (2017), provided via email.

4.3.2. North Dakota Revenue Policy has Changed to Better Serve Localities

Despite major challenges in managing shale development in its early stages, most local governments in North Dakota's Bakken region now report net positive fiscal impacts. Because the region is sparsely populated and experienced a sharp increase in drilling activity beginning around 2009, most local governments struggled to absorb the simultaneous rapid influx of vehicle traffic and population. During our initial visit in late 2013, all local governments reported that the net fiscal impacts of Bakken development had been negative, as costs for infrastructure expansion and staffing needs outpaced revenue growth. Local governments were taking on hundreds of millions of dollars in new debt to pay for needed upgrades.

Two major shifts, one in markets and another in policy, altered these dynamics. In late 2014, oil prices dropped sharply, decreasing drilling activity and associated demand for government services. Several months later, North Dakota's legislature revised its oil and gas tax policies, directing a larger portion of revenue to localities in the Bakken region.

This combination altered the fiscal situation for these localities. In late 2015, we found mixed results, with some reporting net positive effects and others continuing to experience negative effects. But by late 2016, all local governments reported net positive fiscal effects. Government revenues remained strong, and service demands were well below their 2014 peak.

While near-term fiscal conditions have substantially improved in the Bakken, cities in the region continue to face large long-term debt obligations, exceeding \$100 million for small cities such as Dickinson, Watford City, and Williston. If Bakken development continues at a moderate pace, it is unlikely

that this debt will pose major challenges for these cities. However, a prolonged downturn could reduce revenues, raising concerns over debt management. Alternatively, another round of rapid growth could force additional investment. As a result, local officials hope for a "Goldilocks" level of development: not so fast as to overwhelm services, but not so slow as to stifle the flow of oil-derived revenues.

4.3.3. Pennsylvania Impact Fee Generates Limited Revenue but Supports Localities

Compared with severance tax policies in most other states, Pennsylvania's Impact Fee raises a relatively small amount of revenue (Headwaters Economics & Oklahoma Policy Institute 2013; Weber *et al.* 2015; Raimi & Newell 2016c). However, unlike most other states, Pennsylvania allocates a large proportion of that revenue directly to local governments. For many townships, allocations of Impact Fee funds have dramatically increased annual revenues. At the same time, in-kind agreements with operators for road repairs appear to be ubiquitous across Pennsylvania (though not in other states), substantially limiting direct costs to local governments.

This combination of new revenues and limited costs has resulted in net positive fiscal impacts for most local governments in Pennsylvania. While the state continues to debate whether revenue policies should be adjusted, the Impact Fee appears to be adequately supporting local governments.

4.3.4. Fiscal Impacts in Densely Populated Colorado Regions are Modest

In densely populated regions such as Colorado's Front Range, oil and gas development has had a limited fiscal impact for most localities. Because of the region's large and diverse economy, most cities and counties along the Front Range do not rely heavily on oil and gas revenues and report a small net positive impact.

One exception is Weld County, where the bulk of production occurs, and the county collects large revenues from oil and gas property taxes. Weld County contains both rural and fast-growing suburban regions, and development of the Niobrara Shale and other formations have had a large positive fiscal impact.

5. Regional Results

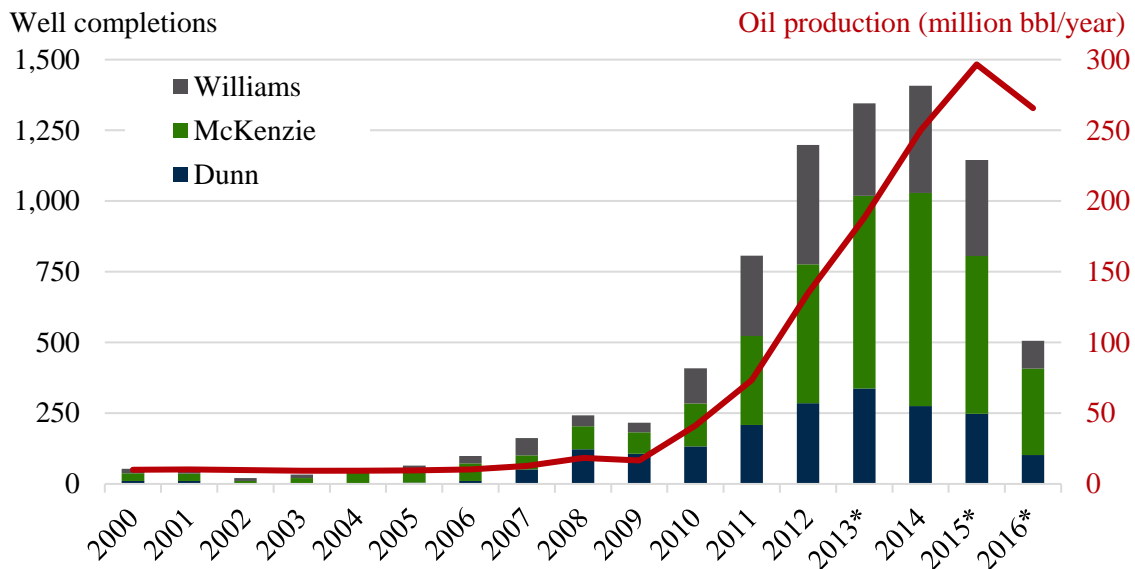
5.1. Bakken Shale region, North Dakota

Because of its highly rural character and large scale of drilling activity, local governments in the Bakken region of North Dakota have experienced the most substantial fiscal impacts of any US region. In our initial interviews during 2013, every local government we examined reported net negative fiscal effects, as population growth and heavy truck traffic consistently outstripped revenue growth. Cities in the region were taking on large debt loads to upgrade infrastructure such as roads and water/wastewater systems, and county governments were unable to keep up with demand for road repairs. Both saw large growth in demand across virtually all

government services and struggled to attract and retain qualified workers. While revenues grew rapidly during this period, in some cases increasing more than tenfold, local governments were unable to keep up with demand for services.

We returned for a series of follow-up interviews in late 2015, then returned again in late 2016. In these subsequent interviews, local officials describe continued challenges but report that the downturn in oil prices had substantially reduced population growth, truck traffic, and associated demand for services. In addition, changes in state government revenue allocation policies and a onetime infusion of cash to the Bakken region provided additional revenues (Raimi & Newell 2016a). As of late 2016, local government officials generally felt as though they had caught up with the boom in growth and were now able to provide higher-quality services than they had before shale development began on a large scale. Although concerns over new debt lingered, most report that the net fiscal impact of the Bakken had been positive. At the same time, local officials acknowledge that these large new debts could pose long-term fiscal challenges if drilling activity suffered a sustained downturn.

FIGURE 3. WELL COMPLETIONS AND OIL PRODUCTION IN SELECT BAKKEN COUNTIES



Data sources: Drillinginfo, <https://info.drillinginfo.com/#explore>, for well completions; North Dakota Industrial Commission, <https://www.dmr.nd.gov/oilgas/stats/statisticsvw.asp>, for production. *Indicates interview years.

5.1.1. Bakken Counties

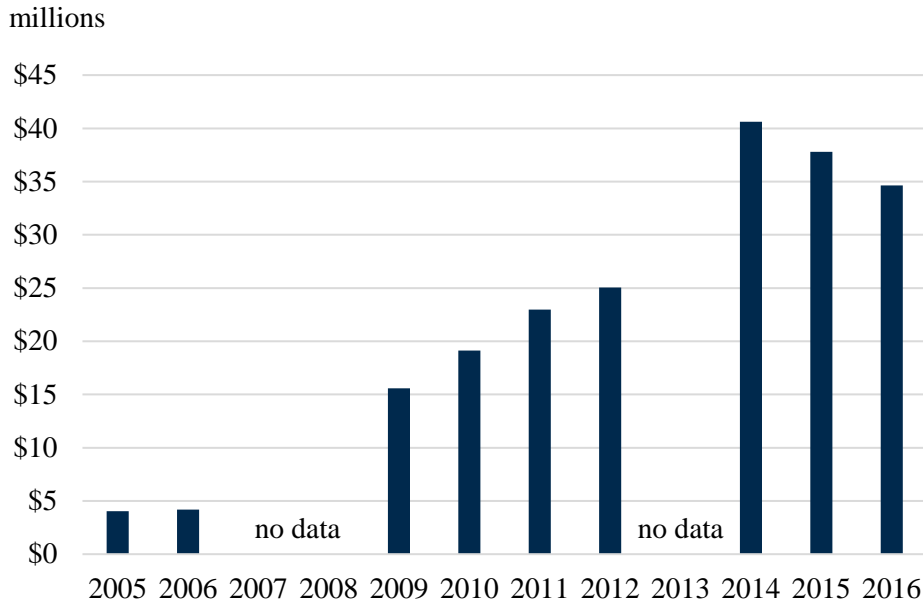
5.1.1.1. Dunn County, North Dakota¹

Local officials report that after a challenging few years, Dunn County is generally in good fiscal condition. However, there are still substantial challenges, including the need to improve roads and expand social services such as mental health treatment. Changes in the state revenue-sharing formula have been important for the county, and drilling activity is now at a level that local officials describe as comfortable and manageable. However, officials believe that either a dramatic increase in drilling activity

or a sustained period of low prices would likely lead to new fiscal challenges.

In raw financial terms, the county has grown enormously over the past decade, from net assets of less than \$5 million in 2005 to more than \$40 million in 2014, then declining to roughly \$35 million in 2016 (Figure 4). Similarly, total revenues grew from roughly \$4.4 million in 2005 to a peak of \$54 million in 2015. In the most recent (FY 2017) budget, officials project revenues of roughly \$42 million. The largest source of revenue growth for the county has been allocations from the state’s oil production tax, which was roughly \$20 million in 2015 and \$17 million in 2016.

FIGURE 4. DUNN COUNTY TOTAL NET ASSETS



Data Source: Dunn County audited financial statements, accessed via hard copy.

¹ Interview with County Commissioner Daryl Dukart and president of DLN Consulting Deb Nelson, October 27, 2016, Dickinson, ND.

One important change for Dunn County has been the development of road maintenance agreements (RMAs) with operators for road repairs. These agreements, which are negotiated and formalized during meetings between operators and county commissioners, have substantially reduced the county's road repair costs, which have easily been the largest source of new government service demands. Highlighting the importance of transportation infrastructure, in 2015, Dunn County spent a total of \$57 million on all services, with \$49 million going to roads and bridges.

While the increase in RMAs and road spending has improved road conditions from where they were in 2013, there are still a number of challenges. Currently, just 62 of the county's 1,280 miles of roadway are paved, and officials are hoping to increase the number of paved miles to roughly 250 in the coming years.

In addition to roads, demand for human service needs continue to grow despite the downturn. This includes child protective services, mental health services, and other family services. Demand on law enforcement has flattened out, and the county sheriff reports that the department is no longer in

need of additional staff and may actually reduce its workforce in the coming years. Other demands on staff are generally manageable, and the county is no longer struggling with workforce retention issues.

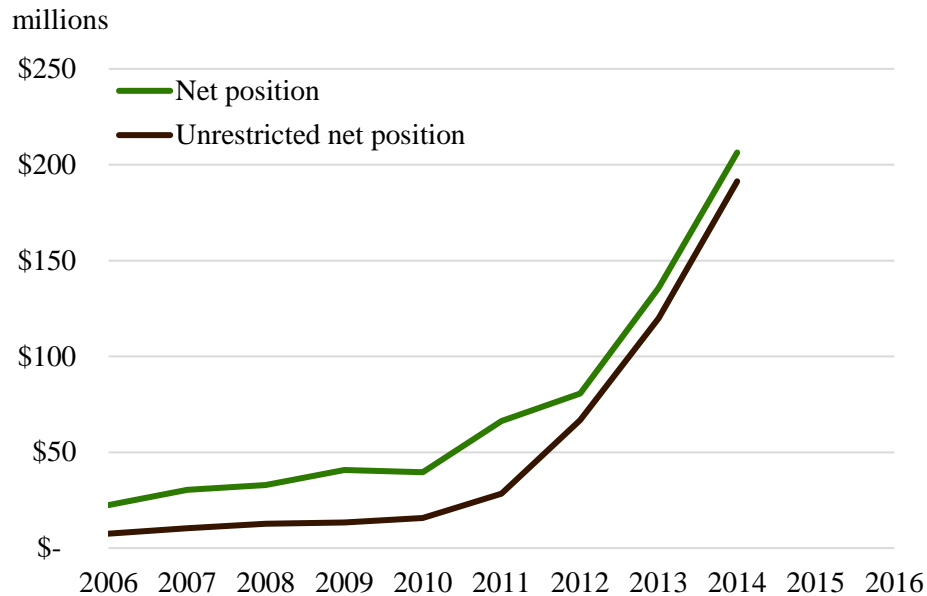
Over the long term, Dunn County officials are working to diversify its economy but acknowledge that its lack of cities and rural nature may make it difficult to attract and retain a non-resource based economy.

5.1.1.2. McKenzie County, North Dakota²

Local officials report that McKenzie County is generally in good fiscal condition after a difficult period. Like other local governments in the region, the county hopes for slow and steady growth over the next several years to maintain its current level of revenues and services and to service substantial new debt.

Like Dunn County, McKenzie County has seen remarkable growth over the past decade, with its net position growing from \$22 million in 2006 to a peak of more than \$206 million in 2014, then declining in 2015 and 2016 (audited data were not available). Unrestricted funds have grown even faster, from \$7.5 million in 2006 to more than \$191 million in 2014.

² Interview with Director of Economic Development Gene Veeder, October 26, 2016, Watford City, ND.

FIGURE 5. MCKENZIE COUNTY NET POSITION AND UNRESTRICTED NET POSITION

Data Source: McKenzie County Auditor's Office, provided via email.

Revenues have moved roughly in tandem with oil prices and drilling activity, driven by changes in oil and gas production tax allocations from the state. In recent years, a large majority of the county's total revenues have come from these allocations. For example, in 2014, McKenzie County received \$80 million in oil and gas production tax revenues out of a total of \$95 million from all sources.

As prices and production declined in 2015 and 2016, these revenues have also declined, but they still make up a majority of county revenue. This downturn has caused the county to cut back on some services, including a planned \$6.5 million road improvement project. At the time of our 2016 interview, local officials reported that they had executed roughly half of their long-term infrastructure plan and would need an increase in revenues above 2016 levels to achieve those goals. Meeting these objectives has become more feasible in recent years, due in part to increased in-kind contributions from operators to repair any road damage, along with new

pipeline infrastructure that has reduced heavy truck traffic.

Workforce retention challenges have eased substantially since the peak of activity, and local officials report that they are generally comfortable with current staffing levels, though there may be some reductions through attrition depending on revenue levels. In addition, the county is currently remodeling its office building at a cost of roughly \$13 million.

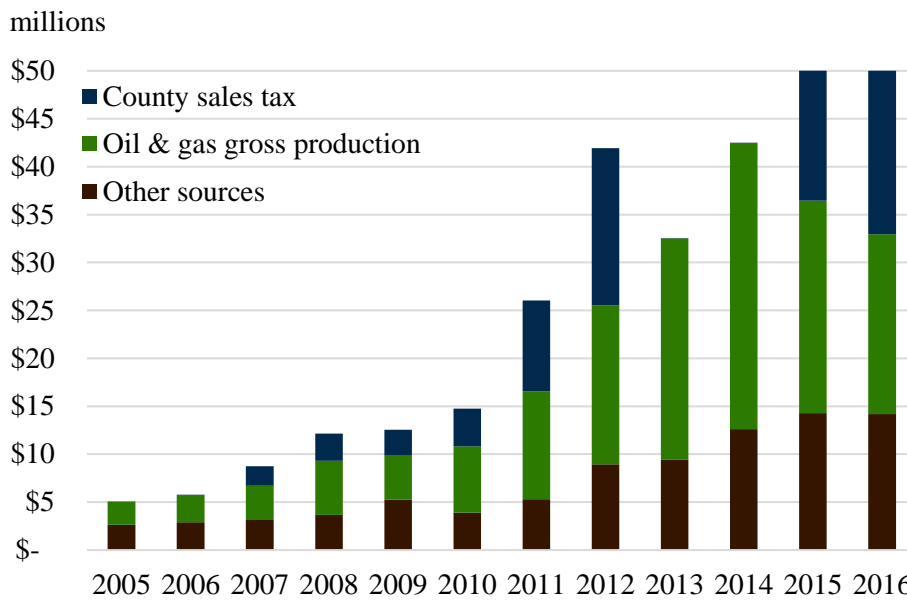
Looking forward, McKenzie County will be shaped by Bakken development for years, if not decades, to come. Watford City, the county seat, is no longer a small town but instead a burgeoning city, with all the amenities and complexities that accompany a large new population. In addition, the county borrowed substantially for the first time, taking on roughly \$20 million in low-interest debt, which will need to be managed in the coming decades. These debts will help the county improve infrastructure and build a new hospital, which it hopes will help diversify the regional economy.

5.1.1.3. Williams County, North Dakota³

As with other counties in the Bakken, the slowdown in drilling activity has eased some of the pressures on Williams County services, and local officials describe the net fiscal impacts of development as positive. However, they note that either a sharp increase in drilling activity or a prolonged downturn in prices could lead to major challenges.

As Figure 6 shows, revenues for Williams County have grown enormously since 2005, led by allocations of oil and gas production tax revenue, along with a county sales tax. These revenues have fallen from their peak but remain far above preboom levels.

FIGURE 6. WILLIAMS COUNTY KEY REVENUES BY SOURCE



Data Source: North Dakota Treasurer’s Office, 2016, <http://www.nd.gov/treasurer/revenue-distribution/>.

³ Interview with County Commissioner Martin Hanson, October 25, 2016, Zahl, ND.

In addition to the funds shown in Figure 6, the state provided additional surge funding of \$44 million in 2015, all of which was spent on roads. As with other counties in the Bakken, there has been an increase in in-kind contributions from operators to assist with road repairs. However, local officials state that significant work goes into maintaining these agreements and that not all operators repair roads to the desired level of quality.

Because of the increase in contributions, greater revenue, and declining traffic, managing road damage has become less of a challenge. However, the county continues to spend more on roads than on any other service, and keeping up with demand continues to be a challenge.

Along with roads, Williams County has added a variety of buildings at a cost of roughly \$68 million, including a new jail and courthouse (\$30 million), office building (\$26 million), and repair shop (\$12 million). The county also joined with the city to construct apartment buildings to house public sector employees who could not afford high housing costs. However, in a sign of the slowing economy, most of these apartments are now unoccupied, as lower housing costs encouraged county employees to move to private housing. Along similar lines, the county no longer has difficulty with workforce retention, and it is planning on reducing staff through attrition in the coming years.

Emergency services such as fire, ambulance, and law enforcement remain busy but are now able to operate with improved

equipment, including upgraded vehicles and communications technology. Local officials note that while demand for most services has eased, crime has remained at or near the peak level, which has continued to strain local law enforcement and the county jail.

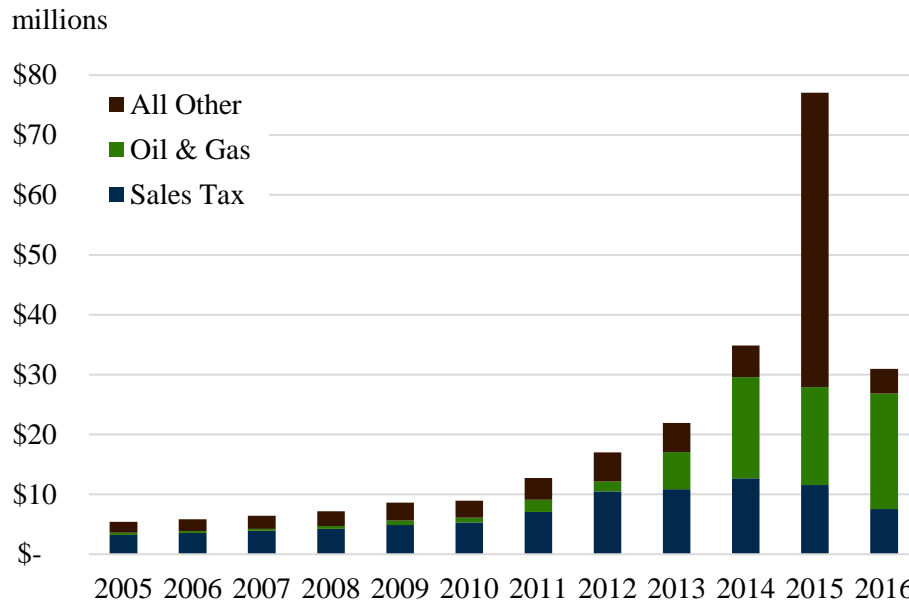
5.1.2. Bakken Municipalities

5.1.2.1. Dickinson, North Dakota⁴

Dickinson, which sits on the southern edge of the Bakken Shale play, faced major fiscal challenges during the peak of drilling activity in 2013–14. However, the challenges have slowed to a manageable level, and local officials now describe the net fiscal impacts as positive. The city has completed a number of major infrastructure upgrades, and population growth has slowed. However, these upgrades have required roughly \$100 million in new debt, which will create fiscal challenges in the future if drilling and associated economic activity were to fall and remain at the lows seen in early 2016.

