

# US state and local oil and gas revenue sources and uses



Richard G. Newell<sup>a</sup>, Daniel Raimi<sup>b,\*</sup>

<sup>a</sup> *Resources for the Future, 1616 P Street NW, Washington, D.C. 20036, United States*

<sup>b</sup> *Resources for the Future, Ford School of Public Policy, University of Michigan, 735 S. State Street, Ann Arbor, MI 48109, United States*

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## ABSTRACT

US state and local governments generate revenues from oil and gas production through a variety of mechanisms. In this paper, we quantify four leading sources: (1) state taxes levied on the value or volume of oil and gas produced; (2) local property taxes levied on the value of oil and gas property; (3) oil and gas lease revenues from state lands; and (4) oil and gas lease revenues from federal lands. We measure these revenues against the total value of oil and gas produced in the top 16 oil- and gas-producing states using fiscal year 2013 as a benchmark. On average, state and local governments collect roughly 10% of oil and gas revenue, ranging from a low of roughly 1% to a high of nearly 40% (not including income taxes). We also assess the use of these revenues, finding that there is substantial variation among states. The largest shares of revenue flow to state governments' current expenditures and education, followed by local governments. Some states also allocate a portion of oil and gas revenues to trust funds endowing future government operations and/or education expenditures.

## 1. Introduction

Oil and gas production has grown substantially in the United States over the past decade, with major implications for state and local governments in regions where production occurs. Over the coming decades, most projections forecast that US production will likely remain at or above historically high levels (BP, 2016; ExxonMobil, 2016; International Energy Agency, 2015; U.S. Energy Information Administration, 2016), suggesting that oil and gas will continue to play a major role in numerous state and regional economies.

While the US federal government levies taxes and imposes certain regulations on the oil and gas industry, the bulk of fiscal and regulatory policy is designed and implemented at the state level. However, as policymakers consider how to tailor their fiscal policies to best meet the needs of residents, businesses, and multiple levels of government, there is limited analysis that allows stakeholders to compare policies among states.

## 2. Background and related literature

Because mining activities such as oil and gas often generate economic rents, taxes on resource extraction have the potential to be less distortionary than other taxes (e.g., taxes on wages or corporate income), allowing governments to raise revenue with less distortion of private behavior. If the revenue is saved, taxes on non-renewable natural resources can also be used to compensate future generations, who

will not be able to produce resources extracted in previous decades. In addition, taxes on mining can be attractive to governments because, unlike many other industries (e.g., manufacturing), the opportunities for firms to shift their operations across borders are more limited since they can only mine in locations where the resource exists. Severance taxes may also be used to offset negative impacts to the environment or public services (e.g., road damage), though in practice, most revenue flows to state general funds (Raimi and Newell, 2016c).

Property taxes apply broadly to real and personal property, with bases and rates varying widely. Methodologies for assessing the value of oil and gas property also vary between states, with most states either taxing the value of the recoverable resource (based on discounted future cash flows or some other model), or taxing the gross value of the produced oil and gas.

Governments also generate revenue from leasing public lands. These revenues accrue to federal, state, or local governments as they would to private landowners, with lease terms negotiated between the two parties. Revenue from leases on federal lands is shared with the state government where the production occurred, helping to compensate states for revenue produced on lands it does not control.

A substantial body of literature examines fiscal policy for natural resource development (Heaps and Helliwell, 1985). In the domain of the oil and gas industry, this research often focuses on fiscal regimes for nations seeking to incentivize production while also achieving broader economic and development goals. Research in this context tends to focus on national (rather than subnational) policy, and because private

\* Corresponding author.

E-mail addresses: [newell@rff.org](mailto:newell@rff.org) (R.G. Newell), [raimi@rff.org](mailto:raimi@rff.org) (D. Raimi).

mineral ownership is essentially unique to the United States, researchers in this field typically analyze situations in which governments are the mineral rights holders (e.g., Agalliu, 2011; International Monetary Fund, 2010; Khelil, 1995; Tordo, 2007). These analyses often refer to the notion of a government “take” ordinarily calculated as the sum of government revenue as a percentage of cash flow from an oil and gas well, project, or operator. Government take estimates typically include lease or concession payments, royalties, corporate income or profit taxes, production-sharing agreements, revenues to national oil companies, and other sources. These estimates generally do not include indirect or induced revenues such as sales or personal income taxes affected by oil and gas activity.

As production from shale and other tight resources has dramatically boosted output in the United States, a number of states have made substantial revisions to their fiscal treatment of oil and gas activity, and debate over the issue continues (Rabe and Hampton, 2015). States sometimes compete for oil and gas investment, seeking to grow their economies and provide local employment opportunities, although evidence suggests state oil and gas taxation generally plays a relatively minor role in firms’ investment decisions (Agalliu, 2011; Chakravorty et al., 2011; Gülen et al., 2013).

The fiscal treatment of the oil and gas industry at the state level has attracted attention from a range of researchers and government agencies in recent years. Some of this research outlines basic statutory elements of existing state oil and gas tax policies, highlighting relevant laws and briefly discussing revenue allocation (Brown, 2013). The Colorado Legislative Council Staff (2014) quantifies oil and gas firms’ effective tax rates across state and local jurisdictions, including severance, property, income, and sales taxes, finding that rates range across western states from 4.4% in Colorado to 12.0% in Wyoming. Weber et al. (2016) describe how collections have risen and fallen with the value of production, finding tax rates ranging from 0.1% in California to 8.6% in Montana, with an average of 3.4%.

In multiple reports, Headwaters Economics estimates severance and property taxes in western states based on revenues generated from single hypothetical wells. They discuss the allocations of these revenues and highlight the potential for a temporal gap between when funds are needed and when they are allocated (Headwaters Economics, 2012, 2014; Headwaters Economics and Oklahoma Policy Institute, 2013). Rabe and Hampton (2016) also examine revenue allocation, focusing on whether and how states utilize long-term savings funds in the context of newly abundant resource revenues. This work helps understand how states can utilize resource wealth to benefit future generations, along with minimizing near-term revenue volatility. Along similar lines, Morris (2016) and Saha and Muro (2016) focus on state reliance on revenues from fossil fuel production, highlighting the risks of heavy dependence on these volatile sources.

With the exception of the work by Headwaters Economics, the analyses noted above focus primarily or exclusively on severance taxes, which tax the value and/or volume of produced oil and gas or, in the case of Pennsylvania, an impact fee, which charges an annual fee for each shale well. While this body of research is valuable, it illuminates just one of multiple oil and gas revenue sources, providing a limited picture of how revenues are collected by, and flow to, state and local governments.

On a closely related topic, some recent research examines how oil and gas development affects state and local government spending patterns. James (2015) estimates that for every dollar in additional natural resource revenues, states tend to spend \$0.50, save \$0.30, and reduce non-resource revenues by \$0.20. Other recent research has examined how oil and gas development affects local public spending. Similarly, Marchand and Weber (2015) find that increased property values driven by oil and gas in Texas led to increased per student public education spending, with new revenues flowing to capital projects and debt service rather than teacher compensation. In a wide-ranging study, Bartik et al. (2017) find that growth in local government revenue modestly

outweighs increased expenditures, though per-student education spending remained roughly flat.

This study provides additional insight into fiscal policy in two key ways. First, we include revenues from sources not accounted for in most of the above analyses, notably local government property taxes and revenues from oil and gas leases on state and federal lands. In total, these revenues are similar in magnitude to severance taxes, underscoring their importance. Second, this report quantifies both how revenues are collected and to what purpose they are allocated, whereas most other work focuses only on revenue collection. It also provides a foundation for future research focused on whether and how revenue policies affect the quality of public services, industry investment decisions, economic growth trends, and more.

This paper does not address the costs incurred by state and local governments associated with oil and gas development, nor does it attempt to assess whether revenues collected by states and localities are sufficient to manage any increased demand for government services associated with the industry. We have addressed this topic in previous work (Raimi and Newell, 2016a; Newell and Raimi, 2015), where we find that for most local governments, near-term revenues associated with oil and gas development tend to outweigh near-term costs, including increased demand for services. (We have not examined this question for state governments.)

### 3. Methodology and data

This paper quantifies the revenues raised by state and local governments directly from oil and gas production in fiscal year (FY) 2013. Sources that are directly tied to the value or volume of oil and gas produced within the state are called *direct* revenues. Because of methodological issues and limited data availability, we do not include corporate income taxes from the oil and gas sector or estimate indirect revenues such as sales taxes, income taxes, and other sources that are often affected by changes in population or economic activity brought about by the oil and gas industry.

The major direct revenues for local and state governments associated with oil and gas production are (1) state taxes levied on the value or volume of oil and gas produced (often referred to as “severance” taxes); (2) local property taxes levied on the value of oil and gas property; (3) oil and gas lease revenues from state lands; and (4) oil and gas lease revenues from federal lands.

We focus on the top 16 oil- and gas-producing states: Alaska, Arkansas, California, Colorado, Kansas, Louisiana, Montana, North Dakota, New Mexico, Ohio, Oklahoma, Pennsylvania, Texas, Utah, West Virginia, and Wyoming. During FY 2013, these states accounted for 99% and 97% of US onshore oil and natural gas production, respectively. To make clear comparisons among states, we examine government revenues in a single year, FY 2013, and show the amount of revenues generated as a percentage of the total value of oil and gas produced during that period.