The city's leading revenue sources have been from sales taxes, oil and gas production tax allocations, and onetime surge funding of \$44 million in 2015. Sales taxes and oil and gas allocations have declined by roughly \$3 million from their peak in 2014 but are far higher than the levels seen before Bakken development surged. In particular, allocations from the state oil and gas production tax have increased markedly, partly due to changes in the distribution formula that allocated more revenue to Bakken-region cities (Figure 7).

⁴ Interview with City Manager Shawn Kessel, October 26, 2016, Watford City, ND.

FIGURE 7. DICKINSON KEY REVENUES BY SOURCE

Data Source: North Dakota Treasurer's Office, (2016), <http://www.nd.gov/treasurer/revenue-distribution/>.

Along with these revenue sources, the city has seen some fiscal benefits from a new oil refinery located nearby. The city treats wastewater from the refinery, then sells that treated wastewater back to the refinery for reuse, generating two streams of revenue. In addition, the refinery owners helped finance the infrastructure needed to transport this water to and from the city wastewater facility, saving millions of dollars for Dickinson. Dickinson has also established a local trust fund for revenues generated by oil leases on city land, which stood in late 2016 at over \$8 million. As with state trust funds, city lawmakers may use only the interest generated by the fund.

City officials report that they have caught up with the demand for new infrastructure caused by population growth. Costs have been led by wastewater infrastructure, totaling roughly \$83 million in recent years, along with expansion of freshwater systems, totaling

roughly \$12 million. Road projects worth \$80 million have also been completed, although the city has contributed only \$7 million to these projects, with the remainder financed by the state.

One major challenge continues to be law enforcement. Although the city has spent roughly \$16 million on an expansion of an emergency services building, drug issues continue to stretch the police force, which has grown from 31 sworn officers in 2009 to 40 officers currently. In addition, the city has continued to struggle with workforce retention for officers, many of whom have moved not to the oil industry, but to positions in neighboring states such as Minnesota.

Other emergency services have expanded and improved substantially in recent years. In particular, the fire department's full-time staff has grown from 4 to 14, with improved equipment and better response times.

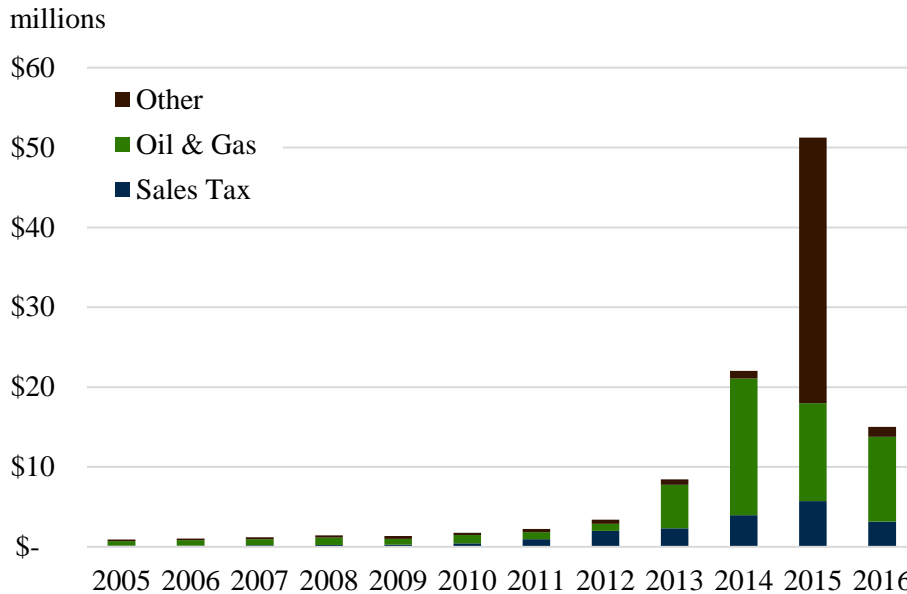
5.1.2.2. *Watford City, North Dakota*⁵

More than any other city in the region, and perhaps the United States, Watford City has experienced enormous population growth due to shale oil and gas development (Raimi & Newell 2016a). As a result, the city expanded services rapidly and has taken on roughly \$150 million in new debt. (Before the boom, the city had virtually zero debt.) During our first visit in 2013, local officials reported that they were unable to meet the demands of this growth. However, on subsequent visits, they said that city services had expanded to meet the needs of the new population. While local officials currently report that city finances are in good shape overall, they acknowledge that

a longer-term downturn in oil prices could lead to significant fiscal issues.

As Figure 8 shows, revenues have grown enormously for Watford City, from \$1.7 million in 2010 to roughly \$15 million in 2016. The large spike in 2015 is primarily due to \$32 million in surge funding from the state. Other growth has come primarily from the state oil and gas production tax (changes in the distribution formula in 2014 dramatically increased the city’s allocation) and from the city sales tax, which together generated more than 900 percent more revenue than in 2010. Other sources, such as restaurant, lodging, and occupancy taxes, have also increased, though these provide a small share of total city revenues.

FIGURE 8. WATFORD CITY KEY REVENUES BY SOURCE



Data Source: North Dakota Treasurer’s Office, (2016), <http://www.nd.gov/treasurer/revenue-distribution/>.

⁵ Interview with Mayor Brent Sanford, October 26, 2016, Watford City, ND. Mr. Sanford was elected lieutenant governor of North Dakota in November 2016.

Watford City has invested heavily in several areas, accumulating roughly \$150 million in debt in recent years. These funds have gone to build an extensive network of new streets, expanded water and wastewater systems, and a law enforcement center that was recently completed in partnership with McKenzie County. Local officials report that they are mostly caught up with needed expansions, though some construction work continues in the city.

Along with these infrastructure expansions, the city also partnered with McKenzie County on the Rough Rider Center, a large multiuse complex that houses conference facilities, office space, recreation facilities, and more. The center, which boasts spacious and high-quality facilities, cost roughly \$100 million. Local officials believe that the center provides quality-of-life benefits for city residents, who pay modest membership fees, in a rural area where no such opportunities had previously existed.

In most areas, the city has adequate staff to meet the needs of the current population, and workforce retention is no longer a major challenge. However, demand for law enforcement has continued to be a challenge despite the downturn, primarily because of higher crime rates associated with drugs, domestic violence, and other issues.

5.1.2.3. Williston, North Dakota⁶

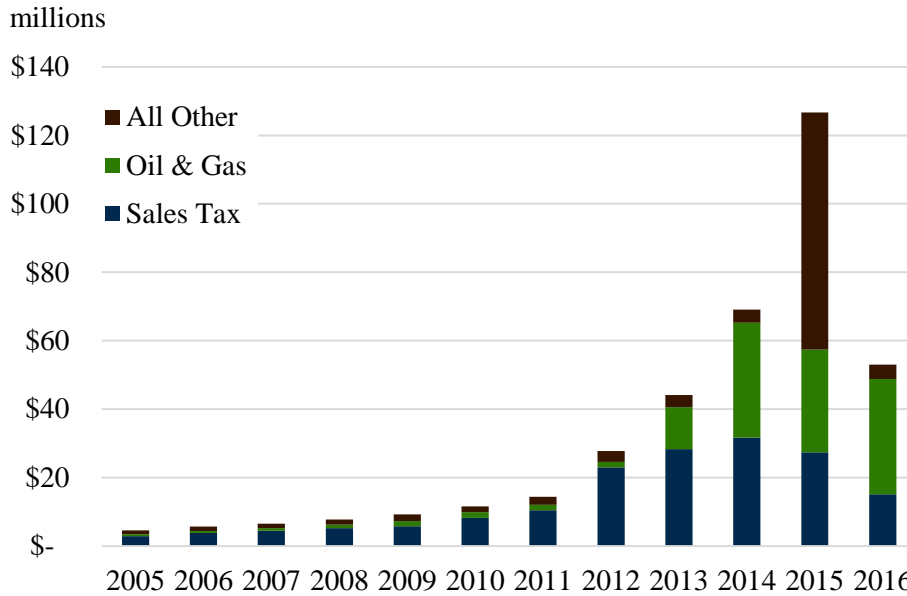
In Williston, the seat of Williams County, local officials report that the net fiscal effects of Bakken development have turned positive but that there have been major challenges. The city has expanded a number of services and improved amenities but now holds roughly \$200 million in debt, and a prolonged downturn in industry activity could cause substantial fiscal problems.

As Figure 9 illustrates, revenues have grown dramatically in recent years, led by sales taxes, oil and gas production tax allocations, and in 2015, \$64 million in surge funding from the state. However, as industry activity fell from 2014 to 2016, sales taxes dropped by roughly 50 percent. Oil and gas production tax allocations have remained relatively constant despite the downturn because of changes in the state's allocation formula.

Along with these major revenue sources, the city also experienced growth in fee-for-service activities, including court fees. As Figure 10 illustrates, violent crime has grown dramatically over the past decade. While many other fee-for-service revenues have declined with the slowdown in oilfield activity, local officials report that court fees have remained roughly constant, reflecting little decline in drugs and criminal activity. Although the city's police force has grown from 20 to 60 officers in recent years, demand remains high.

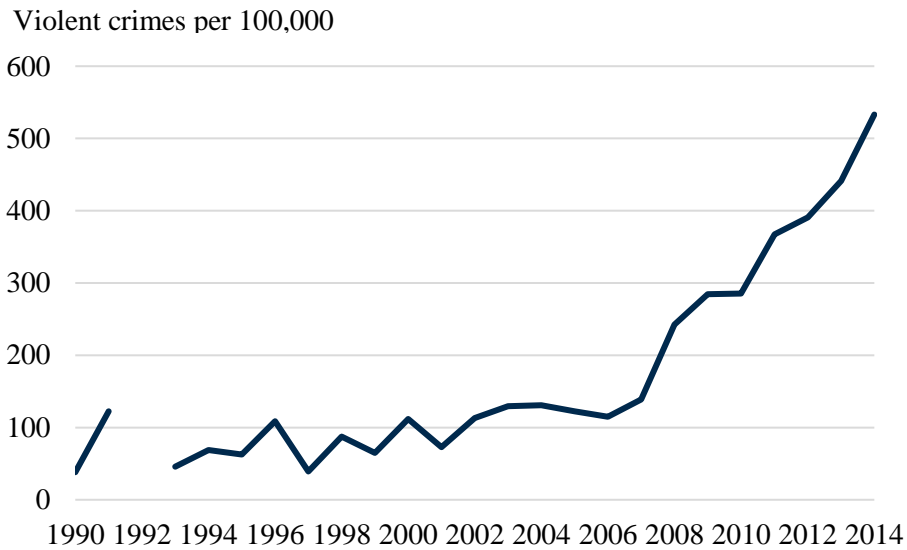
⁶ Interview with City Commissioner and State Senator Brad Bekkedahl, October 24, 2016, Williston, ND.

FIGURE 9. WILLISTON KEY REVENUES BY SOURCE



Data Source: North Dakota Treasurer’s Office, (2016) <http://www.nd.gov/treasurer/revenue-distribution/>.

FIGURE 10. VIOLENT CRIME RATE IN WILLISTON



Data Source: Federal Bureau of Investigation, accessed via <https://www.ucrdatatool.gov/Search/Crime/Local/RunCrimeJurisbyJuris.cfm>.⁷

⁷ Importantly, local officials report that federal census estimates of Williston’s population have undercounted the city’s true population in recent years because of the large number of temporary workers. As a result, the rates reported here, which are calculated as the number of crimes divided by estimated population, likely overstate the extent of the growth in crime. Nonetheless, crime rates would show a substantial increase even if the population figures above reflected city officials’ estimates.

While demand for services has declined in most areas since 2014, financing infrastructure and other capital projects continue to impose large fiscal costs. For example, the city expanded its water and wastewater systems to serve a population of up to 60,000 (in 2010, the estimated population was roughly 16,000) at a cost of \$120 million. In addition, Williston recently added a 1 percent sales tax to finance the \$45 million expansion of its fire department, including new buildings. It is also putting \$60 million toward a new airport.

In a reflection of the decreased demand for services, the city has begun reducing staff through attrition and reducing the housing subsidies and retention bonuses that peaked during the boom at a total of \$2 million per year. As noted above, Williston’s debt at the time of our visit totaled \$218 million, mostly financed through bonds secured by sales taxes and oil and gas production taxes. While local officials report that they are confident in their

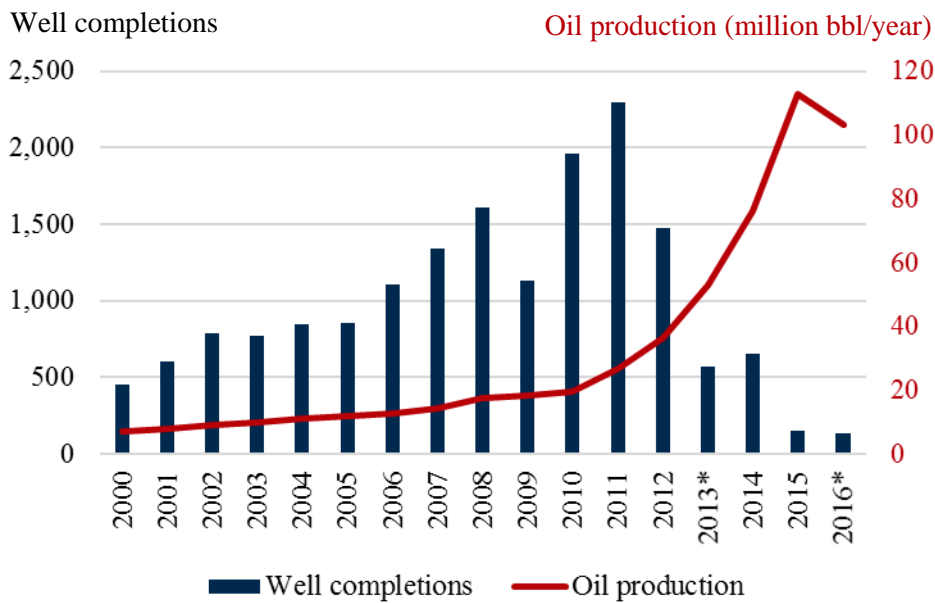
ability to manage this debt load, multiple ratings agencies have cut Williston’s bond rating numerous notches, increasing the cost of new borrowing.

Looking forward, local officials express a desire to diversify the city economy but acknowledge that its remote location and heavy reliance on the oil industry will make that a challenging proposition. Increased volatility in oil markets will also make planning more difficult, exacerbating the challenge of economic diversification.

5.2. Denver-Julesburg Basin, Colorado

Oil and gas development has taken place in the Denver-Julesburg Basin of Colorado for decades, primarily in Weld County. Over the previous 10 years, however, drilling activity has increased substantially, with thousands of new wells drilled into the Niobrara Shale formation. Oil production, in particular, has increased dramatically with the addition of these new wells (Figure 11).

FIGURE 11. WELL COMPLETIONS AND OIL PRODUCTION IN WELD COUNTY



Data Source: Drillinginfo, <https://info.drillinginfo.com/#explore>, for well completions; Colorado Oil and Gas Conservation Commission, <http://cogcc.state.co.us/data.html#/cogis>, for production. *Indicates interview year.

We find that most local governments in the region have experienced net fiscal benefits associated with increased oil and gas production, during both periods of high prices in 2013 and low prices in 2016. However, unlike the other regions examined here, portions of Weld County and many of its neighbors are densely populated, with rapid suburban and exurban growth in and around active drilling regions. This concurrent growth of shale and residential housing development has led in some communities to opposition to oil and gas development, resulting in efforts by a number of local governments to restrict or ban hydraulic fracturing.

Another implication of oil and gas development in densely populated regions is that networks of oil and gas pipelines, and infrastructure such as well pads, may affect growth in multiple ways. In April 2017, an explosion caused by an uncapped natural gas flow line in Weld County killed two residents working in a basement, prompting new measures from the Colorado Oil and Gas Conservation Commission. In addition to these risks, dense networks of oil and gas infrastructure have the potential to restrict residential and commercial growth, as builders may not want to erect structures close to or atop oil and gas systems.

5.2.1. Denver-Julesburg Counties

5.2.1.1. Weld County, Colorado⁸

Local officials report that oil and gas continue to have a net positive fiscal impact for Weld County. The downturn in oil prices beginning in late 2014 has meant decreased revenues along with less traffic, resulting in less demand for road repairs. Volatility has also been successfully managed by the county,

as the large revenues from previous years were largely invested in savings funds and capital projects, with little built into the operating budget. As a result, the county's net financial position (net assets) has improved dramatically in recent years, and its unrestricted assets have remained robust (Figure 12).

Property taxes are the leading revenue source for the county, making up roughly half of annual revenues, with oil and gas constituting roughly two-thirds of countywide assessed value. However, changes in valuation tend to lag behind changes in commodity prices. As a result, county property tax revenues grew from \$90 million in 2012 to \$153 million in 2016, before falling to a projected \$142 million in 2017. Weld County also receives federal leasing revenue from the Pawnee National Grassland and nearby areas. Local officials project revenues of roughly \$10 million in 2017, down from a peak of \$25 million.

These increased revenues have enabled the county to invest in a number of capital upgrades and other projects, including \$15 million in its Bright Futures program, which provides a \$3,000 grant to all graduating high school students, GED recipients, and veterans for use in higher education. Local officials report that this program would not have been possible without revenues from oil and gas production.

In-kind contributions from the industry have also been helpful. The county has been undergoing a \$160 million upgrade to County Road 49, and companies have moved pipelines and other infrastructure at their own expense to make way for the expansion. There

⁸ Interview with County Commissioners Sean Conway, Mike Freeman, Julie Cozad, and Steve Moreno and County Finance Director Don Warden, October 4, 2016, Greeley, CO.

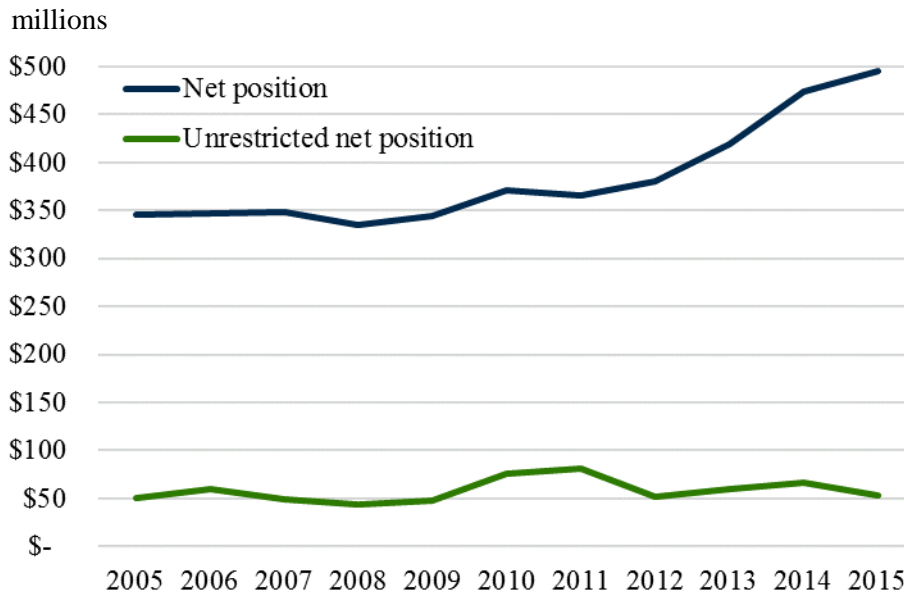
is also occasional cooperation on road repairs, and road use and maintenance agreements (RUMAs) are signed to formalize those agreements.

For Weld County, the County Road 49 upgrade, which consists of a 26-mile, five-lane highway running through the eastern part of the county, is necessary to support oil and gas activity. However, local officials also hope to support a new economic corridor in that area and note that the project would not have been possible without revenues from oil

and gas production. Along with County Road 49, Weld County invests roughly \$8 million per year in maintaining designated industry haul routes. While these costs are substantial, officials continue to hear complaints about road conditions, particularly in the more rural northern portion of the county.

Along with these road costs, workforce retention was the other major challenge during the most active periods of drilling. However, this issue has essentially been resolved by the downturn in prices.

FIGURE 12 WELD COUNTY NET POSITION AND UNRESTRICTED NET POSITION



Data Source: Weld County comprehensive annual financial reports, Accessed via <https://www.weldgov.com/departments/accounting/cafr/>.

5.2.1.2. *Broomfield, Colorado*⁹

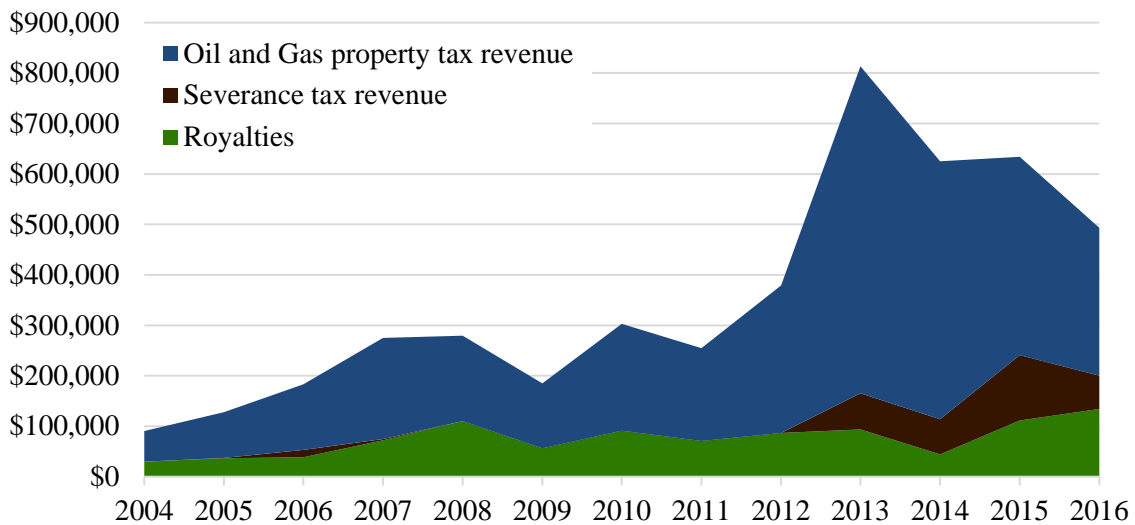
Broomfield is both a city and a county, with a population of roughly 62,000, located just northwest of Denver. Shortly after our visit to the area in late 2016, a new proposal to drill within Broomfield’s borders generated controversy, including calls for the city to ban hydraulic fracturing. (Similar efforts have previously been struck down by the Colorado Supreme Court.)

From a fiscal perspective, local officials believe that oil and gas development has had a small positive impact. However, concerns also exist about long-term impacts, mostly related to environmental issues such as water quality and risks of induced seismicity. Local leaders have also spent substantial time addressing community concerns associated with oil and

gas development, including a 2013 voter referendum that placed a moratorium on fracking, which was struck down by the state’s supreme court in 2016.

Direct revenues from oil and gas production have been volatile in recent years, as Figure 13 illustrates. Property taxes, the leading revenue source, peaked at \$600,000 in 2013, driving total revenues, which include state allocations of severance tax revenue and royalties from production on local government-owned land, to more than \$800,000. In recent years, revenues from royalties and state severance taxes have grown somewhat, while oil and gas property values have declined substantially. Notably, these revenues, even at their peak, are quite small in light of Broomfield’s 2016 budget of roughly \$349 million.

FIGURE 13 BROOMFIELD OIL AND GAS REVENUES



Data Source: Broomfield finance director, provided via email.

⁹ Interview with City/County Manager Charles Ozaki and Finance Director Pat Soderberg, October 7, 2016, Broomfield, CO.

Costs for Broomfield have been modest. The largest cost was managing the 2013 voter referendum that imposed a moratorium on hydraulic fracturing. The city council had been working with companies to develop a memorandum of understanding (MOU) to govern development and was not necessarily in favor of the moratorium. Nonetheless, the measure passed and the city was sued, leading to a major investment of time on the part of many officials, with large opportunity costs.

Broomfield has added a half-time oil and gas inspector to monitor the existing wells within city/county limits. In addition, fees for consultants to advise the city council on a variety of oil- and gas-related issues total roughly \$20,000.

Finally, local officials express some concern that extensive oil and gas development could restrict future growth of residential and commercial property in the coming decades.

5.2.2. Denver-Julesburg Municipalities

5.2.2.1. Brighton, Colorado¹⁰

In Brighton, roughly 30 minutes northeast of Denver, local officials report that oil and gas development has been a large net positive for city finances, despite some early challenges associated with planning. When wells were first proposed in the city, local officials implemented a 90-day moratorium to develop rules related to setbacks from the city's water supply. However, certain companies objected to this moratorium, staging an informal boycott of all city businesses. After 60 days, officials lifted the moratorium and instead worked with operators to develop an MOU regarding a variety of local concerns. Subsequently, the industry has been a "good neighbor," according to

officials, and revenues have easily outweighed fiscal costs for Brighton.

Oil and gas activity, as well as many other factors, has contributed to the doubling of Brighton's population over the previous 20 years. Because of the region's diverse economy, it is difficult to identify the share of growth driven by oil and gas development. However, some direct revenues are clear.

For example, Brighton collected roughly \$400,000 in 2014 and 2015 from state oil and gas revenues, declining to roughly \$200,000 in 2016, and has received between \$2 million and \$3 million in oil and gas impact grants from the state Department of Local Affairs (DOLA). In addition, an oil and gas lease on city property generated a \$1.6 million bonus, though production has not begun, so the city has yet to receive royalties. As Figure 14 highlights, however, these revenues are modest in the context of annual revenues of more than \$70 million in 2015.

Sales taxes have also been substantially boosted by the industry, though the precise level of the contribution is unclear, as overall sales tax revenue has not declined during the downturn in drilling activity. Finally, sales and property tax revenues are boosted by the presence of Baker Hughes, a well services firm that is one of Brighton's largest employers.

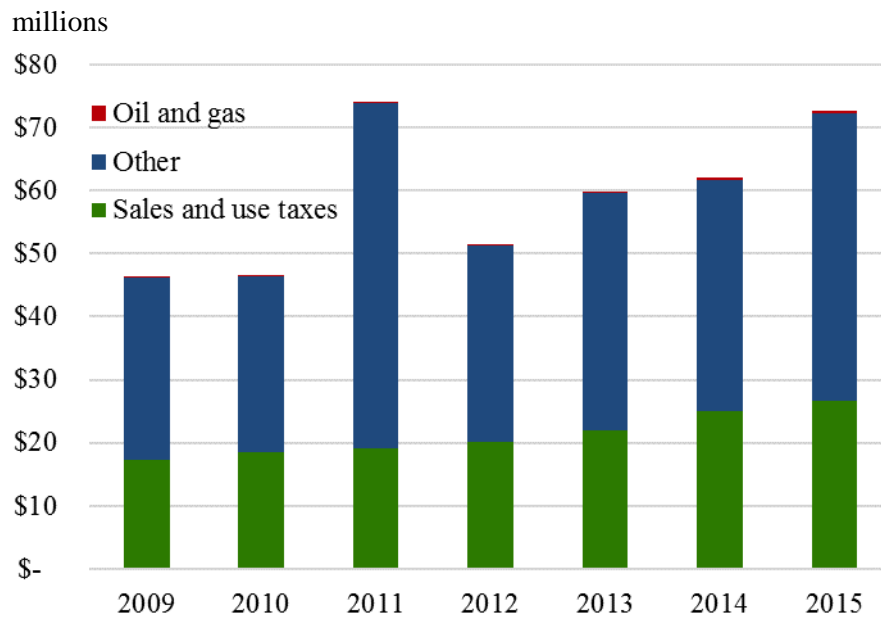
Direct costs for the city are also difficult to quantify but have occurred in several areas. Roads have seen some impact, but local officials describe the damage caused by industry operations as minor, and operators have assisted in repairs in some cases. Other services that grow with population, such as water, wastewater, law enforcement, and emergency services, have also seen modest effects, though again, local officials cannot determine the magnitude.

¹⁰ Interview with City Manager Manuel Esquibel and Mayor Dick McLean, October 7, 2016, Brighton, CO.

One of the clearest impacts for the city has come in the form of workforce retention. The city lost an estimated 10 to 12 employees directly to the oil and gas industry during the heaviest phases of activity in 2013–14. However, this issue has eased with the downturn, and a number of former employees have returned, seeking their previous positions.

Finally, opportunity costs for the city have been substantial, particularly during the 60-day moratorium period. In addition, the city hired several consultants to assist with the development of regulations and the crafting of the MOU with operators, which added tens of thousands of dollars in onetime costs.

FIGURE 14 BRIGHTON KEY REVENUES BY SOURCE



Data Source: Brighton comprehensive annual financial reports, accessed via <http://www.brightonco.gov/245/Financial-Reports>.

5.2.2.2. Eaton, Colorado¹¹

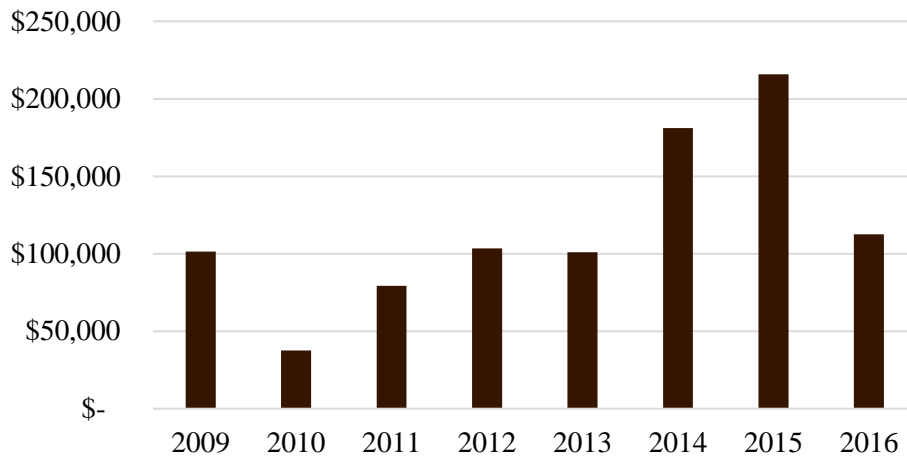
As with our findings in 2013, oil and gas development continues to have a small but positive fiscal impact for the small town of Eaton, roughly 90 minutes north of Denver. Revenues have declined with the downturn in oil prices but are still helpful for the town.

Eaton has experienced some revenue challenges associated with Colorado’s taxpayer bill of rights (TABOR). Similarly to property tax issues in Texas (described in Section 4.3.1), an increase in property tax valuations driven by oil and gas development triggered a decline in the property tax rate. When oil and gas valuations declined as a result of lower prices, the city would have had to increase property tax rates to maintain a steady level of revenue. However, taking this action would require voter approval, and local

officials have been reluctant to put the question to voters, believing that the measure would not pass. Local officials estimate that this lower tax rate results in roughly \$130,000 in annually forgone revenues. With total 2015 revenues of \$3.9 million, this reduction is fairly substantial.

Several other revenue sources are affected by oil and gas development, and these sources have declined in recent years with the downturn in prices. These include allocations from the state severance tax, which have declined from a peak of \$216,000 in 2015 to \$113,000 in 2016 (Figure 15). The city has received roughly \$35,000 from an oil and gas lease on its property in 2016, down from an annual peak of \$100,000. Finally, Eaton sells excess water to operators for hydraulic fracturing, which generated roughly \$150,000 during the first nine months of 2016.

FIGURE 15 EATON ALLOCATIONS OF STATE OIL AND GAS REVENUES



Data Source: Colorado Department of Local Affairs, Direct Distribution: Severance Tax and Federal Mineral Lease, accessed via <https://www.colorado.gov/pacific/dola/direct-distribution-severance-tax-federal-mineral-lease>.

¹¹ Interview with City Manager Gary Carsten, October 4, 2016, Eaton, CO.

Costs for Eaton have been very modest, and the only negative impacts have occurred through damage to city roads and bridges. These effects are relatively small, however, because the primary routes that pass through Eaton are maintained by the state. In Eaton, unlike several other fast-growing municipalities in the region, local officials do not expect that the build-out of oil and gas infrastructure will impede future growth. As one example, the city recently built a new recreation center on top of an abandoned oil and gas well and has not had any problems with construction or operations of the facility.

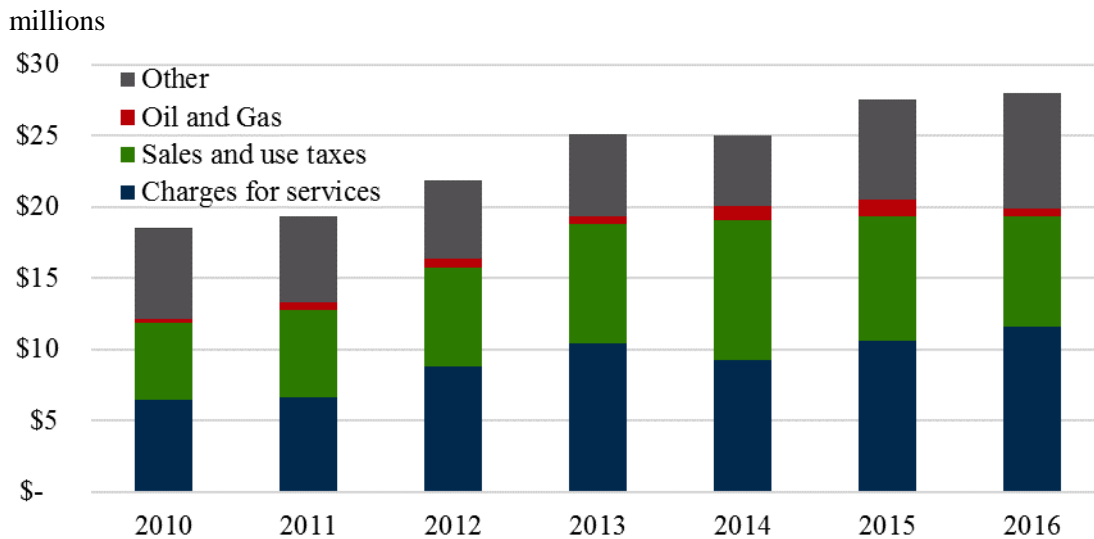
5.2.2.3. *Evans, Colorado*¹²

In the short term, the fiscal impacts of oil and gas development have been positive for the city of Evans, which neighbors to the south the larger city of Greeley, roughly one hour north of Denver. The recent downturn

has not had a substantial negative effect on city finances, as local officials in previous years budgeted for declining oil and gas revenues. However, there is concern that future city growth will be impeded by the dense and growing network of oil and gas infrastructure, such as wellheads and pipelines.

Several revenue sources have increased and decreased along with oil prices in recent years. Allocations from the state severance tax have followed the trajectory of oil prices and drilling activity, peaking at \$1.1 million in 2015 and declining to roughly \$500,000 in 2016. Sales taxes were also affected by the increase in drilling activity and have turned downward following the slowdown. Finally, the city’s hotel tax and vehicle registration revenues were up during the boom and have similarly fallen. Figure 16 displays revenue trends through 2016.

FIGURE 16 EVANS KEY REVENUES BY SOURCE



Data Source: Evans annual financial reports, accessed via <http://www.evanscolorado.gov/finance/financial-statements-and-related-reports>.

¹² Interview with Director of Public Works and Planning Fred Starr, October 4, 2016, Evans, CO.

The leading cost for Evans associated with oil and gas development has come from vehicle traffic. To help manage this issue, the city designated haul routes for oil and gas operators, but local officials describe the overall impacts as substantial. In addition, a company selling sand for hydraulic fracturing is based in Evans, which results in a large volume of truck traffic, though this particular company has contributed to maintaining the roads its trucks affect.

Along with road costs, population growth attributable to the oil and gas industry contributes to all city services, such as water, wastewater, law enforcement, and more. Local officials describe these impacts as fairly modest and difficult to quantify.

Finally, as noted above, local officials worry that extensive oil and gas development may constrain commercial or residential development, potentially limiting revenues in future years.

5.2.2.4 Greeley, Colorado¹³

Oil and gas development continues to have a net positive fiscal impact for Greeley, the seat of Weld County, just over one hour's drive north of Denver. Despite the recent downturn, local officials believe that it will be a positive both in the short term and in the long term.

Sales and use taxes, which are the city's leading revenue source, have steadily grown over the past several years. However, the downturn in oil and gas development has reduced overall economic activity. Revenues

have continued to grow in 2016 primarily because voters approved a sales tax rate increase to add funds for road repairs.

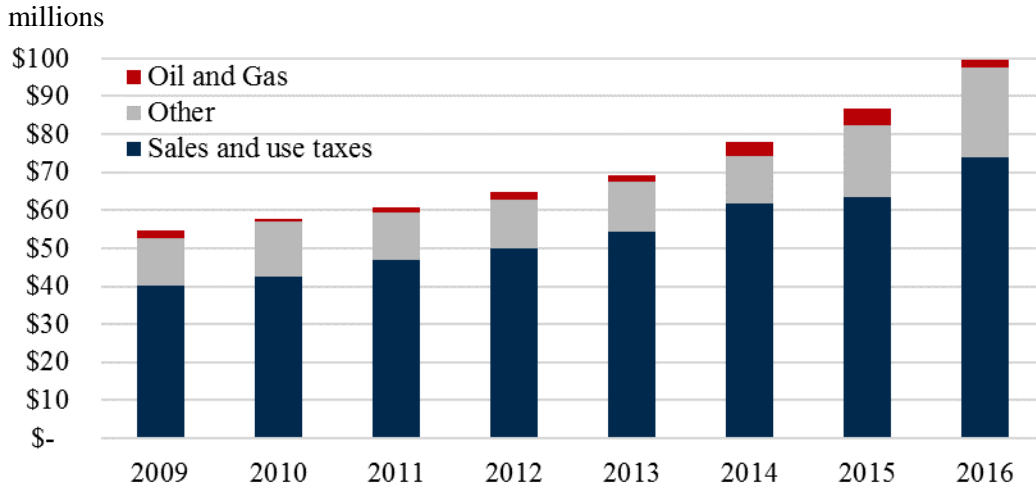
Allocations from state oil and gas revenues have declined by roughly 50 percent, falling from \$4.2 million in 2015 to \$2.1 million in 2016. However, the city budgeted conservatively and does not expect to face major financial challenges as a result, in part because oil and gas revenues are modest relative to other major sources (Figure 17). The city has also continued to benefit from impact grants allocated by the Colorado Department of Local Affairs, including the construction of a new city hall.

Unlike most other local governments in Colorado, Greeley has also implemented a modest impact fee. The fee is based on the estimated costs associated with each well within city limits and is designed to cover road damage. Roads costs were a substantial issue for several years in Greeley, particularly along routes where trucks were hauling water from a city-owned water sales operation. There is also a wastewater disposal facility in the city, which has led to substantial road damage.

Other costs have been associated with staff, including the addition of a new fire inspector focused on oil and gas facilities, and increased demand on law enforcement during periods of heavy drilling activity. However, these demands have largely eased, as have concerns over workforce retention, which was a challenge for the city in 2013–14.

¹³ Interview with City Manager Roy Otto, October 4, 2016, Greeley, CO.

FIGURE 17 GREELEY KEY REVENUES BY SOURCE



Data Source: Greeley annual financial report, accessed via <http://greeleygov.com/government/finance>.

5.2.2.5. Windsor, Colorado¹⁴

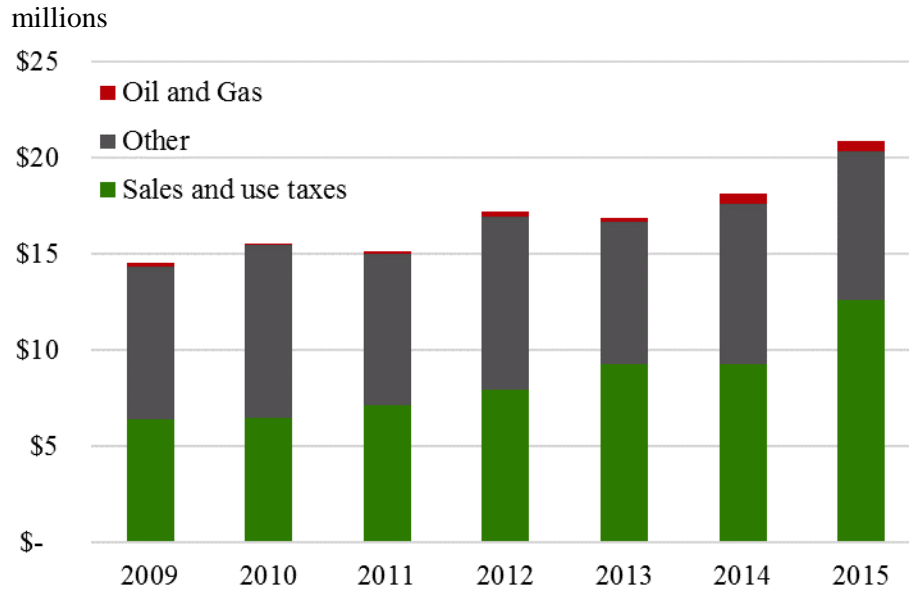
While expanded oil and gas development has occupied a substantial amount of time for local government officials in Windsor, it appears that new revenues generated by the industry have outweighed the opportunity costs of responding to the concerns of residents.