To calculate the total value of oil and gas produced in each state, we rely primarily on data from state and federal government agencies, along with a small set of proprietary natural gas pricing data. For each state, monthly crude oil and marketed natural gas production data are from the US Energy Information Administration (EIA). To estimate the value of production, we multiply these volumes by an estimated average monthly oil and gas price received by the producer. For Louisiana, oil and gas prices are from the state’s Department of Natural Resources (2013). For all other states, we use EIA’s crude oil first purchase price and regional prices at a variety of natural gas market hubs accessed via Bloomberg (Table 1). EIA does not currently report state-level natural gas wellhead prices. We sum estimated oil and gas revenues to derive the total value of oil and gas produced in each state, with summary statistics provided in Table 1.

Next, we gather data on revenues collected by state and local governments from four revenue sources: severance taxes (or similar fees),

**Table 1**

Oil and gas production volumes and prices for 16 states in FY 2013.

Sources: For crude oil and natural gas marketed production: EIA. For crude oil prices: EIA first purchase price. For natural gas prices: AK: Henry Hub; LA: *Energy Facts Annual Report*; other states: regional market hub prices accessed via Bloomberg. Market hubs were determined based on regional gas flows and are as follows: AR: Perryville; CA: SoCal Border; CO: White River; KS: Chicago CityGate; MT: White River; NM: Blanco; ND: White River; OH: Dominion South Point; OK: Chicago CityGate; PA: Dominion South Point; TX: Katy; UT: White River Hub; WV: Dominion South Point; WY: Opal.

State	Oil price (\$/bbl)	Gas price (\$/mcf)	Oil production (million bbl)	Gas production (bcf)	Value of production (billions)
AK	94.97	3.44	186	344	\$18.9
AR	88.21	3.36	7	1,149	\$4.4
CA	102.13	3.52	197	250	\$21.0
CO	84.62	3.31	56	1,652	\$10.2
KS	85.98	3.52	45	292	\$4.9
LA	104.67	3.48	72	2,757	\$17.1
MT	84.47	3.31	28	64	\$2.6
ND	86.28	3.31	277	204	\$24.6
NM	85.55	3.29	93	1,199	\$13.2
OH	90.71	3.39	6	109	\$0.9
OK	88.26	3.52	103	2,083	\$16.5
PA	86.63	3.39	5	2,742	\$9.7
TX	93.68	3.52	861	7,483	\$107.0
UT	80.27	3.31	32	481	\$4.3
WV	86.17	3.39	4	608	\$2.4
WY	79.96	3.32	60	1,919	\$11.2
Total	–	–	2,032	23,336	\$268.9

Notes: bbl = barrels; mcf = million cubic feet; bcf = billion cubic feet. All state fiscal years run from July 1 through June 30 annually, except TX, which runs from September 1 through August 31. Sums may not total due to rounding.

local property taxes, and lease revenue from state and federal lands. We calculate the government share of revenues collected in each state by dividing the sum of these revenue sources by the total value of that state's oil and gas production.

To determine how oil and gas revenues flow to each level of government, we rely on two sources. Where available, we reference reports from state and local government agencies that document allocations from each revenue stream in FY 2013. In most states, the allocation of those revenues is available through various budgetary reports. Where it is not available, we rely on the relevant state statutes to estimate allocations to different government entities (see [Supplemental information](#)).

One state, North Dakota, has made substantial updates to its oil and gas revenue allocation formulas since FY 2013. To reflect these changes, we apply the most recent allocation formula to revenues collected by the state government in FY 2013. As a result, the allocations shown for North Dakota do not reflect actual FY 2013 values, but instead represent what would have flowed to different government entities in that year had the most recent policies been in place.

For property taxes, state-level policies and data availability vary. Of the 16 states examined here, 11—Arkansas, California, Colorado, Kansas, New Mexico, Ohio, Oklahoma, Texas, Utah, West Virginia, and Wyoming—allow local governments to apply their local property tax rates to the assessed value of oil and gas property, along with the surface equipment associated with exploration and production, such as rigs, wellheads, and other equipment. For these states, we gathered tax rates in FY 2013 for each county, school district, municipality, and special district. We then gathered the assessed value of oil and gas production property for each county within the state. To estimate revenues for counties, we applied the county property tax rate to the assessed value of oil and gas production property within each county. For school districts, we applied the average school district tax rate within each county to the assessed value of oil and gas production within that same county. For municipalities, which do not cover entire counties, and special districts, which may overlap, estimating revenues is more challenging (see [SI](#) for details on methods for each state). To

ensure that our methodology was sound, we cross-checked these estimates against data from several counties in each state. These cross-checks validated the approach. For one state, Wyoming, the state reports data on total local government taxes levied on oil and gas property for school districts, counties, municipalities, and other local governments.