Like other cities in Colorado, Windsor relies largely on sales and use taxes to finance operations. Oil- and gas-related revenues, though small by comparison, have been helpful in providing some additional services and enabling capital investments. As Figure

18 shows, sales and use taxes account for more than half of the city’s annual revenues and have grown steadily in recent years. Local officials believe that oil and gas activity has contributed to this growth but are not able to estimate the size of the contribution.

State allocations of oil and gas revenues have been relatively modest, growing to a peak of over \$500,000 in 2015, then declining to \$280,000 in 2016. In addition, oil and gas leases on city property have generated roughly \$4 million between 2014 and 2016, according to local officials (Figure 18).

¹⁴ Interview with Town Manager Kelly Arnold, October 4, 2016, Windsor, CO.

FIGURE 18 WINDSOR KEY REVENUES BY SOURCE

Data Source: Windsor Finance Office, comprehensive annual financial report, (2016), <https://www.windsorgov.com/481/Annual-Fin-Reports-CAFR>.

The largest cost for the city associated with oil and gas development has come in the form of opportunity costs. Responding to residents' concerns over environmental and public health risks, city officials spent a large amount of time holding public meetings, developing local regulations, and deliberating internally over policy.

Another time-consuming issue for the city relates to the assessment methodology for oil and gas property. A recent change to state assessment guidelines stipulates that oil and gas property should be valued based on the location of the wellhead, not the location of the wellbore or the resource itself. As a result, a number of oil and gas properties that had previously been assessed within Windsor were moved outside city limits. Responding to this issue, the city annexed several areas to reclaim the associated properties. This process took substantial time and required consultation with external experts.

The other major challenge for Windsor has been maintaining roads and bridges affected

by heavy industry traffic. Oil and gas operators, as well as trucks hauling to and from local gravel pits, have taken a substantial toll on city roads, though local officials are not able to estimate the precise impact of either industry.

Demand for law enforcement, particularly with regard to prostitution, increased during the most active periods of drilling activity. However, this issue has subsided with the downturn, and local officials believe the decrease in transient industry workers is the reason. Finally, workforce retention has been a challenge for the city and continues to be a challenge despite the decline in oil and gas activity.

5.3. Eagle Ford Shale Region, Texas

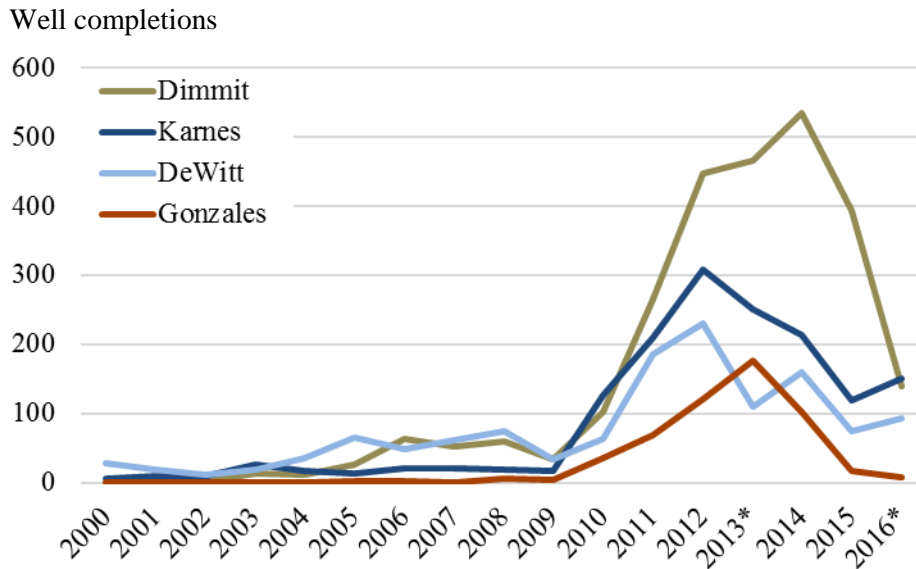
Similarly to the Bakken, the Eagle Ford Shale region in south Texas experienced rapid growth in oil and gas activity beginning around 2010, followed by a steep decline in drilling and, to a lesser extent, production. In the northeastern portion of the play, natural

gas is the primary target for operators, exemplified by DeWitt, Gonzales, and Karnes Counties. In the southwestern portion, exemplified by Dimmit County, oil is the primary focus.

Because natural gas prices declined earlier than oil prices in the most recent downturn,

activity levels varied by county, with natural gas-focused counties peaking in 2012 and 2013, and oil-focused counties peaking in 2014. Nonetheless, the number of well completions and production of both oil and natural gas have declined across the region (Figure 19).

FIGURE 19. WELL COMPLETIONS IN SELECT EAGLE FORD COUNTIES



Data Source: *Drillinginfo*, <https://info.drillinginfo.com/#explore>. *Denotes interview year.

5.3.1. Eagle Ford Counties

As we discussed in Section 4.3.1, county governments in Texas with high levels of oil and gas production have experienced major revenue volatility in recent years. Because the region had not experienced large-scale oil and gas development in previous decades, this volatility is somewhat new for Eagle Ford counties.

When we visited the northeastern portion of the play in 2013, counties were experiencing major challenges in keeping up with demand for road repairs. Responding to this demand, as well as to road damage concerns in other oil- and gas-producing regions, the Texas state government allocated in 2014 roughly \$225 million in onetime funding for counties through its County Transportation Infrastructure Fund (TIF) Grant Program (Texas Dept. of Transportation 2017).

Unlike most other states, Texas does not allocate a portion of its severance taxes to

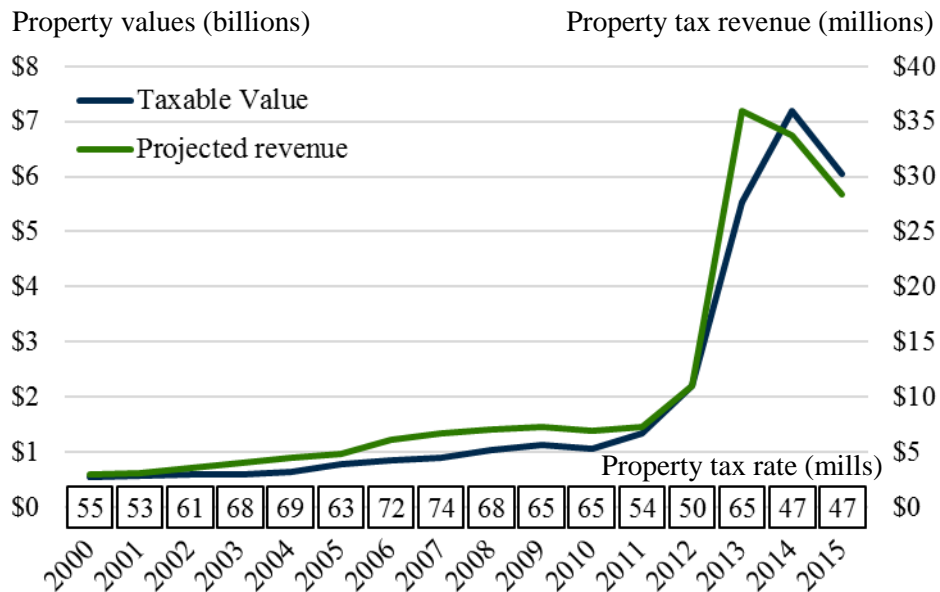
local governments (Raimi & Newell 2016c). Counties rely primarily on property tax revenues to manage their roads.

5.3.1.1. DeWitt County, Texas¹⁵

Despite substantial challenges associated with road repairs, Eagle Ford development has been a net fiscal positive for DeWitt County, according to local officials. Compared with other counties that we examined in the region, DeWitt County has seen less revenue volatility, because it secured voter approval to keep its property tax rates at relatively stable levels despite the rollback provisions described in Section 4.3.1. As a result, the county has expanded its services and improved its roads substantially since our initial visit in 2013.

Overall county revenues have grown rapidly, due primarily to the property tax base growing from \$2 billion in 2011 to a peak of \$7 billion in 2015 (Figure 20).

FIGURE 20 DEWITT COUNTY PROPERTY TAX VALUES, REVENUES, AND TAX RATES



Data Source: Texas Comptroller of Public Accounts, county self-reported property tax data, (2017), provided via email.

¹⁵ Interview with County Judge Daryl Fowler, January 18, 2017, Cuero, TX.

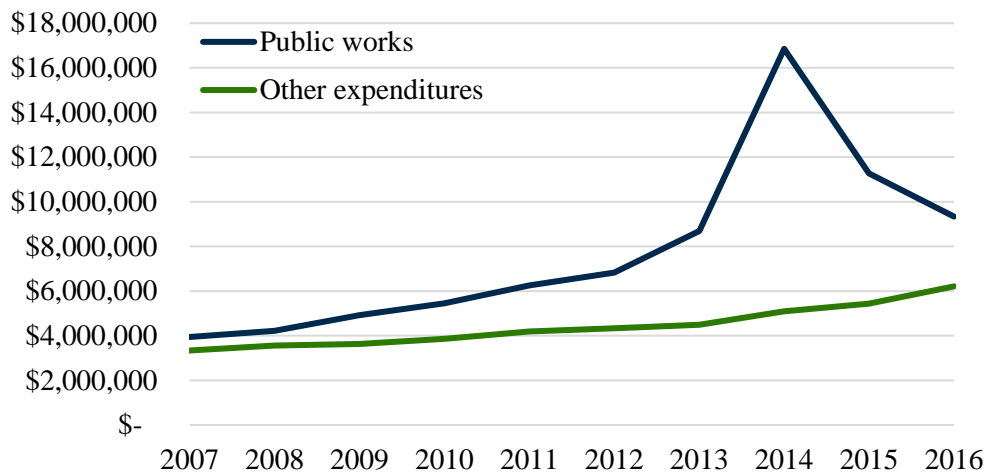
In addition, state TIF grants provided nearly \$5 million in 2014, which helped the county improve its roads. Other revenues for services, such as the county clerk, permitting, and court fees, have also increased, though their impact is more modest.

As noted above, road damage has been the leading cost for DeWitt County. Roads were generally not in good condition prior to the boom, and the county estimates that of its 690 miles of roads, roughly half were negatively impacted by industry traffic. In recent years, it has invested roughly \$32 million on roads, and local officials estimate that conditions are better than before the boom. However, many

roads remain in poor condition, and the county estimates that roughly \$400 million would be required to bring all 690 miles up to good condition.

Other service demands have grown alongside Eagle Ford development. Total county staffing has grown from roughly 110 in 2011 to 160 in late 2016. Despite the downturn in activity, the county does not plan on layoffs, though it is considering workforce reductions through attrition if revenues do not turn upward. Figure 21 illustrates the growth in public works (i.e., roads) expenditures relative to other county services.

FIGURE 21 DEWITT COUNTY EXPENDITURES



Data Source: DeWitt County comprehensive annual financial reports, accessed via http://www.co.dewitt.tx.us/default.aspx?DeWitt_County/CAFR.

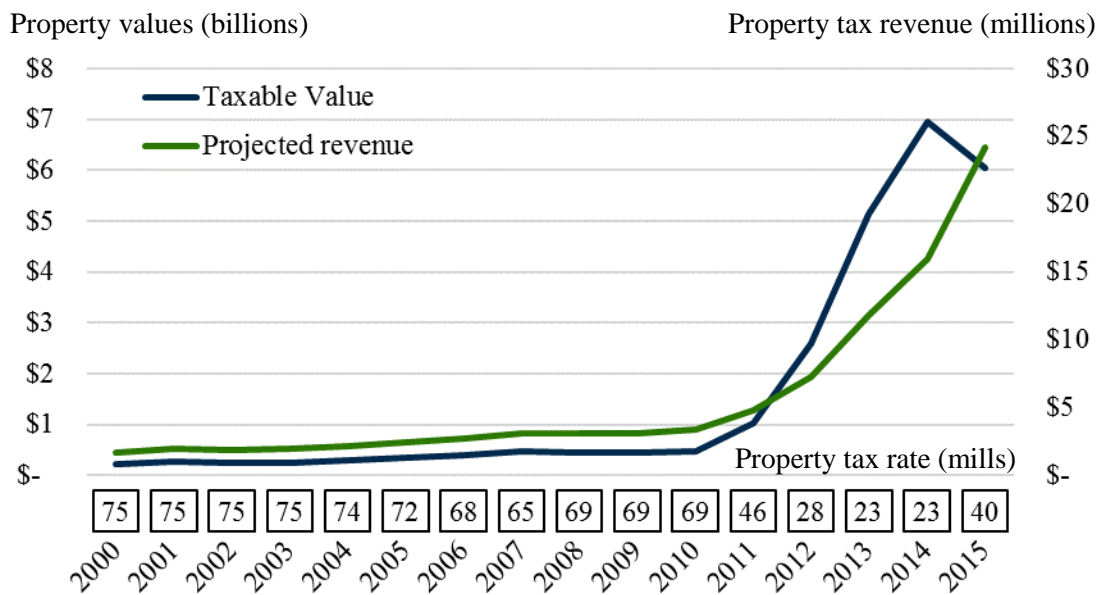
5.3.1.2. Dimmit County, Texas¹⁶

Eagle Ford development has, on net, been a large fiscal positive for Dimmit County. County Judge Francisco J. Ponce describes Dimmit County as having been a “small, sleepy community” before 2010. However, starting in 2009, things “went crazy for a while” as oil development ramped up to a peak of over 500 well completions in 2014. The judge states that prior to the boom, it was often a struggle for the county simply to make

its payroll each month. However, at the end of 2015, it had amassed some \$35 million in reserves and improved services.

As in other Texas counties examined in this report, property values grew rapidly, from roughly \$500 million in 2010 to \$7 billion in 2014. In response, the county property tax rate plunged by about 75 percent from the beginning of the decade through 2014, before increasing sharply in 2015 in response to the drop in oil prices (Figure 22).

FIGURE 22 DIMMIT COUNTY PROPERTY TAX VALUES, REVENUES, AND TAX RATES



Data Source: Texas Comptroller of Public Accounts, county self-reported property tax data, (2017), provided via email.

¹⁶ Interview with County Judge Francisco J. Ponce, January 20, 2017, Carrizo Springs, TX.

Along with property taxes, onetime TIF funding of \$6.8 million boosted revenues in 2014 and 2015. In-kind donations have also been helpful, primarily through donations of road materials such as aggregate from operators. Local officials worked closely with a group of companies to assist on road repairs associated with one large project and have generally been happy with that collaboration. Finally, the county has two oil and gas leases for which it received roughly \$1 million in bonuses, though drilling on the property has not taken place.

Service demands and costs have grown dramatically alongside revenues. Dimmit County internally estimates that its population grew from roughly 10,000 to a high of 50,000 at the peak of activity. Traffic, roads, and accidents have been the biggest challenge for the county. According to local officials, there used to be a single traffic fatality every two to three years, but during the peak of activity, 12 occurred in a month. In response to traffic, as well as increased concerns over drugs, police staffing has grown from 12 to 30 officers.

Road maintenance was also a major challenge during the most active phases of drilling and hydraulic fracturing, though local officials estimate that because of increased investment, overall road conditions are fairly similar to what they were before Eagle Ford development.

Total staffing for Dimmit County has grown from 90 to some 200 employees. While the county has not needed to trim staff

following the downturn, it may begin to reduce its workforce through attrition in the coming years, depending on revenues.

The county has also built a variety of new structures. Some projects, such as a \$10 million rodeo center–conference facility and a \$750,000 recreation center, were constructed in an effort to build new assets that can enable economic growth over the long term. Others, such as a \$6 million courthouse annex and a \$750,000 law enforcement center, were additions necessitated by population growth driven by shale development.

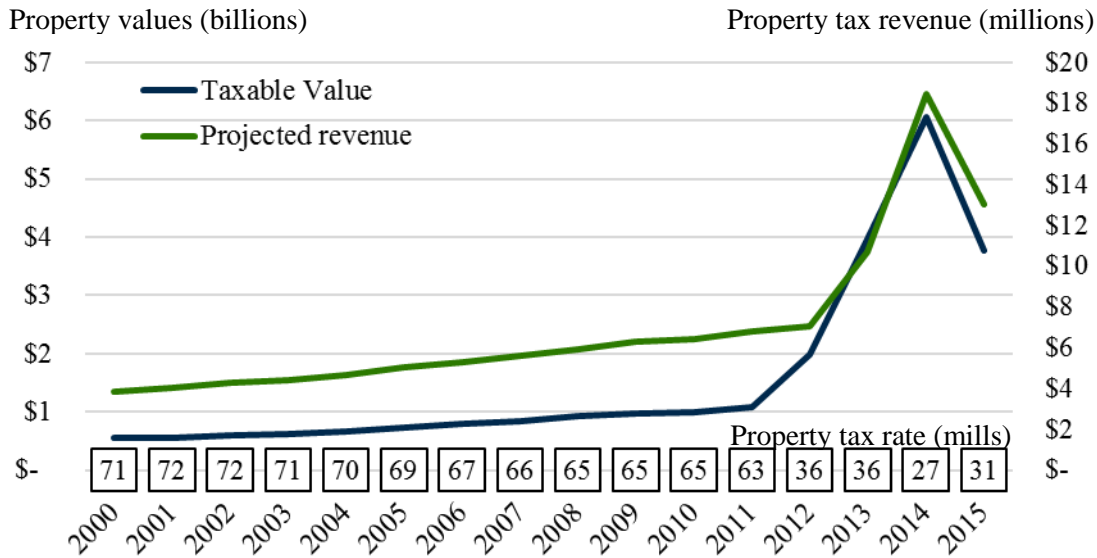
5.3.1.3. *Gonzales County, Texas*¹⁷

For Gonzales County, the net fiscal effects of shale development have been a small net positive, according to local officials. Although revenues have grown rapidly, planning challenges associated with revenue volatility have created a number of issues. In addition, demand for road maintenance and law enforcement have grown dramatically, straining county services.

Unlike most county governments in Texas, Gonzales County relies in part on sales taxes, which help offset property taxes and have roughly tracked drilling activity. However, the largest source of revenue (and revenue volatility) is property taxes, which have varied widely in recent years (Figure 23). These revenues grew more rapidly than in some other counties because, like their neighbors in DeWitt County, Gonzales County voters allowed property tax rates to surpass the rollback rate in 2013 (see Section 4.3.1.).

¹⁷ Interview with County Judge David Bird, January 18, 2017, Gonzales, TX.

FIGURE 23 GONZALES COUNTY PROPERTY TAX VALUES, REVENUES, AND TAX RATES



Data Source: Texas Comptroller of Public Accounts, county self-reported property tax data, (2017), provided via email.

In addition to these internal revenues, the county received roughly \$4.1 million in TIF grant funding from the state, which allowed for upgrades to several miles of roads. In-kind contributions for road repairs have also been substantial, with operators regularly donating materials to repair the roads they affect.

Road costs for the county have been the most substantial demand, growing very high during the peak of activity, then declining to a modest level by 2016. Law enforcement demand has also grown, with Gonzales County adding two sheriff’s deputies and two assistants to the justices of the peace. Crime increased during the boom period and has slowed little in recent years, despite the downturn in drilling. Workforce retention, which was a major challenge during the boom, has receded as an issue for the county.

Finally, Gonzales County purchased and is renovating a new building to expand its tax assessor/collector’s office, at an estimated cost

of \$2.7 million to \$3.7 million. Local officials describe this expansion as an effort that was enabled by oil- and gas-driven revenues, rather than caused by an increase in demand.

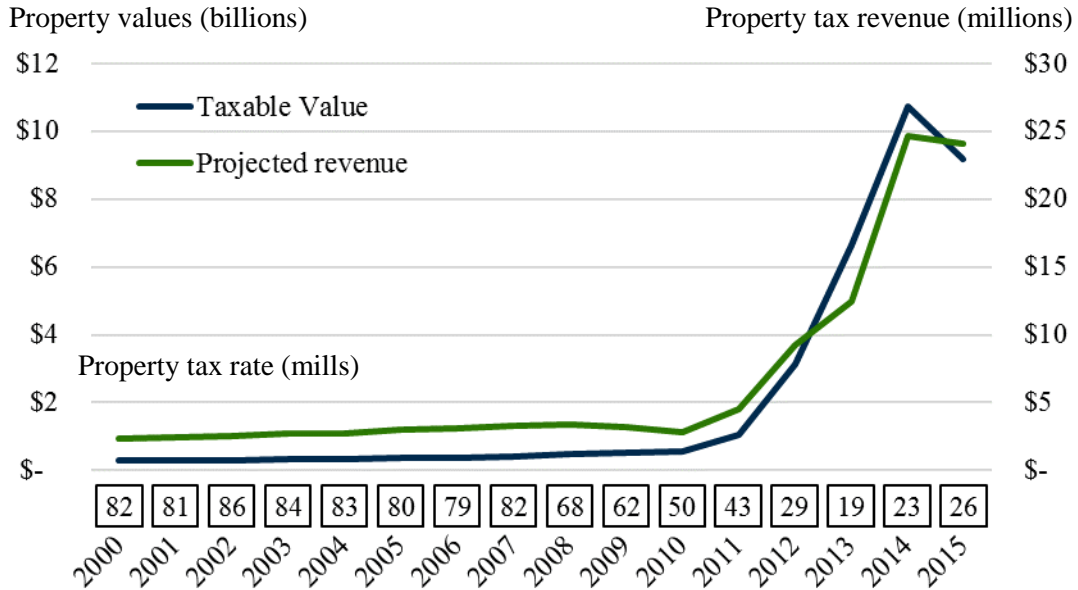
5.3.1.4. Karnes County, Texas¹⁸

Eagle Ford development has been a small net negative for Karnes County’s finances. More than other counties in the region, Karnes County expanded staff and services rapidly during the increase in revenues and was caught somewhat off guard by the steep downturn. As a result, the county now needs to make substantial cuts.