Two states, Alaska and Louisiana, do not allow local governments to levy property taxes on oil and gas production or reserves, but they do allow the taxation of equipment such as wellheads, rigs, and other surface equipment associated with exploration and production. We estimate revenues from those sources using the methods described above.

For most states, we do not include tax revenues from processing/refining infrastructure or transportation infrastructure such as interstate pipelines and compressor stations. Because our focus is on the effect of oil and gas *production* activities on government revenues, we exclude pipelines (with one exception described below), as they are often associated with transmission and distribution, rather than production of oil and natural gas. Similarly, we exclude processing and refining infrastructure, which is often located hundreds of miles from or in different states than oil and gas production centers.

The one exception is the Trans-Alaska Pipeline System, which provides substantial revenue for Alaska governments. This pipeline is entirely associated with crude oil production, does not cross state lines, and is assessed as a stand-alone item in Alaska's annual revenue reporting.

For revenues from oil and gas leases on state land, we collected data through relevant state agencies. In some cases, the allocation of these revenues is not explicitly described, so we rely primarily on statutes and expert interviews to estimate the revenue allocation (see [SI](#)).

We collected data on revenues from oil and gas production on federal lands, along with the allocation of these revenues to state governments, from the federal Office of Natural Resource Revenues, a division of the US Department of Interior. Some states publish the destination of federal lease revenues, but for those that do not, we again rely on statutes and expert interviews to estimate revenue flows (see [SI](#)). [Table 2](#) summarizes state-level revenues.

**Table 2**

Oil and gas revenues for 16 states in FY 2013 (\$millions).

Sources: For severance taxes, other taxes/fees, property taxes, and state lands: various state agencies. For federal lands: US Department of Interior, Office of Natural Resource Revenue (see [SI](#) for details).

State	Severance tax	Other state taxes/fees	Local property taxes	State leases	State share of federal leases
AK	3,972	107	429	2,804	19
AR	91	–	42	No data	2
CA	–	64	505	407	105
CO	136	–	367	104	99
KS	123	8	175	0.6	3
LA	821	5	202	591	27
MT	213	–	–	27	21
ND	2,408	–	–	345	92
NM	781	21	147	543	460
OH	3	2	5	0.005	0.2
OK	494	29	545	90	6
PA	–	226	–	144	–
TX	4,485	1	2,475	1,239	17
UT	53	6	53	69	131
WV	88	27	72	0.2	0.3
WY	597	–	639	140	472
Total	14,264	495	5,657	6,504	1,454

Notes: Sums may not total due to rounding. Types of taxable oil and gas property vary by state. We include local property taxes on oil and gas minerals, produced oil and gas, and exploration/production equipment such as rigs and wellheads. With the exception of AK, where we include property taxes on the Trans-Alaska Pipeline System, we do not include oil and gas refining, processing, or transportation systems, which are not necessarily located in producing regions.

To describe how these revenues flow to different purposes and levels of government, we created five major categories. The first, state current expenditures, includes revenues that are allocated to a state general fund or directly to specific state agencies for operational expenditures. The second, state trust funds, includes revenues that are deposited into savings funds where the endowment is designed to fund future government operations or provide other long-term benefits for citizens instead of regular government spending (though these funds may be tapped under special circumstances that vary by state). We show the inflow, and not the outflow, for these endowments because the annual outflow is determined by past flows into the endowment and investment returns, rather than current year inflows.

The third, funds flowing to primary and secondary education, includes revenues collected directly by school districts, such as local property taxes, as well as revenues collected by the state and allocated to local schools, higher education, or other educational institutions. Fourth, we show revenues flowing into education trust funds, which endow future primary and secondary education. Most western states allocate revenue from state leases to school trust funds, abiding by the stipulation that any revenue generated from the sale of lease of federal lands granted to states be used to further public institutions, primarily education (Souder and Fairfax, 1996).

Finally, we show revenues that are collected by or flow to local governments, including counties, municipalities, hospital districts, and airport authorities. We also include revenues allocated to local governments through grant programs, funds that are set aside to support local governments through grants or low-interest loans. For additional detail on local government revenue sources, see Raimi and Newell (2016b).

#### 4. Results and discussion

In FY 2013, the 16 states produced a total of 2.03 billion barrels (bbl) of oil and 23.3 trillion cubic feet of natural gas. Average oil prices across these states in FY 2013 were \$88.91/bbl, with natural gas prices averaging \$3.40 per million cubic feet, resulting in an aggregate production value of roughly \$269 billion. State and local governments collected a total of about \$28 billion, or roughly 10% of production value, through the four mechanisms we examine here. The aggregate sources and destinations of those revenue flows are shown in Fig. 1.