Similarly to other Texas counties, Karnes has seen its property tax rate decrease rapidly with the increase in oil and gas production. However, tax rates in Karnes County have dropped more dramatically than in any other Texas county we have examined, falling from 82 mills in 2007 to a low of 19 mills in 2013 (Figure 24). The county also imposes a sales tax, which has swung dramatically with the increase and decrease in drilling activity.

¹⁸ Interview with County Commissioner Shelby Dupnik and Assistant to County Judge Mary J. Lozano, January 17, 2017, Karnes City, TX.

FIGURE 24 KARNES COUNTY PROPERTY TAX VALUES, REVENUES, AND TAX RATES



Data Source: Texas Comptroller of Public Accounts, county self-reported property tax data, (2017), provided via email.

State TIF grants provided \$7.7 million, which local officials describe as “crucial,” allowing for the upgrade of 15 miles of road. Road repair needs have also been aided by modest contributions from operators, though these donations are estimated at less than \$500,000.

Measured against the scale of road and bridge needs for the county, these donations have been modest indeed. Annual road spending grew from \$4.5 million before the boom to \$20 million at the peak, and in 2017, it was budgeted near \$9 million. Overall, road conditions are slightly worse than before the boom, local officials report.

Law enforcement services have expanded dramatically, with the sheriff’s office growing from 8 to 28 deputies. These officers have been kept busy by an increase in crime, accidents, and drug issues, which local officials attribute primarily to Eagle Ford

Shale development. To cope with this demand, Karnes County constructed a new jail at a cost of roughly \$11 million. However, this upgrade had been needed for years and was not entirely attributable to Eagle Ford activity. Similarly, the county constructed a new \$2 million emergency medical services (EMS) building and expanded to a full-time staff. Local officials state that this upgrade, which has improved services for citizens, would not have been necessary without Eagle Ford development.

5.3.2. Eagle Ford Municipalities

5.3.2.1. Cotulla, Texas¹⁹

Cotulla sits roughly 90 minutes to the southwest of San Antonio and has grown rapidly as a result of Eagle Ford development. This growth has had a net positive effect on city finances, but volatility has created planning challenges and added a substantial debt load. Still, the city’s net assets have

¹⁹ Interview with City Manager Larry Dovalina, January 19, 2017, Cotulla, TX.

doubled since 2012, and a number of services have been upgraded and expanded.

Cotulla’s largest revenue source is sales taxes, which grew and declined rapidly over the past five years. As Figure 25 shows, average monthly sales volumes increased from roughly \$1 million before the boom to \$7 million in 2013, before falling to \$4 million in 2016.

Property taxes provide a smaller share of city revenues, though these have also followed the levels of industry activity. Citywide valuations grew rapidly as numerous hotels, restaurants, and other establishments were constructed to accommodate Eagle Ford–driven growth. Property valuations peaked in 2015 at \$220 million, though these had declined to roughly \$170 million by early 2017 as a result of the closure of some of these businesses and lower valuations for hotels because of declining nightly rates.

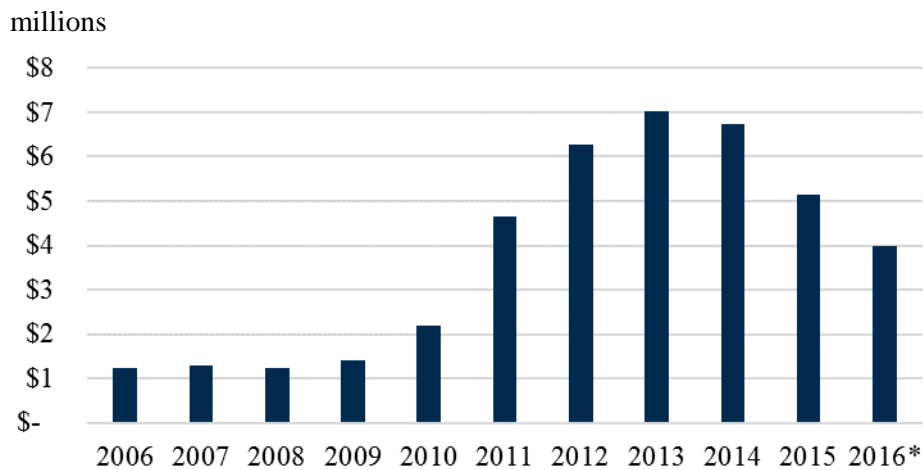
Cotulla has received roughly \$1 million in revenues from an oil and gas lease at the city airport, as well as smaller revenues from smaller leases on other city property. In addition, oil and gas operators have donated roughly \$200,000 to the city’s volunteer fire department.

Costs for the city have been driven by infrastructure projects associated with population growth. A variety of water and wastewater improvements have cost roughly \$7 million, while road and bridge upgrades have cost about \$4 million. These projects have been financed largely through debt, a new challenge for Cotulla to manage in the years to come.

Staff costs have also grown substantially as a result of additions in several city departments. However, the city has reduced its payroll by five positions through attrition because of lower revenues. Population growth has also increased police and EMS costs, which have grown by roughly \$600,000 per year.

Because of its location nearly midway between San Antonio and El Paso, which lies at the Mexico border, local officials are working to position Cotulla as a logistics hub for international trade. The city has recently extended the length of its airport runway and is working to attract firms to invest. Such efforts could help reduce the city’s exposure to economic volatility driven by cycles of oil and gas development.

FIGURE 25 COTULLA MONTHLY AVERAGE TAXABLE SALES



Data Source: Texas Comptroller of Public Accounts, county self-reported property tax data, (2017), provided via email.
 *Data through September 2016.

5.3.2.2. Karnes City, Texas²⁰

Officials in Karnes City, the seat of Karnes County, describe Eagle Ford Shale development as bringing a mixture of “prosperity and peril.” Despite this mix of impacts, the net fiscal effects of shale development have been positive. Revenues have grown substantially, and services have been expanded to serve a larger population. The city now has over \$3 million in debt, which is unlikely to cause major fiscal challenges but is a new experience for Karnes City.

Both sales tax and property tax revenues have seen large swings driven by Eagle Ford activity. Taxable sales have grown from roughly \$500,000 per month before the boom to more than \$2 million at their peak, before falling to \$1.4 million in 2016 (Figure 26).

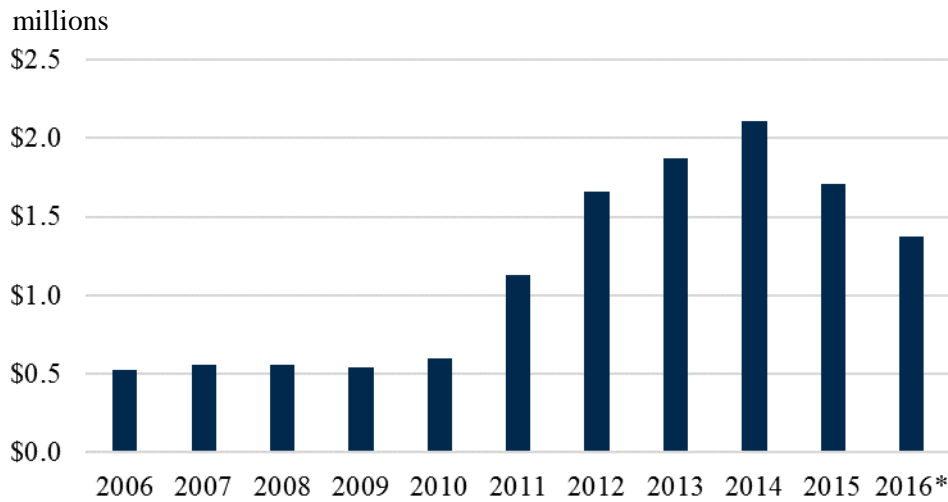
Several other revenue sources have become important for the city as a result of Eagle Ford development. Hotel occupancy taxes have grown to become a substantial source, and the city received a \$1.4 million bonus from an oil and gas lease. Production on the lease generated peaks

between \$200,000 and \$300,000 per month, declining to about \$35,000 monthly by 2017.

Roads have been the largest challenge for Karnes City, as a large volume of industry traffic has affected city streets. Local officials state that road infrastructure was in poor shape before Eagle Ford development began and that the boom rapidly accelerated its deterioration. Roughly \$3 million has been invested on road upgrades in recent years, and the city has taken on \$2.3 million in debt for additional street improvements. Water and wastewater infrastructure has not been a challenge, as these systems were upgraded shortly before Eagle Ford development began in earnest.

Karnes City’s police force has grown substantially, from 3 full-time officers in the early 2000s to 11 today. Much of this expansion occurred before the shale boom, though local officials estimate that 2 new officers were added because of Eagle Ford activity. Crime concerns have focused on prostitution, drugs, and traffic enforcement. The city has also added six new staff in other departments, including four in the public works department.

FIGURE 26 KARNES CITY MONTHLY AVERAGE TAXABLE SALES



Data Source: Texas Comptroller of Public Accounts, county self-reported property tax data, (2017), provided via email.
 *Data through September 2016.

²⁰ Interviews with City Manager Don Tymrak, January 17 and 31, 2017, Karnes City, TX, and via phone.

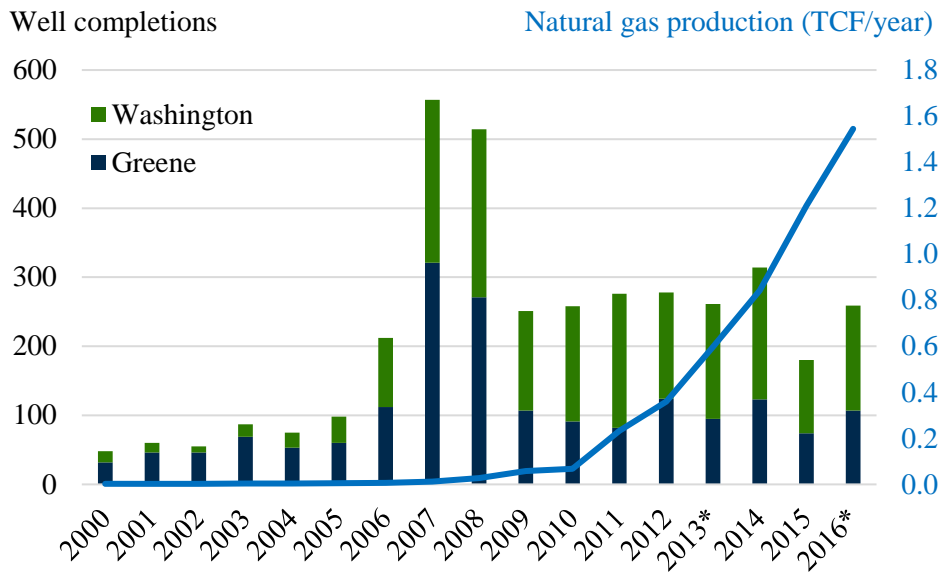
5.4. Marcellus Shale region, Pennsylvania

Although shale development has occurred in dozens of Pennsylvania counties over the past decade, the first Marcellus well was drilled in 2004 in Washington County, in the southwestern region of the state. Since that time, Washington and its neighbor, Greene County, have been two of the most active for Marcellus development, in part because of the

natural gas liquids (e.g., ethane, pentane) that are produced alongside dry gas (i.e., methane) in the region.

As Figure 27 shows, production from these two counties has grown rapidly despite a downturn in drilling activity. Many of the wells drilled in 2007 and 2008 targeted shallower “conventional” formations. These are far less prolific producers than Marcellus wells, which have been the drivers of growth.

FIGURE 27 WELL COMPLETIONS IN GREENE AND WASHINGTON COUNTIES



Data Source: Drillinginfo, <https://info.drillinginfo.com/#explore>.

Pennsylvania local governments cannot levy property taxes on oil and gas equipment, nor does the state collect a severance tax. Instead, the state government collects an Impact Fee, which is applied annually to all “unconventional” (i.e., shale) wells over a period of 15 years (Table 7). The Fee is

adjusted annually based on natural gas prices, and ranges from \$40,000 to \$60,000 per new well. A substantial portion of Impact Fee revenue flows to local governments based on the number of wells drilled in and around the jurisdiction (Raimi & Newell 2016c).

TABLE 7. PENNSYLVANIA IMPACT FEE SCHEDULE

Year	Price of natural gas (\$/Mcf)				
	0–2.25	2.26–2.99	3.00–4.99	5.00–5.99	6.00 & up
1	\$ 40,000	\$ 45,000	\$ 50,000	\$ 55,000	\$ 60,000
2	\$ 30,000	\$ 35,000	\$ 40,000	\$ 45,000	\$ 55,000
3	\$ 25,000	\$ 30,000	\$ 30,000	\$ 40,000	\$ 50,000
4	\$ 10,000	\$ 15,000	\$ 20,000	\$ 20,000	\$ 20,000
5	\$ 10,000	\$ 15,000	\$ 20,000	\$ 20,000	\$ 20,000
6	\$ 10,000	\$ 15,000	\$ 20,000	\$ 20,000	\$ 20,000
7	\$ 10,000	\$ 15,000	\$ 20,000	\$ 20,000	\$ 20,000
8	\$ 10,000	\$ 15,000	\$ 20,000	\$ 20,000	\$ 20,000
9	\$ 10,000	\$ 15,000	\$ 20,000	\$ 20,000	\$ 20,000
10	\$ 10,000	\$ 15,000	\$ 20,000	\$ 20,000	\$ 20,000
11	\$ 5,000	\$ 5,000	\$ 10,000	\$ 10,000	\$ 10,000
12	\$ 5,000	\$ 5,000	\$ 10,000	\$ 10,000	\$ 10,000
13	\$ 5,000	\$ 5,000	\$ 10,000	\$ 10,000	\$ 10,000
14	\$ 5,000	\$ 5,000	\$ 10,000	\$ 10,000	\$ 10,000
15	\$ 5,000	\$ 5,000	\$ 10,000	\$ 10,000	\$ 10,000

Source: Pennsylvania Public Utility Commission, (2017), http://www.puc.state.pa.us/filing_resources/issues_laws_regulations/act_13_impact_fee_.aspx.

5.4.1. Marcellus Counties

Unlike in the other states examined in this report, county governments in Pennsylvania are not responsible for most rural road networks (roads are maintained by townships), though they are responsible for most bridges. In addition, counties provide human services, property assessment, emergency services, law enforcement and corrections, and other services.

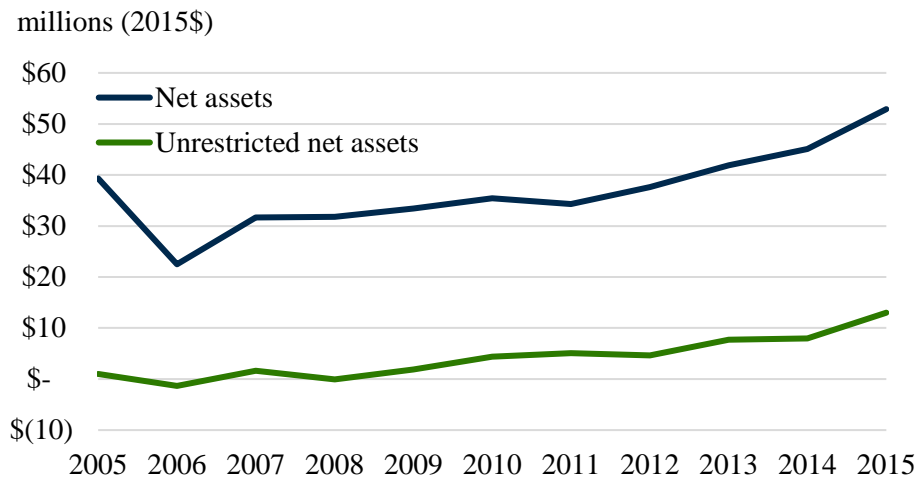
5.4.1.1. Greene County, Pennsylvania²¹

Shale development has had a mixed impact for Greene County, with local officials reporting that the net fiscal impacts have been neutral overall. Impact Fee revenues have enabled the county to upgrade infrastructure, purchase equipment it could not otherwise have afforded, and increase savings. However, road safety, environmental concerns, land use impacts, and community character have all affected the county. Impacts to the county’s 80 bridges are also substantial and have resulted in costly repairs. Local officials report

that shale development primarily supported out-of-state workers, and soon after local businesses started providing services for oil and gas companies, the downturn in prices made it more difficult for local firms.

Despite these concerns as expressed by Greene County officials, most indicators of financial well-being for the county have improved through 2015 (the most recent available year for audited data). As Figure 28 shows, the county’s total assets have more than doubled since a low point in 2006, and unrestricted net assets, which were negative in 2006 and 2008, are now above \$10 million. Other common fiscal indicators, such as asset-to-debt ratios, total revenues, and total expenditures, have also improved over this period. It is possible that fiscal conditions since 2015 have deteriorated for Greene County; however, a review of (unaudited) county budgets for 2016 and 2017 continue to show growth in overall revenues and expenditures.

FIGURE 28 GREENE COUNTY GOVERNMENT ASSETS



Data Source: Greene County Finance Office, annual audited financial reports, (2007-2015), <http://www.co.greene.pa.us/secured/gc2/depts/adm/index.htm>.

²¹ Interview with County Commissioner (Chair) Blair Zimmerman, November 9, 2016, Waynesburg, PA.

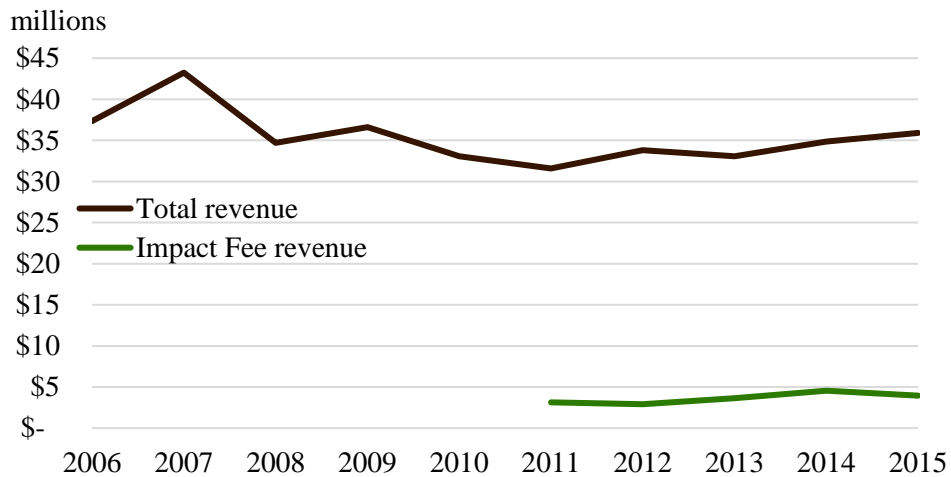
Impact Fee revenue has been by far the leading oil and gas revenue source for the county. In 2015, the most recent available year, these revenues made up \$3.9 million out of a budget of \$29.1 million. As Figure 29 shows, total government revenues are well below their height of 2007 but have modestly increased since a low point in 2011. (Much of the downturn since 2007 is attributable to closure of local coal mines and a coal-fired power plant.)

Other revenues have increased as a result of Marcellus Shale development but have been more modest. Counties in Pennsylvania collect a small income tax, which grew from 2011 through 2015 but has since declined. In addition, the county receives roughly \$5,000 per month in royalties from a lease on county land.

In Greene County, industry truck traffic has caused substantial impact to 80 bridges. Local officials describe two cases where bridges were essentially destroyed by oil and gas traffic and needed to be rebuilt. Impact Fee revenues have enabled the county to make these repairs, which have been as large as \$750,000 for one project. Wear and tear on other bridges is also substantial but harder to quantify.

Other services, particularly law enforcement and social services, have been modestly affected by oil and gas development. Local officials cite an increase in oil and gas vehicle traffic as the primary driver of increased demand for law enforcement, along with—to a lesser extent—issues involving drugs, alcohol, and prostitution.