Although there is substantial variation among states, some general features emerge regarding how revenue sources flow to specific purposes. State severance taxes and similar mechanisms primarily flow to state current expenditures. Revenues from leases on state lands are mostly shared between state current expenditures and education trust funds, whereas revenues from federal leases tend to flow toward education current expenditures. Local property taxes support primarily education current expenditures (i.e., school districts) and local governments (e.g., counties and municipalities).

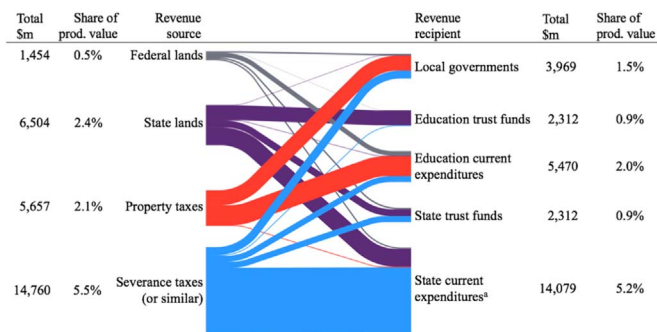


Fig. 1. FY 2013 oil and gas revenue flows for state and local governments in 16 states. <sup>a</sup> A portion of these funds is allocated according to a state budgetary process that includes allocations to education and local government current expenditures.

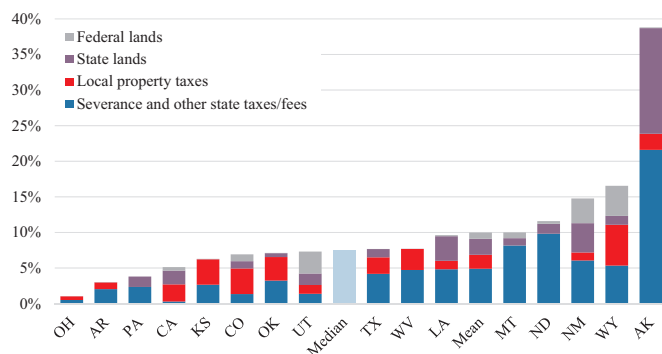


Fig. 2. Sources of government revenues as a share of oil and gas production value in FY 2013. Note: The mean is a simple (unweighted) mean. For the median, only the total revenue is shown because the medians of each category do not sum to the median value of total revenues.

#### 4.1. Comparing state revenue collection

To compare across states, we measure direct revenues for state and local governments as a share of the value of oil and gas produced in each state in FY 2013. In related literature, this metric is often referred to as the government “take” of natural resources revenue. Figs. 2 and 3 present the average state as an unweighted mean. By averaging across states (rather than dividing total government revenue by total production value), we show how a “typical” state collects revenue from oil and gas production. We take this approach because a weighted mean would skew the average towards larger producers (Texas, in particular), making it difficult to discern the typical mix of revenues and underlying policies. For reference, we also include in Fig. 2 revenues for the median state, which reduces the influence of outliers.

On average, state and local government revenues are roughly 10% of total production value, ranging from a low of about 1% to a high of nearly 40% (Fig. 2). The median is roughly 7.5%, substantially lower than the mean due to the reduced influence of outliers, notably Alaska. On average, severance taxes account for the largest portion of the state and local take, followed by state leases, local property taxes, and federal leases.

Before we discuss state-specific details on revenue collection, it is important to note that state and local governments tailor fiscal policies to fit their needs. Thus a low percentage shown in Fig. 2 does not necessarily indicate that a government requires additional revenues from the industry, and a high percentage does not necessarily indicate that government revenues are sufficient to manage any industry-related impacts. We have discussed the issue of whether local government revenues have been sufficient to manage near-term impacts in previous reports (Newell and Raimi, 2015; Raimi and Newell, 2016a).

As Fig. 2 shows, revenue collections vary widely across states (for a detailed discussion on revenue mechanisms in each state, see SI). At the

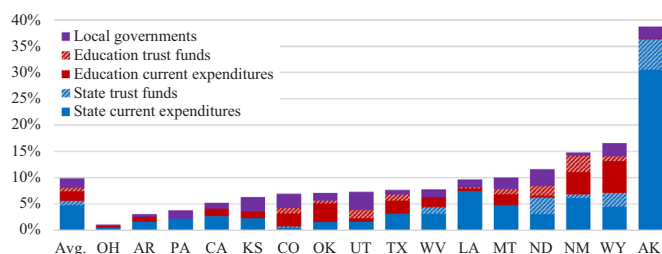


Fig. 3. Uses of government revenues as a share of oil and gas production value in FY 2013. Notes: In most states, a portion of the revenue flowing to state current expenditures goes through an annual budget process, where funds may flow to education current expenditures and local governments. The average is a simple (unweighted) average. For ND, the local governments category includes flows of state severance taxes to tribal governments.



high end, Alaska collected nearly 40% of production value in FY 2013, led by a production tax (21.6%) and revenue from state leases (14.8%). For each state, all four revenue sources can vary substantially from year to year, but Alaska's production tax is particularly prone to volatility. The tax applies to operators' net income, meaning that an operator with \$0 (or less) in net income will pay \$0 in taxes. In addition, Alaska has offered refundable tax credits for certain exploration and production activities. In FY 2015, these refundable credits exceeded production tax collections, leading to net tax revenues of negative \$264 million (Alaska Department of Administration, 2015). While percentage-based taxes on resource profits are generally thought to be more economically efficient than volumetric taxes (e.g., Garnaut and Ross, 1975), they can also lead to greater volatility for governments.

Most other states apply their severance or production taxes to the value or volume of produced oil and gas, leading to less volatility in revenue collection. State and local revenues from property taxes, state lands, and federal lands tend to be based on the value of production (in some states, property taxes are based on the net economic value of reserves) and generally reflect commodity prices and production levels.

Among the states examined here, three—Arkansas, Ohio, and Pennsylvania—collect less than 5% of production value through direct sources, though indirect sources such as corporate incomes taxes or sales taxes may be substantial. In Ohio, a relatively low severance tax rate coupled with modest property tax collections and limited state and federal leasing led to the lowest collections of any state in FY 2013—roughly 1% of production value.<sup>1</sup> In Arkansas, severance-type taxes for oil and gas production apply top rates of 4–5%. However, numerous incentives reduce these headline rates well below that level, with severance-type taxes generating roughly 2% of production value in FY 2013. Pennsylvania collects an annual impact fee from every “unconventional” (i.e., shale) well, generating roughly 2.3% of production value in FY 2013. Pennsylvania also collected 1.5% through state land leases.

States that collect more substantial severance taxes (e.g., Alaska, Montana, North Dakota, Wyoming) apply higher severance tax rates and, in the case of Montana and North Dakota, share a substantial share of those revenues with local governments (discussed below).

Local property taxes provide a major revenue source for local governments and school districts in most of the states where they are levied. Three states—Montana, North Dakota, and Pennsylvania—do not allow local governments to tax oil and gas production property; they instead allocate a substantial portion of state-collected oil and gas revenues to local governments (see SI). In some states, notably California, Colorado, Kansas, Oklahoma, and Wyoming, property taxes generated more total revenue than severance-type taxes in FY 2013. Variation in property tax collections between states varies due to different assessment methodologies (i.e., different tax bases) and different average tax rates between local governments in each state.

State leases provide substantial revenue for several states, notably Alaska, Louisiana, and New Mexico, which respectively collected 14.8%, 4.1%, and 3.5% of production value from this source in FY 2013. This variation is primarily due to the share of oil and gas production that occurs on state lands for each state. In Alaska, the large majority of production occurs on state land along the North Slope. States also vary in the royalty rates they negotiate with operators, ranging from 12.5% to 20% or higher. Royalty rates for production on federal leases are fixed, and collections are higher in western states such as Utah, Wyoming, and New Mexico, where the federal government respectively maintains 65%, 48%, and 35% of total land area (Hardy

<sup>1</sup> Oil and gas lease revenues are collected in Ohio by numerous state agencies that maintain the land on which production occurs. We were able to gather data from just one of these agencies, as statewide data are not collected. However, interviews with state officials suggested that the one unit from which we were able to gather information was the leading recipient of oil and gas lease revenue, indicating that comprehensive data would not qualitatively alter our findings.

Vincent et al., 2014).<sup>2</sup>

#### 4.2. Comparing state uses of revenue

Revenues from the four sources discussed above flow to a variety of state and local government entities according to state-specific policies. Making comparisons among these allocations can be complex, and we group the revenue flows into five major destinations: (1) state current expenditures, funds that flow into state general funds or directly to state agencies to support operational expenses; (2) state trust funds, savings funds that endow future state government operations or, in the case of Alaska, annual disbursements to residents; (3) education current expenditures, funds that are collected by or flow to school districts, units of higher education, or other educational institutions; (4) education trust funds, savings funds that endow future educational operations; and (5) local governments, funds that are collected by or flow to local governments, including counties, municipalities, and others. Fig. 3 summarizes these uses of revenue among the 16 states.

Some states, notably Alaska and Louisiana, use the large majority of revenues to support state current expenditures. Because of the volatility of oil and gas prices and their associated revenue streams, this approach has the potential to generate windfalls when commodity prices are high and lead to budgeting challenges when prices fall. Other states, notably Colorado and Ohio, use only a small fraction of revenues to support current expenditures, helping insulate the state budget from large price swings.