FIGURE 29 GREENE COUNTY REVENUE



Data Source: Greene County Finance Office, annual audited financial reports, (2007-2015), <http://www.co.greene.pa.us/secured/gc2/depts/adm/index.htm>.

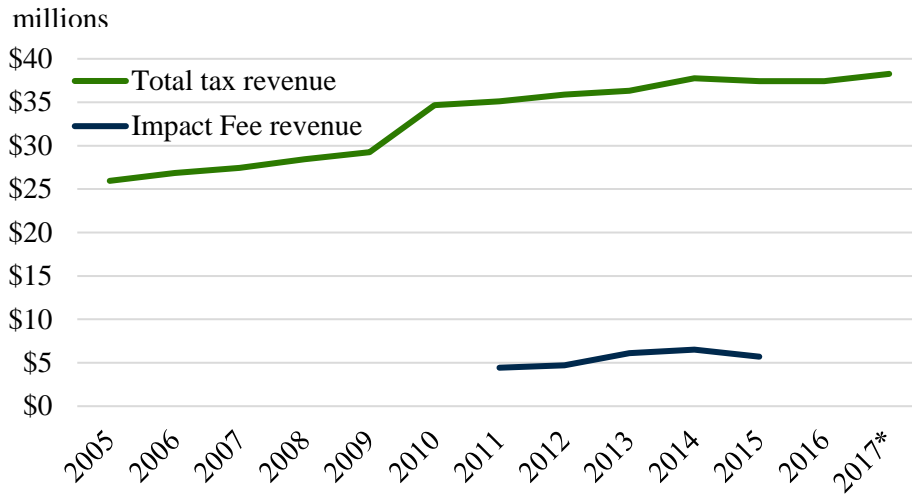
5.4.1.2. Washington County, Pennsylvania²²

Marcellus development has slowed in recent years, but Washington County officials report that the net fiscal effects are clearly positive, even in the downturn. Revenues have been substantial and allowed the county to improve services in a variety of areas.

The leading revenue source for Washington County has been the Impact Fee,

ranging between \$4.4 and \$6.5 million annually. Local officials also believe that increased economic activity associated with Marcellus development has boosted general tax revenues (Figure 30). This growth is in part because when drilling occurs on a parcel of land that may have previously been taxed as agricultural land, that parcel becomes subject to a higher industrial property tax assessment.

FIGURE 30 WASHINGTON COUNTY KEY REVENUES BY SOURCE



Sources: Impact fee revenue from Pennsylvania Public Utility Commission, (2017), http://www.puc.state.pa.us/filing_resources/issues_laws_regulations/act_13_impact_fee_.aspx. Data not available after 2015. Tax revenue data from Washington County Finance Office, annual budgets, (2005-2017), <http://www.co.washington.pa.us/139/County-Budget>. *Projected.

²² Interview with County Commissioner Harlan Shober, November 7, 2016, Washington, PA.

One other major revenue source has come from a lease on county land. In 2014, this lease generated \$3.5 million for the county, followed by \$873,000 in 2015 and roughly \$2 million in 2016. In addition, revenue from hotel taxes has grown substantially, as new hotels have been built to accommodate industry workers.

In-kind contributions from the industry have also been helpful. Local officials describe a walking trail that one operator constructed, which allowed the operator to have a right-of-way for a natural gas pipeline. This was a \$1 million project paid for entirely by the company.

Like Greene County, Washington County maintains a substantial number of bridges (127), and industry traffic has affected this infrastructure. Along with damage to existing bridges, heavier vehicles have required the county to upgrade and reinforce older bridges to handle the new traffic. Local officials do not have an estimate for the precise fiscal impacts but note that Impact Fee revenues have largely covered these costs.

Law enforcement activities related to traffic increased during the most active periods of drilling but have now slowed down. Local officials also describe an increase in issues with drugs, alcohol, child and family services demand, and domestic violence but do not know whether or to what extent this recent increase is related to trends in drilling activity.

Finally, the county and other related entities spent substantial resources on workforce training efforts for residents to increase local employment in the gas industry. However, the downturn has meant that many of those jobs have disappeared. Partly as a result, the county no longer struggles with workforce retention, which it did during the most active periods of drilling.

5.4.2. Marcellus Municipalities

5.4.2.1. Center Township, Greene County, Pennsylvania²³

Local officials report that Marcellus Shale development has had a mixed impact for Center Township. Revenues, primarily from Impact Fees, have been substantial, allowing the township to buy equipment it could not have afforded otherwise. However, demand for road repair has grown substantially despite RUMAs, and township staff report that they now spend all their time working on oil and gas impacts, primarily responding to road complaints from residents and managing RUMAs with operators.

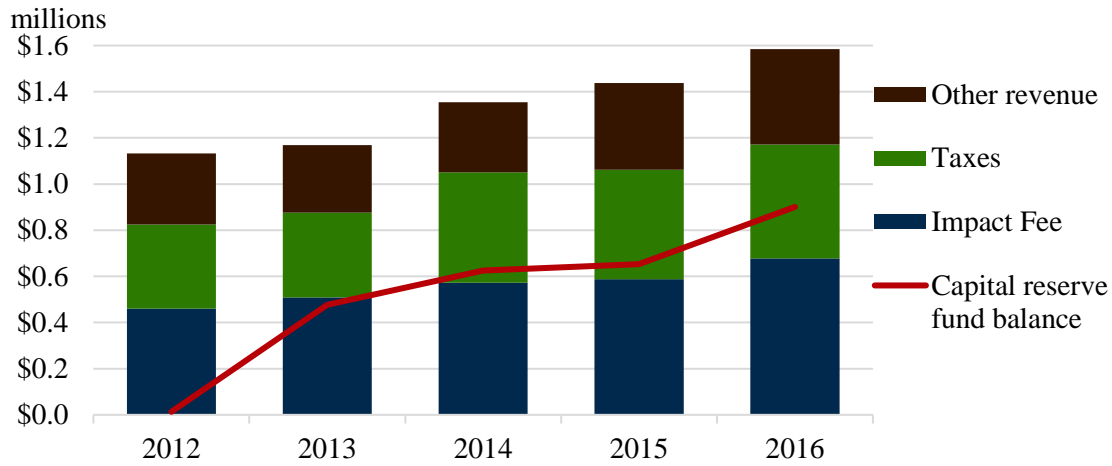
Impact Fee revenue has increased the township's annual budget by more than 40 percent each year since 2012. These added revenues have allowed the township to build a substantial reserve fund, growing from almost \$0 in 2012 to \$900,000 in 2016 (Figure 31).

In-kind contributions for road repairs are substantial, with formalized RUMAs. However, township officials spend the bulk of their time monitoring those agreements and "staying on" the companies to ensure that repairs are made. Despite these efforts, township officials have not always been happy with the resulting repairs. These road issues have imposed large opportunity costs and have made it difficult for staff to work on other priorities.

In addition, local officials express major concern over quality-of-life issues, particularly related to land use impacts. The rural, hilly region has seen substantial new development, with well pads, compressor stations, and pipelines altering the landscape in ways that has generated concern.

²³ Interview with Township Supervisors Seann P. McCollum and Edward "Butch" Deter and Township Secretary Dawn Horr, November 9, 2016, Center Township, PA.

FIGURE 31 CENTER TOWNSHIP ANNUAL REVENUES AND CAPITAL RESERVE FUND BALANCE



Data Source: Center Township annual budgets, accessed via hard copy.

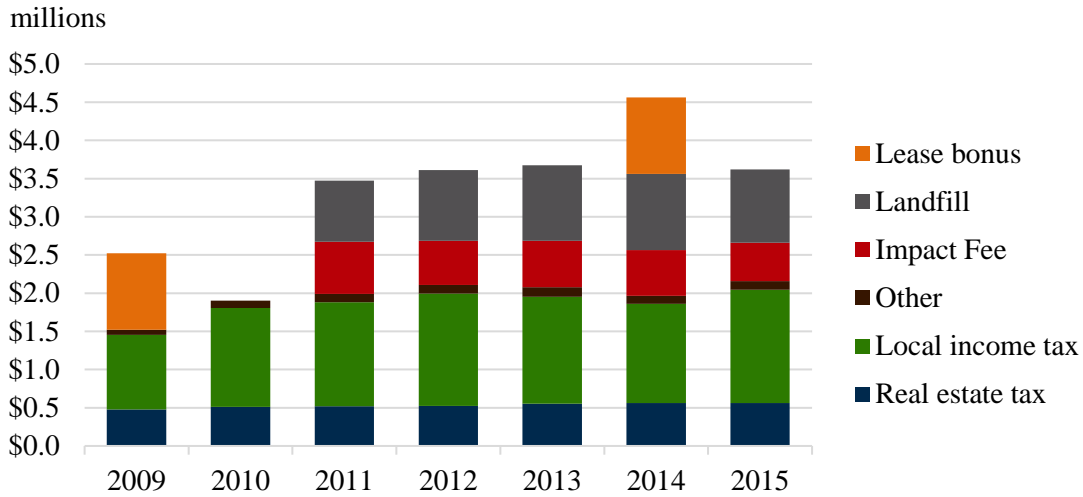
5.4.2.2. Chartiers Township, Washington County, Pennsylvania²⁴

Marcellus development has slowed in Chartiers Township, and though the fiscal impacts are not as dramatic as they were in 2012 or 2013, they are still substantial and positive. Impact Fee revenues have enabled local officials to upgrade capital equipment and invest in infrastructure. Other revenue growth attributable to shale development has allowed for expanded services. However, if revenues continue to fall, services will need to be trimmed or other revenue will have to be raised.

As Figure 32 highlights, revenue has decreased slightly from its 2013 peak, with 2016 revenues expected to fall below 2015 levels. Local officials attribute roughly 75 percent of this to reduced oil and gas activity and 25 percent to the closing of a Caterpillar equipment facility, a large local employer. Revenues from the Impact Fee and local landfill fees have been the leading Marcellus-related source, growing from \$0 in 2010 to a peak of \$1.6 million in 2013. In addition, the township received a leasing bonus of about \$1 million in 2009, but wells were not drilled within the five-year lease window. In 2014, the township received another bonus of \$1 million to release the land.

²⁴ Interview with Township Manager Jodi Noble, November 7, 2016, Chartiers Township, PA.

FIGURE 32. CHARTIERS TOWNSHIP ANNUAL REVENUES



Data Source: Chartiers Township annual budgets, accessed via hard copy.

In-kind road repairs from operators are also important. The township has negotiated a RUMA with each operator, and that process has gone smoothly, according to local officials. In one case, the costs of a \$3 million expansion and upgrade of a local road were shared evenly between the township and one local operator with wells in the region. Because of these types of agreements, the township estimates that it has spent just \$100,000 on roads as a result of Marcellus development.

Unlike other townships we examined, Chartiers maintains its own police force, which has continued to see a small increase in demand due primarily to theft from Marcellus production sites. In addition, workforce retention continues to be a challenge, mostly regarding finding seasonal workers to plow roads. The township raised hourly compensation from \$10 to \$15 for these shifts but still struggles to fill positions during the winter.

Finally, local officials express concern that the buildout of pipelines across rural farms will impede future economic growth. Prior to

Marcellus development, a number of local farmers expressed interest in selling their land for development. However, private revenues from leasing bonuses and royalties have enabled those farms to continue operating, a positive outcome for farmers but a planning challenge for a growing township like Chartiers.

5.4.2.3. South Franklin Township, Washington County, Pennsylvania²⁵

Marcellus development has been a large positive for South Franklin Township’s finances. The downturn has led to a small decline in revenues, but the Impact Fee has allowed a variety of capital upgrades that would not have been possible otherwise. In addition, the township has built its capital reserve fund balance from roughly \$100,000 in 2012 to \$745,000 in 2016.

As Figure 33 highlights, revenues have grown substantially over the past decade, primarily due to Impact Fees and income taxes. Impact Fee revenues have gone to upgrading vehicles and other equipment, as

²⁵ Interview with Township Manager Tyler Linck, November 7, 2016, South Franklin Township, PA.

well as improving roads that were in need of repair before Marcellus development. Employment growth from shale development has helped drive income tax revenues from a low near \$300,000 in 2007 to a high near \$500,000 in 2015. Local officials also report that tax compliance has grown, attributing this trend to improved economic conditions as a result of Marcellus development.

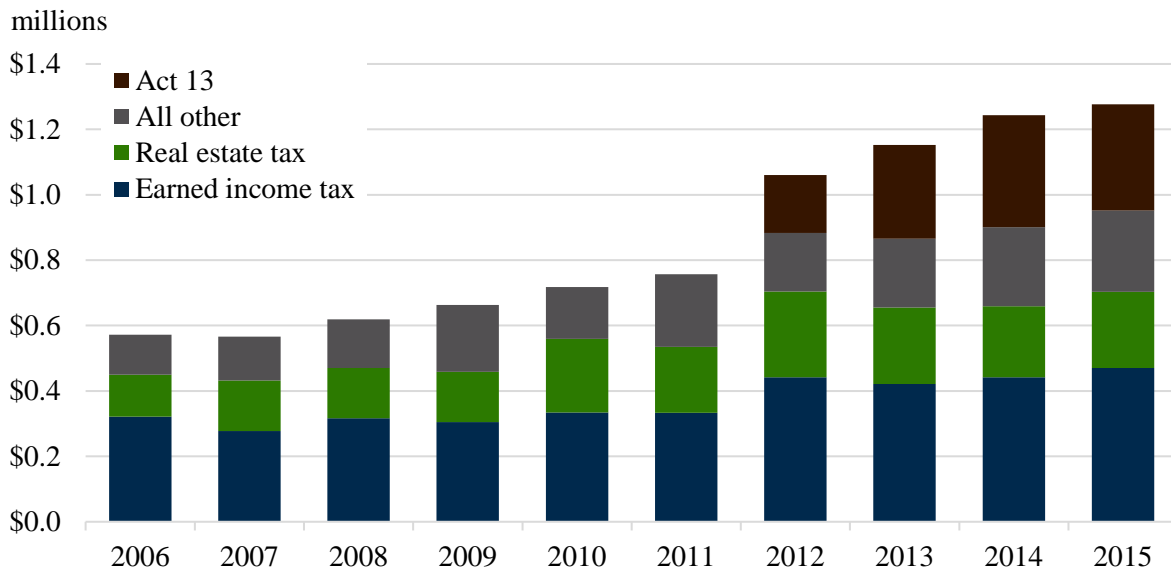
In-kind contributions for road repairs have also been very important. In South Franklin Township, RUMAs are not negotiated, but road repairs are instead required by township ordinances. The main operator in the township has improved several roads and, in one case, restored a collapsed road that was not caused by oil and gas development at a cost of \$900,000. In addition, the township has

received donations of roughly \$150,000 worth of road materials. According to local officials, roads are in better condition now than before shale development.

The township is also using Impact Fee funds to help finance an \$11 million addition of a sewer system for the northern part of the township. This project, which has been part of township plans for over 20 years, would likely not have been possible without impact fee revenues.

While there has been increased demand on local officials to respond to residents who report issues related to roads or truck traffic, there have been no additional hard costs. Local officials do not report any other major costs or challenges with workforce retention.

FIGURE 33 SOUTH FRANKLIN TOWNSHIP ANNUAL REVENUES



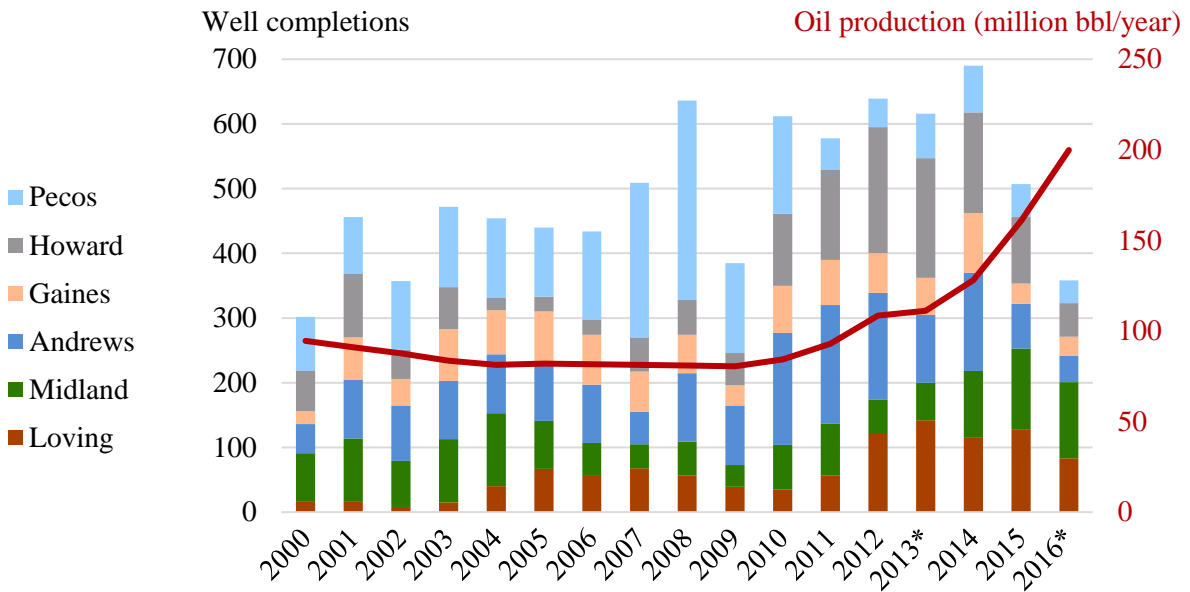
Data Source: South Franklin Township annual budgets, provided via email.

5.5. Permian Basin, Texas

Unlike most other regions, the Permian Basin in Texas has seen continued growth in production despite the downturn in commodity prices. As Figure 34 highlights, oil production has grown substantially in the six counties we examined despite a decline in the number of well completions. These gains are a result of continued improvements in oilfield technology and increased efficiency coupled with the quality of resources found in the Permian Basin.

However, because of the downturn in drilling activity, most local officials describe a decline in demand for services. In addition, lower commodity prices have substantially reduced property tax values and associated revenues. As discussed in Section 4.3.1, state guidelines exert downward pressure on tax rates when property values grow (as they do when oil and gas prices rise), leaving local elected officials with the difficult choice of either increasing tax rates or cutting expenditures when property values fall (as they do when oil and gas prices fall).

FIGURE 34 WELL COMPLETIONS AND OIL PRODUCTION IN SELECT PERMIAN BASIN COUNTIES



Data Sources: Drillinginfo, <https://info.drillinginfo.com/#explore>, for completions; Texas Railroad Commission, <http://www.rrc.state.tx.us/oil-gas/>, for production.

5.5.1. Permian Counties

5.5.1.1. Andrews County, Texas²⁶

Revenue volatility resulting from large changes in oil prices has created budgeting challenges that Andrews County officials describe as “brutal” and the most challenging they have seen during 15 years in office. Despite the challenges associated with managing revenue volatility, officials believe that without the oil and gas industry, both county residents and the government would be substantially worse off. As a result, they describe the oil and gas industry as having a positive net fiscal impact. This view is supported by fiscal data, as the county’s net position has improved considerably over the past 10 years (Figure 35).

The leading contributor to this growth in assets has been revenue from property taxes, the county’s primary source. As property values grew from \$3.3 billion in FY 2010 to more than \$7 billion in FY 2015, the tax rate fell from 48 to 34 mills, resulting in relatively modest revenue growth. As property values declined by almost half from 2015 to 2017, tax rates grew to 57 mills, enough to prevent a 50 percent decline but still resulting in substantial revenue declines (Figure 36). Because of these downturns, the county has cut annual spending from \$27 million to \$24 million in its most recent budget.

Andrews County received about \$9 million in onetime TIF funding, matched by \$3 million from the county. Local officials report no major in-kind contributions from operators and have been reluctant to ask because they already shoulder a large share of the tax burden.

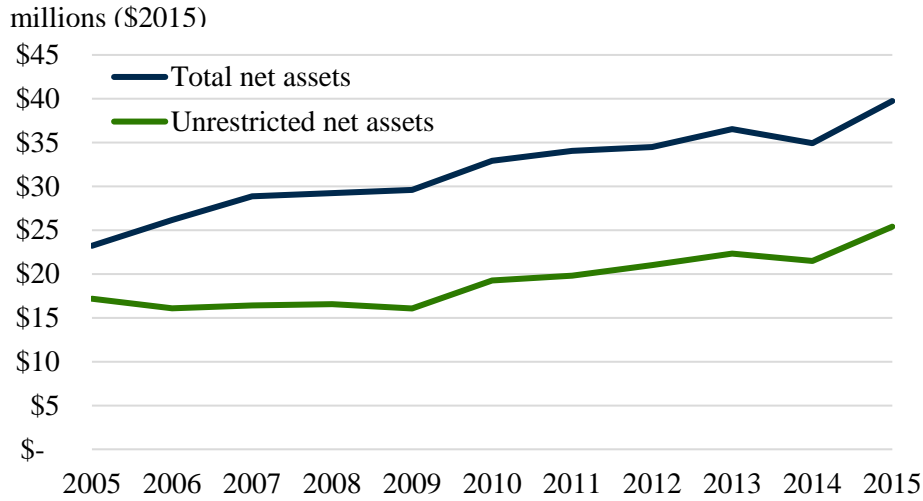
County government costs have been led by roads, which were heavily affected during the most active periods of drilling and have declined with the downturn. However, officials state that roads are in better shape than before the boom as a result of improvements enabled by new revenues.

Law enforcement saw an upswing in a variety of issues during the boom, and despite the decrease in drilling activity, demand has remained high. Vehicle accidents have declined somewhat, but officers are still very busy. Another public safety concern relates to fires that can be caused by electrical lines serving oilfields. In 2009, a series of large grass fires caused by downed electrical lines in producing areas led to substantial onetime costs. However, there have not been any repeats of this kind of incident.

County staffing increased somewhat during the upswing, mostly in the county clerk’s office, and staff is now being decreased through attrition. There is also a soft hiring freeze, with departments needing to justify any new hires.

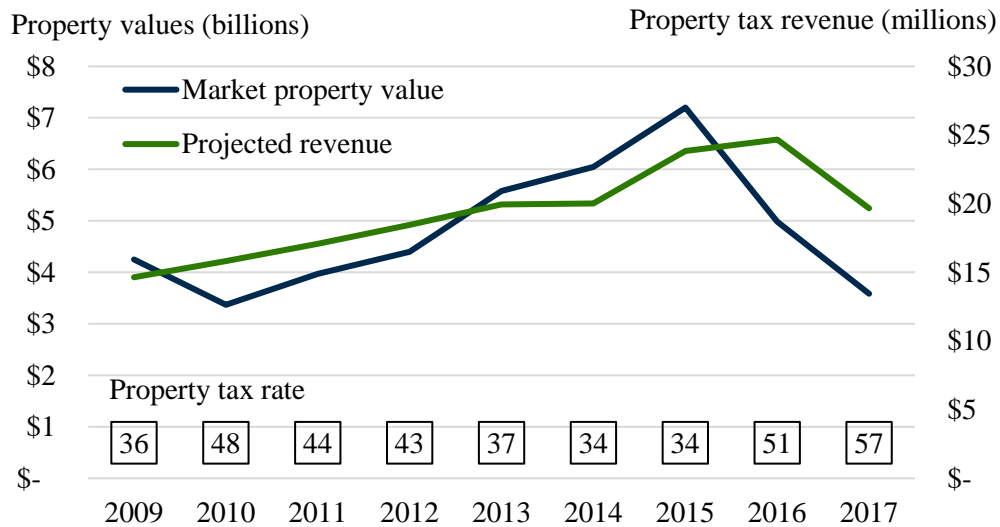
²⁶ Interview with County Judge Richard Dolgener, November 30, 2016, Andrews, TX.

FIGURE 35 ANDREWS COUNTY TOTAL NET ASSETS AND UNRESTRICTED NET ASSETS



Data Source: Andrews County Auditor’s Office, annual financial audits (2006-2016), http://www.co.andrews.tx.us/departments/financial_transparency.php.

FIGURE 36 ANDREWS COUNTY PROPERTY VALUES, TAX RATE, AND REVENUE



Data Source: Andrews County Auditor’s Office, annual financial audits, (2006-2016), http://www.co.andrews.tx.us/departments/financial_transparency.php.

5.5.1.2. *Gaines County, Texas*²⁷

Despite the ups and downs of the industry and substantial fiscal challenges, Gaines County officials state that the oil industry's presence is a large net fiscal positive. Similarly to Andrews County, oil revenues have enabled the government to provide better services than it could without the industry. As shown in Figure 37, county net assets have grown dramatically in recent years, approximately tripling from 2007 through 2015.

Property taxes provide about 98 percent of county revenue, and values have been very volatile in recent years. In previous years, the county put some windfall revenues in reserve funds, but the recent dramatic decline coupled with rollback property tax rate restrictions have created substantial budgeting challenges. Projected property tax collections in FY 2017 are roughly \$17 million, 24 percent lower than in FY 2015 and lower than in any year for which data are available (to FY 2009). This decline in revenue has occurred despite an increase in the countywide property tax rate of 70 percent over the same period (Figure 38). Because of these revenue declines, the county is now cutting staff, primarily through attrition, along with making some reductions in law enforcement.

Local officials cite the rollback provisions on property tax rates as a major budgeting challenge but note that changes are difficult to envision. While the county is eager to diversify its economy and tax base, it is not clear how such a goal would be achieved, and no long-term planning effort is under way.

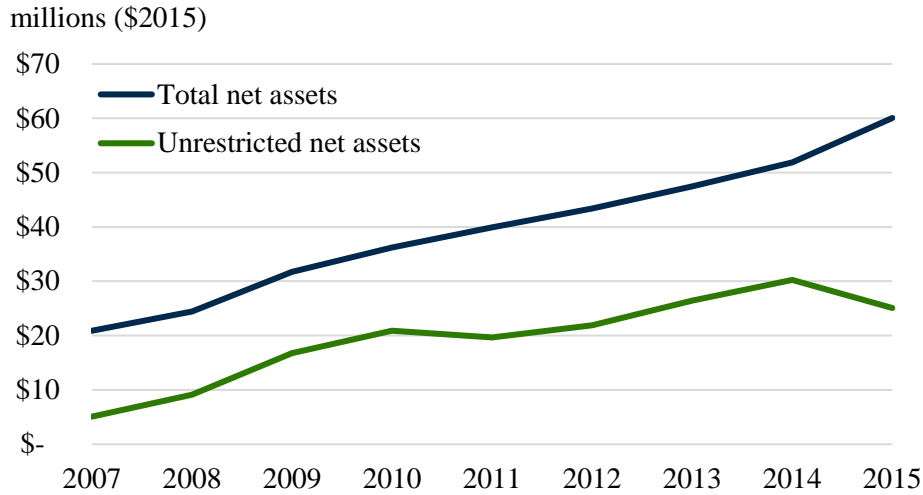
The county received \$4.1 million in onetime TIF funding in 2014 to address road damage and other impacts, matching those funds with roughly \$1 million of its own. Local officials report no major in-kind contributions from industry, though there is some interest in asking companies to assist in road repair, an issue that has also arisen in the context of wind development, which affects local roads too.

Road damage has been the leading challenge for Gaines County, increasing and decreasing with the level of drilling activity in the region. Overall, local officials estimate that roads are in about the same condition as before the most recent boom, though keeping up with repairs has been a challenge.

Law enforcement needs tend to follow the ups and downs of oilfield activity, as does activity in the county clerk's office, which handles land records. Workforce retention has been a continuing challenge for the county, which has struggled to attract and retain a quality workforce since around 2007.

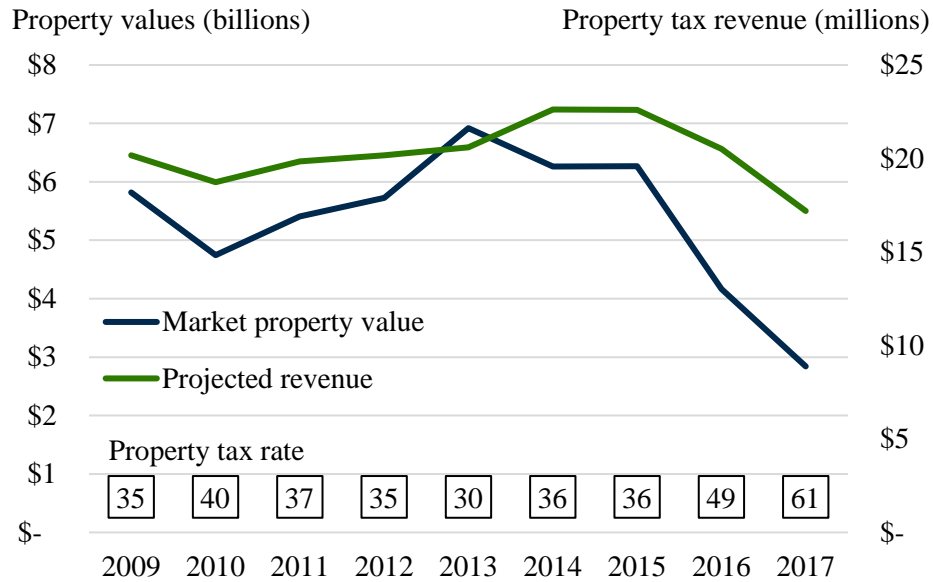
²⁷ Interview with County Judge Tom Keyes, November 29, 2016, Seminole, TX.

FIGURE 37 GAINES COUNTY TOTAL NET ASSETS AND UNRESTRICTED NET ASSETS



Source: Gaines County Auditor, annual financial audits, (2008-2016), http://www.co.gaines.tx.us/default.aspx?Gaines_County/Financial.CAFR.

FIGURE 38 GAINES COUNTY PROPERTY VALUES, TAX RATE, AND REVENUE



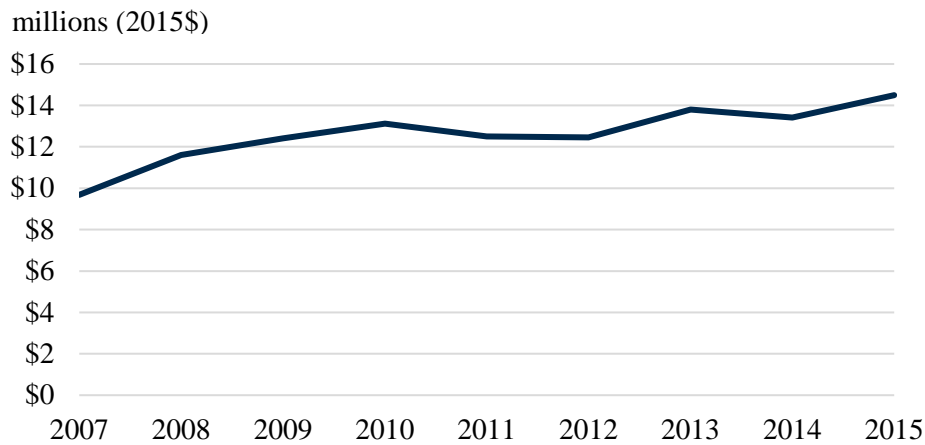
Source: Gaines County Auditor, annual financial audits, (2008-2016), http://www.co.gaines.tx.us/default.aspx?Gaines_County/Financial.CAFR.

5.5.1.3. Howard County, Texas²⁸

Local officials in Howard County describe increased oil and gas activity as having created a number of major challenges. However, benefits in terms of increased revenue and quality of services have generally outweighed these

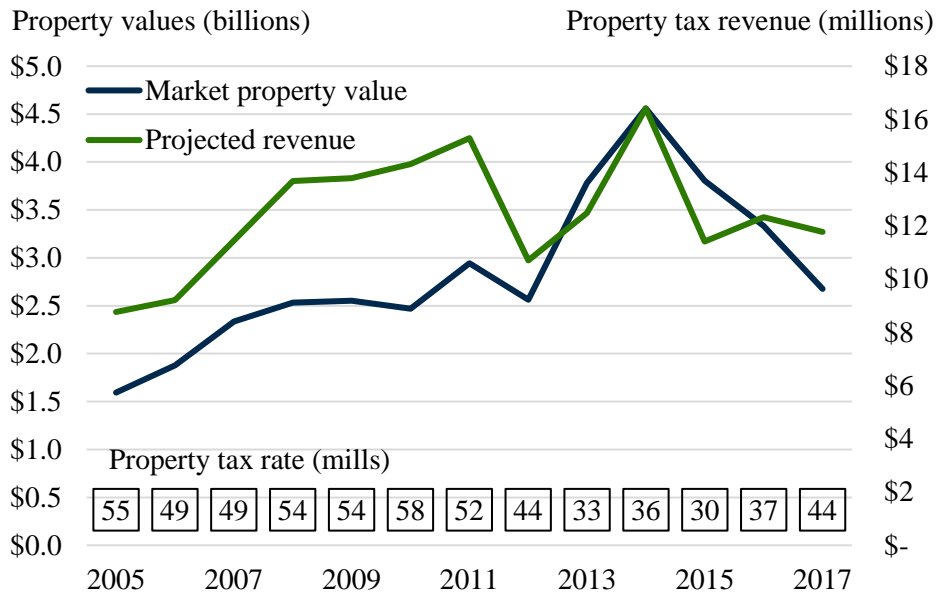
challenges, resulting in a net positive impact. As in other counties in the Permian, local officials report that the employment and tax base provided by the industry is substantial, and the county would be worse off without it. Figure 39 shows trends in the county's net assets.

FIGURE 39 HOWARD COUNTY NET ASSETS



Data Source: Howard County Auditor, comprehensive annual financial reports, (2007-2016), http://www.co.howard.tx.us/default.aspx?Howard_County/Financial.CAFR.

FIGURE 40 HOWARD COUNTY PROPERTY VALUES, TAX RATES, AND REVENUES



Data Source: Howard County annual budgets, (2007-2017), http://www.co.howard.tx.us/default.aspx?Howard_County/Budgets.

²⁸ Interview with County Judge Kathryn Wiseman, November 29, 2016, Big Spring, TX.

As in other Texas counties, property taxes make up the bulk of revenue but are also highly volatile because of their connection with commodity prices. As Figure 40 shows, property values and revenues grew rapidly from 2012 through 2014, then declined almost as quickly over the following three years. During this period, property tax collections grew by 53 percent, to \$16 million in FY 2014, then fell by roughly 40 percent, to \$12 million in FY 2017. As in other counties heavily reliant on oil and gas revenue, property tax rates generally moved in the opposite direction.

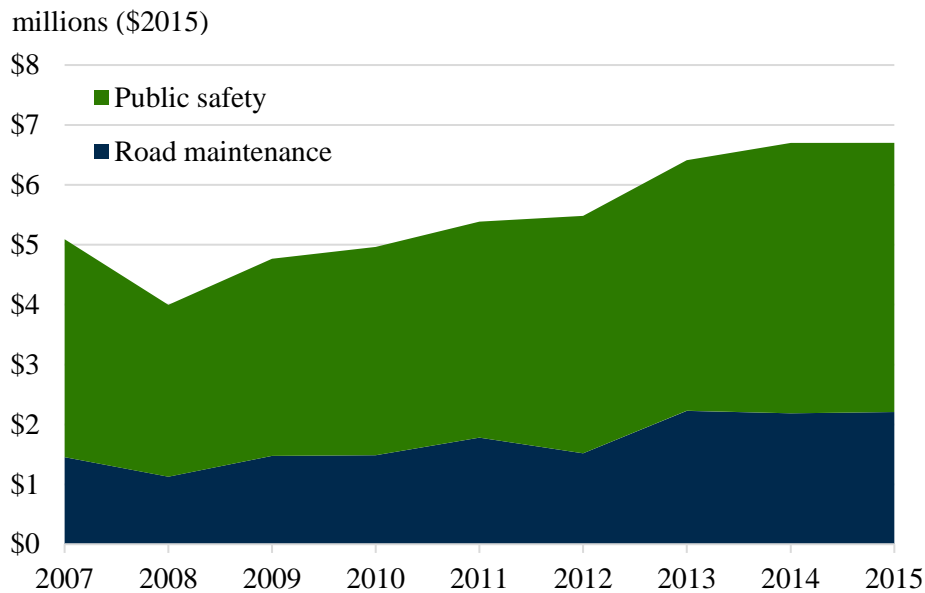
The only other major revenue source for the county has come in the form of \$3.8 million in TIF grant funds.

Roads have been the largest fiscal challenge. The county estimates \$30 million in industry-related damage and that funds are insufficient for all needed upgrades. Expenditures on road maintenance have consistently increased over the last decade,

growing from \$1.3 million in 2007 to \$2.2 million in 2015. Several roads in the region have been repaired by operators, but these efforts have not been systematic or coordinated with the county.

One area of increased costs, as well as forgone revenues for Howard County, relates to law enforcement. Local officials report that demand has grown substantially, driven by traffic accidents, fires at well sites and storage facilities, and increased criminal activity, including drunk driving, theft, assault, and drug-related issues. Because of the time needed to focus on these issues, officers have made fewer routine citations, resulting in decreased revenues. Law enforcement program revenues fell from \$160,000 in 2011 to just \$64,000 in 2012 as a result of this redirection in focus. At the same time, expenditures on public safety have continued to increase despite the downturn in revenues, growing from \$3 million in 2009 to \$4.5 million in 2014 and \$4.7 million in 2015 (Figure 41).

FIGURE 41 HOWARD COUNTY EXPENDITURES ON ROAD MAINTENANCE AND PUBLIC SAFETY



Data Source: Howard County Auditor comprehensive annual financial reports, (2007-2016), http://www.co.howard.tx.us/default.aspx?Howard_County/Financial.CAFR.

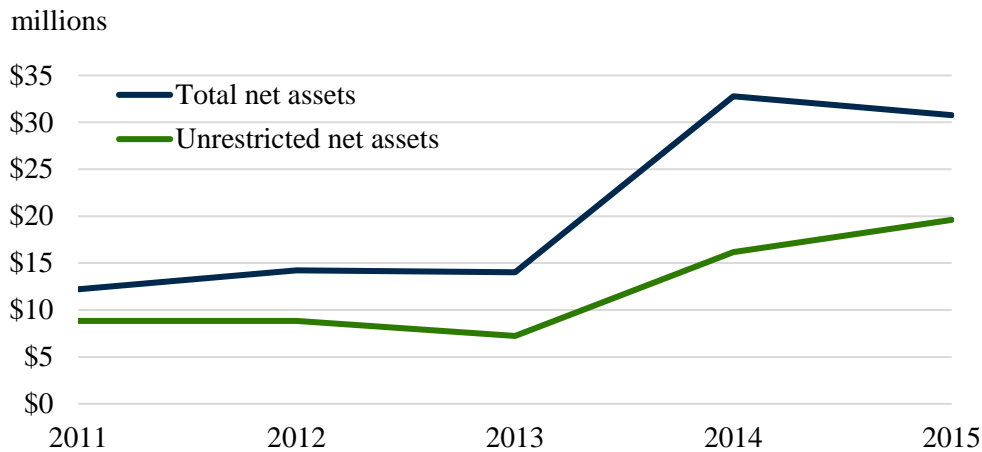
Along with these direct costs, local officials continue to struggle with workforce retention. At the time of our visit, the county was not planning on staff cuts, but wages had been frozen, and a continued downturn in revenues would likely lead to reductions in staffing.

Finally, officials note concerns about water availability, exacerbated by groundwater withdrawals by oil and gas operators in a region where the water table is already stressed. The direct fiscal impacts of these withdrawals have been limited to date, but increased water pumping and treatment costs could result if the water table continues to fall.

5.5.1.4. *Loving County, Texas*²⁹

With just 82 residents spread across 669 square miles (0.12 residents per square mile), Loving County is one of the most sparsely populated counties in the United States. Local officials describe a variety of positive and negative fiscal impacts from increased oil and gas development but report that in general, the positive has outweighed the negative. As Figure 42 shows, net assets and unrestricted assets have grown rapidly, more than doubling since 2013.

FIGURE 42 LOVING COUNTY NET ASSETS AND UNRESTRICTED NET ASSETS



Data Source: Loving County annual financial audits, 2011–15, accessed via hard copy.

²⁹ Interviews with County Auditor Linda Clark, December 2, 2016, Mentone, TX, and County Judge Skeet Lee Jones, December 9, 2016, via phone.

Unlike most other oil- and gas-producing counties in Texas, Loving County has seen property values grow through 2016, as improved technology has increased the overall value of accessible oil and gas resources, despite the downturn in prices (Figure 43).

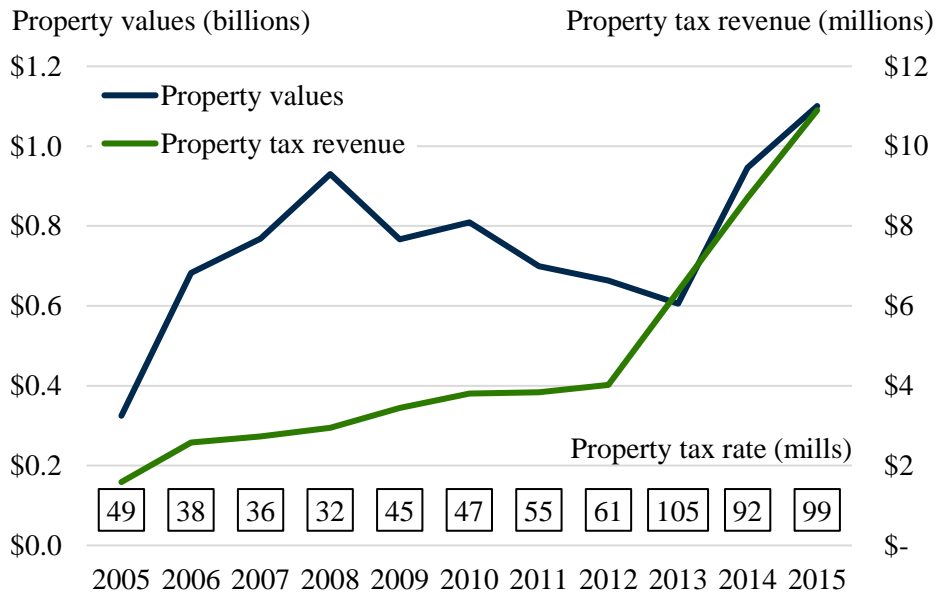
While the county has seen some increased revenues for permit fees from pipelines crossing county roads and clerk’s fees, property tax revenue has dominated revenue growth. Illustrating the change, total revenues roughly tripled from \$6.6 million in FY 2013 to \$19.3 million projected in 2016.