As Fig. 3 shows, oil and gas revenues are put to different uses in each state. On average, 4.8% of the value of oil and gas produced in FY 2013 supported state government current expenditures, with an additional 0.9% flowing into trust funds that support future state operations. Education current expenditures received on average 1.8%, with an additional 0.7% flowing into trust funds to support future education expenses. Counties, municipalities, and other local governments shared 2.1% of production value (see following section).

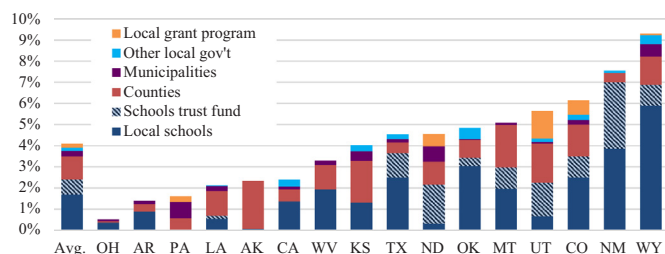
One approach to managing these potentially volatile revenue streams is to use state trust funds that can provide a fiscal cushion during periods of low production or prices. Alaska, North Dakota, and Wyoming respectively allocated 5.8%, 3.2%, and 2.6% of production value to these mechanisms in FY 2013. However, sustained downturns in prices coupled with certain tax policy designs have the potential to drain these funds quickly. For example, recent budget deficits in Alaska due to low oil prices and declining production have led the state to drawdown its Constitutional Budget Reserve Fund by \$3.9 billion and \$3.2 billion in fiscal years 2016 and 2017 (Alaska Office of Management and Budget, 2017). The balance of this fund reached a peak of \$10.1 billion in 2015 (Alaska Department of Revenue, 2016).

Education current expenditures receive the second-largest share of revenue on average. In Oklahoma and Wyoming, educational institutions are the largest recipient of oil and gas revenues. In several states, notably Colorado, New Mexico, Texas, and Utah, a substantial share of oil and gas revenues flows to education through long-term trust funds that support local school districts or higher education. We explore these allocations, along with those to local governments, in the following section.

#### 4.3. Oil and gas revenues for local governments

As noted above, local governments receive revenues either directly through property taxes or indirectly through allocations from the state. The policies surrounding these revenue streams vary widely, both in total allocations and in how funds are shared among school districts, municipalities, counties, and other local government entities. In

<sup>2</sup> The federal government owns 61% of Alaska's total land area, but the vast majority of production occurs on state lands along the North Slope.



**Fig. 4.** Oil and gas revenue sources for local governments in FY 2013. *Notes:* “Counties” refers to boroughs in AK and parishes in LA. “Municipalities” includes townships. This figure shows local government revenues from local property taxes on oil and gas, state allocations of severance taxes, impact fees, and leases of state and federal lands. “Schools trust fund” refers to flows into permanent funds that support future operations. “Local grant program” refers to allocations to local governments via grants or loans. “Other local gov’t” refers to special districts such as sewer and water authorities. The average is a simple (unweighted) mean across all 16 states.

addition, some states allocate substantial revenues to local governments based on grant programs that distribute funds through a competitive process. Fig. 4 summarizes local government revenues.

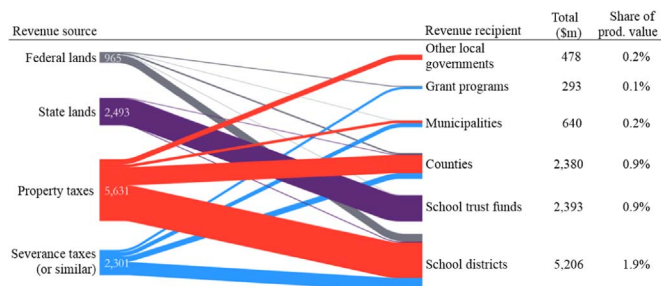
On average, local schools see the largest share of revenue (~ 2.5%), with school districts benefiting through local property taxes and education trust funds receiving revenue from state leases. Most western states allocate revenue from state lands to school trust funds established through land grants from the federal government during westward expansion of the continental United States (Souder and Fairfax, 1996). Schools in Colorado, Oklahoma, New Mexico, Texas, and Wyoming collect the largest share 4–7%), while schools in Louisiana, Ohio, and Pennsylvania receive relatively little direct revenue. This does not necessarily imply that these states are underfunding schools. Each state funds school operations through a range of sources, and these states rely more heavily on sources other than the oil- and gas-related revenues described in this report.

Among county governments, those in Alaska, Colorado, Kansas, Montana, and Utah receive the largest share of revenue 1.5–2%), while counties in Arkansas, California, New Mexico, Ohio, Pennsylvania, and Texas receive smaller shares (< 0.6%). Counties in most states collect the bulk of their revenues through ad valorem taxes on oil and gas reserves, production, or related equipment. In Montana, North Dakota, and Pennsylvania, where localities cannot tax these sources as property, revenues flow to counties primarily through state-levied taxes or, in Pennsylvania, an impact fee.