Along with these new revenues have come substantial challenges, led by road repairs. Just prior to the growth in activity that peaked in 2013, the county borrowed \$20 million to upgrade one stretch of road (County Road 300). However, after the upgrade was

completed, the road deteriorated rapidly as a result of industry truck traffic. Other, smaller roads have also been heavily affected, though those costs are harder to quantify. Officials note that as more pipelines are constructed to carry liquids to and from the oilfield, road damage has declined.

The county has also added three sheriff’s deputies, increasing the total law enforcement staffing level from two to five. The county has paid to train these officers and offered high salaries, in part because of competition from oil and gas employers and in part because of the remote location of Loving County. As an indication of the county’s historically limited resources, these officers drive their own vehicles on duty. The primary issue facing these law enforcement officers has been vehicle accidents, some of which have resulted in fatalities.

FIGURE 43 LOVING COUNTY PROPERTY VALUES, REVENUES, AND TAX RATES



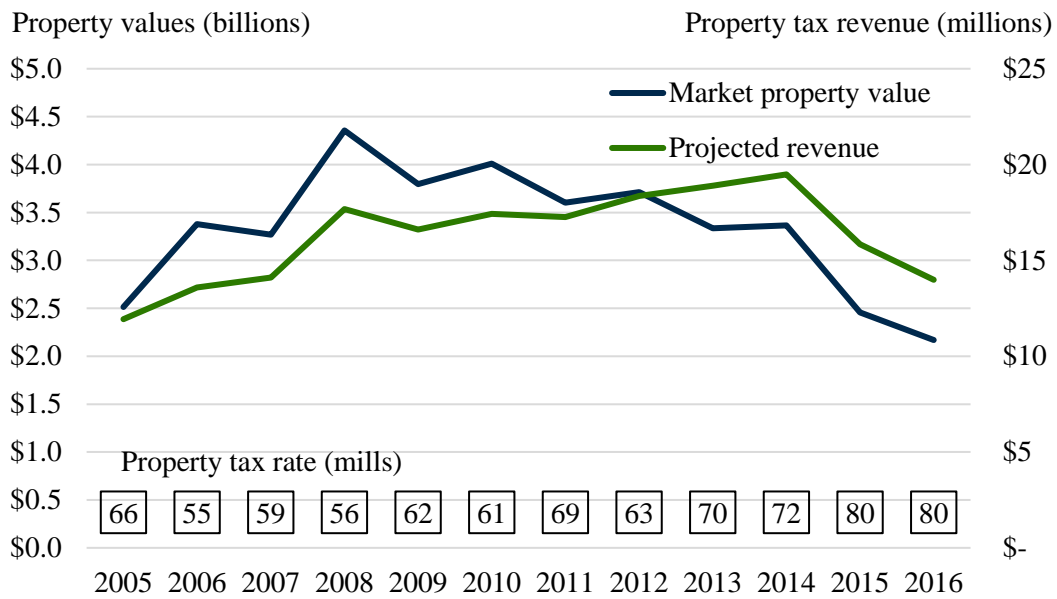
Data Source: Texas Comptroller of Public Accounts, county self-reported property tax data, (2017), provided via email.

5.5.1.5. Pecos County, Texas³⁰

Local officials in Pecos County report that oil and gas activity has had a net positive fiscal impact. At the same time, they describe substantial challenges associated with providing services amid revenue volatility. With an oil- and gas-producing county, “there are always surprises,” say local officials, and as a result, they have sought to put money away during periods of high prices, resulting in a substantial reserve balance and no debt as of the end of 2016.

Oil and gas property makes up roughly 92 percent of county valuations. As with other counties, high oil prices tend to lead to lower tax rates and vice versa. As a result of the downturn in prices, county officials have raised the property tax rate to the state maximum, which is 79.9 mills under most circumstances. Nonetheless, revenues have fallen substantially since their peak in 2014 (Figure 44).

FIGURE 44 PECOS COUNTY PROPERTY VALUES, TAX RATES, AND REVENUES



Data Source: Pecos County annual budgets, (2008-2017), <http://12.227.48.139/category/notices-announcements/county-budgets/>.

³⁰ Interview with County Judge Joe Shuster, December 2, 2016, Fort Stockton, TX.

While property taxes are the primary oil- and gas-related source, the county also receives revenues from oil and gas leases estimated by officials at roughly \$750,000 per year. In addition, Pecos County received about \$2 million in onetime TIF funds in 2014.

Road damage has been the largest challenge for the county, with expenditures nearly doubling in 2013 to keep up with the boom. Local officials estimate that roads are currently no better or worse off than before the surge in drilling activity, though keeping up with demand has been a challenge.

Law enforcement demands tend to follow the cycle, with periods of high prices leading to an increase in population, which in turn leads to additional instances of drunk driving, bar fights, and domestic assaults. EMS and traffic accidents are also an issue for the county, though they are not closely related to oil and gas activity, as multiple freeways with speed limits of 80 miles per hour bisect Pecos County, resulting in regular accidents.

Staff additions have been substantial and have been driven by oil and gas activity. The county has added approximately 10 new positions to keep up with growth, primarily in the sheriff's office and to a lesser extent in the county clerk's and auditor's offices. Because of the downturn in revenues, the county is now reducing staff through attrition, and there have been no raises for the past three years.

Finally, the county also helps support the local hospital, subsidizing it to the tune of \$3 million to \$5 million per year. Local officials report that there is additional demand in the hospital during upturns in oil and gas production, primarily because of worker injuries.

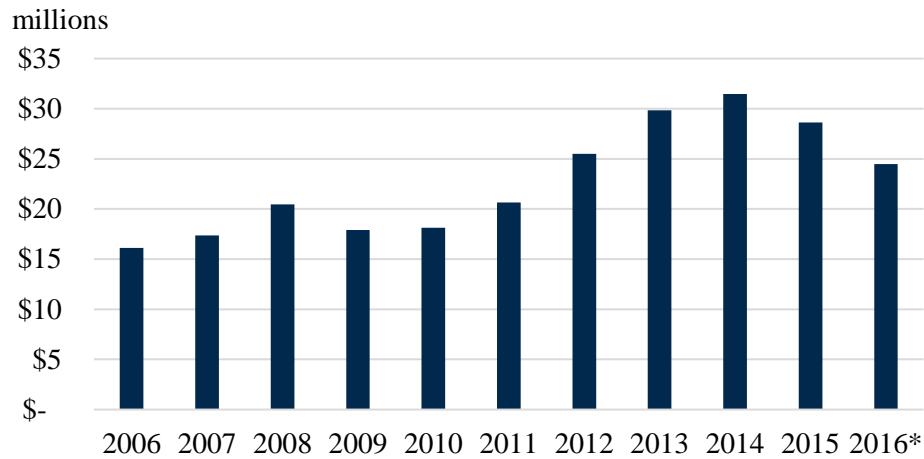
5.5.2. Permian Municipalities

5.5.2.1. Big Spring, Texas³¹

Big Spring (population approximately 28,000), the seat of Howard County, sits roughly 40 miles northwest of Midland. The city experienced substantial population growth through 2014, leading to new challenges alongside increased revenues. After the decline in oil prices, population and revenues receded in tandem. Despite this downturn, local officials report that fiscal conditions are stronger because of the oil and gas industry's presence in the region. As a budgeting strategy, the city has primarily invested boomtime revenues in infrastructure rather than staffing, limiting the fiscal risks of a downturn in oil prices.

Like other Texas cities, Big Spring relies heavily on sales taxes. Taxable sales grew from \$18 million per month in 2010 to more than \$30 million in 2014, then declined to nearly \$25 million per month through the first nine months of 2016 (Figure 45). Local officials attribute all this change to swings in oil and gas activity.

³¹ Interview with Assistant City Manager John Medina and Director of Economic Development Terry Wegman, November 29, 2016, Big Spring, TX.

FIGURE 45 BIG SPRING MONTHLY AVERAGE TAXABLE SALES

Data Source: Texas Comptroller of Public Accounts, county self-reported property tax data, (2017), provided via email.*Data through September 2016.

Hotel occupancy taxes, a smaller revenue source, also grew during the boom and have now begun to decline. Along with these revenues, the city received a bonus in 2016 of \$800,000 for an oil and gas lease at the city airpark. (The independent airpark authority received an additional \$1.8 million, funds that must be spent on the airpark.)

Workforce retention has been the most substantial challenge for Big Spring, particularly in the police force. At the time of our interview, the city was unable to fill about 10 positions out of 48, despite increasing salaries by \$1 million. The city has taken on the cost of training new officers in an effort to attract more staff. Big Spring has also faced challenges in retaining city utility workers with commercial driver's licenses, as they are often attracted to better-paying positions driving with oil- and gas-related firms.

From 2010 through 2014, the city saw a substantial increase in demand for police, firefighters, and EMS, driven primarily by traffic accidents and fires at and around well sites and storage facilities. A smaller portion of this increase was attributed to drunk

driving, assault, and drug-related crimes driven by increased population. Since the downturn, demand for police has fallen, but demands on EMS and the fire department has remained robust.

Along with these staff costs, population growth led to a major issue with the city landfill. Population grew so rapidly that the landfill was taking on more than it could handle, and for several months, the city had to stop receiving construction waste. Since 2014, the city has added capacity, easing the challenge. However, this issue took substantial time and added capital costs.

In the wake of decreased revenues, Big Spring has begun reducing staff by attrition. Recognizing its exposure to volatile commodity price cycles, the city is pursuing a strategy to diversify its economy, based on its location as a crossroads on an east-west interstate (I-20) and a hoped-for north-south link between Canada and Mexico. Local officials believe that coupled with a large nearby abandoned air force base and a major rail depot, this could help the city be a logistics and transportation hub.

5.5.2.2. Fort Stockton, Texas³²

Fort Stockton (population approximately 8,500) is the seat of Pecos County and lies roughly two hours southwest of Midland, near the edge of the Delaware Basin, which occupies the western portion of the Permian Basin. Local officials report that the ups and downs of the oil industry create challenges but that the net fiscal effects have been positive.

Sales taxes are tied closely to activity in the oilfield, though volatility in Fort Stockton has been more modest than in some other Permian cities (Figure 46). Local officials speculate that this is because most operations nearby are in mature fields, with less shale activity and little new drilling.

Hotel occupancy taxes have also provided helpful revenues, but these have been limited because hotel taxes are not collectible if a single occupant books a room for more than 30 days, and large blocks of rooms are often booked by companies for extended stays. The city has also collected modest revenues from leases on city lands.

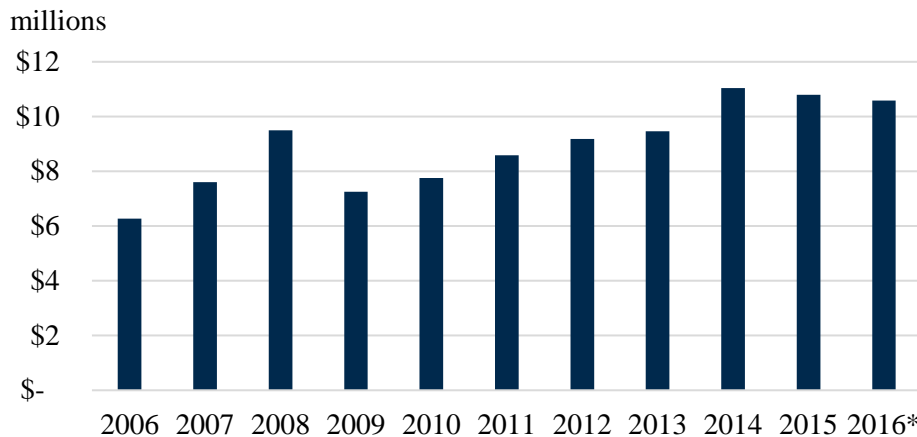
In March 2017, several months after our interviews, the construction of a \$450 million

refinery near Fort Stockton was announced (MMEX Resources Corp. 2017). According to press reports, this refinery will focus on refining Permian Basin crude for export to the Mexican market. It would provide a hedge for the city by increasing employment and tax revenue associated with the midstream market, where profits do not always move in sync with drilling activity tied to upstream prices.

Unlike in some Texas cities, roads and bridges in Fort Stockton have been substantially affected by industry traffic. The city has designated haul routes that are the most heavily affected, though local officials report that the issue does not create a major fiscal strain. While sewer and water systems have not been a major issue to date, local officials express concern that they will be in the future, as continued population growth would likely be driven by oil and gas development.

Workforce retention, which is typically a challenge during boom periods, has not been an issue during the recent period of low prices. Similarly, law enforcement services tend to see an uptick during boom periods, with issues including bar fights, drunk driving, and drugs.

FIGURE 46. FORT STOCKTON MONTHLY AVERAGE TAXABLE SALES



Data Source: Texas Comptroller of Public Accounts, county self-reported property tax data, (2017), provided via email. *Data through September 2016.

³² Interview with City Administrator Raul Rodriguez, December 2, 2016, Fort Stockton, TX.

6. References

- Andrews County Auditor, 2006-2016. Annual Financial Audits. URL http://www.co.andrews.tx.us/departments/financial_transparency.php
- Bartik, A.W., Currie, J., Greenstone, M., Knittel, C.R., 2017. The Local Economic and Welfare Consequences of Hydraulic Fracturing. National Bureau of Economic Research Working Paper Series No. 23060
- Brown, J.P., Fitzgerald, T., Weber, J.G., 2016. Capturing rents from natural resource abundance: Private royalties from U.S. onshore oil & gas production. *Resource and Energy Economics* 46, 23-38
- Considine, T.J., Watson, R., Blumsack, S., 2011. The Pennsylvania Marcellus Natural Gas Industry: Status, Economic Impacts, and Future Potential. Penn State University, Prepared for the Marcellus Shale Coalition
- Costanzo, C., Kelsey, T.W., 2012. Marcellus Shale and Local Collection of State Taxes: What the 2011 Pennsylvania Tax Data Say. Penn State Center for Economic and Community Development
- DiNapoli, T.P., 2014. Fiscal Stress Monitoring System. Office of the New York State Comptroller, Albany, NY
- Feyrer, J., Mansur, E.T., Sacerdote, B., 2017. Geographic Dispersion of Economic Shocks: Evidence from the Fracking Revolution. *American Economic Review* 107, 1313-34
- Gaines County Auditor, 2008-2016. Annual Financial Audits. URL http://www.co.gaines.tx.us/default.aspx?Gaines_County/Financial.CAFR
- Greene County Finance Office, 2007-2015. Annual Audited Financial Reports. URL <http://www.co.greene.pa.us/secured/gc2/depts/adm/index.htm>
- Hardy, K., Kelsey, T., 2015. The Shale Gas Economy in the Northeast Pennsylvania Counties. In: Hefley WE & Wang Y (eds.) *Economics of Unconventional Shale Gas Development*. Springer International Publishing, pp. 71-91.
- Hardy, K., Kelsey, T.W., 2014. Local and nonlocal employment associated with marcellus shale development. National Agricultural and Rural Development Policy Center, Policy Brief 26
- Headwaters Economics, Oklahoma Policy Institute, 2013. Unconventional Oil and Natural Gas Production Tax Rates: How Does Oklahoma Compare to Peers? , Headwaters Economics Oklahoma Effective Tax Rate Study
- Howard County Annual Budgets, 2007-2017. Annual Budgets. URL http://www.co.howard.tx.us/default.aspx?Howard_County/Budgets
- Howard County Auditor, 2007-2016. Comprehensive Annual Financial Reports. URL http://www.co.howard.tx.us/default.aspx?Howard_County/Financial.CAFR
- Hoy, K.A., Kelsey, T.W., Shields, M., 2017. An Economic Impact Report of Shale Gas Extraction in Pennsylvania with Stricter Assumptions. *Ecological Economics* 138, 178-185
- Justice, J.B., Scorsone, E.A., 2013. Measuring and Predicting Local Government Fiscal Stress. In: Levine H, Scorsone EA & Justice JB (eds.) *Handbook of Local Government Fiscal Health*. Jones and Bartlett Learning, Burlington, MA, pp. 43-74.
- Kelsey, T., Hardy, K., 2015. Marcellus Shale and the Commonwealth of Pennsylvania. In: Hefley WE & Wang Y (eds.) *Economics of Unconventional Shale Gas Development*. Springer International

- Publishing, Cham, Switzerland, pp. 93-120.
- Krupnick, A.J., Echarte, I., 2017. Economic Impacts of Unconventional Oil and Gas Development.
- Krupnick, A.J., Echarte, I., Muehlenbachs, L.A., 2017. Local Government Impacts of Unconventional Oil and Gas Development.
- McFarland, C., Pagano, M.A., 2014. City Fiscal Conditions 2014. National League of Cities, Center for City Solutions and Applied Research
- MMEX Resources Corp., 2017. MMEX Resources Announces Plan to Build \$450 Million Refinery in Permian Basin. Nasdaq Globe Newswire
- Muehlenbachs, L., Spiller, E., Timmins, C., 2016. The Housing Market Impacts of Shale Gas Development: Corrigendum. American Economic Review 106, 475-475
- Newell, R.G., Raimi, D., 2015. Shale Public Finance: Local Government Revenues and Costs Associated with Oil and Gas Development. National Bureau of Economic Research Working Paper w21542
- North Dakota Treasurer's Office, 2016. Revenue Distribution webpage. URL <http://www.nd.gov/treasurer/revenue-distribution/>
- Pecos County, 2008-2017. Annual Budgets. URL <http://12.227.48.139/category/notices-announcements/county-budgets/>
- Pennsylvania Public Utility Commission, 2017. Act 13 (Impact Fee). URL http://www.puc.state.pa.us/filing_resource/s/issues_laws_regulations/act_13_impact_fee_.aspx
- Perryman Group, 2011. A Decade of Drilling: The Impact of the Barnett Shale on Business Activity in the Surrounding Region and Texas: An Assessment of the First Decade of Extensive Development. Prepared for the Fort Worth Chamber of Commerce
- Plerhoples, C., Scorsone, E., 2011. Proposed alterations to the local government fiscal stress indicator system for the state of Michigan. Michigan State University, East Lansing, MI. Department of Agricultural, Food, and Resource Economics Staff Paper.
- Raimi, D., Newell, R.G., 2016a. Dunn County and Watford City, North Dakota: A case study of the fiscal effects of Bakken shale development. Duke University Energy Initiative working paper
- Raimi, D., Newell, R.G., 2016b. Local fiscal effects of oil and gas development in eight states. Duke University Energy Initiative working paper
- Raimi, D., Newell, R.G., 2016c. US State and Local Oil and Gas Revenues. Resources for the Future Working Paper 16-50
- Texas Comptroller of Public Accounts, 2017. County Self Reported Property Tax Data. Provided via email on May 10, 2017
- Texas Dept. of Transportation, 2017. Texas County Infrastructure Fund Program. URL <http://www.txdot.gov/government/funding/county-fund.html>
- Tunstall, T., Oyakawa, J., 2013. Economic Impact of Oil and Gas Activities in the West Texas Energy Consortium Study Region. University of Texas at San Antonio Center for Community and Business Research, Institute for Economic Development
- Tunstall, T., Oyakawa, J., 2014. Economic Impact of the Eagle Ford Shale. University of Texas at San Antonio Center for Community and Business Research, Institute for Economic Development
- Univ. of AR Center for Business and Economic Research, 2012. Revisiting the

- economic impact of the natural gas activity in the Fayetteville Shale: 2008-2012. University of Arkansas Sam M. Walton College of Business, Fayetteville, AR
- Washington County Finance Office, 2005-2017. Annual Budgets. URL <http://www.co.washington.pa.us/139/County-Budget>
- Weber, J., Burnett, J., Xiarchos, I.M., 2014. Shale Gas Development and Housing Values over a Decade: Evidence from the Barnett Shale. USAEE Working Paper No. 14-165
- Weber, J.G., Chomas, M., Wang, Y., 2015. How Much Do US State Governments Really Tax Oil and Gas Extraction? , Retrieved from SSRN
- Windsor Finance Office, 2016. Comprehensive Annual Financial Report. URL <https://www.windsorgov.com/481/Annual-Fin-Reports-CAFR>