The wide variation in revenues for schools and counties is largely due to three factors: (1) local governments in different states apply their property tax mill levies to different tax bases, while some do not tax oil and gas property at all; (2) local governments apply a wide range of property tax rates to the value of oil and gas property; and (3) allocations from the state level to school districts and counties vary substantially.

Municipalities and other local governments tend to collect a smaller share of revenues from oil and gas production than counties and school districts (< 0.5% in most cases). Typically, municipalities rely heavily on sales taxes (not included here), which can be indirectly affected through population growth or changes in economic activity associated with oil and gas production. Additionally, municipalities tend to be smaller and more densely populated than counties or school districts. As a result, less oil and gas production occurs within their borders, reducing the availability of property tax revenues. Much of the oil and gas revenues flowing to municipalities pass through the state level, often—but not always—allocated according to local production levels. The states with the highest municipal revenue shares are Kansas, North Dakota, Pennsylvania, and Wyoming 0.5–0.8%).

Grant programs play a significant role in Colorado, North Dakota, Pennsylvania, and Utah, allocating state-collected revenues to local governments through a competitive grant process. Grant programs offer



**Fig. 5.** Aggregate FY 2013 oil and gas revenue flows for local governments. *Note:* These flows include only oil and gas revenues collected by or allocated to local governments.

flexibility and, in principle, allow states to direct revenues to where they are most needed. However, grant programs must balance this discretion with the risk of giving an advantage to local governments that have more resources and skills in grant writing, along with the potential for other forces that could direct spending away from those communities with the greatest need. Fig. 5 illustrates the sources and uses of oil and gas revenues for local governments.

An important revenue source for local governments not captured here is allocations from the state government that are not explicitly tied to oil and gas production in statutes. For example, many states collect large revenues from oil and gas severance taxes, lease revenues, and corporate income taxes and spend those dollars through a budgeting process that is not explicitly tied to oil and gas activity. We do not include those revenue flows here, but instead include them in the state current expenditures category discussed earlier in this paper.

Additionally, local governments may collect revenues from oil and gas leases on local public lands such as parks, airports, or other locations. However, our research has not identified any statewide data on local government lease revenues. Finally, we do not include indirect revenues for local governments such as local sales taxes and—in the rare cases where they exist—local income taxes.

## 5. Conclusions and policy implications

This paper assesses how US state and local governments collect and allocate direct revenues from oil and gas production through four key sources: (1) state taxes levied on the value or volume of oil and gas produced; (2) local property taxes levied on the value of oil and gas property; (3) oil and gas lease revenues from state lands; and (4) oil and gas lease revenues from federal lands.

In the average state, roughly 10% of oil and gas revenue is collected by state and local governments, ranging from a low of roughly 1% to a high of nearly 40%. Because each state tailors fiscal policy to suit its economic and budgetary circumstances, a low percentage does not necessarily indicate that a government requires additional revenues from the industry, and a high percentage does not necessarily indicate that government revenues are sufficient to manage any industry-related impacts.

On average, the leading revenue sources are severance taxes and other similar mechanisms, followed by state oil and gas leases, local property taxes, and federal leases. The bulk of this revenue flows to state current expenditures and education, followed by local governments. Some states also allocate a portion of oil and gas revenues to trust funds endowing future government operations or education expenditures. However, revenue collection mechanisms and allocation policies vary substantially across states, with the shares of these different categories also varying widely.

In some states, notably Alaska, policy design has the tendency to exacerbate rather than smooth out revenue volatility. Policies that exacerbate revenue volatility have the potential to generate windfalls for the government when commodity prices are high but can create substantial budgeting challenges when prices fall. Trust funds can help

smooth out this volatility, but depending on interactions with other revenue policies, they may not be sufficient to manage protracted downturns in commodity prices or production.

This research allows policymakers and other stakeholders to more clearly compare revenue policies between states, and provides a foundation for future research. One important question is what political, economic, or other factors lead states to take different approaches in collecting and allocating revenue, even when they may share similar geologic, socioeconomic, and geographic characteristics. Along similar lines, future research can explore whether certain policy approaches (e.g., allocating large shares to trust funds versus current expenditures) lead to different outcomes in the provision of public services and/or broader economic performance across states. In addition, the current research can provide a foundation to examine whether and how changes in revenue policies within a given state affects the investment climate for operators, the provision of public services, and more.

Notably, state revenue policies typically do not address environmental externalities associated with oil and gas development such as potentially harmful air emissions, risks of water contamination, and climate change. Future research can examine whether certain oil- and gas-driven revenue streams might appropriately be targeted to address these unpriced (and sometimes unregulated) impacts.

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## Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.enpol.2017.10.002>.

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